



PUEY UNGPHAKORN INSTITUTE  
FOR ECONOMIC RESEARCH

# Roles of Parental Risk and Time Preferences in Parental Investment and Aspirations

by

Weerachart T. Kilenthong, Sartja Duangchaiyoosook, and  
Suparee W. Boonmanun

May 2026  
Discussion Paper  
No. 249

The opinions expressed in this discussion paper are those of the author(s) and should not be attributed to the Puey Ungphakorn Institute for Economic Research.

# Roles of Parental Risk and Time Preferences in Parental Investment and Aspirations\*

Weerachart T. Kilenthong<sup>a</sup>, Sarja Duangchaiyoosook<sup>a</sup>, and  
Suparee W. Boonmanunt<sup>b</sup>

<sup>a</sup>University of the Thai Chamber of Commerce (UTCC)

<sup>b</sup>Faculty of Medicine Ramathibodi Hospital, Mahidol University

May 15, 2026

## Abstract

This paper examines how parents' risk and time preferences shape their parental investment and aspirations for children's education and occupations, using a longitudinal survey conducted in rural Thailand. We jointly estimate risk and time preference parameters based on economic theory, using incentivized experiments and incorporating heterogeneous individual background consumption. The first key finding is that parents view parental investment as a risky activity from the early childhood stage onward. Second, parents value later investments more than earlier ones. Third, parents perceive achieving educational success and pursuing a STEM career as risky endeavors

---

\*We thank Thomas Dohmen, Shuaizhang Feng, Glenn Harrison, James J. Heckman, Pacharasut Sujarittanonta, and participants of the Frontiers of Measurement and Formation of Skills conference at Jinan University, and PIER Research Workshop for valuable comments. The authors acknowledge financial support from the Equitable Education Fund (EEF) of Thailand, as well as Sanguansri and Supachai Suthipongchai. The findings and conclusions contained in the report are those of the author(s) and do not necessarily represent the views of the funders.

for their children. This paper also finds that children with divorced parents tend to receive less parental investment, and their parents expect less from them.

**Keyword:** parental investment; education aspiration; occupation aspiration; risk preferences; time preferences; incentivized experiment; early childhood

**JEL Code:** I21; I25; J24

## 1 Introduction

Early parental investment and parental aspirations are key to human capital accumulation (e.g., Knudsen, 2004; Knudsen et al., 2006; Heckman, 2006; Cunha and Heckman, 2008; Del Boca et al., 2014; Boneva and Rauh, 2018; Attanasio et al., 2020, 2022). Providing quality and stimulating time with the child, along with developmentally appropriate toys and learning tools, is a choice parents make. Similar to the standard investment model in financial economics, parental investment choices are determined by their time and material resources, beliefs about the human capital production function, and, importantly, their risk and time preferences. Parental aspirations regarding their children's education and future careers can also be influenced by their preferences.

On the one hand, there is already an extensive literature showing a significant relationship between elicited individuals' economic preferences and their field behaviors, including financial decisions (e.g., Meier and Sprenger, 2010, 2013), health behaviors and outcomes (e.g., Barsky et al., 1997; Chabris et al., 2008; Bradford et al., 2017), and the formation of human capital and schooling outcomes (e.g., Sutter et al., 2013; Cadena and Keys, 2015; Castillo et al., 2019; Falk et al., 2021; Angerer et al., 2023; Wu et al., 2025). However, this literature primarily focuses on the relationship between a person's field behaviors and his/her preferences. On the other hand, the literature investigating the relationship between parents' preferences and their investment in their young children is surprisingly limited, with Checchi et al. (2014); Tabetando (2019); Cuna et al. (2025) being notable exceptions.

This paper aims to provide more empirical evidence regarding this critical issue using a longitudinal survey from rural Thailand, known as the RIECE panel data (RPD), an ongoing early childhood panel dataset starting in 2016, to examine the relationship between parents'

risk and time preferences and their influence on parental investment and aspirations regarding children’s education and occupations. A key strength of the RPD is its longitudinal structure, which enables us to track children from early childhood through their primary school-aged years. The dataset also includes measures of parents’ risk and time preferences collected through incentivized lab-in-the-field experiments.<sup>1</sup> This combination of a long-term panel from early childhood with direct, incentivized measures of preferences provides a novel and complementary perspective on how parental preferences influence both parental investment and aspirations. In addition, the dataset is unique in that only about 30 percent of children had a parent as their primary caregiver, and about half lived without a parent at home. However, for brevity, we use the word parent to refer to the primary caregiver, without biological references, unless stated otherwise.

Conceptually, parents’ risk preferences can influence parental investment because they perceive future benefits from investing in their children as risky. More specifically, they may be uncertain about the human capital production function itself; that is, they may not know what the actual production function is (Attanasio et al., 2024; Cunha et al., 2022). In other words, the productivity of each input to the production function is uncertain, at least from the parent’s perspective. Risk-averse parents may respond to this uncertainty by lowering their investment. Therefore, a negative and significant correlation between parents’ risk aversion parameters and parental investment activity can be interpreted as evidence that parents view such activity as risky.

Time preferences influence parental investment when parents believe the investment yields positive marginal returns in the future. Technically, parents compare the discounted marginal returns of the investment with its marginal cost. Therefore, Parents’ time preferences will respond significantly only to a parental investment activity that they perceive as an important input for human capital formation in future outcomes. On the other hand, we may observe an insignificant impact of time preferences on parental investment if parents do

---

<sup>1</sup>Several longitudinal surveys have questions regarding parents’ preferences, e.g., The German Socio-Economic Panel (SOEP), The Panel Study of Income Dynamics (PSID), but those questions are hypothetical, not incentivized. The Longitudinal Study of Children’s Development (LSCD) from Mianzhu, China, has elicited children’s preferences using incentivized experiments, but not those of their parents (Wu et al., 2025).

not expect a positive marginal return on the investment. For example, as this paper finds, the correlation between parents' discount factors and parental investment activity during the primary school-aged years is significant (parents with different discount factors invested differently), whereas that for the early childhood stage is insignificant. These findings indicate that parents may perceive the marginal returns to investment during early childhood to be smaller than in later stages. In other words, parents value later investments more than earlier ones, even though new scientific evidence overwhelmingly shows that investment returns are highest at the early stage of children's lives (Knudsen, 2004; Cunha and Heckman, 2007; Currie and Almond, 2011).

Technically, this paper addresses an error-in-variable problem arising because the risk and time preference parameters are generated variables estimated using an instrumental-variables approach. More specifically, we utilized the fact that we have multiple elicitation data points for each preference type. Following Durbin (1954), we use other elicitation outcomes as instruments to correct for the error-in-variable bias of the primary outcomes. In addition, because the investment and aspiration data were collected over several years, whereas the preferences were elicited only once, this paper assumes temporal stability of preferences, i.e., that adults' preferences remain stable over time. However, the related empirical findings are mixed: some confirmed the proposition (e.g., Meier and Sprenger, 2010), while others rejected it (e.g., Halevy, 2015; Harrison et al., 2025).

This paper documents three main findings. First, parents view parental investment in early childhood as risky. This interpretation is supported by robust empirical evidence from this study, which confirms that more risk-averse parents invest less in their children aged 4-6 years. Second, parents tend to value later investments (during the primary school-aged years) more than earlier ones (during the early childhood stage). This is supported by empirical findings showing that the correlation between parents' discount factors and their later investment (aged 7-9 years old) is significant, whereas the correlation for the earlier period (aged 4-6 years old) is insignificant. Third, parents perceive achieving educational success and pursuing a STEM career as risky endeavors for their children. That is, more risk-averse parents tend to have lower aspirations regarding their children's education and are less likely to want their children to pursue careers in STEM fields.

The closest study to ours is Tabetando (2019), which examined the relationship between parental risk aversion and human capital investment decisions, i.e., education expenditure, similar to ours. However, ours considers many more outcomes, including time and material investment, as well as educational and occupational aspirations. The other closely related paper is Cuna et al. (2025), which investigated the roles of parental risk aversion and ambiguity aversion in parental investment, focusing on early-life nutrition and children’s later skills. Again, ours considers many more types of parental investment and aspirations. Though we did not examine the effect on children’s skills. With a richer background than either study, our analysis can account for a broader set of household and parental characteristics. Checchi et al. (2014) differs from the other two and our papers in that the children in their study were effectively adults aged 19-30 years old, whose educational decisions may no longer be determined by their parents.

This paper is related to a strand of literature that jointly estimates risk and time-preference parameters based on economic theory (e.g., Andersen et al., 2008; Andreoni and Sprenger, 2012; Kuroishi and Sawada, 2024). Kuroishi and Sawada (2024) is similar to the majority of the literature in this area, which has not incorporated participants’ background consumption into parameter estimation. On the other hand, Andersen et al. (2008) and Andreoni and Sprenger (2012) estimated the parameters by incorporating background consumption. More specifically, the former used the average weekly consumption of the population (not the participants), while the latter accounted for background consumption using the participants’ average daily consumption. Our paper used rich panel survey data to account for individual participants’ background consumption using long-term average per capita weekly consumption. We found that incorporating heterogeneous individual background consumption does matter for estimating the risk aversion parameter, as evidenced by a more symmetric distribution of the estimated risk aversion parameter compared to the case without background consumption or to using the average background consumption.

The remainder of the paper is organized as follows. Section 2 presents the data sources and key measurements, including risk and time preference parameters. Section 3 describes the statistical model. Empirical results are presented in Section 4. Section 5 concludes and discusses the paper. Appendix A provides a simple economic model of parental investment,

while Appendix B presents additional estimation results. Supplementary materials are in the Online Appendix.

## 2 Data and Measurement

This paper utilizes early childhood panel data from rural Thailand, specifically the RIECE panel data (RPD). The survey began in June 2016 and targeted children aged 1 to 4 years at baseline. The survey covers 21 Tambons (sub-districts) in Mahasarakham province and two Tambons in Kalasin province.<sup>2</sup> The survey contains rich information about households, children, and school information. The children’s questionnaire includes information on parental investment—both time and material—and parents’ educational and occupational aspirations for their children, which are crucial to our study. This paper utilizes survey data collected from 2016 to 2022.

### 2.1 Risk and Time Preferences

We used this ongoing panel survey to conduct lab-in-the-field experiments measuring time and risk preferences using two incentivized tasks in 2019 and 2021, respectively.<sup>3</sup> Both tasks were conducted one-on-one at home. The first was for time preferences and was conducted on 929 parents/caregivers from 929 households during June and November 2019. The second experiment elicited risk preferences using a similar procedure to the first and was conducted among 1,270 caregivers from 1,116 households during August 2021 and May 2022. However, only 626 parents from 626 households participated in both tasks. Given that some households have more than one sampled child, those parents can be matched with 702 unique children who participated in the survey between 2016 and 2022.

---

<sup>2</sup>The survey covers Mahasarakham and Kalasin provinces, where the RIECE Thailand project originated. Therefore, it is referred to as RIECE panel data (RPD). There are between 8 and 24 villages per Tambon in the survey areas, with an average of 14. See more details at <https://riped.org/data/riec-panel-data/>.

<sup>3</sup>This paper assumes the standard assumption of temporal stability of preferences. This assumption posits that adults’ preferences remain stable over time; therefore, we can use the one-time elicitation results for this analysis, which were collected at different time points.

### 2.1.1 Elicitation Tasks for Time Preferences: Multiple Price List Method

Following Coller and Williams (1999), we elicited time preferences using the price list method. Each participant was asked to choose between a sooner-but-smaller payoff in option A and a later-but-larger payoff in option B in each decision. There were two choice sets, each comprising 6 decisions, for a total of 12.

For the  $j^{\text{th}}$  decision of choice set 1, each participant had to choose between the sooner-but-smaller reward,  $M_{A,j}^T = 100$  Thai Baht (THB), in the next month and the later-but-larger reward  $M_{B,j}^T$  in two months. There are six different decisions, as shown in Table 1. Choice set 2 is similar, except for the payment dates: “today” for option A and “next month” for option B. The order of the choice sets was random. Note that the maximum payoff of 200 THB was about 30% of the average per capita weekly consumption of the sample in 2019 (approximately 670 THB).

Table 1: Price list in the choice set 1 for the time preference elicitation task

Decision	Option A ( $M_{A,j}^T$ ) next month		Option B ( $M_{B,j}^T$ ) in 2 months
1	100	or	105
2	100	or	110
3	100	or	120
4	100	or	130
5	100	or	150
6	100	or	200

All rewards are in Thai Baht (THB).

This is an incentivized task with a monetary payment, determined by the following randomization procedure. The participant first rolled a six-sided die to determine the choice set, then rolled again to select the awarding decision from the six options in the randomly chosen set. This randomization procedure alleviates potential income effects, generated from the tasks (Charness et al., 2016). This random process was known to all participants. The average award from the time-preference elicitation across all 929 participants was 121 THB.

This experiment was conducted on samples from the annual RIECE panel’s household

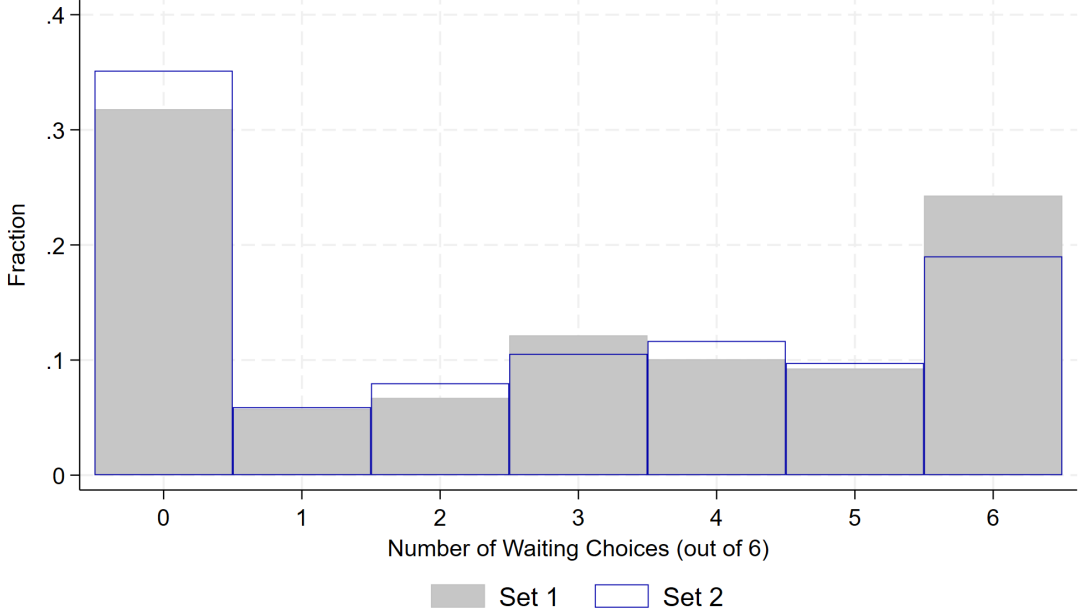


Figure 1: Distributions of the number of waiting choices for set 1 and set 2.

survey, in which participants had participated for 4 years. In addition, “today” payoffs were not paid immediately but in the evening on that day, and all payoffs, including those of “today”, were paid via bank transfers to maintain trust and keep transaction costs homogeneous across all options. Therefore, there should be no concerns about trust and transaction costs that might confound participants’ intertemporal decisions. See more details in Boonmanunt et al. (2025). Figure 1 illustrates the distributions of the number of waiting choices for set 1 and set 2.

### 2.1.2 Elicitation Tasks for Risk Preferences: Multiple Price List Method

We elicited time preferences using the price list method, following Holt and Laury (2002). The procedure for risk preference was similar to the one for time preference. Each participant was asked again to choose between a bundle of less-risky payoffs in option A and a bundle of riskier payoffs in option B. See Table 2 below. Payoffs for options A and B were fixed and denoted by  $(M_{A,l}^R = 1,000, M_{A,h}^R = 1,200)$  and  $(M_{B,l}^R = 100, M_{B,h}^R = 2,500)$ , respectively. The variation of the payoffs defined the riskiness of each option. Note that the maximum payoff of 2,500 THB was about four times the average per capita weekly consumption of the sample

in 2020. Payoffs presented in Table 2 indicate that option A was less risky than option B.

Table 2: Price list for the risk preference elicitation task

Decision	Prob. of Larger Payoff $\pi_j$	Option A		Option B	
		$M_{A,l}^R$	$M_{A,h}^R$	$M_{B,l}^R$	$M_{B,h}^R$
1	0.1	1,000	1,200	100	2,500
2	0.2	1,000	1,200	100	2,500
3	0.3	1,000	1,200	100	2,500
4	0.4	1,000	1,200	100	2,500
5	0.5	1,000	1,200	100	2,500
6	0.6	1,000	1,200	100	2,500
7	0.7	1,000	1,200	100	2,500
8	0.8	1,000	1,200	100	2,500
9	0.9	1,000	1,200	100	2,500
10	1.0	1,000	1,200	100	2,500

All rewards are in Thai Baht (THB).

The payment procedure was similar to the time preference elicitation except for the dice, which were ten-faced dice in this case. The ten-faced dice is more suitable because there were ten decisions with ten different probabilities. Participants rolled the dice to determine the awarding decision from among the ten possible outcomes. They then rolled the dice again to determine the reward according to the lottery/probability of that decision. For example, if the awarding decision is decision 3, the outcomes of the dice corresponding to the larger payoff include 1, 2, and 3, while the rest are for the smaller payoff. The average award from the risk preference elicitation for all 1,270 participants was 1,377 THB.

In addition to the paying round of the ten decisions, we asked each participant to practice the task (ten decisions) for one round. This was to ensure that participants understood the rules of the task well. This practice round is helpful for this study because it can be used to correct measurement errors in risk preference parameters. See section 3 for more details. Figure 2 illustrates the distributions of the number of risky choices for the paying and practice rounds.

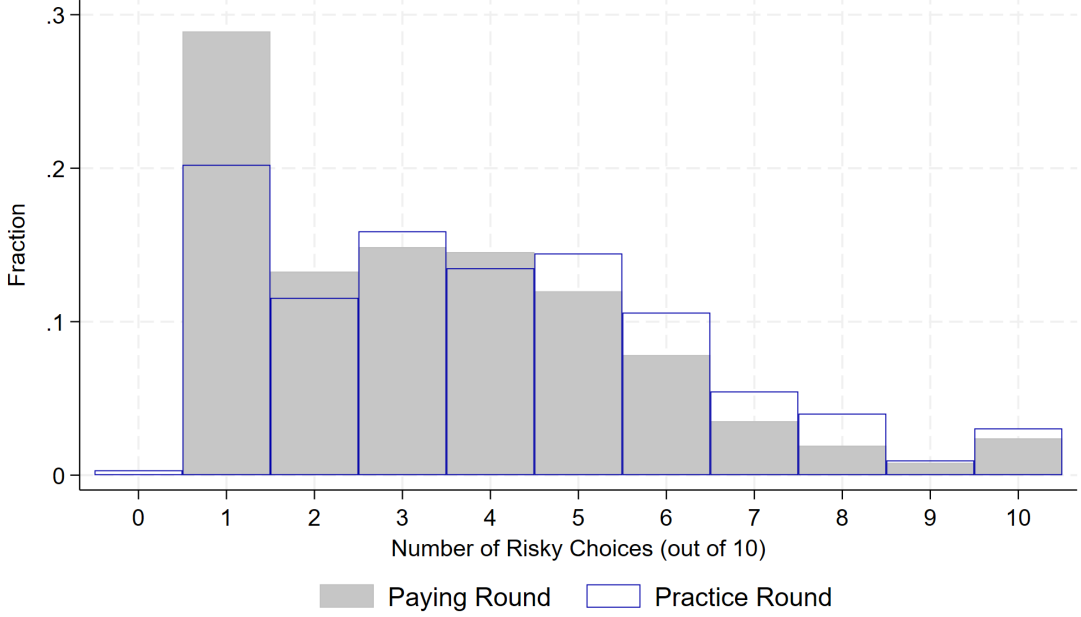


Figure 2: Distributions of the number of risky choices for the paying and practice rounds.

### 2.1.3 Estimating Individual Risk and Time Preference Parameters

This section estimates each individual's risk aversion coefficient (risk preference parameter) and discount factor (time preference parameter), using the following identification strategy. We first identified the relative risk aversion coefficient,  $\gamma_i$ , using data from the risk-preference task. Based on the estimated  $\gamma_i$ , we then estimated the discount factor using the data from the time-preference task.

We first assumed that each individual has the following constant relative risk aversion utility function.

$$U_i(c) = \frac{c^{1-\gamma_i} - 1}{1 - \gamma_i}, \quad (1)$$

where  $\gamma_i$  is the relative risk aversion coefficient parameter of agent  $i$ , and  $c$  is his/her consumption. Each individual is assumed to be an expected utility agent. We, therefore, estimated each individual's risk aversion parameter,  $\gamma_i$ , using the following indifference condition.

$$(1 - \pi^*) U_i(c_i + M_{A,l}^R) + \pi^* U_i(c_i + M_{A,h}^R) = (1 - \pi^*) U_i(c_i + M_{B,l}^R) + \pi^* U_i(c_i + M_{B,h}^R), \quad (2)$$

where  $M_{O,l}^R$  and  $M_{O,h}^R$  denote the lower and the higher payoffs from option  $O = A, B$ , respectively, and  $\pi^*$  is the indifference probability at which the individual values both options equally. Practically, for an individual who switches from one option to another between task  $j$  and  $j + 1$ , we set  $\pi^* = \frac{\pi_j + \pi_{j+1}}{2}$ , where  $\pi_j$  is the probability of getting the larger payoff in task  $j$ .<sup>4</sup> Technically, we solved the indifference condition, Eq.(2), for the individual's relative risk aversion coefficient parameter,  $\gamma_i$ , using a bi-section approach. For an individual who switches more than once<sup>5</sup>, we estimated the parameter at each switching point and then averaged them.

Importantly, this estimation incorporated the individual background consumption using per-capita household consumption. This is feasible because RPD collects detailed consumption data for each household every year. Our benchmark analysis utilized the household's weekly non-durable expenditure per capita, averaged over five years (2017-2021), as individual consumption, denoted as  $c_i$ .<sup>6</sup> We used weekly consumption because our rewards are relatively small, especially for the time preference tasks. Therefore, each individual may benchmark their decisions with their weekly consumption. Notably, this estimation employed a heterogeneous weekly individual consumption per capita, rather than the homogeneous overall average weekly consumption per capita for everyone, as in Andersen et al. (2008). The risk aversion parameter using heterogeneous individual consumption based on the main sample of 626 individuals has a mean of 1.81, a median of 1.81, and a standard deviation of 2.11, indicating that the average individual in this sample is relatively risk-averse, with about 21 percent of the sample as risk-loving individuals (with a negative estimated risk aversion parameter).<sup>7</sup>

Figure 3 illustrates the distributions of the estimated risk aversion parameter,  $\hat{\gamma}_i$ , when using individual consumption, and no consumption ( $c = 0$ ). The distribution is more sym-

---

<sup>4</sup>For example, consider an individual who chose safer option at task  $j = 6$  with  $\pi_j = 0.6$  and switched to the riskier one at task  $j + 1 = 7$  with  $\pi_{j+1} = 0.7$ . The indifference probability (or switching point) is set to be the midpoint, i.e.,  $\pi^* = \frac{\pi_j + \pi_{j+1}}{2} = 0.65$ . For an individual who chose option B at the beginning and never switched (2% of all samples), we set  $\pi^* = 0.05$ . Note that all participants chose option B when the probability of the larger payoff was one.

<sup>5</sup>There were about 26% of the sample who switched more than once.

<sup>6</sup>Mean of weekly consumption per capita of 626 households in the main sample is approximately 670 THB

<sup>7</sup>The risk aversion parameter using heterogeneous individual consumption based on the whole sample of 1,270 individuals has a mean of 1.78, a median of 1.76, and a standard deviation of 2.02.

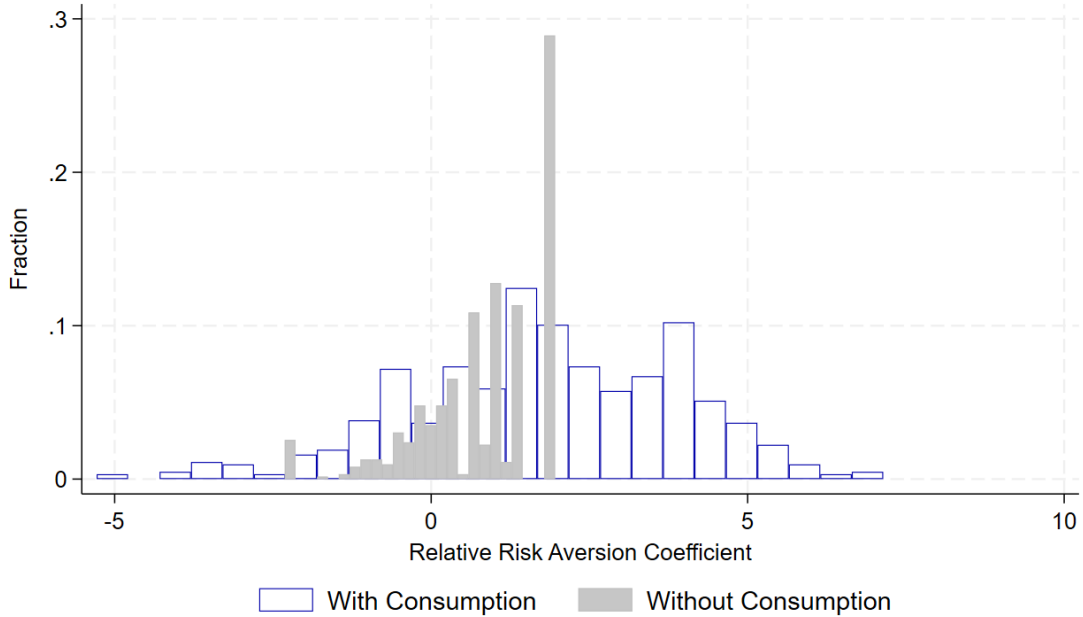


Figure 3: Distributions of estimated risk aversion parameter,  $\hat{\gamma}_i$ , when using individual consumption, and no consumption ( $c = 0$ ).

metric with heterogeneous background consumption than with no background consumption. The figure indicates that the standard deviation of the estimated risk aversion parameter is larger when using background consumption (about 2.11) than when not (about 1.01). In addition, the average risk aversion parameter for the former is about 1.81, significantly larger than the 0.84 estimate of the case without background consumption. The latter estimate is comparable to the estimate of 0.74 reported in Andersen et al. (2008), which assumed identical per-capita background consumption for everyone. On the other hand, the estimate in Tanaka et al. (2010), which utilized the Vietnamese sample, indicates an even smaller risk aversion parameter of approximately 0.39, without accounting for background consumption.<sup>8</sup> These results imply that incorporating heterogeneous individual background consumption matters greatly for estimating the risk aversion parameter.

With the estimated risk aversion parameter,  $\hat{\gamma}_i$ , we estimated the discount factor for

<sup>8</sup>They estimated the utility function curvature by taking a weighted average from the south (with 98 observations) and the north (with 83 observations) samples:  $\frac{0.59 \times 98 + 0.63 \times 83}{181} = 0.61$ , leading to the estimate of risk aversion parameter of 0.39. Note that Tanaka et al. (2010) estimated the one-parameter form of the prospect theory (Prelec, 1998), not the standard expected utility model.

each  $i$  as follows. Each individual is assumed to make an intertemporal decision based on the following indifference condition.

$$U_i(c_i + M_A^T) + \delta_i U_i(c_i) = U_i(c_i) + \delta_i U_i(c_i + M_B^{T*}), \quad (3)$$

where  $\delta_i$  is the discount factor of individual  $i$ ,  $M_A^T$  is the earlier fixed reward (100 THB), and  $M_B^{T*}$  is the later rewards, at which the individual values both options equally. Practically, for an individual who switches from one option to another between task  $j$  and  $j + 1$ , we set the switching point as  $M_B^{T*} = \frac{M_{B,j}^T + M_{B,j+1}^T}{2}$ , where  $M_{B,j}^T$  is task  $j$ 's future reward for option B.<sup>9</sup> We solved for the individual's discount factor,  $\delta_i$ ,<sup>10</sup> using the following formula.

$$\hat{\delta}_i = \frac{U_i(c_i) + U_i(c_i + M_A^T)}{U_i(c_i) + U_i(c_i + M_B^{T*})}. \quad (4)$$

Again, for an individual who switches more than once, we estimated the parameter at each switching point and then averaged them.

The monthly discount factor, calculated using heterogeneous individual consumption data from 626 individuals, has a mean of 0.77, a median of 0.82, and a standard deviation of 0.19. This monthly estimate equals the annual discount factor of about 0.043. Even though this estimate is much lower than the one in Andersen et al. (2008), which is about 0.90, it is surprisingly close to 0.021 from Vietnam, a neighbor of Thailand (Tanaka et al., 2010).<sup>11</sup> One potential explanation is that the Thai and Vietnamese samples share similar characteristics and responded to the elicitation tasks in a similar manner.

Figure 4 illustrates the distributions of estimated discount factor,  $\hat{\delta}_i$ , when using individual consumption, and no consumption ( $c = 0$ ). In contrast to the risk aversion parameter, both distributions are similarly left-skewed; that is, most of the sample has a relatively large discount factor. In particular, the fraction of samples with a monthly discount factor exceeding 0.97 was about 53% in the benchmark case and 80% in the no-consumption case.

---

<sup>9</sup>For an individual who chose to wait at the first item and never switched back,  $M_{B,1}^T = 105$ , we set the switching point as  $M_B^{T*} = 102.5$ . This assumption is that there is a single hidden decision between earlier and later rewards of 100 THB, and the individual always chooses not to wait for that decision. Similarly, for an individual who chose not to wait for all six decisions, we set  $M_B^{T*} = 210$ .

<sup>10</sup>The discount factor can be transformed into the discount rate,  $d$ , using the following equation:  $d = \frac{1}{\delta} - 1$ .

<sup>11</sup>Note that Tanaka et al. (2010) estimated not only the long-term discount factor, but also the other parameters of a prospect theory.

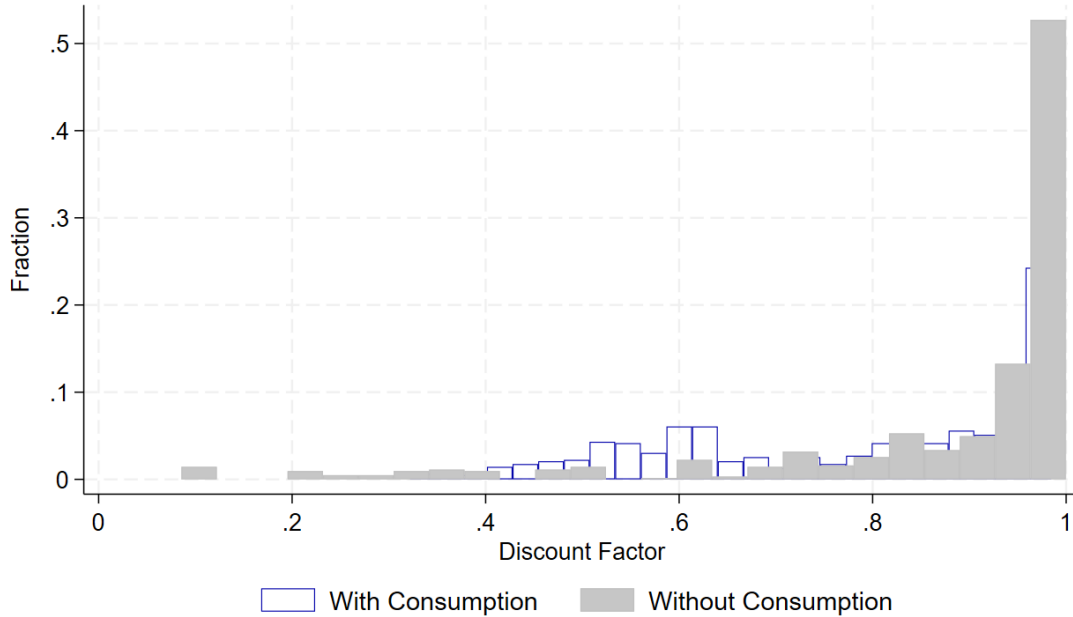


Figure 4: Distributions of estimated monthly discount factor,  $\hat{\delta}_i$ , when using individual consumption, and no consumption ( $c = 0$ ).

On the other hand, the average discount factor for the former is approximately 0.77, which is appreciably smaller than the 0.88 estimate for the case without background consumption.

## 2.2 Parental Investment and Education Expenditure

RIECE Panel Data (RPD) asked the parents about parental investment, including material and time investments, namely ownership of learning tools and time spent with the child on specific activities. We used the information to generate material and time investment indices. The dataset also collected expenditure information for various learning and education tools and activities. That information was used to measure education expenditure.

Following Cunha and Heckman (2007), we conceptualize parental investment as a latent factor. In addition, different types of investment may contribute differently to child development depending on the child's age.<sup>12</sup> To account for such heterogeneity, we calculated the

<sup>12</sup>For convenience, we first define an age group of a child at the baseline using her/his year of age at the baseline (when she/he entered the survey). In the following survey round, the child will automatically advance to the next age group, regardless of their age. For example, a child who entered the survey in 2016, when she was 4 years old, will be placed in age group 4 in 2016, then in age group 5 in 2017, and so on.

investment indices for each age group (age group 3 to age group 10 in most cases) separately. On the other hand, the questionnaire for each age group asked an overlapping but different set of tools and activities. As a result, the investment indices for various age groups may be derived from different sets of tools and activities.

We estimated the material investment index using the following four variables: the number of storybooks, the number of picture books, the number of posters showing alphabets and/or numbers, and the number of writing and counting exercises for the younger cohorts (3-6 years old), while the older ones (7-10 years old) dropped the last item due to the data limitation. To reduce measurement errors and dimensionality, we employed exploratory factor analysis (EFA) to assess the number of latent factors for each age group. The analysis confirms that there is only one latent factor of material investment for each age group, as shown in the Online Appendix. We predicted the factor score using the Bartlett method (Bartlett, 1937). We then standardized the material investment index to have a mean of zero and a standard deviation of one.

The activities used for generating time investment include reading, storytelling, drawing and coloring, role-playing, writing and counting practice, and homework. The unit of measurement for each activity is the number of days per month in the last month. As in the material investment case, we confirmed that there is only one latent factor for time investment using the EFA, predicted the factor score using the Bartlett method, and then standardized the time investment index to have a mean of zero and a standard deviation of one.

Education expenditure refers to the total sum of expenses for the following eight items and activities: toys, stationery, tablets, mobile phones, transportation, tuition, daily allowance, and private tutoring. The unit of each expense is Thai Baht per month. We then standardized the education expenditure to have a mean of zero and a standard deviation of one for each cohort. In addition to the sum of expenses, we also generated a dummy variable indicating whether the child had paid for private tutoring, which is a popular activity

---

Another sample may have entered the baseline at age 3. He will be placed in age group 3 in 2016 and then in age group 4 in 2017. Samples for each age group may come from different survey rounds. To account for differences across survey rounds, we will control for their fixed effects in the regressions.

among young students in Asia (e.g., Kim and Lee, 2010; Bray, 2023), as it was perceived as an essential means of passing entrance examinations to good schools or universities in the future. See the summary statistics of all underlying items and the results of factor analysis in the Online Appendix.

### 2.3 Parental Aspiration and Expectation regarding the Child’s Education and Occupation

Another unique feature of the RPD is information on parental aspirations and expectations regarding the child’s education and occupation. We first generated a dummy variable indicating whether parents *aspired* their children to complete at least a college degree, using the following question: “What is the highest level of education to which you aspire for the child to complete” Similarly, we formed a dummy variable indicating whether parents *expected* their children would complete at least a college degree, using the following question: “What is the highest level of education that you expect the child will complete” The former variable measures the parents’ aspiration, while the latter captures their belief conditional on the children’s ability, parental investment, household financial situation, and other factors. Therefore, we anticipate that economic preferences may influence the latter concept more strongly than the former.

For occupation aspiration, we focused on two classes of occupations: STEM (Science, Technology, Engineering, and Mathematics) and non-government jobs. STEM jobs include doctors, dentists, nurses, engineers, computer and IT workers, and scientists. We first grouped teachers, soldiers, policemen, and other civil servants or government employees as government careers, and then defined non-government careers as jobs outside government. As a result, non-government jobs encompass STEM jobs. We generated two dummy variables indicating whether parents *aspired* for their children to have a STEM job and a non-government job, respectively.

### 2.4 Samples

The sample in this study comprises 712 children aged 3-10 years who participated in the survey between 2016 and 2022 and had their parents perform both risk and time elicitation

tasks. However, the pooled sample contains only 3,680 observation-years for which children could be matched with parents who performed both tasks because some children did not participate in all survey rounds. These 3,680 observation-years constitute our main sample in this study. On the other hand, the whole sample in this study comprises all children aged 3-10 years who participated in the survey between 2016 and 2022.

## 2.5 Summary Statistics

Table 3 presents summary statistics of key variables for our main sample and the whole sample of the RPD. To save space, we discuss only a few interesting variables here. About 81% of the main sample aspired/wanted their children to have at least a college degree, but only 35% expected them to succeed. This may be because Thai rural households faced financial constraints, or they generally underestimated their children’s abilities. Only 19% of the samples would like their children to pursue a STEM job. A unique feature of this data set is that most primary caregivers (approximately 70%) were not parents, with the majority being maternal grandmothers, whereas most of the literature has studied the data of children and their biological parents. The primary reason for the high rate of non-parent caregivers is parental absence, which accounts for 52% of the main sample. Another interesting but alarming feature of the sample is the high divorce rate, which was approximately 32% for the main sample and reached 40% among the samples interviewed in the 2022 survey year. Approximately 16% of the children in the main sample were born to teenage mothers. These last three statistics suggest that our samples were relatively disadvantaged in terms of parent characteristics.

## 3 Statistical Model

The benchmark model for this paper is the following linear specification:

$$Y_{i,a} = \beta_{0,a} + \beta_{\gamma,a}\hat{\gamma}_i + \beta_{\delta,a}\hat{\delta}_i + \beta_{X,a}\mathbf{X}_{i,a} + \lambda_{t,a} + \varepsilon_{i,a},$$

where  $Y_{i,a}$  is the outcome of interest (parental investment, education expectation, and occupation expectation) when the child was  $a$  years old (technically, in age group  $a$ ),  $\hat{\gamma}_i$  and

Table 3: Summary statistics of key variables based on the pooled sample.

	Main Sample			Whole Sample		
	Mean	SD	N	Mean	SD	N
Materials investment	-0.04	0.92	3,409	0.00	1.00	8,086
Time investment	-0.04	0.97	3,505	0.00	1.00	8,385
Education expenditure	-0.14	0.74	3,675	0.00	1.00	9,617
Private tutoring	0.08	0.28	3,317	0.10	0.30	8,642
Expecting college or above	0.35	0.48	2,296	0.34	0.48	5,916
Aspiring for college or above	0.81	0.39	2,296	0.79	0.41	5,916
Aspiring for non-gov.	0.54	0.50	1,772	0.55	0.50	4,829
Aspiring for STEM jobs	0.19	0.39	1,772	0.17	0.37	4,829
Risk aversion coeff.	1.83	2.11	3,680	N.A	N.A	N.A
Discount factor	0.77	0.18	3,680	N.A	N.A	N.A
No. of waiting decisions	2.63	2.36	3,680	N.A	N.A	N.A
No. of riskier decisions	3.36	2.23	3,680	N.A	N.A	N.A
Wealth	-0.07	1.08	3,680	0.00	1.30	9,539
Divorce before	0.32	0.47	3,680	0.34	0.47	9,642
Teen mom	0.18	0.38	3,680	0.19	0.39	8,382
Parental absence	0.52	0.50	3,680	0.41	0.49	9,642
Schooling CG	7.17	3.52	3,680	7.26	3.68	9,569
Age of CG	49.76	12.54	3,680	49.78	13.25	9,594
Parent as CG	0.30	0.46	3,680	0.31	0.46	9,632
Female CG	0.93	0.25	3,680	0.91	0.29	9,631
Female	0.49	0.50	3,680	0.49	0.50	9,642
Firstborn with sibling	0.16	0.37	3,680	0.16	0.37	9,642
Notfirstborn with sibling	0.23	0.42	3,680	0.24	0.43	9,642
HH size	4.91	1.62	3,680	5.18	1.75	8,830
No. children	1.66	0.75	3,680	1.73	0.80	8,830
No. siblings	0.39	0.57	3,680	0.42	0.59	9,642
No. chronic diseases	0.24	0.51	3,680	0.27	0.54	8,761

$\hat{\delta}_i$  are parents' estimated parameters of risk aversion and discount factor, respectively, and  $\lambda_{t,a}$  are the survey-year fixed-effects.  $\mathbf{X}_{i,a}$  is the set of control variables when the child was  $a$  years old, including household wealth, a dummy variable indicating that parents were divorced before the interview, a dummy variable indicating that the mother was a teenage mother when pregnant with the child, a dummy variable indicating that both parents were not a household member<sup>13</sup> or parental absence, caregiver's years of schooling, caregiver's age, a dummy variable indicating that the caregiver is a biological parent, caregiver's gender (female), child gender (female), a dummy variable indicating that the child is a firstborn with siblings, a dummy variable indicating that the child is not a firstborn, household size, the number of children in the household (younger than 13 years old), the number of siblings in the household, and the number of household members with chronic diseases.

Key parameters of interest are  $\beta_{\gamma,a}$  and  $\beta_{\delta,a}$ , which capture the relationship between risk and time preferences and the outcomes of interest, respectively. We clustered standard errors at the child level, as each child may have multiple observations in the pooled data. We expect to observe the above relationships because parents are primarily responsible for their children's education and learning decisions, and consequently, their risk and time preferences should influence parental investment and aspirations.

In addition, since  $\hat{\gamma}_i$  and  $\hat{\delta}_i$  are estimated variables, the error-in-variable problem is a concern. Following Durbin (1954), we utilized the multiplicity of risk and time tasks to correct for measurement errors of the estimated variables. More specifically, we used the number of riskier decisions (out of ten) from the practice round as the instrument for the risk aversion parameter, and the number of waiting decisions (out of six) from the choice set 2 is the instrument for the discount rate. The identification assumption is that the measurement errors from estimating the risk and time preference parameters are uncorrelated with the errors from the practice round of the risk task and the choice set 2 of the time task, respectively.

---

<sup>13</sup>This survey defines a household member as an individual who has spent time in the household more than six months since the last 12 months.

## 4 Estimation Results

Panel A of Table 4 presents the estimation results based on the main sample of all cohorts for material investment (Ma.), time investment (Time), education expenditure (Edu. Exp.), private tutoring (Tutor), expecting the child to have at least a college degree (Exp. BA), aspiring the child to have at least a college degree (Asp. BA), aspiring the child to have a non-governmental job (Asp. NGov), and aspiring the child to have a STEM job (Asp. STEM), using the instrumental variable approach to correct for measurement errors. See a corresponding table using an ordinary least squares (OLS) method in the Appendix.

As expected, we found that having more risk-averse parents is negatively associated with parental investment and education and occupation aspirations, except for education expenditure, as shown in the first row of column (1) in Panel A of Table 4. However, only the estimation coefficients for relative risk aversion for material investment, private tutoring, expecting the child to have at least a college degree, and aspiring the child to have a STEM job are statistically significant. More specifically, a one-standard-deviation increase in the relative risk aversion coefficient is associated with a decrease in material investment, in the probability of having private tutoring, in the probability of expecting the child to have at least a bachelor degree, and in the probability of aspiring the child to have a STEM job, by 0.06 SD, 1.9 percentage points, 4.2 percentage points, and 4.2 percentage points, respectively. These numbers are the product of each estimation coefficient and the standard deviation of the relative risk aversion coefficient, which is approximately 2.11. The negative relationship between the relative risk aversion coefficient and material investment, as well as private tutoring, suggests that parents perceive parental investment to be a risky activity. Similarly, the negative results for expecting the child to have at least a college degree and aspiring the child to have a STEM job suggest that achieving educational success and pursuing a STEM job are perceived as risky endeavors for their children.

The most disappointing finding so far is the insignificant result of time preferences, as shown in the second row of Panel A. Conceptually, more patient parents with a larger discount factor should invest more in their children when parental investment is a long-term commitment. One potential explanation is that the time discount factor is too noisy to deliver

Table 4: Estimation results based on the main sample using the instrumental variable approach to correct for measurement errors.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Ma.	Time	Edu. Exp.	Tutor	Exp. BA	Asp. BA	Asp. NGov.	Asp. STEM
Panel A: All Cohort								
$\hat{\gamma}$	-0.03**	-0.02	-0.00	-0.01**	-0.02***	-0.00	-0.01	-0.02**
	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
$\hat{\delta}$	0.28	0.00	0.04	0.09	0.16	-0.01	0.03	0.03
	(0.25)	(0.24)	(0.18)	(0.06)	(0.12)	(0.11)	(0.16)	(0.12)
$N$	3409	3505	3675	3317	2296	2296	1772	1772
$F$	102.21	103.86	106.36	105.47	93.47	93.47	89.21	89.21
Panel B: Early Childhood or Younger Group (cohort 3 years to 6 years)								
$\hat{\gamma}$	-0.04***	-0.01	0.00	-0.01**	-0.01	0.01	-0.04**	-0.03**
	(0.02)	(0.02)	(0.02)	(0.00)	(0.01)	(0.01)	(0.02)	(0.01)
$\hat{\delta}$	0.01	-0.01	-0.04	-0.03	-0.14	-0.18	0.04	-0.06
	(0.27)	(0.29)	(0.23)	(0.06)	(0.17)	(0.14)	(0.28)	(0.23)
$N$	1936	2035	2082	1719	980	980	514	514
$F$	96.17	99.59	100.45	90.67	61.44	61.44	39.80	39.80
Panel C: Primary School-Aged or Older Group (cohort 7 years to 10 years)								
$\hat{\gamma}$	-0.01	-0.04*	-0.01	-0.01	-0.03***	-0.02*	-0.00	-0.02*
	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$\hat{\delta}$	0.66**	0.07	0.17	0.22**	0.37**	0.11	0.02	0.06
	(0.31)	(0.31)	(0.18)	(0.10)	(0.15)	(0.13)	(0.18)	(0.12)
$N$	1473	1470	1593	1598	1316	1316	1258	1258
$F$	86.77	87.85	90.28	90.76	96.22	96.22	91.23	91.23

Note: Clustered-standard errors at the child level are in parentheses: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Columns (1)-(8) stand for material investment, time investment, education expenditure, private tutoring, expecting the child to have at least a bachelor degree, aspiring for the child to have at least a bachelor degree, aspiring for the child to have a non-governmental job, and aspiring for the child to have a STEM job, respectively.

a significant result. This is possible given that the reward size was only about one-third of the daily minimum wage. Unfortunately, it is currently impossible to verify using the available data. Another plausible explanation is related to parents' beliefs regarding children's skill formation. Parents may place more emphasis on the latter investment compared to the earlier one. If this is the case, we should expect that time preferences will be significant for older children, but not for the younger ones. To explore this possibility, we separated the sample into two groups: the younger or early childhood group (3-6 years) and the older or primary one (7-10 years), corresponding to primary schooling.

Panel B of Table 4 presents the IV estimation results based on the early childhood sample (aged 4-6 years old). Overall, the results are qualitatively similar to the benchmark results across all cohorts; that is, only the relative risk aversion estimation coefficients are statistically significant. The estimates for material investment, private tutoring, and aspiring the child to have a STEM job are still significant, as in the benchmark results, while the estimates for aspiring the child to have a non-governmental job are now significant, differing from the benchmark result. However, we should interpret this different result with caution, as the sample size for the occupation aspiration variables is relatively small.

The estimation results for the older group (aged 7-10 years old) differ from the benchmark results in that some of the estimation coefficients of the discount factor are now statistically significant (parents with different discount factors invested differently), as shown in Panel C of Table 4. In particular, the estimation coefficients of the discount factor for material investment, private tutoring, and expecting the child to have at least a college degree are positive and significant. On the other hand, the estimation coefficients for the risk aversion in material investment and private tutoring are not statistically significant.

Considering the results from both the younger and older groups provides the following insights. First, parents were concerned about the riskiness of parental investment and occupational returns since the early childhood stage. That is why we found a negative and significant association between risk aversion and parental investment and aspirations in the younger group. Second, parents believed that the marginal returns to their investment were greater at the primary school-aged stage than at the early childhood stage. That is why we found significant results for the discount factor only in the older group. This is also evident

in the estimation results by cohorts, as shown in Table 7 and 8 in the Appendix. That is, the estimation results are considerably larger and statistically significant for the 9-year-old cohort.

On the other hand, the insignificance of risk aversion in the estimate of material investment and private tutoring for the older group should not be interpreted as a contradiction to the above explanation. First of all, both are negative as in the benchmark case. In addition, the material investment index for the older group was derived from the number of storybooks, picture books, and posters showing alphabets and/or numbers, a smaller set compared to the one used for the younger group. The smaller number of items may lead to a noisier index, resulting in the insignificance of the index. For private tutoring, the effect size is even slightly larger than the benchmark result; however, the estimate is more imprecise.

We also performed several robustness checks: when preference parameters were estimated without background consumption, when preference parameters were not jointly estimated<sup>14</sup>, and when preference parameters were proxied by the number of waiting tasks and non-risky tasks. The results are presented in Table 5 below. Overall, the benchmark results are robust to these changes. In particular, the estimates for the risk aversion are statistically significant for material investment, expecting the child to have at least a college degree, and aspiring the child to have a STEM job in all three cases. However, the significant levels for material investment, private tutoring, and aspiring the child to have a STEM job are slightly weaker than the benchmark case. This weaker significance may stem from the fact that using individual background consumption leads to more accurate estimates of preference parameters.

Additionally, the estimation coefficients of certain control variables are noteworthy. To save space, our discussion is based on the benchmark estimation results only (see Table 9 in the Appendix), as the other specifications yield similar results. First, as expected, household wealth is positively and significantly associated with almost all outcomes, except

---

<sup>14</sup>In this case, we used the individual risk aversion coefficient of the 626 matched individuals as the benchmark case, but we estimated the discount rate differently. Specifically, we first averaged risk aversion coefficients across all 1,270 individuals. We then used the average to solve for the discount factor for each individual.

Table 5: Estimation results based on the main sample of all cohorts without background consumption, preferences parameters were not jointly estimated, and preferences parameters were proxied by the number of waiting tasks and non-risky tasks using the instrumental variable approach to correct for measurement errors.

	Ma.	Time	Edu. Exp.	Tutor	Exp. BA	Asp. BA	Asp. NGov.	Asp. STEM
Panel A: without background consumption								
$\hat{\gamma}$	-0.13*	-0.04	-0.01	-0.04**	-0.09**	-0.01	-0.03	-0.05
	(0.07)	(0.07)	(0.05)	(0.02)	(0.03)	(0.03)	(0.04)	(0.03)
$\hat{\delta}$	0.56	0.02	0.09	0.17	0.33	-0.01	0.06	0.07
	(0.48)	(0.47)	(0.35)	(0.12)	(0.24)	(0.21)	(0.31)	(0.22)
$N$	3409	3505	3675	3317	2296	2296	1772	1772
$F$	40.75	39.86	40.64	40.69	37.46	37.46	37.26	37.26
Panel B: not jointly estimated								
$\hat{\gamma}$	-0.03**	-0.02	-0.00	-0.01	-0.02***	-0.00	-0.01	-0.02**
	(0.01)	(0.02)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
$\hat{\delta}$	0.28	0.00	0.04	0.09	0.16	-0.01	0.03	0.03
	(0.25)	(0.24)	(0.18)	(0.06)	(0.12)	(0.11)	(0.16)	(0.12)
$N$	3409	3505	3675	3317	2296	2296	1772	1772
$F$	102.63	104.46	107.15	106.26	94.70	94.70	90.18	90.18
Panel C: proxied by the number of waiting tasks and non-risky tasks								
$\hat{\gamma}$	-0.02**	-0.02	-0.00	-0.01	-0.02***	-0.00	-0.01	-0.02**
	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
$\hat{\delta}$	0.02	0.00	0.00	0.01	0.01	-0.00	0.00	0.00
	(0.02)	(0.02)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
$N$	3409	3505	3675	3317	2296	2296	1772	1772
$F$	110.45	112.51	115.57	114.34	102.30	102.30	99.20	99.20

Note: Clustered-standard errors at the child level are in parentheses: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Columns (1)-(8) stand for material investment, time investment, education expenditure, private tutoring, expecting the child to have at least a bachelor degree, aspiring for the child to have at least a bachelor degree, aspiring for the child to have a non-governmental job, and aspiring for the child to have a STEM job, respectively.  $\hat{\gamma}$  and  $\hat{\delta}$  in panel C are the number of non-risky choices and the Number of waiting choices in Set 2 (1 vs 2 months), respectively.

for time investment and both variables related to occupation aspirations. In words, wealthier households invested more and expected their children to have a higher level of education. Given that parental investment and educational aspirations play a significant role in human capital formation, the positive wealth effect could potentially lead to a wider gap in human capital in the long run.

Another interesting group of variables includes having divorced parents (before the interview), having a teenage mother, and both parents being absent. Overall, these factors are negatively correlated with parental investment and aspirations. Divorce and teenage motherhood are statistically significant in several cases. In particular, having divorced parents is negatively and significantly associated with material and time investments and educational aspirations. That is, children with divorced parents tend to receive less parental investment, and their parents expect less from them. Both negative results are alarming since both factors are key to later success in life. Surprisingly, parental absence has a small and mostly insignificant impact. These results suggest that society should be more concerned about children with divorced parents, which has been rising to almost 40% in our sample, than the child-left-behind issue by itself, as the mere absence of the child's parents appears less harmful than having divorced parents.<sup>15</sup>

Consistent with the literature, parents' years of schooling are positively and significantly correlated with parental investment and educational aspirations. This suggests that more educated parents may believe that parental investment is essential to child development and may form higher educational aspirations based on their personal experiences. Another surprising result is the estimation coefficient for an indicator of having a parent as a primary caregiver. In particular, a child whose primary caregiver is his/her parent tends to have lower parental investment and educational expectations. This counterintuitive result may stem from the fact that biological parents (about 94% of them were mothers) in this setting have to act as primary caregivers because they did not receive support from other adults (mostly grandmothers). Without sufficient support, they may not be able to invest sufficiently and may have to lower their aspirations regarding their children's education.

---

<sup>15</sup>Of course, divorced parents tend to leave their children behind. In our data, approximately 58% of the left-behind children (without both parents at home) had divorced parents as well.

Another issue that aligns with the literature is the impact of being the firstborn child on parental investment. The results indicate that non-firstborn children received significantly less investment. On the other hand, parents of firstborn children in families with multiple children and parents of single children were equally invested in their children and had indistinguishable educational and occupational aspirations, as evidenced by the insignificant estimation coefficients for being a firstborn child in a family with multiple children (relative to the single child).

## 5 Conclusion and Discussion

This paper examines the roles of parents' risk and time preferences in parental investment, and educational and occupational aspirations, using an ongoing panel data set from rural Thailand, the RIECE Panel Data, which contains comprehensive survey and preference-elicitation data necessary for the analysis.

The first insight from this study is that parents seem to view parental investment as a risky activity from the early childhood stage onward. Empirically, more risk-averse parents tend to invest less in their children.<sup>16</sup> This finding aligns with the standard result in investment theory: more risk-averse investors invest less in risky assets. Parents may be uncertain about the human capital production function itself; that is, they may not know what the actual production function is (Attanasio et al., 2024; Cunha et al., 2022). In other words, the productivity of each input to the production function is uncertain, at least from the parent's perspective. Risk-averse parents then respond to this uncertainty by lowering their investment. This result suggests that reducing uncertainty by informing parents about the actual productivity of each input to the human capital production function could raise parental investment.

Second, parents tend to value later investments (during the primary school-aged years)

---

<sup>16</sup>Note that this negative correlation between risk aversion and parental investment differs from that found by Cuna et al. (2025), who reported that more risk-averse parents invested more in early-life nutrition for their children. The difference may be due to the different types of investment. Our time and material investments may have risky returns, while theirs, nutritional intakes, are risk prevention activities.

more than earlier ones (during the early childhood stage). This result is consistent with Boneva and Rauh (2018). On the other hand, the literature on human capital formation consistently demonstrates that early investments yield the highest returns due to the principles of dynamic complementarity and the foundational nature of early skill development (Knudsen, 2004; Cunha and Heckman, 2007; Currie and Almond, 2011). Therefore, this finding suggests that an information-provision intervention aimed at informing parents about new scientific evidence on the benefits of early investment may be beneficial (Cunha et al., 2022).

Third, parents perceive achieving educational success and pursuing a STEM career as risky endeavors for their children. That is, more risk-averse parents tend to have lower aspirations regarding their children’s education and are less likely to want their children to pursue careers in STEM fields. This finding has an important policy implication for STEM education: providing better social insurance to disadvantaged households and informing them about job opportunities in STEM fields could increase the likelihood that their children pursue STEM careers.

An alarming result in this study is that children with divorced parents tend to receive less parental investment, and their parents have significantly lower aspirations for them. On the other hand, parental absence has a small and mostly insignificant impact. These findings suggest that we should be more concerned about the rising divorce rate than the child-left-behind issue by itself.

One limitation of this study is that the average payment for time preferences is exceptionally small —approximately one-third of the daily minimum wage—while that for risk preferences is more than four times the minimum wage. The small size of the awards could lead to noisy estimates of the time preference parameter and, consequently, yield insignificant results. It would be interesting to elicit both preferences using more comparable award sizes in the same group of participants in the future. Another limitation is that, to correct for measurement errors, we must sacrifice the ability to estimate the present-bias parameter, as there are only two sets of time-preference elicitation tasks. It would be better to have more sets of tasks so that we can estimate both the long-term discount factor and the present-bias parameter. Having more data points will also allow us to estimate the long-term

discount factor with more precision. Another weakness is the standard assumption of the temporal stability of preferences, which posits that adults' preferences remain stable over time. However, the empirical findings are mixed: some confirm the proposition (e.g., Meier and Sprenger, 2010), while others contradict it (e.g., Halevy, 2015; Harrison et al., 2025). It would be fruitful to test whether Thai households' preferences are temporally stable. We leave this interesting research topic for the future.

## References

- S. Andersen, G. W. Harrison, M. I. Lau, and E. E. Rutström. Eliciting risk and time preferences. *Econometrica*, 76(3):583–618, 2008.
- J. Andreoni and C. Sprenger. Estimating time preferences from convex budgets. *American Economic Review*, 102(7):3333–56, December 2012.
- S. Angerer, J. Bolvashenkova, D. Glätzle-Rützler, P. Lergetporer, and M. Sutter. Children's patience and school-track choices several years later: Linking experimental and field data. *Journal of Public Economics*, 220:104837, 2023.
- O. Attanasio, C. Meghir, and E. Nix. Human capital development and parental investment in india. *The review of economic studies*, 87(6):2511–2541, 2020.
- O. Attanasio, T. Boneva, and C. Rauh. Parental beliefs about returns to different types of investments in school children. *Journal of Human Resources*, 57(6):1789–1825, 2022.
- O. Attanasio, F. Cunha, and P. Jervis. Subjective parental beliefs: their measurement and role. Technical report, National Bureau of Economic Research, 2024.
- R. B. Barsky, F. T. Juster, M. S. Kimball, and M. D. Shapiro. Preference parameters and behavioral heterogeneity: An experimental approach in the health and retirement study. *The quarterly journal of economics*, 112(2):537–579, 1997.
- M. S. Bartlett. The statistical conception of mental factors. *British Journal of Psychology. General Section*, 28(1):97–104, 1937.

- T. Boneva and C. Rauh. Parental beliefs about returns to educational investments—the later the better? *Journal of the European Economic Association*, 16(6):1669–1711, 2018.
- S. Boonmanunt, W. Jantorn, V. Khruapradit, and W. T. Kilenthong. Intergenerational transmission of time preferences: Evidence from rural thailand. *Labour Economics*, 2025.
- D. Bradford, C. Courtemanche, G. Heutel, P. McAlvanah, and C. Ruhm. Time preferences and consumer behavior. *Journal of Risk and Uncertainty*, 55(2):119–145, 2017.
- M. Bray. Shadow education in asia and the pacific: Features and implications of private supplementary tutoring. In *International handbook on education development in the Asia-Pacific*, pages 159–181. Springer, 2023.
- B. C. Cadena and B. J. Keys. Human capital and the lifetime costs of impatience. *American Economic Journal: Economic Policy*, 7(3):126–53, 2015.
- M. Castillo, J. L. Jordan, and R. Petrie. Discount rates of children and high school graduation. *The Economic Journal*, 129(619):1153–1181, 2019.
- C. F. Chabris, D. Laibson, C. L. Morris, J. P. Schuldt, and D. Taubinsky. Individual laboratory-measured discount rates predict field behavior. *Journal of risk and uncertainty*, 37(2):237–269, 2008.
- G. Charness, U. Gneezy, and B. Halladay. Experimental methods: Pay one or pay all. *Journal of Economic Behavior & Organization*, 131:141–150, 2016.
- D. Checchi, C. V. Fiorio, and M. Leonardi. Parents’ risk aversion and children’s educational attainment. *Labour Economics*, 30:164–175, 2014.
- M. Coller and M. B. Williams. Eliciting individual discount rates. *Experimental Economics*, 2(2):107–127, 1999.
- M. Cuna, L. Fiala, M. S. Lee, J. A. List, and S. Roy. The role of risk and ambiguity preferences on early-childhood investment: Evidence from rural india. *NBER Working Paper*, (w33610), 2025.

- F. Cunha and J. Heckman. The technology of skill formation. *American Economic Review*, 97(2):31–47, 2007.
- F. Cunha and J. J. Heckman. Formulating, identifying and estimating the technology of cognitive and noncognitive skill formation. *Journal of Human Resources*, 43(4):738–782, 2008.
- F. Cunha, I. Elo, and J. Culhane. Maternal subjective expectations about the technology of skill formation predict investments in children one year later. *Journal of Econometrics*, 231(1):3–32, 2022.
- J. Currie and D. Almond. Human capital development before age five. In *Handbook of labor economics*, volume 4, pages 1315–1486. Elsevier, 2011.
- D. Del Boca, C. Flinn, and M. Wiswall. Household choices and child development. *Review of Economic Studies*, 81(1):137–185, 2014.
- J. Durbin. Errors in variables. *Review of the Institute of International Statistics*, pages 23–32, 1954.
- A. Falk, F. Kosse, P. Pinger, H. Schildberg-Hörisch, and T. Deckers. Socioeconomic status and inequalities in children’s IQ and economic preferences. *Journal of Political Economy*, 129(9):2504–2545, 2021.
- Y. Halevy. Time consistency: Stationarity and time invariance. *Econometrica*, 83(1):335–352, 2015.
- G. W. Harrison, M. I. Lau, and H. I. Yoo. Constant discounting, temporal instability, and dynamic inconsistency in denmark: A longitudinal field experiment. *International Economic Review*, 66(1):363–392, 2025.
- J. J. Heckman. Skill formation and the economics of investing in disadvantaged children. *Science*, 312(5782):1900–1902, 2006.
- C. A. Holt and S. K. Laury. Risk aversion and incentive effects. *American economic review*, 92(5):1644–1655, 2002.

- S. Kim and J.-H. Lee. Private tutoring and demand for education in south korea. *Economic development and cultural change*, 58(2):259–296, 2010.
- E. I. Knudsen. Sensitive periods in the development of the brain and behavior. *Journal of cognitive neuroscience*, 16(8):1412–1425, 2004.
- E. I. Knudsen, J. J. Heckman, J. L. Cameron, and J. P. Shonkoff. Economic, neurobiological, and behavioral perspectives on building America’s future workforce. *Proceedings of the national Academy of Sciences*, 103(27):10155–10162, 2006.
- Y. Kuroishi and Y. Sawada. On the stability of preferences: Experimental evidence from two disasters. *European Economic Review*, 161:104632, 2024.
- S. Meier and C. Sprenger. Present-biased preferences and credit card borrowing. *American Economic Journal: Applied Economics*, 2(1):193–210, 2010.
- S. Meier and C. D. Sprenger. Discounting financial literacy: Time preferences and participation in financial education programs. *Journal of Economic Behavior & Organization*, 95:159–174, 2013.
- D. Prelec. The probability weighting function. *Econometrica*, pages 497–527, 1998.
- M. Sutter, M. G. Kocher, D. Glätzle-Rützler, and S. T. Trautmann. Impatience and uncertainty: Experimental decisions predict adolescents’ field behavior. *American Economic Review*, 103(1):510–31, 2013.
- R. Tabetando. Parental risk aversion and educational investment: panel evidence from rural uganda. *Review of Economics of the Household*, 17(2):647–670, 2019.
- T. Tanaka, C. F. Camerer, and Q. Nguyen. Risk and time preferences: Linking experimental and household survey data from vietnam. *American economic review*, 100(1):557–571, 2010.
- B. Wu, S. Feng, Y. Zhang, and Y. Han. Do children’s time preferences predict future school outcomes? *China Economic Review*, page 102490, 2025.

## A A Stylized Model of Parental Investment under Uncertainty

This section presents a stylized model to facilitate our discussion of the empirical results regarding the role of risk preferences on parental investment.

There is uncertainty regarding the child's human capital formation, with two states of nature,  $s = 1, 2$ . The parent believes that a unit of parental investment in the first state, occurring with probability  $p_1$ , will turn out to be  $A_1$  units of consumption in the next period, whereas the investment in the second state, occurring with probability  $p_2 = 1 - p_1$ , will turn out to be  $A_2$  units of consumption. We assume that  $A_1 > A_2$ , and therefore call the first state the high-value state, and the second one the low-value state. We further assume that the parent uses his/her own constant relative risk aversion (CRRA) utility function to derive the child's utility.

Formally, the parent maximizes expected utility by choosing saving on a risk-free asset (used as an inheritance)  $S$ , and (risky) parental investment  $I$  as follows.

$$\max_{S, I} \left[ p_1 \left( \frac{(S + A_1 I)^{1-\gamma} - 1}{1-\gamma} \right) + p_2 \left( \frac{(S + A_2 I)^{1-\gamma} - 1}{1-\gamma} \right) \right] \quad (5)$$

subject to the budget constraint

$$S + I \leq Y, \quad (6)$$

where  $Y$  denotes wealth, and  $\gamma$  is the relative risk aversion coefficient of the parent. The optimal parental investment  $I^*$  is

$$I^* = \left[ \frac{\left( \frac{p_1}{p_2} \left( \frac{A_1 - 1}{1 - A_2} \right) \right)^{\frac{1}{\gamma}} - 1}{\left( \frac{p_1}{p_2} \left( \frac{A_1 - 1}{1 - A_2} \right) \right)^{\frac{1}{\gamma}} - 1 + A_1} \right] Y, \quad (7)$$

where we assume that the risky parental investment is worthwhile for risk-averse parents, i.e.,  $p_1 A_1 + p_2 A_2 > 1$  and that the optimal investment is an interior solution, i.e.,  $A_1 > 1$  and  $A_2 < 1$ . These two assumptions ensure that the optimal parental investment is an interior solution and  $I^* > 0$ , when  $\gamma > 1$ .<sup>17</sup>

---

<sup>17</sup>The assumptions will be in the opposite direction when  $\gamma < 0$ .

We can then derive three implications of the model. First, the parental investment will be lower when the relative risk aversion coefficient is larger. Second, the larger the probability of the high-value state,  $p_1$ , the more the parental investment. Third, the larger the variance in returns to parental investment, the lower the parental investment. We do not test all these implications directly in this study. We nevertheless use them to interpret the empirical results on the effect of the relative risk aversion coefficient on the parent investment.

## **B Estimation Results for Each Age Group**

Table 6: Estimation results based on the main sample using an ordinary least squares (OLS) method.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: All Cohort								
$\hat{\gamma}$	-0.02**	-0.01	0.00	-0.01*	-0.01***	0.01	-0.01	-0.01***
	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.01)
$\hat{\delta}$	0.20*	-0.04	0.08	-0.01	0.12**	0.04	0.12	0.09
	(0.12)	(0.13)	(0.10)	(0.04)	(0.06)	(0.05)	(0.08)	(0.06)
$N$	3,409	3,505	3,675	3,317	2,296	2,296	1,772	1,772
Panel B: Early Childhood or Younger Group (cohort 3 years to 6 years)								
$\hat{\gamma}$	-0.04***	-0.01	0.01	-0.01**	-0.01	0.01**	-0.01	-0.01
	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
$\hat{\delta}$	0.12	0.03	0.14	-0.06*	0.14*	0.01	0.17	0.03
	(0.14)	(0.15)	(0.12)	(0.04)	(0.08)	(0.07)	(0.13)	(0.11)
$N$	1,936	2,035	2,082	1,719	980	980	514	514
Panel C: Primary School-Aged or Older Group (cohort 7 years to 10 years)								
$\hat{\gamma}$	-0.00	-0.00	-0.00	-0.00	-0.02***	-0.00	-0.01	-0.02***
	(0.01)	(0.02)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
$\hat{\delta}$	0.31*	-0.11	0.00	0.06	0.11	0.06	0.09	0.11*
	(0.16)	(0.17)	(0.10)	(0.06)	(0.08)	(0.07)	(0.09)	(0.07)
$N$	1,473	1,470	1,593	1,598	1,316	1,316	1,258	1,258

Note: Clustered-standard errors at the child level are in parentheses: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Columns (1)-(8) stand for material investment, time investment, education expenditure, private tutoring, expecting the child to have at least a bachelor degree, aspiring for the child to have at least a bachelor degree, aspiring for the child to have a non-governmental job, and aspiring for the child to have a STEM job, respectively.

Table 7: Estimation results based on the early childhood or younger sample (cohort 3 years to 6 years) using the instrumental variable approach to correct for measurement errors.

	Ma.	Time	Edu. Exp.	Tutor	Exp. BA.	Asp. BA.
Panel A: Cohort 3 years						
$\hat{\gamma}$	-0.04 (0.03)	-0.01 (0.03)	-0.00 (0.03)	N.A. N.A.	0.00 (0.02)	0.05*** (0.02)
$\hat{\delta}$	-0.29 (0.34)	0.10 (0.47)	0.11 (0.45)	N.A. N.A.	-0.26 (0.34)	-0.20 (0.23)
$N$	385	403	403	N.A.	161	161
$F$	62.78	67.56	67.56	N.A.	25.55	25.55
Panel A: Cohort 4 years						
$\hat{\gamma}$	-0.05** (0.02)	-0.01 (0.03)	0.01 (0.02)	0.00 (0.00)	-0.02 (0.03)	-0.04*** (0.02)
$\hat{\delta}$	-0.38 (0.41)	-0.47 (0.46)	-0.28 (0.41)	-0.00 (0.08)	-0.43 (0.42)	0.02 (0.25)
$N$	488	491	517	392	215	215
$F$	65.54	75.43	73.48	55.68	16.91	16.91
Panel B: Cohort 5 years						
$\hat{\gamma}$	-0.04 (0.02)	-0.03 (0.03)	-0.00 (0.03)	-0.00 (0.01)	-0.01 (0.02)	0.01 (0.02)
$\hat{\delta}$	0.22 (0.43)	0.10 (0.42)	0.11 (0.33)	-0.14 (0.10)	0.29 (0.32)	-0.19 (0.26)
$N$	543	567	584	513	274	274
$F$	95.92	92.21	96.95	76.91	31.85	31.85
Panel C: Cohort 6 years						
$\hat{\gamma}$	-0.05** (0.02)	-0.00 (0.03)	-0.00 (0.02)	-0.02*** (0.01)	-0.02 (0.02)	0.02 (0.01)
$\hat{\delta}$	0.56 (0.35)	0.26 (0.45)	-0.10 (0.23)	0.02 (0.11)	-0.28 (0.26)	-0.13 (0.23)
$N$	520	574	578	577	330	330
$F$	76.25	88.55	88.78	88.93	36.35	36.35

Note: Clustered-standard errors at the child level are in parentheses: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Columns (1)-(6) stand for material investment, time investment, education expenditure, private tutoring, expecting the child to have at least a bachelor degree, and aspiring for the child to have at least a bachelor degree, respectively.

Table 8: Estimation results based on the primary school-aged or older sample (cohort 7 years to 10 years) using the instrumental variable approach to correct for measurement errors.

	Ma.	Time	Edu. Exp.	Tutor	Exp. BA	Asp. BA	Asp. NGov.	Asp. STEM
Panel A: Cohort 7 years								
$\hat{\gamma}$	-0.02	-0.01	-0.00	0.00	-0.01	-0.02	0.01	-0.00
	(0.02)	(0.03)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
$\hat{\delta}$	0.49	0.21	-0.01	0.14	0.25	0.12	-0.04	0.07
	(0.46)	(0.41)	(0.25)	(0.16)	(0.22)	(0.21)	(0.27)	(0.21)
$N$	545	569	569	569	402	402	346	346
$F$	72.66	81.55	81.55	81.55	70.79	70.79	54.84	54.84
Panel B: Cohort 8 years								
$\hat{\gamma}$	-0.02	-0.04	-0.02	-0.02*	-0.02	-0.02*	-0.02	-0.04***
	(0.02)	(0.03)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
$\hat{\delta}$	0.75	-0.56	0.37	0.11	0.21	0.11	0.21	0.18
	(0.46)	(0.49)	(0.30)	(0.15)	(0.24)	(0.21)	(0.26)	(0.20)
$N$	475	491	488	492	394	394	392	392
$F$	73.99	76.81	75.37	76.82	56.61	56.61	56.14	56.14
Panel C: Cohort 9 years								
$\hat{\gamma}$	-0.03	-0.05	-0.01	-0.01	-0.05***	-0.01	-0.00	-0.02
	(0.03)	(0.04)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)
$\hat{\delta}$	0.73	0.21	0.50***	0.58***	0.77***	0.09	-0.05	-0.10
	(0.63)	(0.61)	(0.18)	(0.18)	(0.26)	(0.24)	(0.30)	(0.21)
$N$	272	286	344	344	327	327	327	327
$F$	44.02	46.03	54.46	54.46	49.10	49.10	49.10	49.10
Panel D: Cohort 10 years								
$\hat{\gamma}$	0.02	-0.10	0.01	-0.00	-0.03	-0.01	0.02	-0.01
	(0.04)	(0.06)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
$\hat{\delta}$	0.89	1.71*	-0.07	0.11	0.27	0.15	-0.09	0.09
	(0.76)	(0.96)	(0.22)	(0.17)	(0.34)	(0.29)	(0.37)	(0.23)
$N$	181	124	192	193	193	193	193	193
$F$	31.45	16.98	30.71	30.42	30.42	30.42	30.42	30.42

Note: Clustered-standard errors at the child level are in parentheses: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Columns (1)-(8) stand for material investment, time investment, education expenditure, private tutoring, expecting the child to have at least a bachelor degree, aspiring for the child to have at least a bachelor degree, aspiring for the child to have a non-governmental job, and aspiring for the child to have a STEM job, respectively.

Table 9: The detail of estimation results based on the the main sample of all cohorts using the instrumental variable approach to correct for measurement errors.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\hat{\gamma}$	-0.03** (0.01)	-0.02 (0.01)	-0.00 (0.01)	-0.01** (0.00)	-0.02*** (0.01)	-0.00 (0.01)	-0.01 (0.01)	-0.02** (0.01)
$\hat{\delta}$	0.28 (0.25)	0.00 (0.24)	0.04 (0.18)	0.09 (0.06)	0.16 (0.12)	-0.01 (0.11)	0.03 (0.16)	0.03 (0.12)
Wealth	0.10*** (0.02)	0.02 (0.02)	0.16*** (0.03)	0.03*** (0.01)	0.08*** (0.01)	0.03*** (0.01)	0.01 (0.01)	0.00 (0.01)
Divorced before	-0.10** (0.05)	-0.13*** (0.05)	-0.07* (0.03)	-0.02* (0.01)	-0.07*** (0.03)	-0.05** (0.02)	0.05 (0.03)	-0.00 (0.02)
Teen mom	-0.10* (0.05)	-0.09 (0.06)	-0.05 (0.04)	-0.00 (0.02)	-0.10*** (0.03)	-0.09*** (0.03)	-0.01 (0.04)	-0.04 (0.03)
Parental absence	-0.10* (0.05)	0.01 (0.06)	-0.05 (0.04)	-0.02 (0.02)	-0.02 (0.03)	-0.00 (0.03)	0.01 (0.04)	-0.02 (0.03)
Schooling CG	0.04*** (0.01)	0.01 (0.01)	0.01 (0.01)	0.00 (0.00)	0.03*** (0.00)	0.02*** (0.00)	-0.01 (0.01)	0.00 (0.00)
Age of CG	-0.01** (0.00)	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.01*** (0.00)	-0.00 (0.00)
Parent as CG	-0.11 (0.08)	0.05 (0.10)	-0.11* (0.06)	-0.06** (0.03)	-0.09* (0.05)	-0.05 (0.05)	-0.03 (0.06)	-0.04 (0.05)
Female CG	-0.04 (0.08)	-0.15 (0.09)	-0.01 (0.06)	0.04** (0.02)	0.02 (0.05)	0.02 (0.04)	-0.13** (0.05)	-0.05 (0.05)
Female	0.06 (0.04)	0.06 (0.05)	-0.07** (0.03)	0.01 (0.01)	0.11*** (0.02)	0.03 (0.02)	-0.00 (0.03)	0.11*** (0.02)
Firstborn with sibling	-0.06 (0.09)	-0.08 (0.09)	-0.05 (0.05)	0.01 (0.03)	0.01 (0.04)	0.05 (0.04)	0.02 (0.06)	0.01 (0.04)
Notfirstborn with sibling	-0.21* (0.11)	-0.16 (0.10)	-0.16** (0.06)	-0.01 (0.03)	-0.04 (0.05)	0.00 (0.05)	0.04 (0.06)	-0.03 (0.04)
HH size	-0.03 (0.02)	0.03* (0.02)	-0.01 (0.01)	-0.01 (0.01)	-0.02*** (0.01)	-0.02** (0.01)	-0.00 (0.01)	-0.01 (0.01)
No. children	0.05 (0.03)	-0.03 (0.04)	-0.04 (0.03)	-0.01 (0.01)	0.04** (0.02)	0.01 (0.02)	0.05** (0.02)	0.04** (0.02)
No. siblings	0.09 (0.09)	0.04 (0.07)	0.07* (0.04)	0.01 (0.02)	0.02 (0.04)	-0.01 (0.04)	-0.10** (0.05)	-0.02 (0.03)
No. chronic diseases	-0.01 (0.03)	-0.02 (0.03)	0.04 (0.03)	0.02** (0.01)	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)	-0.03* (0.02)
Constant	-0.01 (0.28)	0.25 (0.32)	0.35 (0.25)	-0.04 (0.09)	0.02 (0.17)	0.79*** (0.15)	0.89*** (0.22)	0.44*** (0.16)
$N$	3409	3505	3675	3317	2296	2296	1772	1772
$F$	102.21	103.86	106.36	105.47	93.47	93.47	89.21	89.21

Note: Clustered-standard errors at the child level are in parentheses: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Columns (1)-(8) stand for material investment, time investment, education expenditure, private tutoring, expecting the child to have at least a bachelor degree, aspiring for the child to have at least a bachelor degree, aspiring for the child to have a non-governmental job, and aspiring for the child to have a STEM job, respectively.