

Household Choices and Child Development

Daniela Del Boca, Christopher Flinn, Matthew Wiswall

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James J. Heckman



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1. Introduction

2. Model

2.1 Timing and preferences (one child case)

We assume a Cobb–Douglas household utility function and restrict the preference parameters to be stable over time:

$$u(l_{1t}, l_{2t}, c_t, k_t) = \alpha_1 \ln l_{1t} + \alpha_2 \ln l_{2t} + \alpha_3 \ln c_t + \alpha_4 \ln k_t, \quad (1)$$

where $\sum_j \alpha_j = 1$. In the empirical implementation of the model, we will allow heterogeneity in the parameter vector α across households.

2.2 Child quality production

We assume a Cobb–Douglas form for the child quality technology:

$$\begin{aligned} k_{t+1} &= f_t(k_t, \tau_{1t}(a), \tau_{2t}(a), \tau_{1t}(p), \tau_{2t}(p), e_t) \\ &= R_t \tau_{1,t}(a)^{\delta_{1,t}(a)} \tau_{2,t}(a)^{\delta_{2,t}(a)} \tau_{1,t}(p)^{\delta_{1,t}(p)} \tau_{2,t}(p)^{\delta_{2,t}(p)} e_t^{\delta_{3,t}} k_t^{\delta_{4,t}}, \end{aligned} \tag{2}$$

where $R_t > 0$ is the scaling factor known as total factor productivity, or TFP.

2.3 Dynamic problem

The value function for the household in development period t is then

$$V_t(S_t) = \max_{l_{1t}, l_{2t}, \tau_{1t}(a), \tau_{2t}(a), \tau_{1t}(p), \tau_{2t}(p), e_t} u(l_{1t}, l_{2t}, c_t, k_t) + \beta E_t V_{t+1}(S_{t+1}), \quad (3)$$

$$\text{s.t. } T = l_{jt} + h_{jt} + \tau_{jt}(a) + \tau_{jt}(p), \quad j = 1, 2 \quad (4)$$

$$c_t + e_t = w_{1t}h_{1t} + w_{2t}h_{2t} + I_t \quad (5)$$

where the vector of state variables S_t consists of the current level of child quality, the wage offers to the parents, and non-labour income,

$$S_t = (k_t \ w_{1t} \ w_{2t} \ I_t),$$

β ($\in [0, 1)$) is the discount factor, and E_t denotes the conditional expectation operator with respect to the period t information set. The conditional expectation is taken with respect to the random

2.4 Terminal value

We can write the period M optimization problem as

$$\begin{aligned} & V_M(w_{1M}, w_{2M}, I_M, k_M) = \\ & \max_{l_{1,M}, l_{2,M}, \tau_{1,M}(a), \tau_{1,M}(p), \tau_{2,M}(a), \tau_{2,M}(p), e_M} \alpha_1 \ln l_{1M} + \alpha_2 \ln l_{2M} + \alpha_3 \ln c_M + \alpha_4 \ln k_M \\ & + \beta \psi \{ \delta_{1,M}(a) \ln \tau_{1,M}(a) + \delta_{2,M}(a) \ln \tau_{2,M}(a) + \delta_{1,M}(p) \ln \tau_{1,M}(p) \\ & + \delta_{2,M}(p) \ln \tau_{2,M}(p) + \delta_{3,M} \ln e_M + \delta_{4,M} \ln k_M \} \end{aligned}$$

2.5 Model solution

We can write the conditional factor demands for child inputs, where we are conditioning on labour supply choices and non-labour income, as

$$\tau_{1,t}^*(a) = (T - h_{1t}) \frac{\varphi_{1,t}(a)}{\alpha_1 + \varphi_{1,t}(a) + \varphi_{1,t}(p)} \quad (6)$$

$$\tau_{2,t}^*(a) = (T - h_{2t}) \frac{\varphi_{2,t}(a)}{\alpha_2 + \varphi_{2,t}(a) + \varphi_{2,t}(p)} \quad (7)$$

$$\tau_{1,t}^*(p) = (T - h_{1t}) \frac{\varphi_{1,t}(p)}{\alpha_1 + \varphi_{1,t}(a) + \varphi_{1,t}(p)} \quad (8)$$

$$\tau_{2,t}^*(p) = (T - h_{2t}) \frac{\varphi_{2,t}(p)}{\alpha_2 + \varphi_{2,t}(a) + \varphi_{2,t}(p)} \quad (9)$$

$$e_t^* = (w_{1t}h_{1t} + w_{2t}h_{2t} + I_t) \frac{\varphi_{3,t}}{\alpha_3 + \varphi_{3,t}} \quad (10)$$

where

$$\varphi_{l,t}(\xi) = \beta \delta_{l,t}(\xi) \eta_{t+1}, \quad l = 1, 2; \quad \xi = a, p,$$

$$\varphi_{3,t} = \beta \delta_{3,t} \eta_{t+1}.$$

The sequence $\{\eta_t\}_{t=1}^{M+1}$ is defined (backwards-) recursively as

$$\begin{aligned}\eta_{M+1} &= \psi\alpha_4 \\ \eta_M &= \alpha_4 + \beta\delta_{4,M}\eta_{M+1} \\ &\vdots \\ \eta_t &= \alpha_4 + \beta\delta_{4,t}\eta_{t+1} \\ &\vdots \\ \eta_1 &= \alpha_4 + \beta\delta_{4,1}\eta_2.\end{aligned}\tag{11}$$

Define two “latent” labour supply variables in period t by

$$\begin{aligned}\hat{h}_{1t} &= \frac{A_{1t} - A_{2t}B_{1t}}{1 - A_{2t}B_{2t}} \\ \hat{h}_{2t} &= \frac{B_{1t} - B_{2t}A_{1t}}{1 - A_{2t}B_{2t}},\end{aligned}\tag{12}$$

where

$$\begin{aligned}A_{1t} &= \frac{w_{1t}T(\alpha_3 + \varphi_{3,t}) - (\alpha_1 + \varphi_{1,t}(a) + \varphi_{1,t}(p))I_t}{w_{1t}(\alpha_1 + \alpha_3 + \varphi_{1,t}(a) + \varphi_{1,t}(p) + \varphi_{3,t})} \\ A_{2t} &= \frac{w_{2t}(\alpha_1 + \varphi_{1,t}(a) + \varphi_{1,t}(p))}{w_{1t}(\alpha_1 + \alpha_3 + \varphi_{1,t}(a) + \varphi_{1,t}(p) + \varphi_{3,t})} \\ B_{1t} &= \frac{w_{2t}T(\alpha_3 + \varphi_{3,t}) - (\alpha_2 + \varphi_{2,t}(a) + \varphi_{2,t}(p))I_t}{w_{2t}(\alpha_2 + \alpha_3 + \varphi_{2,t}(a) + \varphi_{2,t}(p) + \varphi_{3,t})} \\ B_{2t} &= \frac{w_{1t}(\alpha_2 + \varphi_{2,t}(a) + \varphi_{2,t}(p))}{w_{2t}(\alpha_2 + \alpha_3 + \varphi_{2,t}(a) + \varphi_{2,t}(p) + \varphi_{3,t})}.\end{aligned}$$

2.6 The two-child household

3. Econometric Issues

3.1 The one child case

- In terms of the non-labour income process, there are a large number of households with no non-labour income in a given period, so we consider this process to be a truncated version of a latent variable process in levels (instead of logs).
- In particular, let

$$I_t^* = \mu_{3,t} + \varepsilon_{3,t}, \quad (13)$$

be the latent non-labour income in period t , with a mean given by $\mu_{3,t}$ and where $\varepsilon_{3,t} \sim i.i.d.N(0, \sigma_{33})$, for all t .

- The actual non-labour income process is given by

$$I_t = \max(0, I_t^*), \text{ for all } t. \quad (14)$$

We choose the following function that satisfies these restrictions:

$$\begin{aligned} p(k; \lambda) &= \frac{\exp(\lambda_0 + \lambda_1 \ln k)}{1 + \exp(\lambda_0 + \lambda_1 \ln k)} & (15) \\ &= \frac{\exp(\lambda_0) k^{\lambda_1}}{1 + \exp(\lambda_0) k^{\lambda_1}}, \lambda_1 > 0. \end{aligned}$$

3.1 The two child case

3.3 Measuring child quality

- As in all factor models, we will have to restrict the values of λ_0 and λ_1 in order to identify other model parameters.
- We will set $\lambda_0=0$ and $\lambda_1=1$, so that the normalized function p is given by

$$\begin{aligned} p(k; \lambda_0=0, \lambda_1=1) &= \frac{\exp(\ln k)}{1 + \exp(\ln k)} \\ &= \frac{k}{1+k}. \end{aligned}$$

3.4 Identification

3.5 Data

A summary of the data used in the estimation is given in the following table:

<i>Variable</i>	<i>Description</i>	<i>Survey Years</i>	<i>Model Years</i>	<i>Source</i>
$\{h_{1,t}, h_{2,t}\}$	Parental labour supply	1997,1999,2001	1996,1998,2000	PSID
$\{w_{1,t}, w_{2,t}, I_t\}$	Parental wages and non-labour income	1997,1999,2001	1996,1998,2000	PSID
$\{k_t^*\}$	Letter-Word score	1997,2002	1997,2002	CDS
$\{\tau_{1,t}(a), \tau_{2,t}(a), \tau_{1,t}(p), \tau_{2,t}(p)\}$	Time spent with child by parent	1997,2002	1997,2002	CDS
X	Demographic characteristics	1997	1997-	PSID

3.6 Descriptive statistics

TABLE 1
Descriptive statistics

1997 PSID-CDS				
	One child		Two child	
	Mean	Std.	Mean	Std.
Mother's age	34.78	6.33	33.83	5.40
Father's age	37.28	8.20	36.10	6.38
Mother's education	13.50	2.22	13.67	2.19
Father's education	13.55	2.23	13.54	2.79
Birth Spacing			2.73	1.18
			Older	
Child's age	6.32	2.97	7.77	2.45
Fraction Male	0.495	0.502	0.470	0.501
Mean Letter-Word raw score	23.91	16.61	32.64	14.45
Median LW raw score	21		37.5	
Minimum LW raw score	1		4	
Maximum LW raw score	55		55	
			Younger	
Child's age			5.04	2.26
Fraction male			0.515	0.502
Mean Letter-Word raw score			20.46	14.95
Median LW raw score			13	
Minimum LW raw score			1	
Maximum LW raw score			57	

TABLE 1
Descriptive statistics

	1996–2002 PSID			
	One child		Two child	
	Mean	Std.	Mean	Std.
Mother's work hours per week	32.19	16.65	26.91	18.37
Father's work hours per week	43.79	11.21	45.35	11.30
Mother's hourly wage	15.38	10.24	14.86	8.56
Father's hourly wage	19.52	11.89	23.07	16.74
Non-labour income per week	105.41	213.28	142.17	217.08

Notes: Sample of intact households (mother and father present in household) with one or two children. The top panel statistics are for the year 1997 from the 1997 PSID-CDS. Work hours, wages, and non-labour income statistics are averaged over all years of PSID data. *Source:* PSID-CDS combined sample from 1997 and 2002 interviews and 1997, 1999, 2001, 2003 PSID core data.

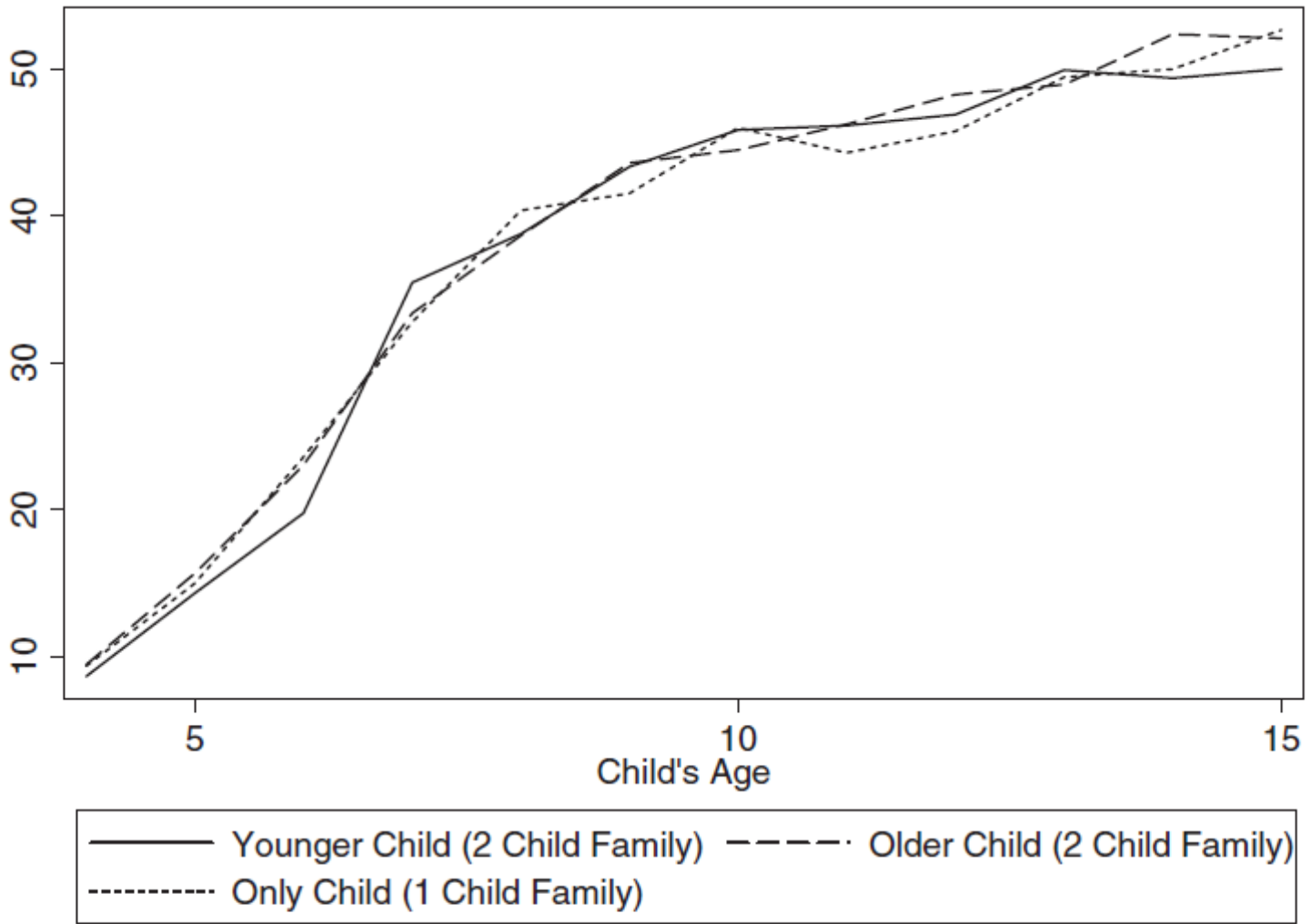


FIGURE 1

Average child's Letter-Word score.

Source: PSID-CDS combined sample from 1997 and 2002 interviews and 1997, 1999, 2001, 2003 PSID core data

TABLE 2
Parent's labour supply by child age

Fraction working > 0 hours						
Child age	One child		Younger child		Older child	
	Mother	Father	Mother	Father	Mother	Father
3	0.750	0.937	0.651	0.977	–	–
4–5	0.821	0.982	0.781	0.979	0.750	0.979
6–8	0.822	0.985	0.792	0.971	0.712	0.975
9–11	0.882	0.961	0.783	0.992	0.796	0.984
12–15	0.835	0.987	0.891	0.957	0.833	0.978

Average hours working						
Child age	One child		Younger child		Older child	
	Mother	Father	Mother	Father	Mother	Father
3	26.38	44.38	23.53	44.98	–	–
4–5	37.63	44.58	24.48	45.76	35.19	44.91
6–8	38.44	45.69	25.96	45.02	32.64	46.26
9–11	38.08	44.46	28.02	45.26	32.31	46.43
12–15	39.83	43.13	35.76	47.52	36.36	46.33

Notes: Sample of intact households (mother and father present in household) with one or two children. *Source:* PSID-CDS combined sample from 1997 and 2002 interviews and 1997, 1999, 2001, 2003 PSID core data.

TABLE 3
Parent's time with child by child age

Active time (Avg.)						
Child age	One-child families		Two-child families			
	Mother	Father	Younger child		Older child	
			Mother	Father	Mother	Father
3	29.29	16.90	23.19	13.20	–	–
4–5	21.37	11.08	17.64	8.40	17.46	10.78
6–8	16.47	12.11	11.06	6.95	13.03	8.70
9–11	15.72	8.59	8.63	6.30	10.50	7.40
12–15	12.30	8.93	5.61	3.50	8.11	5.80
Passive time (Avg.)						
Child age	One-child families		Two-child families			
	Mother	Father	Younger child		Older child	
			Mother	Father	Mother	Father
3	12.45	5.16	17.99	5.50		
4–5	13.22	6.37	20.10	8.12	16.93	8.28
6–8	9.47	8.07	11.10	6.07	16.68	6.96
9–11	10.88	8.08	7.08	4.84	9.69	5.22
12–15	15.22	13.19	5.59	5.57	7.18	5.35

Notes: Sample of intact households (mother and father present in household) with one or two children. Child age for two child families is the age of either the younger or the older child. *Source:* PSID-CDS combined sample from 1997 and 2002 interviews and 1997, 1999, 2001, 2003 PSID core data.

TABLE 4
Joint time allocation of parents

Younger {passive,active,none}	Older {passive,active,none}	Mother's time	Father's time
active	–	4.49	2.38
passive	–	4.08	1.90
–	active	1.20	1.22
–	passive	1.87	1.73
active	active	11.45	7.09
active	passive	2.45	0.93
passive	active	1.86	1.16
passive	passive	10.72	4.65

Notes: Sample of intact households (mother and father present in household) with two children. *Source:* PSID-CDS combined sample from 1997 and 2002 interviews and 1997, 1999, 2001, 2003 PSID core data.

3.7 Estimator

4. Model Estimates

4.1 One-child households

TABLE 5
Preference parameter estimates

	1 Child		2 Child	
	Estimate	SE	Estimate	SE
Mean of α_1	0.196	(0.011)	0.170	(0.0062)
Mean of α_2	0.194	(0.0096)	0.233	(0.0075)
Mean of α_3	0.257	(0.016)	0.194	(0.0074)
Mean of α_4	0.353	(0.015)	–	
Mean of α_4 (Child 1)	–		0.185	(0.0040)
Mean of α_5 (Child 2)	–		0.217	(0.013)
Std. of α_1	0.121	(0.012)	0.084	(0.0049)
Std. of α_2	0.085	(0.010)	0.094	(0.0049)
Std. of α_3	0.093	(0.012)	0.095	(0.0078)
Std. of α_4	0.200	(0.015)	–	
Std. of α_4 (Child 1)	–		0.119	(0.0052)
Std. of α_5 (Child 2)	–		0.139	(0.0090)
Correlation of α_1 and α_2	0.360	(0.142)	0.764	(0.048)
Correlation of α_1 and α_3	–0.032	(0.158)	0.777	(0.048)
Correlation of α_2 and α_3	0.172	(0.194)	0.984	(0.014)
	Terminal payoff to child quality			
ψ	28.89	(6.61)	–	
ψ_1 (Child 1)	–		2.58	(0.268)
ψ_2 (Child 2)	–		2.99	(0.393)

TABLE 6
Technology parameter estimates (1-child families)

	Estimate	SE
Mother's active time intercept	-1.33	(0.054)
Mother's active time slope	-0.139	(0.0030)
Father's active time intercept	-2.47	(0.016)
Father's active time slope	-0.029	(0.0033)
Mother's passive time intercept	-1.76	(0.029)
Mother's passive time slope	-0.125	(0.0023)
Father's passive time intercept	-2.86	(0.038)
Father's passive time slope	-0.012	(0.0054)
Child expenditures intercept	-3.27	(0.037)
Child expenditures slope	0.104	(0.0058)
Last period's child quality intercept	-2.047	(0.027)
Last period's child quality slope	0.085	(0.0068)

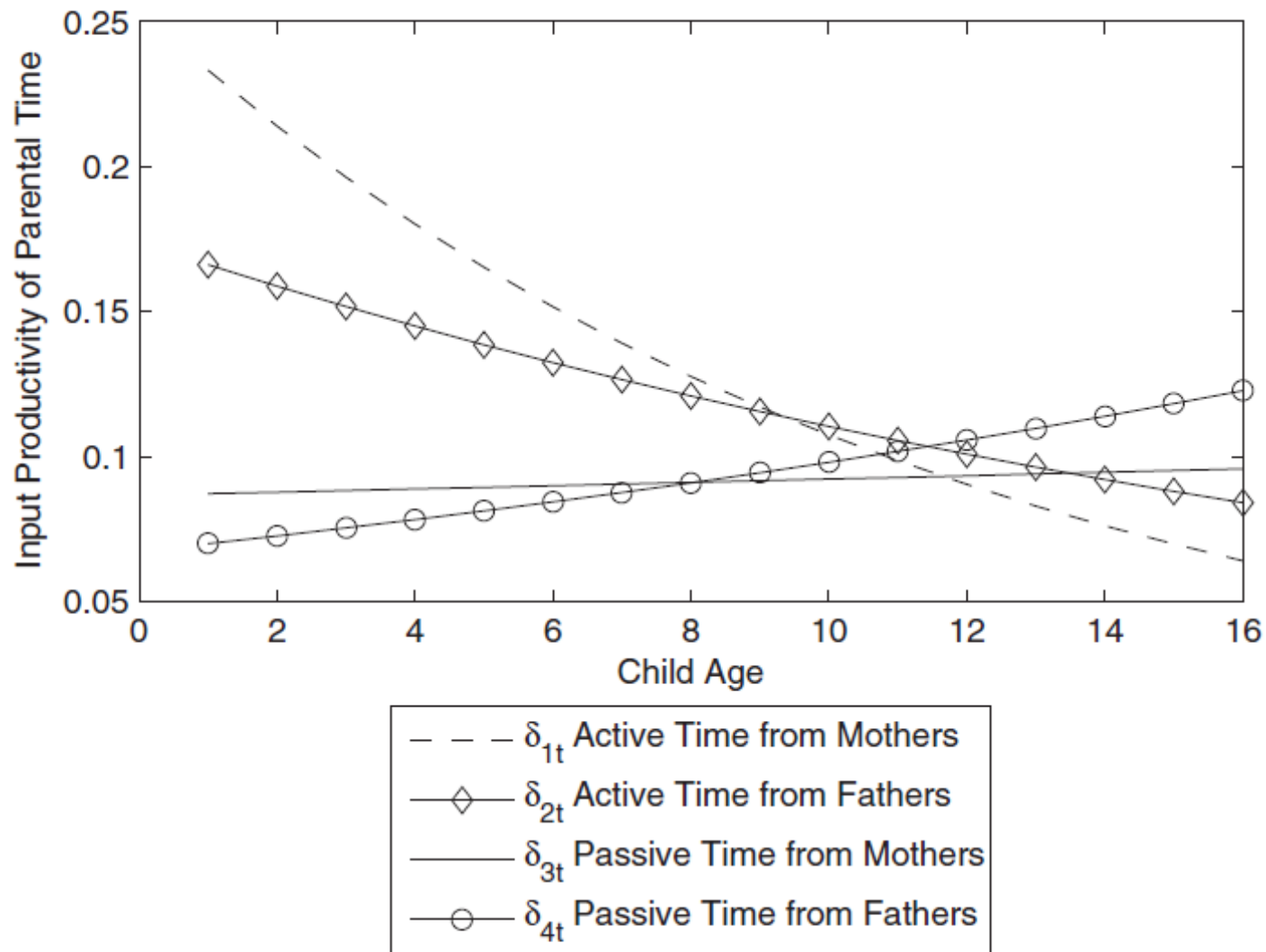


FIGURE 2

Estimated child development parameters by child age (one-child model).

Notes: This graph plots the function estimate by child age (from Table 6)

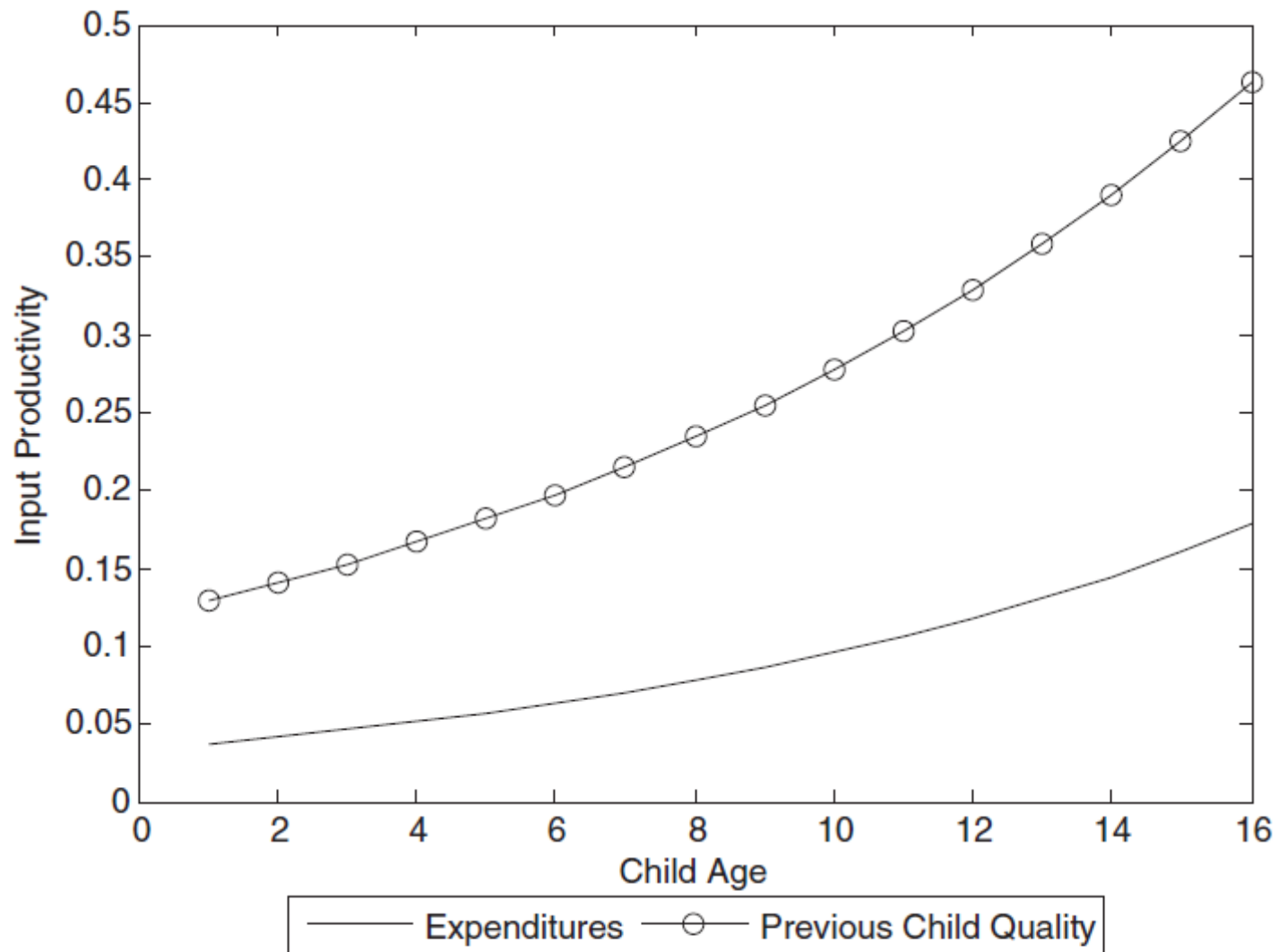


FIGURE 3

Estimated child development parameters by child age (one-child model).

Notes: This graph plots the function estimate by child age (from Table 6)

TABLE 7
Wage and income parameter estimates

	1 child		2 child	
	Estimate	SE	Estimate	SE
Mother's log wage offer				
μ_1^0 (intercept)	1.4195	(0.072)	1.057	(0.014)
μ_1^1 (mother's education)	0.049	(0.0038)	0.070	(0.0003)
μ_1^2 (mother's age)	0.0044	(0.0003)	0.0068	(0.0001)
μ_1^3 (mother's age sq \times 1000)	0.161	(0.043)	0.225	(0.018)
μ_1^4 (mother's year of birth \times 1000)	0.076	(0.045)	-0.138	(0.013)
σ_1 (standard deviation of innovation)	0.047	(0.0141)	0.185	(0.018)
ρ_{12} (correlation with father's wage shock)	0.710	(0.017)	0.753	(0.012)
Father's log wage offer				
μ_2^0 (intercept)	1.3694	(0.073)	1.12	(0.018)
μ_2^1 (father's education)	0.081	(0.0039)	0.102	(0.0005)
μ_2^2 (father's age)	0.0081	(0.0003)	0.0091	(0.0001)
μ_2^3 (father's age sq \times 1000)	-0.014	(0.049)	0.235	(0.0160)
μ_2^4 (fathers's year of birth \times 1000)	-0.0050	(0.031)	-0.134	(0.0090)
σ_2 (standard deviation of innovation)	0.731	(0.094)	0.738	(0.039)
Latent non-labour income				
μ_3^0 (intercept)	-14.12	(36.61)	-32.14	(29.61)
σ_3 (standard deviation of innovation)	376.16	(32.67)	352.30	(25.42)

TABLE 8
Sample fit for wages and income

	1 child		2 child	
	Data	Simulated	Data	Simulated
Avg. mother's wage	15.38	16.62	14.86	13.34
Std. mother's wage	10.24	9.59	8.56	9.23
Avg. father's wage	19.52	18.42	23.07	23.79
Std. father's wage	11.89	10.72	16.74	15.68
Avg. non-labour income	142.17	142.17	122.08	122.10
Std. non-labour income	216.81	216.81	194.62	194.61
Fraction with 0 non-labour income	0.621	0.621	0.633	0.658
	Data	Simulated	Data	Simulated
Avg. mother's wage (mother's age < 30)	14.08	13.23	9.84	10.42
Avg. mother's wage (mother's age ≥ 40)	16.74	18.50	16.62	16.10
Avg. father's wage (father's age < 30)	14.13	14.10	12.35	13.56
Avg. father's wage (father's age ≥ 40)	20.44	19.50	27.27	29.22

Notes: Data refers to actual data from sample of intact households (mother and father present in household) with one or two children. Simulated refers to the model prediction at estimated parameters given above. *Source:* PSID-CDS combined sample from 1997 and 2002 interviews and 1997, 1999, 2001, 2003 PSID core data.

4.2 Two-child households

TABLE 9
Sample fit of mother and father's time allocation by child age (1-child families)

Probability work > 0 hours				
Child age	Mother		Father	
	Data	Simulated	Data	Simulated
3-5	0.806	0.784	0.986	0.980
6-8	0.822	0.859	0.985	0.978
9-11	0.882	0.874	0.961	0.982
12-15	0.835	0.935	0.987	0.989

Hours worked if work (avg.)				
Child age	Mother		Father	
	Data	Simulated	Data	Simulated
3-5	34.44	38.71	46.18	45.02
6-8	32.43	37.61	48.31	44.94
9-11	33.86	37.30	43.29	44.55
12-15	28.65	36.32	45.18	44.72

TABLE 9
Sample fit of mother and father's time allocation by child age (1-child families)

Child age	Active time (avg.)			
	Mother		Father	
	Data	Simulated	Data	Simulated
3–5	25.56	22.34	14.16	13.31
6–8	16.48	16.49	12.11	10.39
9–11	15.72	12.70	8.59	8.40
12–15	12.30	14.94	8.93	10.74

Child age	Passive time (avg.)			
	Mother		Father	
	Data	Simulated	Data	Simulated
3–5	12.82	10.03	5.73	6.31
6–8	9.47	10.29	8.07	6.92
9–11	10.88	11.01	8.08	7.84
12–15	15.22	19.44	13.19	15.26

Notes: Data are actual data from sample of intact households (mother and father present in household) with one child. Simulated is the model prediction at estimated parameters given above. *Source:* PSID-CDS combined sample from 1997 and 2002 interviews and 1997, 1999, 2001, 2003 PSID core data.

TABLE 10
Technology parameter estimates (2-child families)

	Estimate	SE
Mother's parameters		
Active child alone intercept	-2.33	(0.0090)
Active child alone slope	-0.430	(0.0002)
Passive child alone intercept	-3.09	(0.0030)
Passive child alone slope	-0.227	(0.0003)
Active both children intercept	-2.35	(0.0056)
Active both children slope	-0.215	(0.0005)
Active child 1, passive child 2 intercept	-3.58	(0.0038)
Active child 1, passive child 2 slope	-0.236	(0.0003)
Passive child 1, active child 2 intercept	-3.99	(0.0031)
Passive child 1, active child 2 slope	-0.252	(0.0006)
Passive both children intercept	-2.36	(0.0035)
Passive both children slope	-0.216	(0.0002)
Father's parameters		
Active child alone intercept	-3.93	(0.0021)
Active child alone slope	-0.018	(0.0003)
Passive child alone intercept	-2.58	(0.0051)
Passive child alone slope	-0.158	(0.0009)
Active both children intercept	-2.50	(0.0034)
Active both children slope	-0.141	(0.0003)
Active child 1, passive child 2 intercept	-4.12	(0.0024)
Active child 1, passive child 2 slope	-0.159	(0.0003)
Passive child 1, active child 2 intercept	-4.23	(0.0044)
Passive child 1, active child 2 slope	-0.225	(0.0004)
Passive both children intercept	-3.03	(0.0031)
Passive both children slope	-0.107	(0.0008)
Child expenditures intercept	-1.83	(0.0039)
Child expenditures slope	0.0017	(0.0008)
Last period's child quality intercept	-1.873	(0.0046)
Last period's child quality slope	0.112	(0.0012)

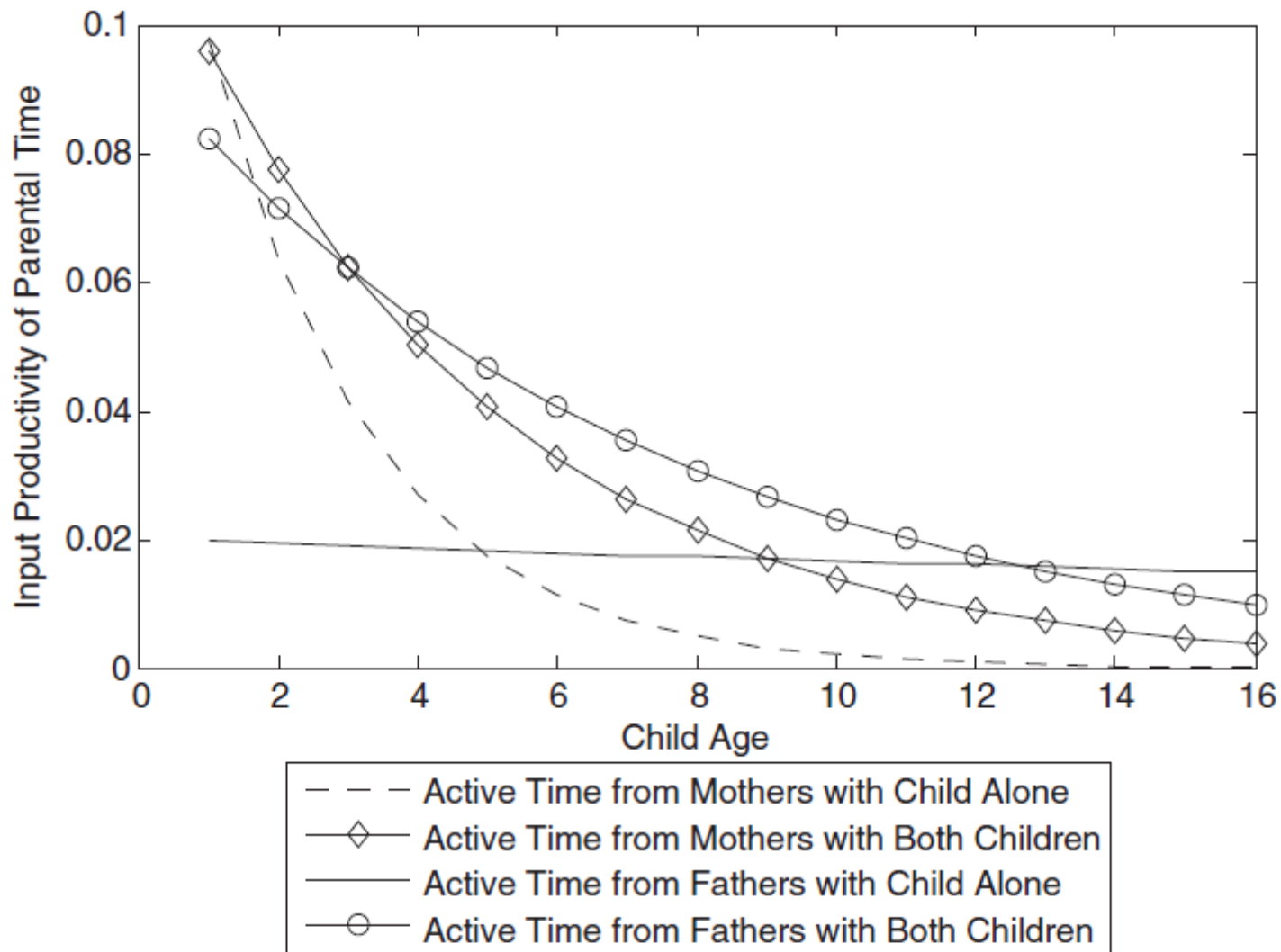


FIGURE 4

Estimated child development parameters by child age (two-child model).

Notes: This graph plots function estimates by child age (from Table 10)

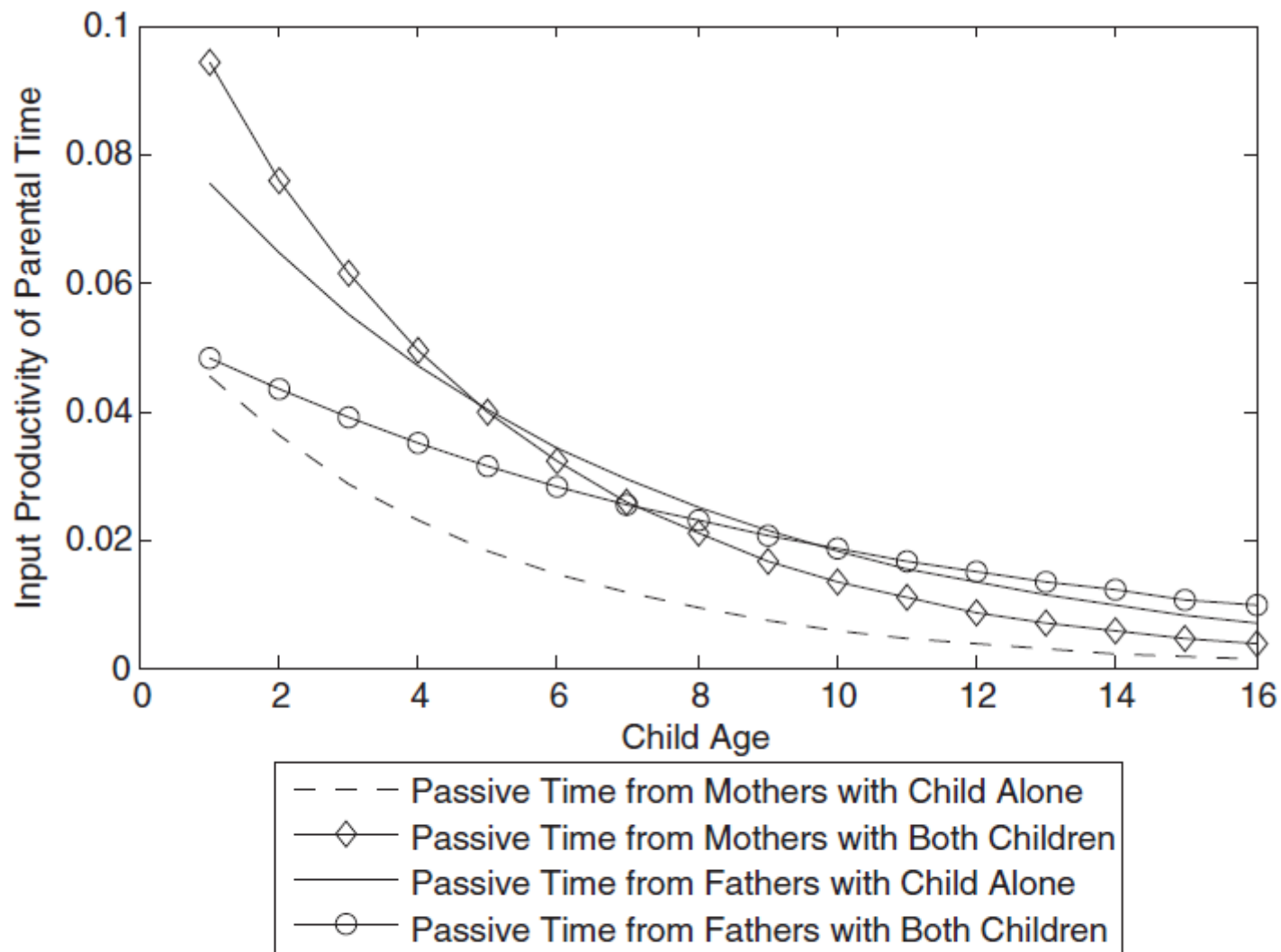


FIGURE 5

Estimated child development parameters by child age (two-child model).

Notes: This graph plots function estimates by child age (from Table 10)

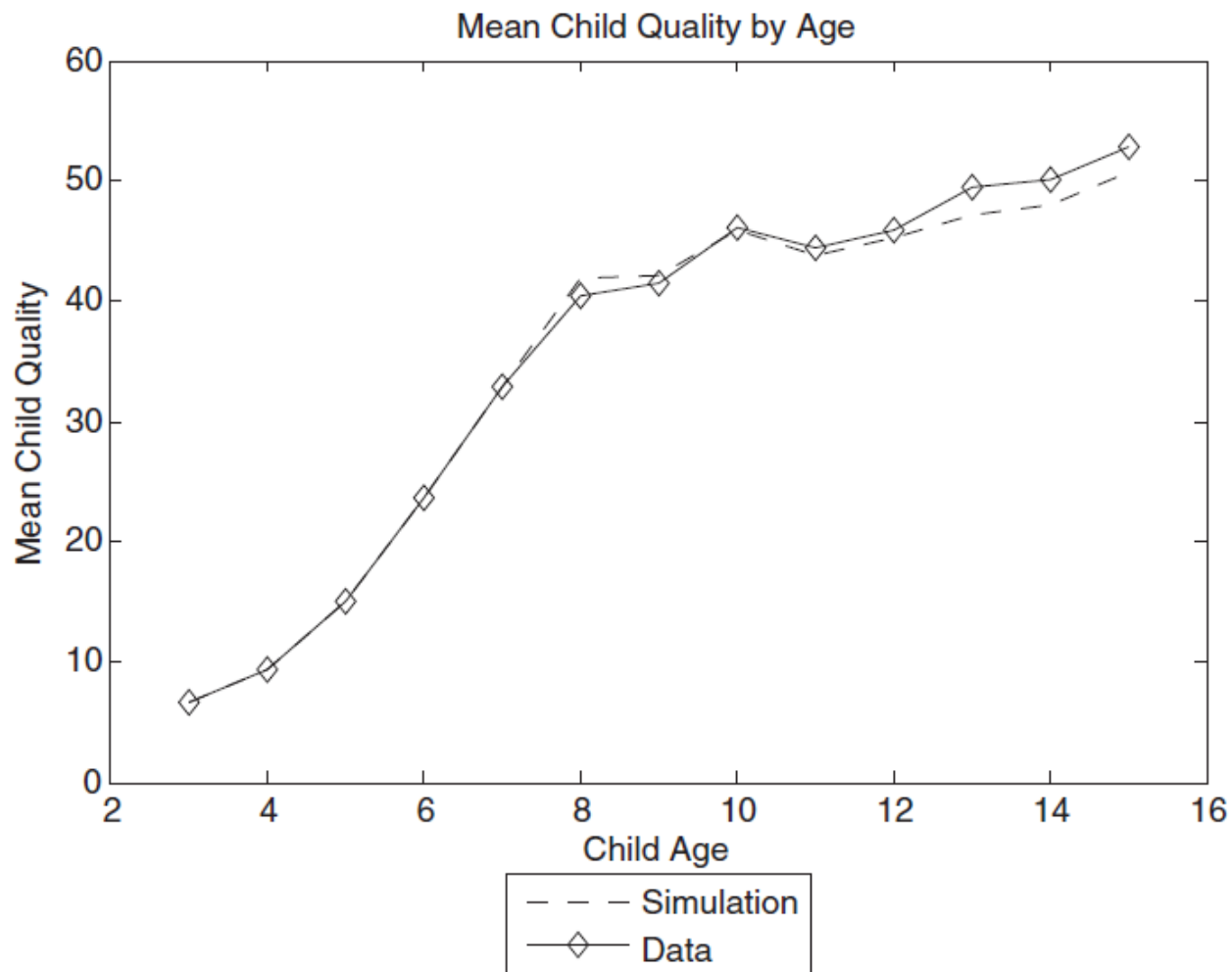


FIGURE 6

Simulated and actual average Letter-Word score by child age (one-child family).

Notes: Data refers to actual data from sample of intact households (mother and father present in household) with one child. Simulated refers to the model prediction at estimated parameters given above. *Source:* PSID-CDS combined sample from 1997 and 2002 interviews and 1997, 1999, 2001, 2003 PSID core data

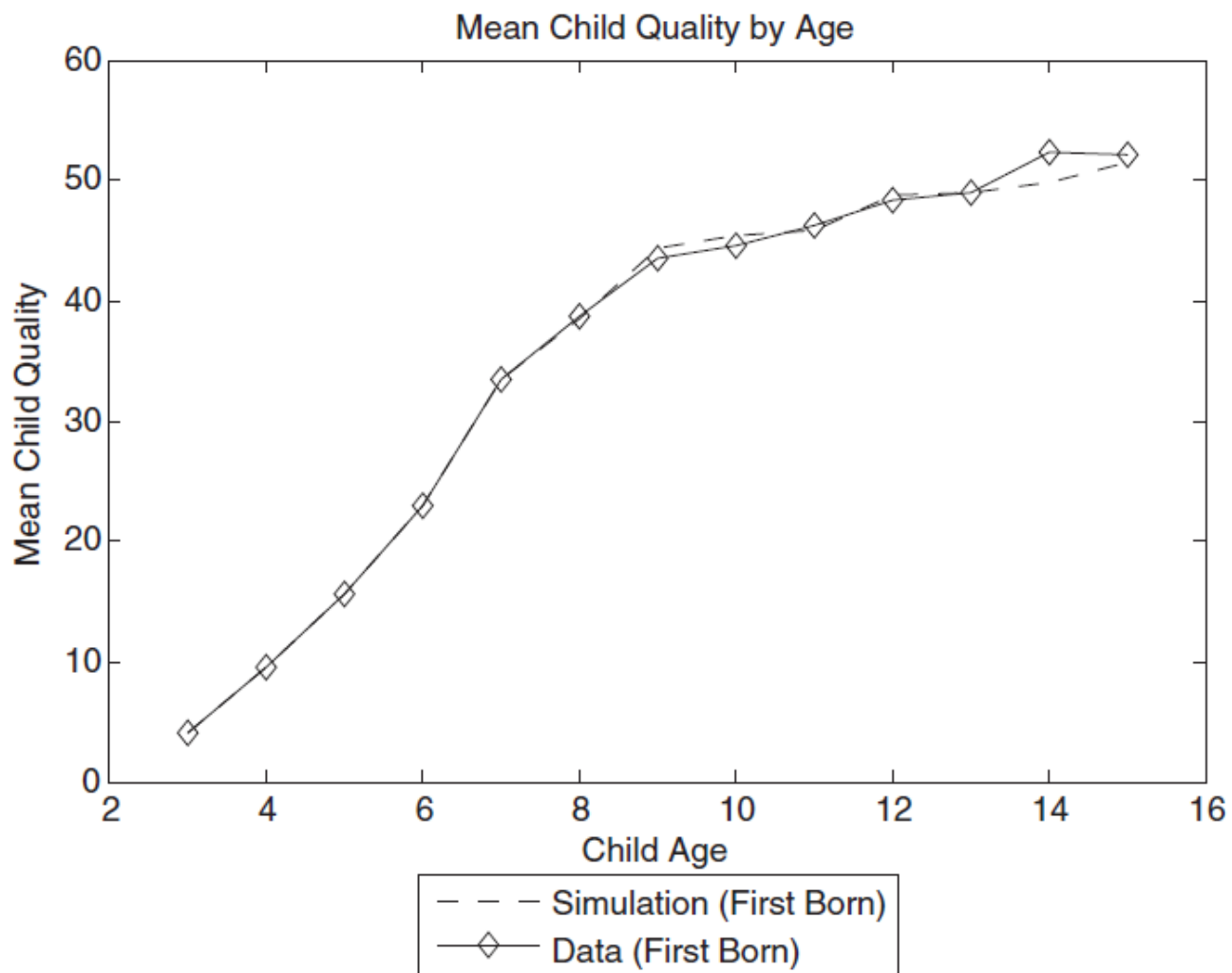


FIGURE 7

Sample fit of average child's Letter-Word score (two-child family, first born).

Source: PSID-CDS combined sample from 1997 and 2002 interviews and 1997, 1999, 2001, 2003 PSID core data

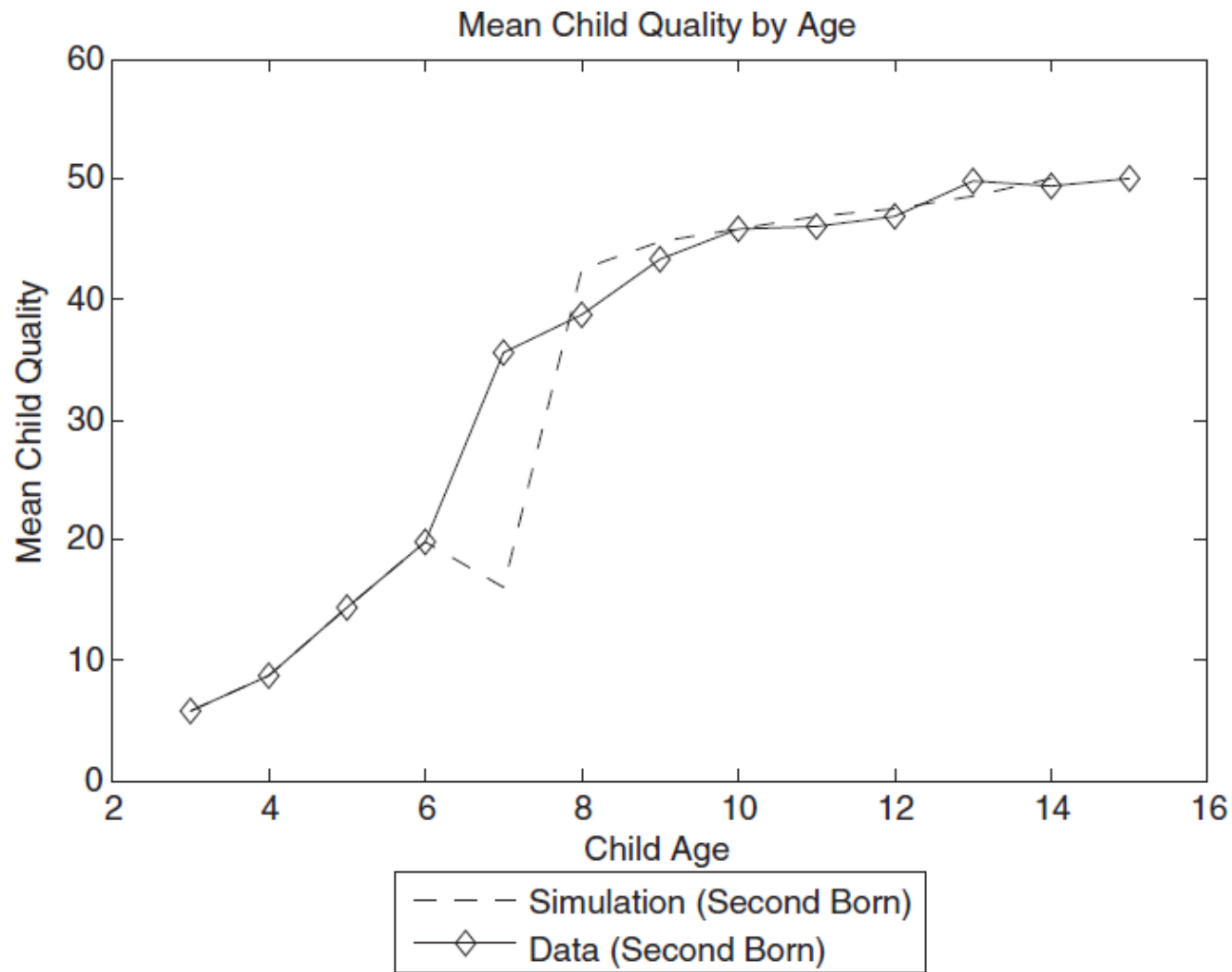


FIGURE 8

Sample fit of average child's Letter-Word score (two-child family, second born).

Source: PSID-CDS combined sample from 1997 and 2002 interviews and 1997, 1999, 2001, 2003 PSID core data

TABLE 11

Sample fit of mother and father's time allocation by child age (2-child families)

Child 1's age	Probability work > 0 hours			
	Mother		Father	
	Data	Simulated	Data	Simulated
3-5	0.771	0.589	0.967	0.996
6-8	0.712	0.721	0.975	0.994
9-11	0.796	0.818	0.984	0.992
12-15	0.833	0.881	0.978	0.997

Child 1's age	Hours worked if work (avg.)			
	Mother		Father	
	Data	Simulated	Data	Simulated
3-5	30.10	31.37	47.82	44.96
6-8	36.71	28.93	48.73	46.15
9-11	28.94	29.52	46.05	46.24
12-15	28.55	28.09	46.83	46.27

TABLE 11

Sample fit of mother and father's time allocation by child age (2-child families)

Child 1's age	Child 1 active time (avg.)			
	Mother		Father	
	Data	Simulated	Data	Simulated
3-5	18.14	17.93	10.56	10.10
6-8	13.02	13.49	8.70	8.99
9-11	10.50	9.99	7.40	8.05
12-15	8.11	6.47	5.80	7.17

Child 1's age	Child 1 passive time (avg.)			
	Mother		Father	
	Data	Simulated	Data	Simulated
3-5	16.99	17.56	8.26	8.50
6-8	16.68	13.78	6.97	7.47
9-11	9.69	10.42	5.22	6.58
12-15	7.18	6.81	5.35	5.68

TABLE 11
Sample fit of mother and father's time allocation by child age (2-child families)

Child 2's age	Child 2 active time (avg.)			
	Mother		Father	
	Data	Simulated	Data	Simulated
3–5	19.95	16.59	10.30	9.41
6–8	11.18	10.84	6.94	8.04
9–11	8.60	7.26	6.18	7.19
12–15	5.86	4.53	3.43	6.45

Child 2's age	Child 2 passive time (avg.)			
	Mother		Father	
	Data	Simulated	Data	Simulated
3–5	19.31	15.95	7.27	8.79
6–8	11.02	11.31	6.13	7.33
9–11	7.12	7.90	4.95	6.37
12–15	5.47	5.07	5.81	5.36

Notes: Data refers to actual data from sample of intact households (mother and father present in household) with two children. Simulated refers to the model prediction at estimated parameters given above. Child 1 is the first-born child in the family.

Source: PSID-CDS combined sample from 1997 and 2002 interviews and 1997, 1999, 2001, 2003 PSID core data.

5. Comparative Statics Exercises

5.1 Preferences and investment

TABLE 12
Optimal decisions with alternative preferences

	Level at baseline	Child quality maximizing preferences	Selfish parent preferences
Mean latent child quality (age 16)	13.38	19.20	0
Mean hours work (mother)	33.25	16.38	43.30
Mean hours work (father)	44.02	40.29	43.31
Mean active time w/ child (mother)	15.66	52.60	0
Mean active time w/ child (father)	10.38	38.43	0
Mean passive time w/ child (mother)	13.96	43.02	0
Mean passive time w/ child (father)	10.29	33.28	0
Mean leisure (mother)	49.13	0	68.70
Mean leisure (father)	47.31	0	68.69
Mean child expenditures / 1000	0.436	1.211	0
Mean household consumption / 1000	1.11	0	1.69
Mean utility /1000	0.0632	0.0091	0.056

Notes: Child-quality maximizing preferences set the preference weight on parental leisure and consumption to 0: $\alpha_1 = \alpha_2 = \alpha_3 = 0$. Under these preferences, the household then maximizes the level child quality, and consumption $c_t = 0$ for all t . Selfish Parent Preferences set $\alpha_4 = 0$, and the household puts no weight on child quality. With these preferences, all child inputs equal 0 for all t . Mean latent child quality (age 16) is the latent value of child quality at the end of age 16 or the start of period $t = 17$, k_{17} .

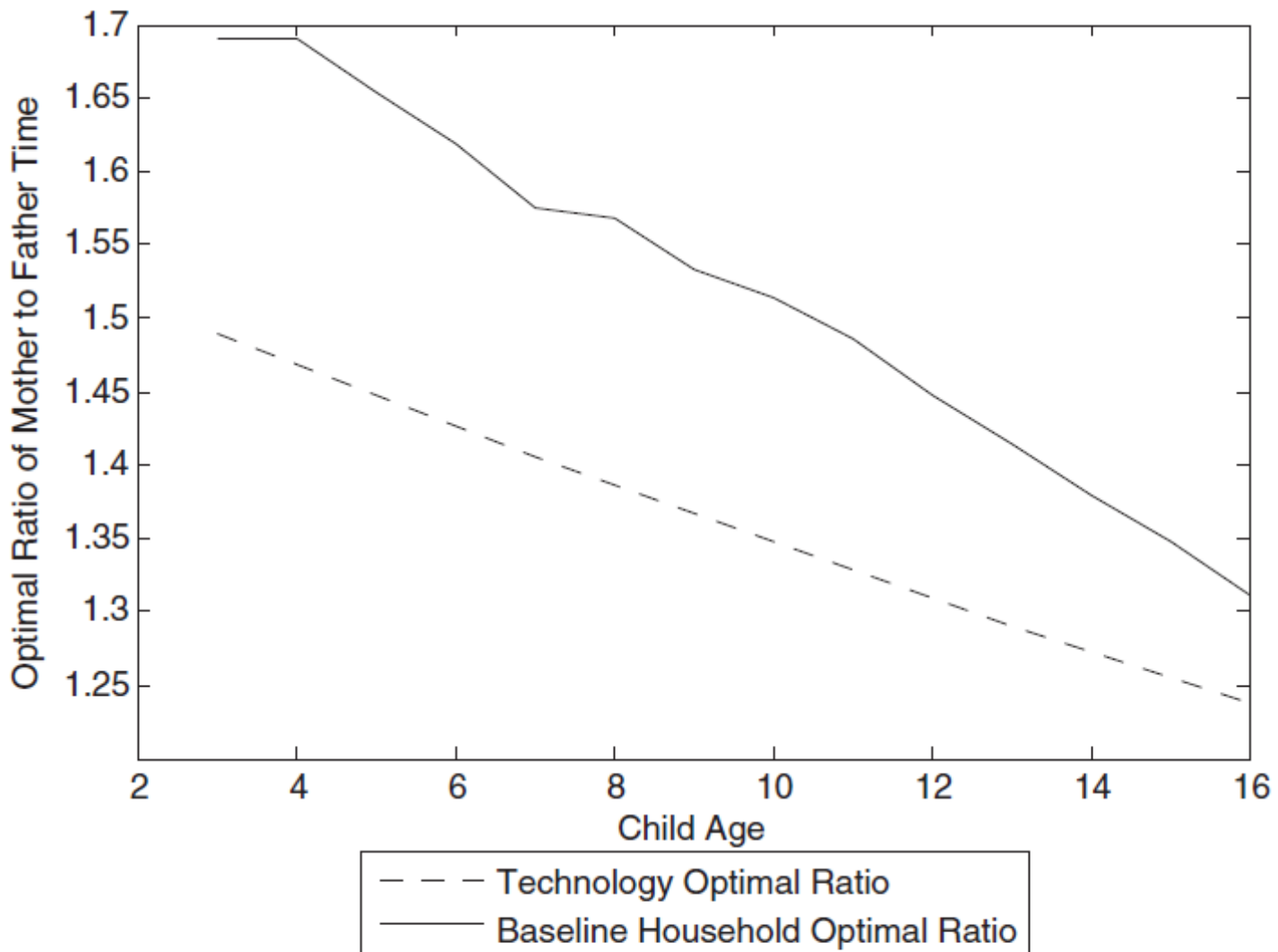


FIGURE 9

Optimal ratio of mother's and father's time with child under different modelling assumptions.

5.2 Policy analysis

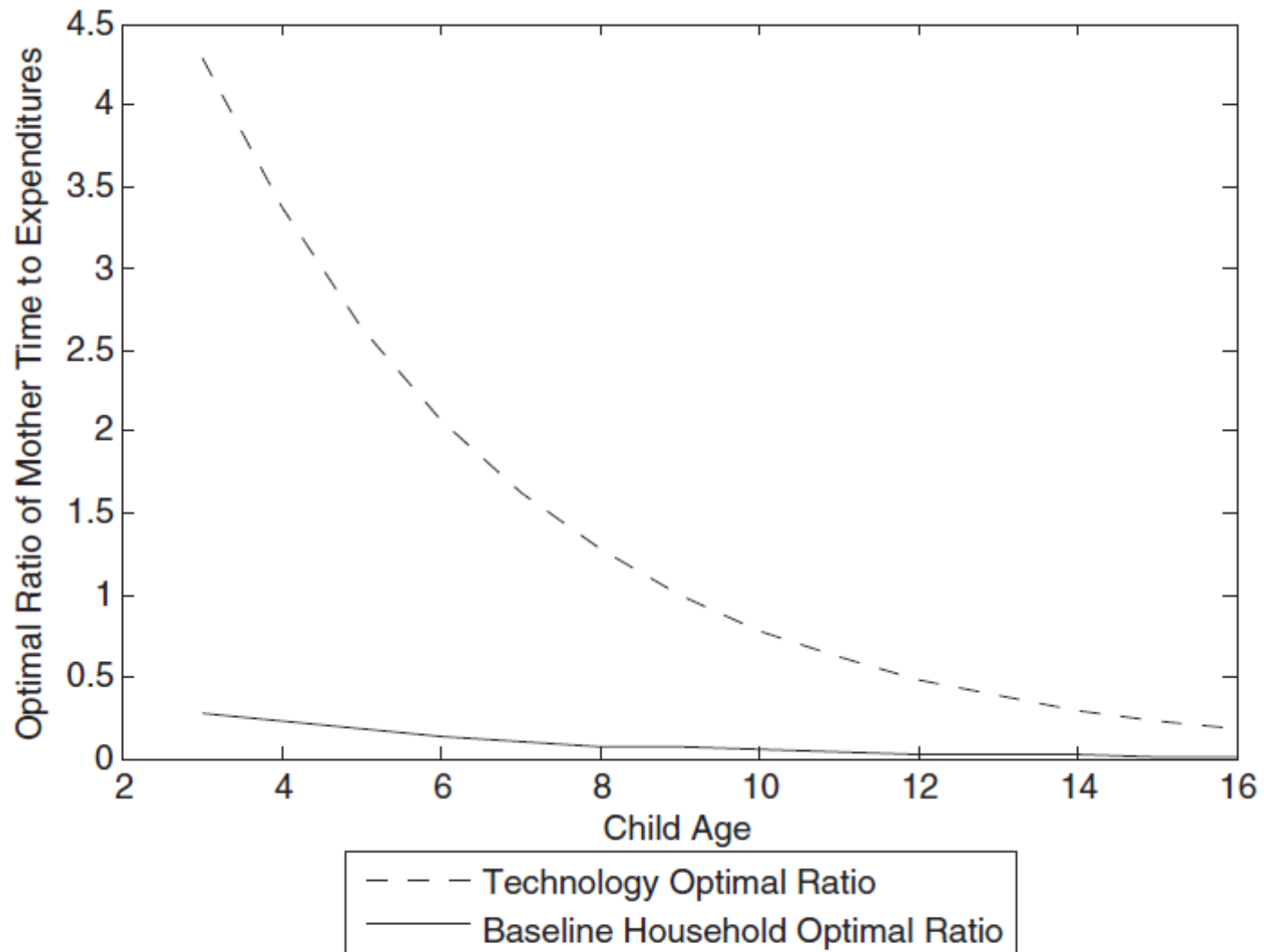


FIGURE 10

Optimal ratio of mother's time with child and child expenditures under different modelling assumptions.

6. Conclusion