

*Children's Education Attainment: The Effects of Mothers' Working on the Children's Golden Age Period**

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Abstract—Using the household production function approach, mother's employment during the golden age period may entail a negative time effect and a positive income effect on the child's quality, of which the net effect is ambiguous and thus may become a source of dilemma for the family. Empirical studies on this issue in Indonesia are still limited. This study conducted an empirical investigation on whether mother's employment when the child was in the golden age (i.e., 0-5 years old) would influence the child's education attainment in Indonesia. Employing the longitudinal data from the Indonesian Family Life Survey (IFLS) of the 1993-2007 period, the study constructed several children sub-sample whose education outcome were observed in the 2007 IFLS; and the mothers' working hours were reported in the IFLS of the previous years. It was found a significant positive impact of mothers' working hours to the children's probabilities of finishing the elementary school, continuing to junior high school, and finishing the junior high school. The results were robust when the nearest distance to school was included to control the supply-side factor. These empirical results show that mothers' decision to work during the children's golden age may have generated a substantial income effect greater than the time effect.

Keywords— children education outcome, mother employment

I. INTRODUCTION

The negative impacts of mothers' working time on the children's quality often become a source of dilemma for the family, especially in mother's labor supply decisions. The dilemma is not only a social issue but also an economic issue; there is scarcity of resources issue that can be provided for the child by a working mother. The effects of mothers go working on the quality of children has received attention in economics, especially the debate about whether working mother will increase or decrease the quality of children. Generally, economic literature uses the basic skeleton of Becker's household production function for analyzing the debate [1]. The function of household production states that time and goods are inputs in the production of household commodities (e.g. the quality of child) [2]. The children's quality as measured by the children's educational attainment can be

enhanced by increasing the time and goods from parents for children [3]. However, when a mother decides to work, mother's time for children is reduced, but family income to purchase inputs of goods and services for children may increase [4][5].

A working mother creates two contradictory effects to the educational attainment of the children: the negative time effect and the positive input effect. A working mother affects negatively in a way the mother's time for working reduces her time in establishing the children education attainment [5]. A working mother affects positively since a working mother can earn income for purchasing goods and services inputs such as books, educational toys, courses, nutritious food or health care that can support children education attainment [3][6]; this is sometimes referred to as the positive income effect [4][5][7]. These two contradictory effects cause the net effect of working mothers on the children's educational attainment to be ambiguous.

A model built to determine the effects of mothers go working on the educational attainment of children needs to consider the point of mother's working time. This study focuses on the measurement of mother's working time when the children aged 0-5 years. Based on consideration of psychology, the age of 0-5 years is a childhood golden age period. Parents' investment in those years is important for the intellectual and emotional development of the children [7]. Based on consideration of empirical problems, endogenous problems in this study can arise when the decisions of mothers go working are influenced by the ability of the children. By focusing on the working mothers with early-age children, 0-5 years, the endogenous problems caused by reverse causality can be overcome because the ability of the children is not fully known by the mothers; so that mothers will not decide to work based on the ability of the children [3][7].

An important issue in the measurement of mothers' employment time when the children aged 0-5 years is the condition of working mothers which are not fixed every year;

this may change both the status and working hours of the mothers. Because of that, the measurement of mothers' employment time, which show working time thoroughly during children aged 0-5 years, is required. A British study conducted by [7] defined mothers' employment time as the number of months that mothers spent for working when the children aged 0-5 years, because the employment data used did not record working hours information. Other studies measured the mother's working time by the average working hours/weeks during the child aged 0-3 years [3]. The measurement of mothers' employment time in this study is calculated through continuous data i.e. the mother's average working hours/year during children aged 0-5 years. This strategy is expected to provide better measurements than just looking at the status of employment, working hours/week or working weeks/year in a particular year.

Based on the background above, some international studies have sought to raise the issue of working mothers at early childhood and the effects on children's outcomes in both cognitive outcomes and outcomes of children's education. Unfortunately, research in Indonesia raising the issue is still very limited. On the other hand, mothers' concerns about the negative impacts of working on the children's outcomes become a dilemma in the maternal labor supply [8]. The results of the study in Indonesia concluded that the probability of married women to exit from employment is higher when married woman have a child than married women who do not have any child [9]. Therefore, a study that examines the effects of mother's working time on educational attainment of children in Indonesia is interesting to do. Thus, the purpose of this study is to determine the effects of mother's average working hours/year during the children golden age period (i.e. 0-5 years) on the children's education attainment; it is measured by the children's probabilities of finishing the elementary school (SD), continuing to junior high school (SMP), finishing the junior high school (SMP) and continuing to the senior high school (SMA) from longitudinal data of IFLS at individual, household and community level 1993-2007.

II. ANALYTICAL FRAMEWORK

The effects of mothers' working time on the children's education attainment were built through the conceptual framework from [7] as the development of the household production function [2]. By assuming that the fathers' working time as a given, paternal utility is a function from the sub utility function $V(\cdot)$ which shows the parents' standard of living and the sub utility function $W(\cdot)$ which indicates parents' satisfaction resulting from the future capacity of the children.

$$U = U[V(x, L), W(e_i)] \quad (1)$$

U: utility of parents

x: family public good

e_i : child's capacity in the future for child i

L : mother's leisure time

e_i is produced in the family by requiring mother's time input and the input of goods and services purchased in the market.

$$e_i = f(\tau_i, m_i, x, \varepsilon_i) \quad (2)$$

τ_i : mother's time input for the formation of child i's capacity in the future

m_i : specific goods for child i

ε_i : ability of child i

To maximize the utility, the budget constraint encountered is given by

$$b + wT = wL + x + w\tau_i + pm_i \quad (3)$$

T: total mother's time available

w : mother's wage

p : the price of specific goods for child i

b : father's income and family's non labor income

While limited time of mother is not only used for the production child i's capacity in the future but also for working and leisure time.

$$T = \tau + L + h \quad (4)$$

Mother's working time, h is treated as a parameter in the constrained utility maximization problem. Given h, the reduced form of the conditional demand function for child i's capacity in the future becomes

$$e_{i=} = g(h, b + wh, p, \varepsilon_i) \quad (5)$$

So the impact of mother's working time on child i's capacity in the future is given by

$$\frac{\partial e_i}{\partial h} = \frac{\partial f}{\partial \tau_i} \frac{\partial \tau_i}{\partial h} + \frac{\partial f}{\partial m_i} \frac{\partial m_i}{\partial h} + w \frac{\partial f}{\partial x} - p \frac{\partial f}{\partial x} \frac{\partial m_i}{\partial h} \quad (6)$$

Mother's working time can reduce mother's time for formation of the child i's capacity or called a negative time effect. On the other hand, the mother's working time can result a positive income effect on the child i's capacity through the purchase of goods for her child. These two conflicting effects can cause the impact of mother's working time on the child's capacity to be ambiguous.

III. METHOD

The objective of the study is to determine the effects of mother's working time during the children's golden age period (i.e. 0-5 years) on the children's education attainment in the future. The empirical model refers to the conditional demand function model in equation (5). The equation is estimated using the logit method.

$$P(y_i = 1|x_i) = F(\alpha_0 + \alpha_1 h_i + \alpha_2 w_i + \alpha_3 b_i + x_control'_i \beta + u_i) \quad (7)$$

Where F(.) is a logistic function (logistically distributed error)

y_i : children education attainment in 2007

h_i : mother's working time when child i is in golden age period

w_i : mother's wage when child i is in golden age period

b_i : father's income when the child i is in golden age period

$x_control'_i$: the control variable vector consisting of the characteristics from the child, father, mother and community

u_i : error term

Measurements of the dependent variable of children education attainment in this study are dichotomous i.e. whether the child has finished elementary school (SD) or equivalent or not in 2007; which specifically has value of 1 if years of schooling ≥ 6 and 0 if years of schooling < 6 for observation of

children aged 13 -19 years. Whether the child continued to junior high school (SMP) or equivalent or not in 2007, it specifically has value of 1 if years of schooling ≥ 7 and 0 if years of schooling <7 for observation of children aged 13-19 years. Whether the child finished junior high school (SMP) or equivalent or not in 2007, it specifically values 1 if years of schooling ≥ 9 and 0 if years of schooling <9 for observation of children aged 16-19 years. Whether the child continued to senior high school (SMA) or equivalent or not in 2007, it specifically values 1 if years of schooling ≥ 10 and 0 if years of schooling <10 for observation of children ages 16-19.

Sampling of children with age ranged of 13-19 years in 2007 or were born from 1988-1994 has a strong reason. This study observed mothers' working time during the first 5 years of the children; while mothers' employment data including working hours and labor income derived from retrospective data as well as baseline data of IFLS 1,2 and 3 were only available from 1988-2000.

IV. RESULT

Table 1 shows estimation results for observation of children aged 13-19 years; children's probabilities of finishing the elementary school (SD) is the dependent variable. The logit estimation results show that the average working hours/year of the mothers when the children were 0-5 years old have a significant positive effect on the children's probabilities of finishing the elementary school, after controlling the variables associated with the characteristics of children and parents.

Table 1. Estimated Results on Children's Probabilities of Finishing the Elementary School

Independent Variables	Marginal Effect		Marginal Effect ^a	
Average mother's working hours/year during child's golden age period (hour)	0,00002 ***		0,00002 ***	
Birth year of the child	-0,011 ***		-0,011 ***	
Gender of the child (1. female, 0. male)	0,028 ***		0,026 ***	
Average mother's wage/year during child's golden age period (thousands of IDR)	0,001		0,001	
Length of mother's education (years)	0,009 ***		0,008 ***	
Mother's age when the child was born(years)	0,002 **		0,002 ***	
Average father's labor income/year during child's golden age period (thousands of IDR)	4,79e-08		2,95e-08	
Length of father's education (years)	0,005 ***		0,004 ***	
Father's age when the child was born (years)	-0,0004		-0,0003	
Observations	3765		3739	

Description: 1) ***p<0.01, **p<0.05, *p<0.1. 2) The numbers in brackets indicate p-value. 3) Marginal effect^a shows the marginal effect value with dummy control of children's entering elementary school defined as 1 if the child entered SD (years of schooling ≥ 1) and 0 if not (years of schooling <1).

The marginal effect showed that on the sample average, a 1 hour increase from the average working hours/year of the mother when the child was 0-5 years old would increase the children's probabilities of finishing the elementary school by 0.00002. Addition of control variable i.e. children's entering elementary school dummy as requirement for finishing

elementary school; to avoid sample selection bias not change result of estimation by logit that is still robust show average working hours/year of mother when child age 0- 5 years have a significant positive effect on the children's probabilities of finishing the elementary school with a marginal effect of 0.00002.

Table 2. shows the estimation results for observation of children aged 13-19 years in which children's probability of continuing junior high school (SMP) as dependent variable. The logit estimation results show that the mother's average working hours/year during child's golden age period significantly affects positively on the probability of continuing to junior high school. However, the marginal effect becomes smaller in logit estimation with additional dummy control variable of children's finishing from elementary school that is equal to 0.00002.

Table 2. Estimated Results on Children's Probabilities of Continuing the Junior High School

Independent Variables	Marginal Effect		Marginal Effect ^a	
Average mother's working hours/year during child's golden age period (hour)	0,00003 ***		0,00002 ***	
Birth year of the child	-0,041 ***		-0,027 ***	
Gender of the child (1. female, 0. male)	0,046 ***		0,015 *	
Average mother's wage/year during child's golden age period (thousands of IDR)	0,007 **		0,006 **	
Length of mother's education (years)	0,021 ***		0,012 ***	
Mother's age when the child was born (years)	0,004 ***		0,003 ***	
Average father's labor income/year during child's golden age period (thousands of IDR)	4,38e-08		9,36e-09	
Length of father's education (years)	0,020 ***		0,014 ***	
Father's age when the child was born (years)	-0,001		-0,001	
Observations	3765		3445	

Description: 1) ***p<0.01, **p<0.05, *p<0.1. 2) The numbers in brackets indicate p-value. 3) Marginal effect^a shows the marginal effect value with dummy control of children's finishing from elementary school defined as 1 if the child graduated from elementary school (years of schooling ≥ 6) and 0 if not (years of schooling <6).

Table 3 shows the estimation results for the observation of children aged 16-19 years with children's probability of finishing the junior high school (SMP) as the dependent variable. Estimation results with and without control variable dummy of children's entering junior high school still robust shows a significant positive effect of mother's working time when children aged 0-5 years on children's probability of finishing junior high school. However, the addition of that variable causes the decline of marginal effect value.

The mothers' working time significantly affects positively on the children's probability of finishing elementary school (SD), continuing junior high school and finishing junior high school (SMP) On the other side, the estimation results indicate that mothers' average working hours/year when the children aged 0-5 years does not significantly affect the children's probability of continuing high school (SMA) as shown in table 4. This result remains robust when the dummy of the children's finishing from junior high school are controlled.

Table 3. Estimated Results on Children's Probabilities of Finishing the Junior High School

Independent Variables	Marginal Effect		Marginal Effect ^a	
Average mother's working hours/year during child's golden age period (hour)	0,00006 (0,000)	***	0,00001 (0,000)	***
Birth year of the child	-0,022 (0,002)	***	-0,020 (0,000)	***
Gender of the child (1. female, 0. male)	0,044 (0,002)	***	0,026 (0,004)	***
Average mother's wage/year during child's golden age period (thousands of IDR)	0,010 (0,002)	***	0,004 (0,029)	**
Length of mother's education (years)	0,021 (0,000)	***	0,004 (0,036)	**
Mother's age when the child was born (years)	0,005 (0,004)	***	0,002 (0,079)	*
Average father's labor income/year during child's golden age period (thousands of IDR)	1,70e-07 (0,249)		1,59e-07 (0,376)	
Length of father's education (years)	0,023 (0,000)	***	0,005 (0,001)	***
Father's age when the child was born (years)	-0,0005 (0,700)		-0,0004 (0,559)	
Observations	2097		1715	

Description: 1) ***p<0.01, **p<0.05, *p<0.1. 2) The numbers in brackets indicate p-value. 3) Marginal effect^a shows the marginal effect value with dummy control of children's continuing to junior high school that defined as 1 if the child continued to junior high school (years of schooling ≥7) and 0 if not (years of schooling <7).

Table 4. Estimated Results on Children's Probabilities of Continuing the Senior High School

Independent Variables	Marginal Effect		Marginal Effect ^a	
Average mother's working hours/year during child's golden age period (hour)	0,00002 (0,180)		-0,00001 (0,370)	
Birth year of the child	-0,107 (0,000)	***	-0,089 (0,000)	***
Gender of the child (1. female, 0. male)	0,111 (0,000)	***	0,080 (0,001)	***
Average mother's wage/year during child's golden age period (thousands of IDR)	0,0003 (0,428)		0,00006 (0,819)	
Length of mother's education (years)	0,039 (0,000)	***	0,020 (0,000)	***
Mother's age when the child was born (years)	0,009 (0,001)	***	0,007 (0,012)	**
Average father's labor income/year during child's golden age period (thousands of IDR)	1,45e-08 (0,939)		-4,63e-08 (0,754)	
Length of father's education (years)	0,040 (0,000)	***	0,022 (0,000)	***
Father's age when the child was born (years)	-0,001 (0,688)		-0,0015 (0,520)	
Observations	2097		1569	

Description: 1) ***p<0.01, **p<0.05, *p<0.1. 2) The numbers in brackets indicate p-value. 3) Marginal effect^a shows the marginal effect value with dummy control of children's finishing junior high school that defined as 1 if the child graduated from junior high school (years of schooling ≥9) and 0 if not (years of schooling <9).

In the model of children educational attainment, control of education supply side variables needs to be done because it may affect the children's education attainment. This study tries to control the distance from the village's head office to the nearest school as the proxy of the education supply side factor.¹

¹ The use of the nearest school distance variable that is measured from IFLS 2007 must fulfill the assumption that the village don't has rapid development for several years. If that assumption is not fulfilled, the variables can only be relevant for sample of children aged 13-19 years in 2007 who were

The result of robust estimation shows that the mother's working time during the child's golden age period has significant positive effect on the children's probabilities of finishing the elementary school (SD), children's probabilities of continuing the junior high school (SMP), children's probabilities of finishing the junior high school (SMP); but the mother's working time during the child's golden age period has no significant effect on the children's probabilities of finishing the junior high school (SMA), as shown in Table 5².

Table 5. Estimated Results with Variable Distance from Village to Nearest School as Proxy the Education Supply Side Variable

Independent Variables	Marginal Effect ^a		Marginal Effect ^b		Marginal Effect ^c		Marginal Effect ^d
Average mother's working hours/year during child's golden age period (hour)	0,00002 (0,000)	***	0,00002 (0,030)	**	0,00001 (0,076)	*	-4,17e-06 (0,779)
Distance to nearest SD (km)	0,007 (0,370)						
Distance to nearest SMP (km)			-0,005 (0,157)		-0,002 (0,394)		
Distance to nearest SMA (km)							-0,011 (0,005)
Observations	2495		2294		1133		1026

Description: 1) ***p<0.01, **p<0.05, *p<0.1. 2) The numbers in brackets indicate p-value. 3) Marginal effect^a shows the marginal effect on children's probabilities of finishing the elementary school 4) Marginal effect^b shows marginal effect on children's probabilities of continuing the junior high school 5) Marginal effect^c shows marginal effect on children's probabilities of finishing the junior high school 6) Marginal effect^d shows marginal effect on children's probabilities of continuing the senior high school

V. DISCUSSION

The empirical results indicate that the mothers' working time during the children's golden age period has the potential positive net effect on the children education attainment in the future. In other word, mothers' decisions to work in Indonesia during the children's golden age period may have generated a substantial income effect which is greater than the time effect. The results of this study are consistent with the result from [3] which stated that there was no strong evidence of mothers went working when the children were 0-3 years old would endanger children education attainment in the future; even that study showed that mother's working hours positively affected the children education attainment. Although initially the negative time effect can occur when the mothers go working during the first year of childhood, but the negative time effect can be replaced by the positive income effect that may occur when the mothers work in the second and third years of childhood [4][10].

graduated from SD and were in transition from SD to SMP in 2007 and for sample of children aged 16-19 years in 2007 who were graduated from SMP and were in transition from SMP to SMA in 2007

² The model had tried to overcome the endogenous problems caused by unobservable mother preference by controlling ownership of maternal assets. Asset ownership is used as a proxy for mother's preference because it is assumed that individual asset ownership of mothers can increase bargaining power of mothers in households so that mothers can satisfy the preferences for their children's education. For the proxy of mother's preference, this study used the dummy variable of mother's individual asset ownership when the child is 0-5 years in the form of dwelling house ownership dummy, other house ownership dummy, land ownership dummy, livestock ownership dummy and vehicles ownership dummy.

Based on the observation of the marginal effect obtained: when the distance of the nearest school is controlled, the estimation result shows the marginal effect value of mothers' working time on the children's probability of finishing the elementary school and continuing the junior high school is 0.00002; while the marginal effect of mothers' working time on the children's probability to finish the junior high school is equal to 0.00001, with the level of significance decreases along with an increase of educational achievement. The marginal effect of mothers' working time was reported to be very significant for children's probability to finish elementary school, and to continue to junior high school, but less significant for children's probability in finishing junior high school, and insignificant for children's probability in finishing senior high school. There is an allegation of insignificant effect on the children's probability to finish the senior high school because the positive effect of mothers go working during the children's golden age period that increased the initial human capital of children was not enough to make the children through senior high school level. Supporting conditions when the children enter high school such as family economic strength, the number of dependent members in the family and the accessibility of the school, especially the distance of the nearest high school are expected to affect the probability of children continuing senior high school.

VI. CONCLUSION

This study tried to find out the effects of mothers go working during the children's golden age period (i.e. 0-5 years) on the children education attainment in the future, by using IFLS longitudinal data from 1993-2007 at individual, household and community level. The result of this study proved that the effect of mother's working time during childhood golden age period is positive and significant on the children's probability of finishing elementary school, the children's probability of continuing junior high school and the children's probability of finishing junior high school. Therefore, at the household level, the decision of the maternal labor supply in childhood golden age period does not necessarily be a dilemma in the family. Based on the results of the study, mothers go working during the golden age period of the children potentially generate a positive net effect on educational attainment of children in the future; which means positive income effect dominates the negative time effect.

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