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The Effect of Working Mother on Children's Cognitive Achievement

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Abstract: Children's cognitive is the main role in increasing human capital. Female labor force participation is important not only for supporting economic growth but also for human capital. Moreover, female labor force participation can reduce the income gap based on gender and it gives women opportunity to increase their skills. Workers in the informal sector are more dominant than a worker in the formal sector in almost developing countries, especially women who are already married. Therefore, the effect of female labor participation is still on debated. This research aims to know the different effects of working mothers based on the formal and informal sectors on children's cognitive development. This study is using IFLS 2, IFLS 3, IFLS 4, and IFLS 5. The sample is mother who have children aged 0-3 years old. Children's cognitive is measured by national examination scores in Elementary school and Junior High school. Moreover, this study used a fixed-effect method to reduce the bias effect. The result shows that working mother in the formal sector affects children cognitively higher than children with working mother in the informal sector. Working mother in the formal sector has a higher impact on the short-term than long-term. Caused by mother education in the formal sector is higher than working mothers in the informal sector. Moreover, a working mother can be alleviated maternal education which means a higher maternal education can increase children's cognitive. Although maternal education has a higher impact when children are in elementary school and it tends to decrease when children are in Junior high school. Several children have a negative and significant effect on children's cognition but birth order has a positive and significant effect on children cognitive.

Keywords: Working Mother; Children's Cognitive Score

JEL Classification: P46; O15

Introduction

One of the goals of Sustainable Development Goals (SDGs) aims to reduce discrimination against woman and increase women participation which can reduce the income gap between women and men (Sohn, 2015). Gender equality on labor force participation rate remains lower for women than man (Statistics Indonesia, 2019). Women labor force participation rate is 53.13 percent while men labor force participation rate is 82.41 percent. Women labor force participation rate is fluctuate albeit its percentage tends to stagnant almost 2 decades in Indonesia. Based on World bank (2019), the total percentage on female labor participation was 52 percent in 1990 and it became 53 percent in 2000. However, this percentage decreased up to 47 percent in 2006 but it increase sharply become 51 percent in 2007. It tends to increase up to 56 percent in 2019.

Gender gap on labor force participation might be affecting by economic, social, and institutional (Klasen et al., 2020). Despite, religion has significant effecting women labor force participation in Indonesia. The different participation rate among various religion might be determining by cultural and social norm (Alam et al., 2018). Mostly developing countries especially Indonesia adopting patriarchal system which is among man and women have different role in household. Man is a head of household must be participate in labor force, while women is housewives has responsible for managing household. Thus, marital status and number of children are main drives of women participation on the labor force. Most marriage women tends to opt out of work when they have a toddler. Despite the women re-entering into labor force participation on informal sector when they are marriage or their children is getting older (Setyonaluri, 2014; Schaner & Das, 2016; Widarti, 1998, Cameron, et al., 2019).

There are some barriers for marriage women to participate in the formal sector, including the short period of maternity leave, the lack of facilities to provide women reproductive health rooms such as lactation rooms for breastfeeding mother, lack of providing childcare service near the office, which is women worry about the security of their children and the lack of regulation regarding part-time hours in the formal sector. It can be seen that Woman labor force in Indonesia is dominated by workers in the informal sector than formal sector. Statistics Indonesia (2019) informs that woman in informal sector was 43.91 percent and 35.30 percent in the formal sector. Informal sector has more time flexibility needs for women for balancing home and work activities. Moreover, this sector gives opportunity for women to involve in economic activity lead to higher income family and increase household expenditure would be impacted on children cognitive by fulfill family and children necessities. Despite women labor force participation increase investment education by increase the enrollment of children school participation thus stimulate development of children cognitive (Arvin & Summers, 2000).

Nevertheless, the participation of women in economic activities is still debatable especially regarding children's cognitive development. There are some studies found that working mother has positive effect on children cognitive (Vandell & Ramanan, 1992; Arvin & Summer, 2000) but some studies also found that working mother has negative effect and has no effect on children cognitive (Han et al., 2001; Stephania & Wisana: 2019; Vikram et al., 2018; Baum (2004).

Some studies found that working mother has an effect on children cognitive based on child birth. Han et al. (2001) found that working mother in the first year of child birth has negative effect but it turns to be positive effect on children's cognitive when mother works in the second and third year of birth. James-Burdumy (2005) by using fixed effect (FE) found that working mother in the first child birth has negative effect on Peabody Individual Achievement Test- Math (PIAT-M) but there is no significant effect of working mother in the second and third birth. In line with Waldfogel et al. (2002) & Berger, et al (2008) by using OLS and PSL shows that working mother in first birth has negative effect on PPVT-R toward white race children. On contrary, Baum (2004) found that working mothers have no effect on children's cognitive when the children is 0-6 years old but it turns to be negative effect when children is over 13 years old. However, Stephiana and

Wisana (2019) found that working mother has negative effect toward children's cognitive in the first 3 years of birth but it has positive effect in over 3 years of birth. In contrast, Regmi and Henderson (2019) found that maternal's income has no effect on children's cognitive whilst father's income has strong effect on children's cognitive development by fulfilling their needs. In line with Blau and Grossberg (1992) and Baum (2003) explained that working mother has no effect on children's cognitive because of increasing of mother's income does not have a direct impact on children's cognitive. Vikram et al. (2018) classifying type of working mother by using Order Logit Regression found that no-working mother has positive effect on math and reading score which is higher than working mother. Besides, working mother which is outside their home and working mother by more than one job have lower score on math and reading.

Based on mother working hours, Lightbody and Williamson (2017) by using OLS found that working mother has positive effect on PPVT-R while working mother is above 20 working hours has negative effect on children. Moreover, (Muller, 1995) classify the time of working mother into part-time and full-time. It shows that working mother with part-time has math score higher on children than full-time working mother. However, Künn-Nelen et al. (2014) shows that working mother both full-time and part-time has positive effect on children. working mother affects increase in income family so that she can fulfill their necessities on nutrition and non-nutrition goods which has impact on children cognitive development. On contrast, Berger et al (2008) & Huerta et al. (2011) has negative significant effect both part-time and full-time. In line with Ermisch and Francesconi (2012) by using fixed effect and instrumenta variable shows working mother has negative effect on children cognitive both part-time and full-time.

Working mother has positive effect on children by increasing income family. Vandell and Ramanan (1992) explains that working mother has positive effect on children cognitive especially who came from low-income families through supplying family needs. In line with James-Burdumy (2005) and Ruhm (2008) found that working mother with low economic status has positive effect on children's cognitive than working mother with high economic status although working mother with high economy level effects on children score higher than children with working mother in low economy level. Mother's income has effect to fulfill family needs by providing nutrition food and school needs which has impact on children cognitive development. Therefore, increased in family income through working mother has effect on increasing investment in education (Maertens & Verhofstadt, 2013; Arvin & Summers, 2000; Cameron et al., 2019). Besides, mother's education can mitigate the negative effect of working mother. Supporting these study, Cordero-Coma and Esping-Andersen (2018) found that working mother with high education and high working hours has positive effect toward children school participation in Germany. These result is in line with Künn-Nelen et al. (2014) and Vikram et al. (2018) finds that maternal education can reduce negative effect on children cognitive. Anggaraini and Setyari (2020) founds that the impact of working mothers has a significant effect on children's human capital in Indonesia and there is a significant difference where the income of working mothers has a greater influence on children's human capital in Indonesia.

Stephiana and Wisana (2019) studies the effect of working mother and non-working mother toward children cognitive in Indonesia. The results is working mother gives negative effect for children under 5 years old compared on non-working mother but it turns to be positive when their children is older. These studies focus on comparing the effect of working mothers and non-working mother on children cognitive but still lack focus on type of job. Indonesia is developing countries which has informal worker more than formal worker but women in the informal sector is higher compared than man. It is due to responsibility of marriage women for balancing work and home obligation. Therefore, this study focus on the effect of working mothers based on formal and informal sector toward children cognitive in Indonesia.

Research Method

This research aims to know the different effect of working mother in the formal and informal sector on children's cognitive. It uses secondary micro data taken from Indonesia Family Life Survey (IFLS). IFLS is a panel data for Indonesian household and provides data at the individual, household and community level. IFLS is the largest longitudinal survey in Indonesia because its survey represents 83 percent of the Indonesian population from 13 provinces out of 26 provinces in Indonesia. IFLS has implemented its survey for 21 years which is consist of 5 waves indicating the time when the survei has been conducted, namely IFLS-1 (1993), IFLS-2 (1997), IFLS-3 (2000), IFLS-4 (2007) and IFLS-5 (2014).

This research is using pooled-cross section data because of data limitation in IFLS. The sample of research are 445 individuals consist of working mother who has children birth in 1989-1992 in IFLS 2 and working mother who has children birth in 1993-1996 in IFLS 3. Moreover, this study contains working mother who has children with complete score both on mathematics and Indonesia language examination in junior high school level and high school level which is obtained in IFLS 4 and IFLS 5. This study exclude english national examination score and senior high school level because of missing data. This study aims to examine the short-run and long-run effect of working mother on children cognitive. This study uses a fixed-effect estimation based on research conducted by James-Burdummy (2005). There is a time-invariant family in maternal characteristics which is one mother can have one children or more than one children in one household so that it can lead to biased results. Moreover, there is time invariant for each of provinces has different characteristic for measure the national examination so it leads for doing regional and year fixed effect. This study is accurate and unbiased if there is no relationship between errors and independent variables in the model. The following formula is based on James-Burdummy (2005):

$$\begin{aligned} UN_{ij} = & \beta_0 + \beta_1 \text{dummyforworkingmother}_{ij} + \beta_2 \text{dummymotherworkinghour} \\ & + \beta_3 \text{dummyforchidrengender}_{ij} + \beta_4 \text{birthorder}_{ij} \\ & + \beta_5 \text{numberofchildren}_{ij} + \beta_6 \text{motherage}_{ij} + \beta_7 \text{mothereduc}_{ij} \\ & + \beta_8 \text{dummybreastfeeding}_{ij} + \beta_9 \text{fatherage}_{ij} \\ & + \beta_{10} \text{fatherincome}_{ij} + \beta_{11} \text{dummymcity}_{ij} + \beta_{12} \text{dummyjavai} \\ & + \beta_{12} PCE_{ij} + \epsilon_{ij} \end{aligned}$$

Dependent variable is children cognitive measured by using national examination (UN) score on math and Indonesia language in elementary school and junior high school. EBTANAS, UAN, or UN score is national assessment standards for determining graduation at primary and secondary school level by Indonesian government. Independent variable are dummy for formal and informal working mother and dummy for working hours. formal worker is self-employed with temporary worker and permanent worker, government worker and private worker whilst informal sector is consisted of self-employed with temporary and permanent worker, and unpaid family worker Hohberg and Lay (2015). The value are 0 for informal worker and 1 for formal worker. Working hours is divided into part-time and full-time. Full-time working mothers is women by above 35 hours per week whilst part-time working mothers is women by under 35 hours per week (Statistics Indonesia, 2019). The value are 0 for part-time and 1 for full-time. There are also control variables such as dummy for children gender, mother age among 15-50 years old, mothers education, dummy for breastfeeding, number of birth, number of biological children, father's age among 15-50 years old, father's income, household expenditure, dummy of city, and dummy of province.

Result and Discussion

Tabel 1 describes the effect of difference working mother on formal and informal sector. It shows that children have lowest score 3.8 poin and highest score 9.8 on Indonesia elementary school national examination score. While on math national examination in junior high school, children have a lowest score 1.5 and highest score 10. The average score of Indonesia language national examination on elementary school and high school are 7.1 poin and 7.3 poin respectively. The average score for math national examination are 6.4 point and 7.2 point. Moreover, these household have 3 children on average and the children is second birth order with the number of female children is 52 percent. Besides, the household characteristic are personal consumption expenditure (PCE), dummy regional and dummy province.

Working mother on formal sector is 28 percent. It leads that working mother on formal and informal sector are 123 and 317 respectively. It is based on Statistics Indonesia (BPS) that Indonesian worker dominated by informal sector than formal sector. Moreover, mother who work on full-time job is 61 percent and part-time job is 39 percent. Married women prefers to working on informal sector and have a full-time job because they have flexibility to manage the household and taking care of children so working mother can not distinguish time activities among them. Furthermore, informal sector is dominated by less educated worker. It can be seen that the average of mother education in this study is 6 years or in the elementary school level. The average of mother age is 34 years old and mother who are breast feeding is 97 percent. The characteristic of father are father's age and father's income.

Table 1 Descriptive statistics

Variable	Obs	Mean	SD	Min	Max
Indonesia elementary school national examination score	445	7.187	1.107	3.8	9.8
Math elementary school national examination score	445	6.446	1.489	1.5	10
Indonesia high school national examination score	445	7.379	1.142	4	9.99
Math high school national examination score	445	7.284	1.492	2.5	10
Dummy for formal working mother	445	0.287	0.453	0	1
Dummy for full-time working mother	445	0.617	0.489	0	1
Dummy for female children	445	0.528	0.499	0	1
Birth order	445	2.593	1.415	1	8
Number of children	445	3.110	1.575	1	10
Mother's age	445	33.94	5.016	22	47
Mother's education	445	6.880	3.776	0	16
Dummy for mother's breast feeding	445	0.973	0.162	0	1
Father's age	445	38.262	5.805	24	50
Log father's income	445	14.425	1.538	0	17.088
Dummy urban	445	0.480	0.496	0	1
Dummy Jawa	445	11.643	0.500	0	1
PCE	445	0.013	0.720	0	15.562

Processed data: Stata 14.

Table 2 explained the difference effect of working mother in formal and informal by using fixed effect model. This study also examine the difference effect of working mothers based on working hours, which is divided into part-time job and full-time job. Model 1 and 3 explained without control variables whilst model 2 and 4 explained with control variables. Model 1 and 3 shows that formal working mother has positive effect with 1 percent significant level. Formal working mother has a positive Indonesian elementary school national examination score by 0.365 point and math elementary school national examination score by 0.514 point. It leads to working mother on formal sector have 0.365 point higher on children's Indonesia elementary school national examination score than children with working mother on informal sector. Moreover, working mother on formal sector effects children's math elementary school national examination score 0.514 point higher than children with informal sector. Model 1 and 3 examine the effect of mother's working hours on children national examination score without control variable. The result shows that mother's working hours is positive by 0.118 point on Indonesian elementary school national examination score and 0.045 poin on math elementary school national examination score, but they are not significant.

Model 2 and 4 shows that children with working mother on formal sector have positive on Indonesian and math elementary school national examination score by 0.144 point and 0.153 point respectively. However, working mother is not significant both on formal sector and informal sector. It is in line with mother's working hours which is not significant on children cognitive but it has positive on children's national examination score by 0.135 point and 0.022 point respectively. Female children has 0.022 point higher on Indonesian national examination score than male, but it turns to be lower by 0.0001 point on math elementary national examination score than male even it is not significant. In line with birth order has positive effect on both Indonesian and math national examination score by 0.067 point and 0.108 point and it is not significant on children cognitive. Number of children has negative effect on children score by 0.077 point on Indonesian national examination score and 0.132 point on math national examination score but it is not significant.

Father's age is negative effect on children cognitive. It shows that one year father's age higher will reduce 0.004 point on Indonesian national examination score and 0.007 point on math examination score on elementary score. however, father's age is only significant on Indonesian national examination score with 1 percent significant level but it is not significant on math national examination score. Moreover, father's income is not significant on children cognitive. The household characteristic are not significant on children cognitive.

Mother characteristic shows that mother education has positive and significant with 1 percent significant level. It leads to mother education has strong power to affect children cognitive. It shows that mother education has 0.043 point on Indonesian national examination score and 0.098 point on math national examination score. Mother with higher education by one year can effect 0.043 point higher on Indonesian national examination score and higher on math national examination score by 0.098 point. Although, mother age and mother breast feeding are not significant.

Table 3 shows that working mother on model 5 and 7 without control variables has no significant effect on children cognitive. In line with model 6 and 8 without control variables, it shows that working mother both on formal sector and informal sector has no significant effect on children cognitive in junior high school. This study examines the effect of working mother and mother working hours toward children cognitive in high school. Model 5 and 7 examine the effect of working mother on children and mother working hours toward children cognitive without control variables. It shows that working mother has positive effect but it is not significant. It is in line with mother working hours which are positive and not significant. Model 6 and 8 with control variables shows the same results that working mother and mother working hours have positive but not significant effect on children cognitive in high school. However, mother education has positive and significant effect with 10 percent significant level on math national examination score, it has no significant effect on Indonesia language national examination score. This results indicate that if mother education higher on 1 level effected higher on children math national score by 0.039 point. The study exhibit mother education give less impact on children when they are elderly. It caused by children affected by their environment when they are getting older so the mother has a weak power to influence children.

Birth order has significant effect on Indonesia national examination score by 1 percent and math score by 10 percent. It shows that the increase of 1 sequence of children will increase Indonesian national examination score by 0.200 point and math national examination score by 0.229 point. The elder children can helping and teaching their young children for learning. The number of children has negative effect and significant with 1 percent significant level on Indonesia high school national examination. It shows that the increase 1 of children will lower 0.187 poin. However, number of children has no significant effect on children cognitive but it has a negative effect by 0.207 poin. It explained that as many as children has negative effect on children. It caused by working mother has a limit time to control children. While female children have a positive and significant by 1 percent significant level on Indonesia high school national examination score. It shows that female has 0.209 point higher on Indonesia high school national examination score than male, but it has no significant effect on math high school national examination score.

Table 2 The difference effect of working mother in formal and informal sector in elementary school

Variable	Indonesia Language		Math	
	(1)	(2)	(3)	(4)
Dummy for mother in formal sector	0.365*** (0.115)	0.144 (0.125)	0.514*** (0.155)	0.153 (0.168)
Dummy for mother in full-time working	0.118 (0.108)	0.135 (0.108)	0.045 (0.145)	0.022 (0.145)
Children's gender dummy		0.022 (0.105)		-0.0001 (0.141)
Children's birth order		0.067 (0.094)		0.108 (0.126)
Number of biological children		-0.077 (0.085)		-0.132 (0.114)
Mother's age		0.018 (0.017)		0.031 (0.023)
Mother's education		0.043*** (0.016)		0.098*** (0.022)
Mother's breast-feeding dummy		-0.333 (0.329)		-0.258 (0.441)
Father's age		-0.004*** (0.014)		-0.007 (0.019)
Father's income log		-0.009 (0.037)		0.068 (0.050)
Household's expenditure log		0.143 (0.089)		-0.010 (0.120)
Urban dummy		-0.010 (0.114)		-0.043 (0.153)
Java dummy		-0.079 (0.242)		0.068 (0.325)
Constant	7.008 (0.090)	5.247 (1.132)	6.270 (0.121)	4.578 (1.518)

Data processed: Stata 14. Significance level: ***1%, **5%, *10%

Birth order has significant effect on Indonesia national examination score by 1 percent and math score by 10 percent. It shows that the increase of 1 sequence of children will increase Indonesian national examination score by 0.200 points and math national examination score by 0.229 point. The elder children can helping and teaching their young children for learning. The number of children has negative effect and significant with 1 percent significant level on Indonesia high school national examination. It shows that the increase 1 of children will lower 0.187 poin. However, number of children has no significant effect on children cognitive but it has a negative effect by 0.207 poin. It explained that as many as children has negative effect on children. It caused by working mother has a limit time to control children. While female children have a positive and significant by 1 percent significant level on Indonesia high school national examination score. It shows that female has 0.209 poin higher on Indonesia high school national examination score than male, but it has no significant effect on math high school national examination score.

Table 3 The difference effect of working mother on formal and informal sector in Junior High School

Variable	Indonesia Language		Math	
	(5)	(6)	(7)	(8)
Dummy for mother in formal sector	0.816 (0.120)	0.078 (0.128)	0.514 (0.157)	0.005 (0.171)
Dummy for mother in full-time working	0.123 (0.112)	0.088 (0.110)	0.053 (0.147)	0.037 (0.147)
Children's gender dummy		0.209*** (0.107)		-0.027 (0.143)
Children's birth order		0.200 (0.096)		0.229* (0.128)
Number of biological children		-0.187*** (0.087)		-0.207 (0.116)
Mother's age		-0.012 (0.017)		-0.002 (0.023)
Mother's education		0.022 (0.016)		0.039* (0.021)
Mother's breast-feeding dummy		-0.306 (0.336)		0.294 (0.448)
Father's age		0.004 (0.014)		0.003 (0.019)
Father's income log		0.014 (0.038)		0.078 (0.051)
Household's expenditure log		-0.020 (0.091)		-0.123 (0.122)
Urban dummy		0.086 (0.116)		0.153 (0.155)
Java dummy		0.258 (0.248)		-0.228 (0.330)
Constant	7.249 (0.093)	7.510 (1.157)	7.207 (0.123)	7.151 (1.543)

Data Processed: Stata 14. Significance level: ***1%, **5%, *10%.

Father age are negative and not significant. Father income have positive and not significant effect on children cognitive. It shows that father income can fulfill children needs and it can encourage of children cognitive development. However, household characteristic has no significant effect.

Based on the results above, working mother in formal sector has positive significant effect on children cognitive than working mother in the informal sector. It because working mother in the formal sector has higher education and intelligence compared to working mother in the informal sector. Mother with high education leads to higher income compared to less educated mother. In line with Schander and Das (2016) informs that wage worker is better educated causing casual and self-employment job is negative with education and wages of employment is positive with education. Mothers with high education and intelligence are able to manage their time for working and caring their children. Besides, working mothers tend to reduce child fertility in order to improve child quality. This is in line with Han et al. (2001) and Vikram et al. (2018) found that mother education can reduce the negative effect of working mothers by teaching their children.

Besides, working mothers with high education can reduce her personal time and allocate her time to spent with children so that children are still to have good quantity and quality with her mother. Working mother with high education can guide her children to get involve in the activities that can encourage children's cognitive development such as reading, singing and telling a story. Income of working mother can increase family income so that it can fulfill to children's needs which can improve their cognitive development such as toys and books (Cordero-Coma & Esping-Andersen, 2018); Reynolds, Fernald, & Behrman, 2017). Besides, families with working mother in the formal sector tends to have her education than working mother in informal sector so that mother will increase investment in education by increasing school participation rate that gives impact to children's return on education in the future (Arvin & Summer, 2000). Thus, children who have a good return on education will have an impact on children's welfare in the future through getting good job and income.

Mothers education have significant effect on increasing national exam score at elementary level but the impact of working mother tend to decrease when children in the junior high school. This implies that working mother only have temporary effect (Blau & Grossberg, 1992). It caused by social interactions between children and their environment. The environment can stimulate children cognitive by any activity that can improve capability of children cognitive. Moreover, the number of children in the household can affects mothers tend to focus for caring and teaching children in the home. Besides, number of children in the household causes the limitation of resources that are distributed within the household so that it affects children's cognitive achievement. In contrast, the birth order has positive and significant effect on children's cognitive. This is because siblings can help each other in order to increase children's achievement.

Conclusion

Women labor participation rate can stimulate economic growth. In fact, female labor participation in Indonesia tends to flatter in 2 decades caused by some policies do not provide what women needs in the office especially for woman who are married and having children. Female labor participation in Indonesia is dominated by informal workers, especially women who are married and have children. therefore, the regulation are needed to increase female labor force participation in the formal sector through the availability of part-time hours in formal sector and childcare in the work office. Some regulations are also needed to improving women labor force participation in informal sector by encourage training jobs to increasing skill and give them easy access for joining into microenterpreneurship. Although, working mothers have impact on time spent between mothers and children that can affect on children's cognitive development. The effect of working mother to children's cognitive is debatable.

This study contributes to the previous literature to knowing the effect of working mother on children's cognitive by separating the type of mother job into formal sector and informal sector. We employ fixed-effect model to estimate the effect of working mother on children's cognitive achievement. These method applied to remove the time-invariant of maternal characteristics due to having more one sample children. We found that mothers in the formal sector have a positive but not significant effect on national examination score both on elementary school and high school. Mother's influence diminished when children getting older because children development mostly influenced by interaction in social environment. On the other hand, mother education has a strong power to examine the effect of working mother on children cognitive. Mother with high education tends to working in the formal sector than informal sector. Moreover, these mother has good capability to manage her job and her children. Mother with high education also can guide her children to doing some activities that can improve children cognitive development.

This study has limitation by exploring more data on community that can give impact to children's cognitive. Therefore, further study might be adding data community and using another model that can capture determine factors of working mother into formal and informal sector which give effect on children cognitive.

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