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Revisiting the Link between Maternal Employment and School-Aged Children Health Status in Developing Countries: An Instrumental Variable Approach

Risti Permani

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Risti Permani (risti.permani@adelaide.edu.au)

School of Economics – The University of Adelaide

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Abstract

This study analyses the link between maternal employment and the health status of the child. Using data from Indonesia, it uses mothers' risk averse measures, households' recent flood and drought experience, and the interactions between risk measures and experience of recent natural disasters to explain endogenous maternal employment as proxied by mothers' working hours. Critical values based on Stock and Yogo (2002) suggest that these are strong instruments. Moreover, the Hausman test suggests that the Instrumental Variable method is preferred to the Ordinary Least Squares method. However, estimates across differing specifications consistently suggest insignificant effects of maternal employment on children's health status. However, a mother's education and her health knowledge are important for child's well-being. In contrast, school's lunch programs, sanitation, sports and health facilities are not significantly associated with child's well-being. The results emphasise the roles of family compared to schools, in particular the roles of mothers in improving their children's well-being. In addition, there still seems to be inequality in the well-being of children between in urban and rural areas. Finally, this study finds no significant evidence of the link between hiring a domestic assistant, outside food consumption and a child's well-being.

Keywords: maternal employment, school-aged children, children health status, instrumental variable, height z-score, Indonesian households, risk aversion, outside food consumption, domestic assistant.

JEL codes: I12, J13, J22

1. Introduction

This study investigates the link between maternal employment and the health status of the child. Much has been written on the link between mothers' schooling and their children's health status (Glewwe 1999; Aslam and Kingdon 2010). However, it is unclear how we should translate their findings into the link between maternal employment and the health status of the child. Controlling for mothers' education, identifying through which pathways maternal employment affects the health status of the children is not straightforward. Children might benefit from increased family income as a result of maternal employment. Family income has been argued to have a positive correlation with the health status of the child (Alaimo, Olson et al. 2001). However, a child is more likely to be overweight if his/her mother works more hours per week (Anderson, Butcher et al. 2003). Maternal employment may also reduce the time a mother has available at home to supervise her children in participating in health-improving activities such as exercise, as well as consuming nutritional food. It may also reduce the time available to cook at home and, consequently, might increase the frequency of consuming foods prepared away from home or 'outside foods'. In developed countries, these outside foods have been reported to have more calories and sodium; a higher density of cholesterol; a higher quantity of fat; and contain less dietary fibre, calcium, and iron (Guthrie, Lin et al.).

There are relatively few studies which look at the relationship between maternal employment and a child's well-being, where the definition of well-being includes a child's nutritional status as well as cognitive outcomes (Horton 1988; Desai, Chase-Lansdale et al. 1989; Moore and Driscoll 1997; Anderson, Butcher et al. 2003; Fertig, Glomm et al. 2009). While these studies offer useful insight to the issue, this study is concerned about a possible bias due to exogeneity assumptions that most studies include. An exception is Anderson Butcher et. al (2003) who address the endogeneity of maternal employment. The study offers an alternative approach to the problem by adding to the list potential instruments for maternal employment. In addition, most studies on the link between maternal employment and child well-being target pre-school aged children (Desai, Chase-Lansdale et al. 1989; Vandell and Ramanan 1992; Brooks-Gunn, Han et al. 2002; Waldfogel, Han et al. 2002). This study therefore fills a void in the literature by providing empirical evidence using data from primary school-aged children i.e. aged seven to 14 – thereby shedding light on possible school programs the Indonesian Government may need to design. This study also sheds light on the effects of maternal employment in developing countries. In particular, this study looks at the consumption of outside food. The results derived from this study might be different from the existing literature, which mostly was done in the US, given the difference in the nutritional and economical values of outside food or take-away food.[1] The decision on consuming outside food, in contrast to the households in western countries, may actually reflect the higher economic level of the household although one may argue that there is a wide range of takeaway food in Indonesia. However, no study has addressed this issue. In addition, in Indonesia, one most important roles of mothers is cooking.[2] Many Indonesian households also many households in some Asian and Middle-East countries such as Singapore, Malaysia, Saudi Arabia and Qatar can afford to hire a domestic assistant to cook and do other household chores. This study can therefore draw on some facts regarding the contribution of the domestic assistants to assist working mothers in providing food and its effects on children.

This study uses data from the fourth wave of the Indonesian Family Life survey held in 2007.[3] The Indonesian Family Life Survey is a continuing longitudinal socio-economic and health survey. The 1993 survey was based on a sample of households representing about 83% of the Indonesian population living in 13 of the nation's 26 provinces and the survey has been carried out again in 1998, 2000 and 200/2008

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1 In the US and some other western countries, take-away food is often associated with junk food for example burgers, pizzas, etc. However, the belief in Indonesia is that fast foods such as McDonald and Pizza Hut serve luxurious food.

2 Most students in the first grade of primary schools are familiar with the sentence "My mother is cooking in the kitchen; My father is reading newspapers in the front terrace" found in their bahasa (Indonesian language) textbook. This simple example indicates that the social norm is that food preparation at home is the responsibility of women. It is fair to say that what is never seen in their textbook is "My father is cooking in the kitchen".

3 The first wave (IFLS1) was administered in 1993 to individuals living in 7,224 households. IFLS2 sought to reinterview the same respondents four years later. A follow-up survey (IFLS2+) was conducted in 1998 with 25% of the sample to measure the immediate impact of the economic and political crisis in Indonesia. The next wave, IFLS3, was fielded on the full sample in 2000. IFLS4 was fielded in late 2007 and early 2008 on the same 1993 households and their split-offs; 13,535 households and 44,103 individuals were interviewed; see Strauss, Witoelar, Sikoki and Wattie (2009). The dataset can be accessed free of charge from RAND's official website (http://www.rand.org/labor/FLS/IFLS/ifls4.html)

as explained in footnote 3. The survey collects data on individual respondents, their families, their households, the communities in which they live, and the health and education facilities they use. This study limits the observations to children aged between seven and 14 who live in the same house with their mothers.

Given the nature of the focused topic, this study uses Instrumental Variable (IV) methods to deal with the endogeneity of maternal employment. It uses mothers' risk averse measures, households' flood and drought experience in the past 12 months and the interactions between risk measures and the experience of recent natural disasters to explain maternal employment as proxied by mothers' working hours. These variables are assumed to be exogenous with respect to a child's height. It is worth noting that this approach is quite different from Maccini and Yang (2009) but somewhat in line with their conclusions. Their study concludes that there is a positive correlation between early life rainfall shocks and a female's height. They find no evidence of a link between rainfall shocks in later years after the birth year and an adult's height (Maccini and Yang 2009). My instruments which are based on the household's recent natural shocks should therefore be exogenous with respect to a child's height. The Sargan test confirms that the excluded instruments are distributed independently of the error process at the 5% level of significance. Moreover, critical values based on Stock and Yogo (2002) suggest that they are strong instruments. Moreover, the Hausman test suggests that the IV method is preferred to the Ordinary Least Squares (OLS) method. However, estimates across differing specifications consistently suggest insignificant effects of maternal employment.

This study finds that a mother's education (positively), a mother's health knowledge (positively), living in urban areas and the size of land for farming purposes (positively) are associated with a child's health status. The significance of the land size and the mother's health knowledge is lower than the significance of living in urban areas and the mother's educational background. None of the school programs or facilities is significant for a child's health status. This study finds no enough evidence of a link between hiring a domestic assistant, outside food consumption and a child's well-being.

The remainder of the paper is organised as follows. Section 2 presents a simple analytical framework to estimate the relationships between variables of interest. Section 3 presents empirical analyses. Section 4 concludes.

2. Analytical Framework

Estimating the pathways by which maternal employment affects child health and academic performance is not straightforward. This section provides a framework for thinking about how to estimate these relationships. More specifically, this study attempts to estimate the determinants of the health production function. There are some choices of proxies for the health status of the child. This study uses three different variables: the Body Mass Index (BMI), child height for sex and age z-scores[4], and the sex-adjusted and age-adjusted BMI categorical variables[5]. Following previous studies on formulating a production function for health (Schultz and Tansel 1997; Glewwe 1999), the child's current health status is a result of parental investment in health (including nutritious food and disease-reducing interventions such as immunisation). These health inputs (I_i) and health endowments of the child (G_i) that are not affected by family or individual behaviour and environmental conditions (E_i) determine the child's current health status (H_i):

$$H_i = h(C_i(AGE_i, MALE_i, URBAN_i, DIF_i, MS_i), I_i, G_i, E_i, MWORK_i, \epsilon_i) \qquad (1)$$

where ϵ_i is the error term. The health status is also affected by the child's individual characteristics (C_i) such as age (AGE_i), sex ($MALE_i$), a dummy variable on location of residence (one if in urban areas)

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4 The z-scores are based on fitting a standard normal distribution to the growth curves of a healthy population of children. A child with a z-score of zero is exactly at the median in terms of height for age, while children with positive (negative) z-scores are taller (shorter) than average. Low height for age z-scores indicate stunting due to repeated episodes of malnutrition over the life of the child (see Glewwe (1999)). The world's average height for age and z-scores are available from the World Health Organization's website. The summary is presented in Appendix 1.

5 The BMI has been extensively used in the literature (for example Higgins and Alderman (1997)). The BMI is calculated by dividing the weight (in kilograms) by the squared child's height (in metres). For children and teenagers, however, the interpretation of BMI varies across gender and age. The Centers for Disease Control and Prevention (CDC) has gender- and sex-appropriate BMI charts on its website (http://www.cdc.gov/growthcharts/). The diagrams can be used to transform the BMI into four categories taking into account a child's sex and age: (i) Underweight; (ii) Healthy weight; (iii) Overweight; (iv) Obese.

($URBAN_i$), the difference in the mother's and child's age (DIF_i), and the mother's marital status (MS_i). DIF_i may reflect the mother's age and experience with child rearing and is related to the attention paid to the child health and household resources allocation. MS_i may reflect the (additional) available support for mothers, both from their husbands as well as family in-laws. Parents consider Equation (1) as best they can to make decisions affecting their children's health.

Maternal employment ($MWORK_i$ is the main variable of interest in this study. To proxy maternal employment I use the average number of working hours (Figure 1). I consider this variable to be a better alternative to a dummy variable on maternal employment status due to the nature of the IFLS questions. In the IFLS, respondents aged over 15 were asked about their work activity during the past week. This would allow us to get a dummy on the previous week's maternal employment status. However, this variable might be highly subject to the temporary well-being of the child. If I used this variable, I would still have respondents who reported a non-zero number of working hours from the question: "Normally, what is the approximate total number of hours you work per week?"; although they mentioned they had no work activity in the past week. Hence, I use the latter variable to capture the impacts from women's activities. In the next section, I also consider variation in the nature of jobs, for example, between self-employed and government officials.

Regarding health inputs, a seminal study by Glewwe (1999) instruments health inputs (I_i) using the mother's and father's schooling and household assets. The impact of the parents' schooling on the health status of the child is a debate in itself. Better educated parents are probably more able to provide more nutritional food. An insight from evaluation research on a lunch program suggests that children whose parents reported no higher than a high school education consumed more regular and total vegetables than students whose parents reported some college or higher education (Cullen, Eagan et al. 2000). To clarify which pathways, Glewwe (1999) looks at the impact of the health knowledge and literacy of the mother on the child's health status, rather than the mother's years of schooling. However, health knowledge is potentially endogenous given that mothers with healthy children might not feel the need to acquire as much knowledge as parents with unhealthy children. Therefore, Glewwe (1999) uses three instruments to measure a mother's health knowledge: the presence of close relatives who could act as sources of health knowledge; exposure to mass media; and the mother's education (if this can be excluded from the child's well-being's equation). However, Aslam and Kingdon (2010) argue that these variables still have potential endogeneity problems and suggest the use of the mother's height as an instrument for the mother's knowledge. On the same issue, Thomas, Strauss et al. (1990) explain that the impact of maternal education can be explained by indicators of access to informative newspapers, watching television, and listening to the radio. Very little of the maternal education effect is transmitted through income (Thomas, Strauss et al. 1991). I also consider the mother's time spent with the children (Muller 1995; Bianchi 2000; Zick, Bryant et al. 2001; Anderson, Butcher et al. 2003). This study also considers the number of children in the family which may affect the available resources for each child and the ownership of land for farming. Farm households might have better access to vegetables, fruits, and meat products.

Given the above discussion and subject to the availability of data, I define health inputs as a function of $ME_i, HK_i, R_i, TV_i, A_i, NC_i, LAND_i$:

$$H_i = h[C_i(AGE_i, MALE_i, URBAN_i, DIF_i, MS_i), I_i(ME_i, HK_i, R_i, TV_i, A_i, NC_i, LAND_i), G_i, E_i, MWORK_i, \epsilon_i] \qquad (2)$$

where ME_i is the mother's years of schooling; HK_i is the mother's health knowledge; R_i is a dummy variable on mother's literacy (one if the mother can read newspapers capturing both literacy and access to information); TV_i is a dummy variable on television ownership (one if the household owns a TV); A_i (natural logarithm of) represents total household assets; NC_i is the number of children in the family; and $LAND_i$ is the (natural log) size of land for farming ownership.

This study captures variations in the mother's knowledge (HK_i) by using women's knowledge about pap smears, self breast examination and mammograms. I construct an index of a maximum value of three which is the sum of three dummy variables relating to whether the mother knows these three aspects. An early prediction is that women who are taking care of their health well are most likely to be more knowledgeable about the health treatment for their children. Such information should not be related to child health endowments, making it a potential candidate as a proxy for the mother's knowledge.

Most studies assume that child health endowment status in unobservable. This study uses the following strategy. To control for child endowment status (G_i), it includes variables on the child's physical health.

The IFLS datasets cover a relatively wide range of information about this aspect. Some of the diseases or disability symptoms might be related to health issues that the child has had since he or she was born.[6]

In addition, this study uses a proxy for the child's Intelligence Quotient (IQ) score.[7] Previous studies suggest that intellectual ability may also affect the health status suggesting the necessity to control for this aspect (Hartog and Oosterbeek 1998). There is not enough evidence to conclude that there is a significant correlation between the IQ score and the socio-economic status or wealth (Hartog and Oosterbeek 1998; Batty, Der et al. 2006). Hence, there is no serious concern over correlation between the IQ score and unobservable factors of the health status of the child. To control for ability resulting from formal education, I also include the highest level of education that the child attained.

Environmental conditions (E_i) for school-aged children include both family and school characteristics.[8] For household characteristics, the variation in the consumption of fruit and vegetables may partially explain the impact of household behaviours on the child's health status. The survey provides information on the frequency of consumption of ten types of food: sweet potatoes, eggs, fish, meat (including beef, chicken, and pork), dairy, green leafy vegetables, bananas, papayas, carrots, and mangoes. For each type of food, children were asked: (i) "In the last week, did you eat any [FOOD TYPE]?"; (ii)"How many days did you eat [FOOD TYPE] in the last week?" Variable FS_i is defined as $\left(\frac{1+FS_{1_i}}{1+FS_{2_i}}\right)$, where FS_{1_i} is the total number of days of consuming fruits and vegetables and FS_{2_i} is the total number of days of consuming animal products (including meat such as chicken, beef, and pork; dairy products and eggs). Preliminary regressions suggest that FS_i has the highest correlation with the health status of the child.

This study also takes into account the role of domestic assistants in some Indonesian households as well as consumption of outside food. In the survey, each wife of the head of household or female head of household was asked: (i)"During the past week, what was the total expenditure to purchase outside food?" Figure 2 suggests no significant difference in the share of outside food consumption. Another factor might be television viewing. The existing literature suggests that children from families in which television viewing is a normal part of meal routines consume less nutritional foods (fewer fruits and vegetables) and more unhealthy foods (such as pizzas, snack foods, and sodas) and have higher risks of obesity than children from families in which television viewing and eating are separate activities (Dietz and Gortmaker 1985; Coon, Goldberg et al. 2001; Grimm, Harnack et al. 2004; Matheson, Killen et al. 2004). I assume that a dummy variable on television ownership as included in Equation (2) can capture variations in television viewing. Additionally, I take into account dummy variables on whether the household has a toilet and whether it boils water before drinking. Note that sanitation in Indonesia is still an issue and tap water is not suitable for human consumption. As with the school characteristics, this study includes variables on the existence of school health services, sports equipment, sports fields, canteen/cafeteria, a toilet and school committee. These factors may affect child well-being and

[6] The child was asked "Did you experience any of these symptoms in the last four weeks?". Then, I derive 15 indicators of symptoms D_i $i = 1, \dots, 15$ where D_i={headache, dry cough, cough with phlegm, bloody cough, wheezing, short and rapid breath, fever, stomach ache, nausea/vomiting, diarrhoea at least three times a day mixed with blood, diarrhoea at least three times a day mixed with mucus, skin infection, eye infection, toothache, cold sores}. Then, I use the total of these 15 dummy variables as a proxy for $SUFFER_i$.

[7] A unique feature of the IFLS survey is that it includes 17 IQ test-like questions to respondents aged between seven and 14 to measure the child's cognitive skills. In particular the 17 questions test: (i) spatial ability i.e. the ability to visualise manipulation of shapes; (ii) mathematical ability i.e. the ability to solve problems and use logic; (iii) memory ability i.e. the ability to recall things presented either visually or aurally. Each question is designed to test for a specific cognitive ability. However, many psychologists agree that the results of the IQ test also indicate general intellectual ability. The limitation of IQ test-type questions, however, is that they cannot quantify the children's knowledge including the knowledge they received from their teachers at school. Therefore a variable on the level of education the child has achieved is also included.

[8] Roles of the families definitely have been affecting children since they were pre-school age which might affect their current well-being. For example, milk consumption in pre-school aged children reduces the risks of asthma as suggested by Wijga, Smit, Kerkhof, de Jongste, Gerritsen, Neijens, Boshuizen and Brunekreef (2003). Or, being breast-fed when they are babies might lead to better health status. However, working mothers may be less able to do so as suggested by Barber-Madden, Petschek and Pakter (1987). This study focuses on current consumption patterns and their link with performance of school-aged children while it attempts to control for some existing illness and medical history of the children.

preliminary observations suggest that there is not enough evidence that the existence of such facilities is correlated with a family's income status.

Thus, Equation (2) can be rewritten as:

$$H_i = h[C_i(AGE_i, MALE_i, URBAN_i, DIF_i, MS_i), I_i(ME_i, HK_i, R_i, TV_i, A_i, NC_i, LAND_i), G_i(SUFFER_i, IQ_i, S_i),$$
$$E_i(FS_i, TOILETHH_i, BOILEDDRINK_i, OS_i, SV_i, SH_i, SSE_i, SSF_i, CANTEEN_i, TOILETSCHOOL_i, LUNCH_i, SCOMMITTEE_i),$$
$$MWORK_i, \epsilon_i] \quad (3)$$

where IQ_i is the IQ test scores; $SUFFER_i$ is a vector of dummy variables on whether the child ever experienced various symptoms; S_i is the level of education the child has completed; FS_i is fruit and vegetable consumption; SH_i is a dummy variable on school health services (one if it is available), SSE_i dummy variable on school sports equipment (equals to one if it is available); SSF_i is a dummy variable on school sports field (equals to one if it is available); OS_i is the share of outside food consumption in total food consumption; SV_i is a dummy variable on the presence of a domestic assistant in the household; $TOILETHH_i$ and $TOILETSCHOOL_i$ are dummy variables on the presence of a toilet in the house and school, respectively; $BOILEDDRINK_i$ equals one if the family boils water before drinking; $CANTEEN_i$ is a dummy variable relating to the presence of a school canteen; $LUNCH_i$ is a dummy variable on the existence of a school lunch program; and $SCOMMITTEE_i$ is a dummy variable on the existence of an active school committee.

3. Empirical Analysis

Table 1 presents the summary of statistics. I divide the samples into two categories based on their average daily working hours with eight hours as the cut-off. Those who work long hours have a higher probability of living in urban areas; coming from landless households; working in the private sector or self-employed; are more risk averse; their children relatively consume less fruits and vegetables; and their children have more limited access to school health and sports facilities than those who work shorter hours. There is no significant difference in the health status of the child between children whose mothers are working less than eight hours and over eight hours. The difference in household assets is not significant either (as shown in Figure 3). The empirical work in the next sub-section is to investigate the relationship between the health status of the child and maternal employment controlling for other factors.

3.1. The Basic Reduced-Form Model

This section begins with a reduced form model of Equation (3) and assumes $MWORK_i$ is exogenous:

$$H_i = h[AGE_i, MALE_i, URBAN_i, DIF_i, MS_i, ME_i, HK_i, R_i, TV_i, A_i, NC_i, LAND_i, SUFFER_i, IQ_i, S_i,$$
$$FS_i, TOILETHH_i, BOILEDDRINK_i, OS_i, SV_i, SH_i, SSE_i, SSF_i, CANTEEN_i, TOILETSCHOOL_i, LUNCH_i, SCOMMITTEE_i,$$
$$MWORK_i, \epsilon_i] \quad (4)$$

Table 2 presents the results. First, this study considers BMI as the dependent variable in Columns (1) to (4). Individual characteristics (including the child's age, sex, whether the child lives in urban areas, difference in mother's and child's ages, and the mother's marital status) present in all columns. Column (1) only includes variables that proxy health inputs. Column (2) adds variables to control for the child's health endowment. Column (3) adds variables controlling for environment conditions, both school and household conditions. Column (4) adds $MWORK_i$ into the model.

Columns (1) to (4) of Table 2 show relatively consistent correlations between a mother's marital status (negatively), household assets (positively), number of children (negatively), fruit and vegetable relative consumption (positively), and the presence of a canteen at schools (positively). However, it is rather difficult to interpret what they actually imply. An increase in BMI is good for those who are underweight but may put children who are obese at higher risk of health issues.

Therefore, Column (5) uses sex-adjusted and age-adjusted BMI categorical variables. Given the nature of the variables, Column (5) uses an ordered probit model. Compared to Columns (1) to (4), only a few variables continue to show significant effects: the mother's marital status (negatively), the number of children (normally) and the presence of a canteen at schools (positively).

One may argue that BMIs are very sensitive to the temporary state of child's well-being. Therefore, Column (6) of Table 2 uses height z-scores. As noted previously, the low scores indicate repeated malnutrition over the period of a child's life. Note that this study uses average and standard deviation from the population distribution of children in the world. Hence, the scores are relative to the world's population. There are significant differences between results from Columns (1) to (5) and Column (6). Column (6) suggests that living in urban areas (positively), a mother's education (positively), access to television (positively), the number of young children (negatively), child's IQ (positively) and the presence of a canteen at schools (positively) are correlated with children's height z-scores. Compared to the world's population, Indonesian children are worse off as they get older in terms of height.

The use of average daily working hours does not shed light on the nature of the mother's employment. Column (7) of Table 2 adds the status of the mother's employment into the equation. None of the additional variables are significant.

3.2. An Instrumental Variable Model

The inclusion of a variable on maternal employment ($MWORK_i$) in the child health status equation is potentially subject to a simultaneous bias. There are many variables that have been suggested by various studies to have correlation with maternal status and may affect its relationship with the child's outcome: 1) whether the mother is a single parent – being a working mother and a single parent might give negative effects on child educational outcome (Milne, Myers et al. 1986); 2) the number of young children – this is premised on vast literature on the link between fertility and education although studies find mixed results (Cheng and Nwachukwu 1997; Mari Bhat 2002); 3) the size of the land the family owns. These variables have been included in our estimates as presented in Table 2. This implies that each of those variables has a low possibility of being instruments for maternal employment status.

The strategy used by this study is therefore to use an instrumental variable approach. A good instrument is correlated with the mother's labour participation but uncorrelated with the health status of the child. The use of various health indicators such as BMI and height of the mother is common in literature to instrument labour participation (Campolieti 2002). However, such measures are potentially correlated to unobservable components of child health factors. The present study uses three different variables: (i) income variability; (ii) the mother's risk aversion; (iii) the interactions between (i) and (ii). This study uses dummy variables on whether the household has experienced flood and drought in the past 12 months as instruments for recent income variability. In the end we have five instruments for maternal employment. Such instruments are assumed to be exogenous with respect to the health status equation. The use of these variables is motivated by a study by Mishra and Goodwin (1997) on the substitution between farm and off-farm income in a farm household. They find that if farmers are risk averse, greater farm income variability should increase off-farm labour supply (Mishra and Goodwin 1997). This study tests a hypothesis of whether a family's income variability and the mother's risk attitudes affect the mother's decision on participating in the labour market.

To capture the mother's risk behaviours, this study uses responses to hypothetical lottery pair questions. In the survey, each respondent aged over 15 is asked hypothetical lottery pair questions without monetary compensation. The first question is:

> Suppose you are offered two ways to earn some money. With option 1, you are guaranteed Rp 800 thousand per month. With option 2, you have an equal chance of either Rp 800 thousand per month, or, if you are lucky, Rp 1.6 million per month, which is more. Which option will you choose?

Then, respondents are asked to choose between option 1, i.e. a guaranteed amount of Rp 800 thousand per month or a 50-50 chance between a specific amount less than Rp 800 thousand per month or Rp 1,6 million per month. Table 3 summarises the lottery pairs.

Using the information provided by the answers to the above questions, this study measures the Arrow-Pratt index of Absolute Risk Aversion (ARA) for each mother. Let A denote the non-random household asset or endowment, Z_L the low payoff and Z_H the high payoff. The individual utility can be defined as:

$$U(A) = 0.5U(A + Z_L) + 0.5U(A + Z_H) \quad (5)$$

Taking a second-order Taylor expansion of the right hand side of Equation (5) around A yields the Arrow-Pratt measure of ARA (ρ) which is presented by Figure 4:

$$\rho = \frac{(Z_H + Z_L)}{\{Z_L^2 + (Z_H - Z_L)^2 + Z_L(Z_H - Z_L)\}} \quad (6)$$

To sum, this study has the following system of equations:

$$H_i = X_i^{'}\beta_H + MWORK_i + \epsilon_i \quad (7)$$

$$MWORK_i = M_i^{'}\theta + w_i \quad (8)$$

where X_i is a vector of all variables listed in Equation (4) except $MWORK_i$; M_i a vector of instruments including the mother's absolute risk averse measure (ARA_i); flood experience in the past 12 months ($FLOOD_i$); drought experience in the past 12 months ($DROUGHT_i$); and the interactions between risk measures and flood and drought experience ($ARA_i \times FLOOD_i$ and $ARA_i \times DROUGHT_i$). These variables are assumed to be strongly correlated with $MWORK_i$ but exogenous with respect to H_i i.e. $corr(M_i, \epsilon_i) = 0$.

The application of IV methods requires tests of two assumptions: (i) the excluded instruments are distributed independently of the error process; (ii) they are sufficiently correlated with the included endogenous regressors. A test of over-identifying restrictions such as the Sargan test addresses the first assumption. At the 5% level of significance, there is not enough evidence to reject the null hypothesis. To test the second assumption, we should consider the goodness of fit of the first-stage regression. Using F-statistics, Stock and Yogo (2002) provide useful critical values to estimate the extent of potential bias from using IV i.e. whether the instrument is weak (Stock and Yogo 2002). Assuming the model is correctly specified, the Hausman test may help to compare specifications.

Table 4 presents the summary of the IV analysis. Column (1) only includes MRA_i as an instrument for $MWORK_i$. A coefficient for MRA_i is positive implying that being a risk lover is associated with higher working hours. Although the instrument is significant at the 5% level at the first-stage regression, the first-stage F-statistics indicate that this variable alone is a weak instrument.

Column (2) adds $FLOOD_i$ and $DROUGHT_i$ in the equation. $FLOOD_i$ is only significant at the 10% level, whilst $DROUGHT_i$ is insignificant. The three variables are jointly significant at the first-stage regression but according to Stock and Yogo (2002) critical values, they appear to be weak instruments. A negative coefficient for $FLOOD_i$ suggests that a mother who experienced flood in the past 12 months tends to have less working hours. This study has limited insight to the exact explanation. Recent natural disasters may decrease their risk-taking behaviours (Cameron and Shah 2010), but they may reduce one's incentive to accumulate wealth. Therefore, it is important to include interaction terms to see whether the effect of recent flood experience on a mother's working hours is affected by her risk attitudes.

Column (3) considers the interactions between proxies for recent income variability and a mother's risk aversion. A positive coefficient for the household's flood and drought experiences should be interpreted carefully. The interaction terms $ARA_i \times FLOOD_i$ as well as $ARA_i \times DROUGHT_i$ are negative and statistically significant at the 1% and 10% levels, respectively. It implies the effect of being a risk lover on reduced working hours can be inflated if the household recently experienced flood and drought. The F-statistic from the first-stage regression is above 10 indicating strong instruments. Using critical values from Stock and Yogo (2002), the bias of IV is relatively low suggesting that the instruments are quite strong. The Hausman test further confirms that the IV model presented in Column (3) of Table 4 is preferred to the OLS model presented in Column (6) of Table 3 at the 5% level of significance.[9]

Of a long list of explanatory variables included in the second-stage regression (results not presented), only the mother's education (positively), the mother's health knowledge (positively), living in urban areas and the size of land for farming purposes (positively) are associated with the child's height z-score. The significance of the land size and mother's health knowledge is lower than the significance of living in urban areas and the mother's educational background. None of the school programs or facilities is significant for the child's height z-scores.

4. Concluding Remarks

This study has analysed the links between maternal employment and other determinants of a child's health status. It is important to emphasise that this study focuses on children aged between seven and 14 instead of children aged under five, as what many existing studies have been focusing on so that generalisation of results can be made accordingly. This study has not found enough evidence to support the hypothesis that maternal employment influences a child's well-being. However, a mother's education and her health knowledge are important for her child's well-being. In contrast, school lunch programs, sanitation, sports and health facilities are not significantly associated with a child's well-being. The results emphasise the roles of family compared to schools, in particular the roles of mothers in improving their

[9] In the first stage regression, of a long list of right hand side variables I include in the model, only number of children is (negatively) significantly associated with mother's working hours.

children's well-being. In addition, there still seems to be inequality in children's well-being between urban and rural areas. In regard to clarifying anecdotal evidence in Indonesia, I find no significant association between hiring a domestic assistant and increasing outside food consumption with a child's well-being. However, further research should define more thoroughly the characteristics of outside food in Indonesia. At this stage, the nutritional value of outside food referred by the Indonesian population is not clear.

The results from this study are in line with several studies which suggest that there is not enough evidence that maternal employment has a negative impact on children's outcomes (Moore and Driscoll 1997; Fertig, Glomm et al. 2009) and in contrast with: 1) existing studies which suggest adverse effects of maternal employment on pre-schooler's IQ (Desai, Chase-Lansdale et al. 1989; Brooks-Gunn, Han et al. 2002; Waldfogel, Han et al. 2002), 2) a study uses data from children aged three to 11 which suggests positive links between maternal employment and children being overweight (Anderson, Butcher et al. 2003). However, it is worth noting that my results do not necessarily support the hypothesis that there are positive effects associated with the maternal employment as reported by some studies (Vandell and Ramanan 1992). Overall, it seems that existing literature implies that maternal employment in early childhood has adverse effects on children's development while maternal employment at a later stage does not seem to undermine children's well-being.

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Figure 1 Kernel Density of Mother's Working Hours

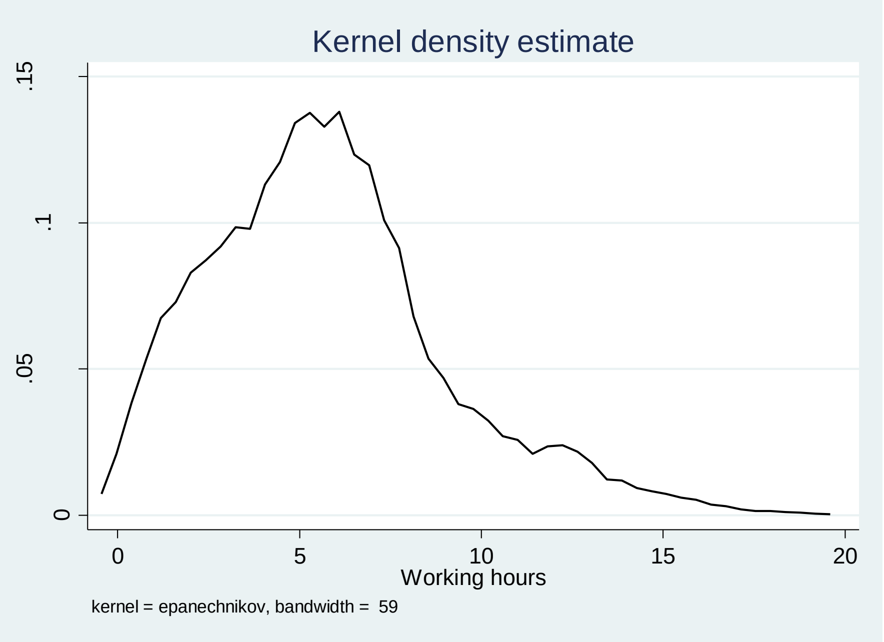

Figure 2 Share of Outside Food Consumption in Total Food Consumption

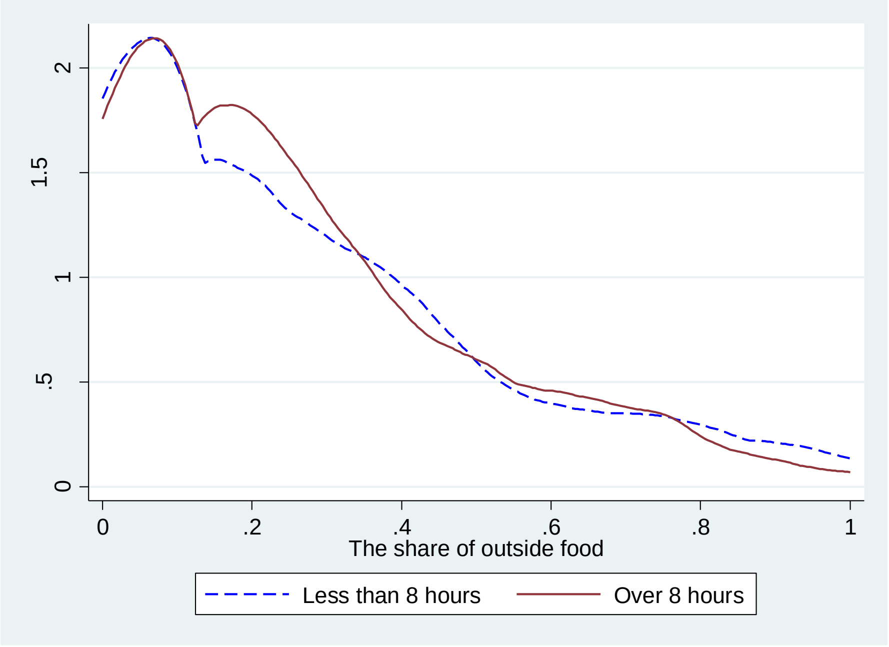

Figure 3 (Natural log) Total Household's Assets (by Mother's Working Hours)

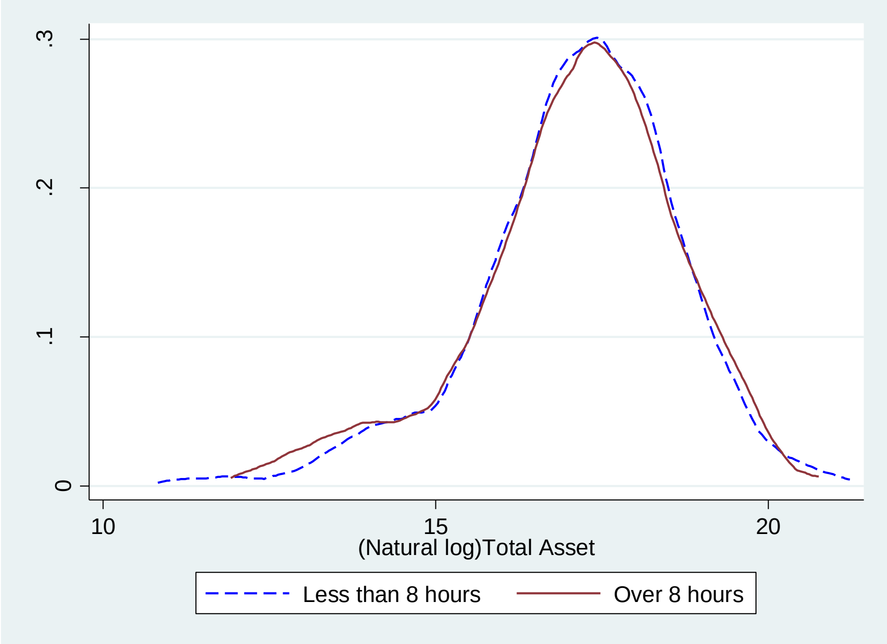

Figure 4 Absolute Risk Averse (ARA)

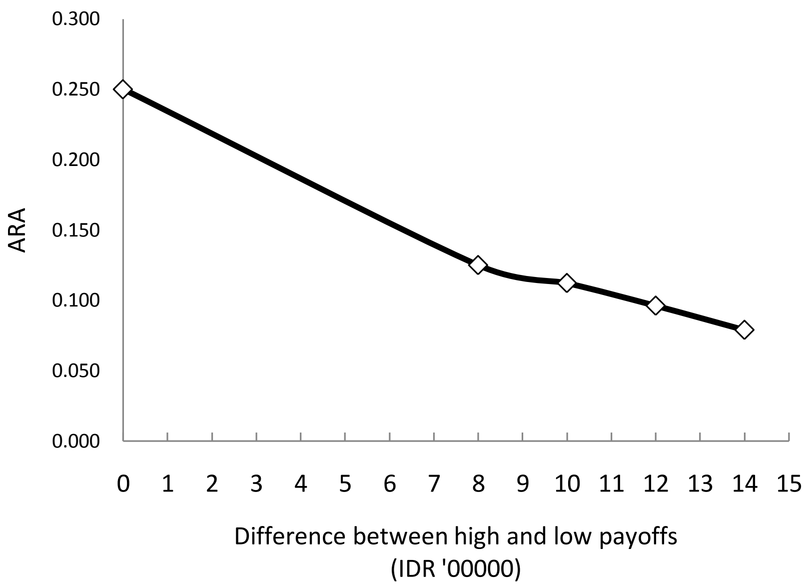

Table 1 Descriptive Statistics (by Mothers' Working Hours)

Variables		Less than 8 hours (N=1096) (A)	Over 8 hours (1007) (B)	Difference (A)-(B)
I. Health status measure				
BMI	Body mass index	16.732	16.473	0.258
HEIGHT_Z	Height Z-score	-1.258	-1.197	-0.061
II. Child characteristics				
AGE	Age	10.652	10.358	0.294**
MALE	One if the child is a boy	0.505	0.493	0.012
URBAN	One if the child lives in an urban area	0.505	0.571	-0.066**
MS	One if child's mother is married	2.182	2.146	0.037
DIF	Difference in mother's and child's ages	27.664	26.018	1.646***
III. Health Inputs				
ME	Mother's years of schooling	5.811	6.185	-0.374
HK	Mother's health knowledge index (0 to 3)	0.282	0.269	0.013
R	One if the child's mother can read	0.829	0.897	-0.067***
TV	One if the household owns at least one television	0.758	0.832	-0.074***
A	(Natural log) Total household's assets	17.140	17.139	0.001
NC	Number of children in the household	2.134	2.278	-0.144**
LAND	(Natural log) The size of land for farming purposes	1.622	0.625	0.997***
IV. Child's health endowments				
IQ	Child's IQ score (0 to 17)	11.862	11.712	0.151
S	One if child is attending formal education	0.952	0.958	-0.006
SUFFER	Health problems/symptoms index (0 to 15)	1.429	1.495	-0.066
V. Environments				
(i) Household characteristics				
FS	The ratio of total number of days of consuming fruits and vegetables to total number of days consuming meat products	1.197	1.092	0.105***
OS	Share of outside food consumption in total food consumption	0.267	0.253	0.014
SV	One if the household hires at least one domestic assistant	0.010	0.022	-0.012
TOILET_HH	One if the household has a toilet in the house	0.620	0.627	-0.006
BOILEDDRINK	One if the household normally boils the water for drinking	0.830	0.822	0.008
(iii) School characteristics				
SSF	One if the child's school has at least one sports field	0.531	0.514	0.017
SSE	One if the child's school has sports equipment	0.629	0.552	0.077***
SH	One if the child's school provides on-site health services	0.506	0.449	0.058**
CANTEEN	One if the child's school has a canteen/cafeteria	0.312	0.295	0.017
TOILET_SCHOOL	One if the child's school has at least one toilet for students	0.602	0.523	0.079***
LUNCH	One if the child's school has a lunch program	0.025	0.021	0.004
SCOMMITTEE	One if the child's school has an active school committee	0.623	0.546	0.077***

[Table 1 continued]

VI. Proxies for maternal employment and her status				
ARA	Mother's absolute risk averse measure	0.186	0.196	-0.011**
FLOOD	One if the household experienced flood in the past 12 months	0.003	0.001	0.002
DROUGHT	One if the household experienced drought in the past 12 months	0.036	0.009	0.027***
STATUS_SELF	One if self-employed	0.167	0.248	-0.080***
STATUS_SELF_UNPAID	One if self-employed with unpaid family worker/temporary worker	0.307	0.150	0.156***
STATUS_SELF_PERM	One if self-employed with permanent worker	0.021	0.021	0.000
STATUS_GOV	One if government worker	0.100	0.108	-0.008
STATUS_PRIV	One if private worker	0.239	0.308	-0.068**
STATUS_CAS_AGR	One if casual worker in agriculture	0.022	0.018	0.003
STATUS_CAS_NONAGR	One if casual worker in non-agriculture	0.053	0.038	0.014

Sources: Author's calculation using data from the 2007 IFLS dataset (RAND 2007)

Table 2 Reduced-form Models

Dependent variable:	BMI	BMI	BMI	BMI	Sex-age-adj. BMI	Height Z-score	Height Z-score
Method	OLS	OLS	OLS	OLS	Ordered probit	OLS	OLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Individual characteristics							
AGE	0.527***	0.519***	0.492***	0.493***	0.001	-0.043**	-0.049**
	(13.660)	(12.595)	(10.776)	(7.190)	(0.063)	(-3.045)	(-3.384)
MALE	-0.491*	-0.516*	-0.533**	-0.691**	-0.152*	0.045	0.055
	(-2.503)	(-2.521)	(-2.728)	(-2.738)	(-2.004)	(0.589)	(0.685)
URBAN	0.335	0.328	0.206	-0.074	0.009	0.360***	0.333**
	(1.780)	(1.784)	(1.249)	(-0.281)	(0.106)	(3.675)	(3.402)
MS	-0.185	-0.213*	-0.244*	-0.258*	-0.097*	-0.06	-0.006
	(-1.770)	(-2.073)	(-2.457)	(-2.397)	(-2.312)	(-1.206)	(-0.117)
DIF	0.008	0.007	0.011	0.008	0.002	0.003	0.001
	(0.528)	(0.444)	(0.792)	(0.428)	(0.382)	(0.532)	(0.198)
Health inputs							
ME	0.032	0.029	0.027	0.028	0.018	0.022**	0.023*
	(1.755)	(1.689)	(1.546)	(1.173)	(1.700)	(2.814)	(2.649)
HK	0.132	0.112	0.054	0.106	0.002	0.126	0.165*
	(1.043)	(0.901)	(0.409)	(0.584)	(0.026)	(1.794)	(2.442)
R	-0.308	-0.314	-0.302	-0.069	0.007	-0.063	-0.059
	(-0.797)	(-0.807)	(-0.752)	(-0.229)	(0.038)	(-0.547)	(-0.490)
TV	0.304	0.316	0.326	0.404	0.034	0.192*	0.12
	(1.587)	(1.523)	(1.607)	(1.619)	(0.345)	(2.150)	(1.239)
A	0.179**	0.180**	0.167**	0.252**	0.065	0.026	0.036
	(3.317)	(3.372)	(2.913)	(3.019)	(1.930)	(1.100)	(1.323)
NC	-0.224**	-0.237**	-0.214*	-0.207*	-0.065*	-0.077*	-0.093**
	(-2.729)	(-2.722)	(-2.551)	(-2.263)	(-1.993)	(-2.319)	(-2.913)
LAND	-0.004	-0.005	0	-0.039	-0.012	0.015	0.015
	(-0.151)	(-0.213)	(0.005)	(-1.569)	(-1.293)	(1.309)	(1.088)
Environments							
IQ		0.007	-0.011	-0.044	-0.002	0.023*	0.021
		(0.181)	(-0.323)	(-1.177)	(-0.107)	(2.127)	(1.809)
S		-0.723	-0.757	-0.905	-0.212	-0.056	0.017
		(-1.608)	(-1.620)	(-1.463)	(-1.212)	(-0.210)	(0.060)
SUFFER		-0.041	-0.045	-0.039	-0.007	0.023	0.022
		(-0.805)	(-0.850)	(-0.839)	(-0.379)	(1.340)	(1.203)
FS			0.203*	0.404*	0.11	0.048	0.061
			(2.091)	(2.577)	(1.753)	(0.805)	(1.021)
OS			-0.032	-0.018	0.137	0.171	0.214
			(-0.109)	(-0.037)	(0.897)	(1.465)	(1.734)
SV			-0.277	-0.635	-0.013	0.172	0.137
			(-1.586)	(-1.621)	(-0.073)	(0.792)	(0.694)
TOILET_HH			0.231	-0.158	-0.014	0.169	0.179
			(1.028)	(-0.774)	(-0.134)	(1.828)	(2.000)
BOILEDDRINK			-0.039	-0.122	-0.048	0.039	-0.019
			(-0.222)	(-0.604)	(-0.464)	(0.382)	(-0.191)

[Table 2 continued]

SSF			0.043	0.062	0.043	-0.064	-0.092
			(0.226)	(0.227)	(0.425)	(-0.567)	(-0.717)
SSE			-0.580*	-0.47	-0.089	-0.021	-0.137
			(-2.206)	(-1.060)	(-0.407)	(-0.111)	(-0.631)
SH			-0.327	-0.481*	-0.179	-0.043	-0.003
			(-1.465)	(-2.101)	(-1.515)	(-0.284)	(-0.018)
CANTEEN			0.623*	0.819*	0.224*	0.160*	0.128
			(2.178)	(2.221)	(2.387)	(2.299)	(1.921)
TOILET_SCHOOL			0.219	0.674	0.26	0.262	0.244
			(0.496)	(0.741)	(0.821)	(0.939)	(0.853)
LUNCH			-1.198***	-0.837	-0.389	-0.038	-0.124
			(-4.030)	(-1.718)	(-1.952)	(-0.173)	(-0.463)
SCOMMITTEE			0.224	-0.195	-0.226	-0.229	-0.113
			(0.492)	(-0.202)	(-0.685)	(-0.907)	(-0.422)
Mother's working hours and employment status							
MWORK				0.035	0.007	0.001	0.005
				(1.937)	(0.797)	(0.139)	(0.469)
STATUS_SELF							-0.126
							(-0.591)
STATUS_SELF_UNPAID							-0.025
							(-0.109)
STATUS_SELF_PERM							0.003
							(0.010)
STATUS_GOV							-0.031
							(-0.123)
STATUS_PRIV							-0.057
							(-0.247)
STATUS_CASH_AGR							-0.148
							(-0.689)
STATUS_CASH_NONAGR							0.187
							(0.786)
Constant	8.378***	9.282***	9.752***	8.451***		-1.986***	-2.100***
	(6.498)	(6.425)	(6.668)	(4.055)		(-4.728)	(-3.931)
Adj-R2	0.104	0.103	0.116	0.125		0.153	0.15
Log-likelihood	-5918.224	-5788.517	-5640.891	-3527.146	-1042.088	-2028.507	-1805.65
No. observations	2103	2052	2031	1273	1253	1273	1133

Note: For all columns, t-statistics are in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively. Standard errors are clustered at the district (kecamatan) level. District fixed effects are included.

Table 3 Lottery Pairs

Setting				Absolute risk averse coefficient
Gamble choice	Low Payoff (in Rp '00000)	High Payoff (in Rp '00000)	Expected value (in Rp '00000)	
A[(a)]	8	8	8	0.250
B	8	16	12	0.125
C	6	16	11	0.112
D	4	16	10	0.096
E	2	16	9	0.079

Notes: In Games B, C, D and E, respondents can choose between Choice A where gains of Rp 800,000 are guaranteed (although no real money was provided) and the listed lottery pairs. The study uses the lowest ARA of the respondents. That is, the ARA from the (n − 1)-th choice where the n-th choice is when the respondent switches its answers to Option 1 (Choice A).

Table 4 Instrumental Variable Models

Dependent variable: Height Z-Score	(1)	(2)	(3)
MWORK	0.028	0.02	0.041
	(0.291)	(0.231)	(0.760)
Constant	-1.372*	-1.346*	-1.419**
	(-2.102)	(-2.117)	(-2.657)
First stage regression			
ARA	-4.320**	-4.420**	-3.954**
	(1.842)	(1.851)	(1.857)
FLOOD		-2.247*	18.663***
		(1.323)	(4.710)
DROUGHT		-0.119	2.099*
		(0.691)	(1.092)
ARA X FLOOD			-200.952***
			(46.610)
ARA X DROUGHT			-13.182**
			(5.621)
The Sargan score		2.188	3.587
First stage F-statistics	3.878	6.414	10.888
Prob F-Test	0.055	0.001	0
RMSE	1.024	1.021	1.03
No. observations	913	913	913

Note: For all columns, t-statistics are in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively. Standard errors are clustered at the district (kecamatan) level. District fixed effects and all explanatory variables listed in Table 2 are included. The instrumented variable is mothers' working hours(MWORK). According to Stock and Yogo (2002), for one endogenous variable and 3 and 5 instruments the critical values of less bias at 10% are 9.18 and 10.83, respectively.

Appendix 1Average and Standard Deviation of Child Height in the Population

Age	Average		Standard deviation	
	Girls	Boys	Girls	Boys
5	109.60	110.30	4.77	4.59
6	115.60	116.30	5.15	4.96
7	121.30	122.20	5.49	5.32
8	127.00	127.70	5.82	5.68
9	133.00	133.00	6.13	6.04
10	139.20	138.20	6.42	6.40
11	145.50	143.60	6.67	6.76
12	151.70	149.62	6.85	7.11
13	156.70	156.65	6.94	7.45
14	160.00	163.73	6.94	7.71
15	161.80	169.35	6.87	7.81

Source: WHO's website: http://www.who.int/growthref/hfa_girls_5_19years_z.pdf for girls; and http://www.who.int/growthref/hfa_boys_5_19years_z.pdf for boys.