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The Consequences of Child Market Work on the Growth of Human Capital

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Summary. — The paper measures the effect of child market work on the long-term growth of human capital, focusing on the output of the human capital production: mathematics skills, cognitive skills, pulmonary function, and educational attainment. Our full sample is drawn from a rich longitudinal dataset Indonesia Family Life Survey (IFLS). We address endogeneity of child market work using provincial legislated minimum wage as the instrument. Our instrumental variable estimation shows that child labor negatively affects mathematics skills and pulmonary function, but not cognitive skills and educational attainment. We find heterogeneities in type of work. Those who work outside of family business have lower educational attainment than those working for family business.

Key words — child labor, human capital, skills, health, Indonesia

1. INTRODUCTION

Child labor is one of the most pressing problems in the developing countries. In 2012 the global number indicates that about 168 million children were in child labor, almost 11% of total child population in the world (ILO-IPEC, 2013). More importantly, more than half of them, 85 million children, worked in hazardous sectors. In the literature, attention on child labor has been increasing in the last fifteen years (Edmonds, 2008). Edmonds (2008) explains that emergence of theoretical works on child labor helps generate awareness in this topic, especially on its relation to human capital (i.e., Baland & Robinson, 2000; Basu & Van, 1998).

The majority of studies use education attainment or school enrollment as a proxy for human capital (Basu, 1999; Edmonds, 2008). The use of education attainment or school enrollment as a proxy for human capital has two shortcomings. First, they are measures of input into human capital production (Edmonds, 2008; Gunnarsson, Orazem, & Sanchez, 2006). The problem is that in countries where school quality is low, input is a poor measure of output, in this case human capital (Dumas, 2012). Secondly, several studies find that the output of the human capital production is a better measure of the level of a country's human capital. These studies also find that the variation in the output provides a better explanation for the variation on personal income and economic growth (Glewwe, 2002; Hanushek & Woessmann, 2008).

Studies in the literature also examine the effect of child labor on health, the second aspect of human capital. However, most use subjective measures of health (Wolff & Maliki, 2008) or objective measures whose trajectory are determined early in life, such as height (Beegle, Dehejia, & Gatti, 2009; O'Donnell, Rosati, & van Doorslaer, 2005). Ideally, the health measures used must be objective and could still be affected well into adolescence.

In addition to the difficulties in determining the appropriate outcomes on which the effect of child labor should be estimated upon, the literature has also found conflicting results. Conceptually, the effect of child labor on human capital is ambiguous. On one hand, working can displace schooling. Even in the case where working and schooling go hand-in-hand, the negative effect of working can come through reducing time available for studying, playing, and sleeping (Edmonds & Pacvnik, 2005). On the other hand, child labor may provide household with sufficient income to keep children in school. Indeed, many studies cited in the literature reviews by Basu (1999) and Edmonds (2008) find zero or positive effect of child labor on school enrollment and education attainment.

With regards to health, child labor can impart stress on a young body, as a consequence of contacts with hazardous material, or cause exhaustion (O'Donnell *et al.*, 2005). However, the additional income can be used to maintain the health of children and buy sufficient food. Grootaert and Kanbur (1995) note that if survival depends on work in the informal sector, then the most sensible solution is to take children out from school and put them to work.

In this paper, we estimate the effect of child labor on the accumulation of human capital. Our paper makes several contributions to the literature. First, we measure the effect of child labor on the growth of human capital over a seven-year period using a rich longitudinal dataset from Indonesia. Only few studies in the literature examine the effect of child labor on the growth of human capital (for example Beegle *et al.*, 2009; O'Donnell *et al.*, 2005), while most only look at the contemporaneous effect of child labor on human capital due to the general lack of longitudinal dataset in developing countries.

Second, we focus on the output of human capital production: mathematics skills, cognitive skills, and an objective measure of health that may be directly affected by child labor: pulmonary function as measured through lung capacity. We believe this is a better measure of the potential adverse effect of child labor on health, as lung capacity can be affected well

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into adulthood. Finally, we also include the traditional measure of human capital, education attainment.

Thirdly, the data allow us to begin the initial step in distinguishing the heterogeneous effect of child labor based on whether the work is for wage outside the household or for the household business. This may only address the issue of the human capital effects of hazardous or the worst forms of child labor (Dessy & Pallage, 2005) in a very limited way, but still important given the lack of empirical evidence on this particular type of heterogeneity in the literature thus far.

In this study we use nominal provincial minimum wage as the instrument to treat the endogeneity problem in our estimation. Our 2SLS estimation results show that child labor has significant impacts on the long-term growth of mathematics skills and lung capacity. We find that compared to working in family business, children who are in wage sectors have lower educational attainment. We, however, cannot draw meaningful inferences about other heterogeneities' effects of child labor.

We organize the rest of the paper as follows. The next section describes the datasets used in the paper. Section 3 discusses child labor in Indonesia, while Section 4 outlays the estimation strategy. Section 5 presents the main estimation results, while Section 6 examines heterogeneities in the effect of child labor. The final section concludes.

2. DATA

The first dataset that we use is the National Labor Force Statistics (*Sakernas*), which is an annual, nationally representative, repeated cross-sectional labor force survey that records the activity of individuals older than 10 years in the sample households. We use Sakernas to show the share of children ages 10–14 who were engaged in market work during 1986–2007. Although less than ideal because Sakernas does not record the activities of individuals younger than 10, it is the only nationally representative dataset that allows us to observe the annual child market work trend in Indonesia over the past two decades.

The second dataset is the Indonesia Family Life Survey (IFLS), a longitudinal household survey that began in 1993. Three full follow-up waves were conducted, in 1997, 2000, 2007, and 2014. In this paper, we only use the 2000 and 2007 waves. The first wave represented about 83% of Indonesia's 1993 population, and covered 13 of the nation's then 27 provinces. This initial round interviewed roughly 7,200 households. By 2007, the number of households had grown to 13,000 as the survey endeavored to re-interview many members of the original sample that form or join new households. Household attrition is quite low; only around 5% of households were lost each wave. Overall, 87.6% of households that participated in IFLS1 were interviewed in each of the subsequent three waves (Strauss, Witoelar, Sikoki, & Wattie, 2009).

IFLS added a specific child labor module (B5A-DL4) to the 2000 wave. The module was administered to children younger than 15 years, and recorded market work both inside and outside the household. In addition, the module collected information on the age at which a child worker began working, hours worked in the past week, and wage rate of the children who work outside the household.

We define a child work if he or she had engaged in economic work in the past month. The definition of economic work is participation in the production of economic goods and services (Edmonds, 2008). Market work can be conducted both inside and outside the household. In the case of child workers, market work inside the household is usually unpaid.

IFLS also conducted mathematics and cognitive tests to 7- to 14-year-old individuals (EK1) and 15- to 24-year-olds (EK2). The former contains five numeracy problems and 12 shape matching problems, while the latter contains five numeracy problems and eight shape matching problems.[1] The numeracy problems in EK2 are significantly more complex than those in EK1. These modules were first included in 2000. The identical modules were then re-enumerated to individuals in the 2007 survey round, on the following procedure. Individuals who had taken EK1 in 2000 were asked to retake EK1 in 2007. In addition, individuals who were already at least 15-year-old in 2007 were also asked to answer EK2. Note that these individuals had been 7- to 14-year-old in 2000 and were around 14- to 21-year-old in 2007. Similarly, individuals who had answered EK2 in 2000 were also asked to work on EK2 in 2007. Finally, EK1 was administered to individuals who were 7- to 14-year-old in 2007. In this paper, we use EK1 results in 2000 and 2007 for individuals who were first tested in 2000. Given that household surveys in developing countries rarely administer identical tests to the same individuals twice in a seven-year period, IFLS allows us to go beyond most studies by assessing skills accumulation of the same individuals over a relatively long time period.

Finally, IFLS measured various health outcomes. In this paper, we use growth in lung capacity as our health measure. We argue that lung capacity, which measures pulmonary function (Lebowitz, 1991) and respiratory health (He *et al*., 2010; Rojas-Martinez *et al*., 2007; Schwartz, 1989), is a better measure of health because unlike height, whose trajectory is determined early in life, lung capacity growth can still be adversely affected by low air quality or excessive physical exertion well into adolescence.[2]

The third dataset is the *Podes* (village census), which records infrastructure availability and demographic data of every village in Indonesia. Statistics Indonesia conducted Podes three times every decade. We use the dataset collected in 2000 to construct our measures of district-level infrastructure availability.

3. CHILD MARKET WORK IN INDONESIA

Similar to developing countries in general (Edmonds, 2008), child market work in Indonesia is related to poverty (Kis-Katos & Sparrow, 2011; Suryahadi, Priyambada, & Sumarto, 2005). We begin this section by presenting the participation rate in market work for children 10–14 from 1986 to 2007. Figure 1 shows the participation rate by gender. The rate for males was always higher than females throughout the period, and they exhibited the same pattern. After slightly increasing during 1986–89, child market work participation rate began to decline during 1990–96, during Indonesia's high economic growth period when annual output growth reached close to 7% and the headcount poverty rate declined from 32% to 17% (Suryahadi, Suryadarma, & Sumarto, 2009). During this period, the decline in child market work was around 35% proportionally for males, from 5% to 3.2%, and around 37% proportionally for females, from 3.5% to 2.2%.

The child market work participation rates then soared to 9.1% for males and 6.4% for females during the economic crisis in 1997 and 1998. During the same period, the economy contracted by 14% in 1998 and remained stagnant in 1999 (Strauss *et al*., 2004) and headcount poverty rate reached

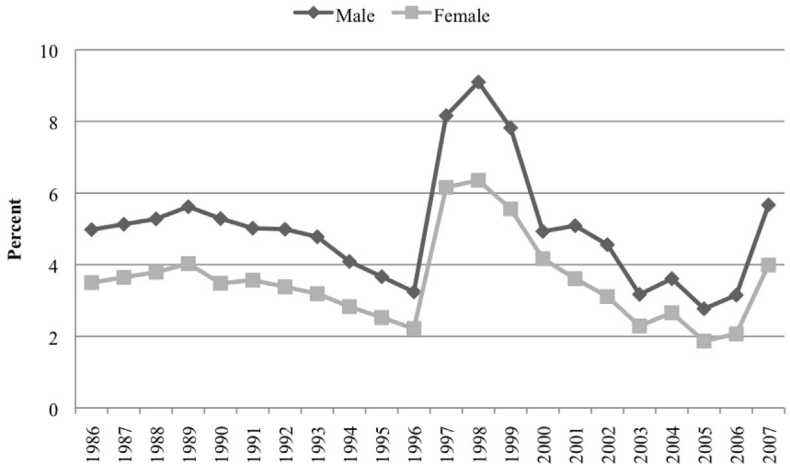


Figure 1. *Market work participation rate of 10- to 14-year-olds, by gender 1986–2007. Source: Authors' calculation from Sakernas 1986–2007.*

27% in 1999 (Suryahadi *et al.*, 2009). In addition to the dramatic increase in 1997, another notable change in the market work participation pattern is that the rate of increase during 1996–97 was higher for males than females, as shown by the steeper slope between the two years. This was then accompanied by a higher rate of decline for males during 1999–2000 as the economy recovered.

Child market work participation rate had continued to decrease during 2000–06, reaching 2.6%, before dramatically reversing in 2007. While the participation rate in 2006 was lower than 2000, the rate in 2007 was double the rate in 2006. The explanation does not seem to lie in the economy contracting or an increase in adult unemployment, because the economy grew by 6.3% in 2007, higher than in 2006 when growth was 6%, and adult open unemployment rate was lower in 2007 compared to 2006 (Kong & Ramayandi, 2008). While understanding the cause of this trend reversal is important, we leave such endeavor for the future.

The second important issue in child labor is the occupation sector of the child workers. We again use information on sectoral share from Sakernas. Similar to other developing countries as mentioned in Edmonds and Pacvnik (2005), the majority of child workers in Indonesia are in agriculture (63% in 2000, 62% in 2007). Outside the agricultural sector, the next three sectors that employ most of the child workers are manufacturing, trade, and other services. Together, these four sectors employed between 96% and 97% of child workers in 2000 and 2007.

Although the occupation sector shares of child workers appear to be relatively constant during 2000–07, we observe considerable heterogeneity in the pattern by gender. Figure 2A shows the distribution of child workers by gender in 2000 and 2007 in agriculture, manufacturing, and trade. The share of male child workers in agriculture is significantly higher than the share of female child workers in the sector. The gap was around 15 percentage points in 2000 and has since widened to 25 percentage points by 2007 as female child workers moved out of agriculture and male child workers moved into agriculture. In contrast, there are significantly more female child workers in manufacturing and trade. The share of female child workers in both sectors was almost double that of male child workers in 2000, and the gaps have slightly widened by 2007. Different from the contrasting gender trend in agriculture, however, it appears that both female and male child workers' participation in manufacturing slightly declined, while their participation in trade increased.

The sectoral gender difference is more striking when we examine the rest of the occupation sectors, as shown in Figure 2B. The largest increase took place in the other services sector, which includes occupations like domestic helper.[3] In 2000, about 2% and 3.4% of male and female child workers respectively were working in this sector. By 2007, the share for male child workers reached 2.8% while the share for female child workers almost tripled to 9.1%. On the other hand, the share of male child workers in the other occupations declined during 2000–07, while the share of female child workers increased in all other sectors except construction.

Linking the information of occupation sectors to strenuous and hazardous work, the higher participation rate of male child workers in construction and mining sectors may imply a larger health effect of child labor on males than females. In addition, it may also be possible that the kind of work that male and female child workers are engaged in is different even in the same occupation sector. These observations provide the motivation for examining gender heterogeneity in the effect of child labor on human capital growth.

To conclude, we find that child market work participation rate in Indonesia, averaging 4.3% during 1986–2007, is smaller than most developing countries listed in Edmonds (2008). Despite the low child market work participation rate in Indonesia, more than 2.7 million children between 5 and 14 were engaged in market work in 2007. Therefore, the empirical question of whether child market work adversely affects human capital accumulation remains important.

4. ESTIMATION STRATEGY

Given our focus on the effect of market work on the growth of skills and health during 2000–07, our main child worker sample consists of those who were engaged in market work in 2000 while the comparison group consists of those who were not working in 2000. We employ a value-added model shown in Eqn. (1):

$$\frac{Y_{ijk,2007}}{\sigma_{2000}} = f\left(W_{ijk,2000}, \frac{Y_{ijk,2000}}{\sigma_{2000}}, X_{ijk}, P_{ijk}, D_k, \varepsilon_{ijk}\right) \quad (1)$$

where the dependent variable is individual i's outcomes of interest (mathematics skills, cognitive skills, and lung capacity) in 2007, divided by the standard deviation of each particular outcome in 2000. Our main independent variable is $W_{ijk,2000}$,

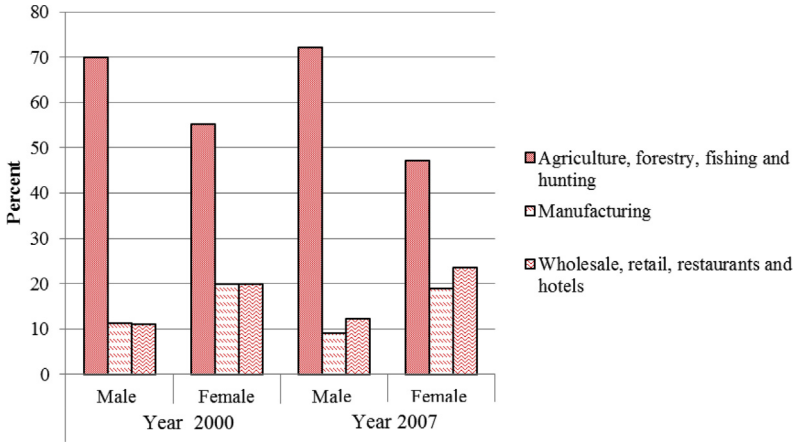


Fig. 2A. *Three most popular occupation sectors of child workers 2000 & 2007, by gender. Source: Authors' calculation from Sakernas 2000 and 2007.*

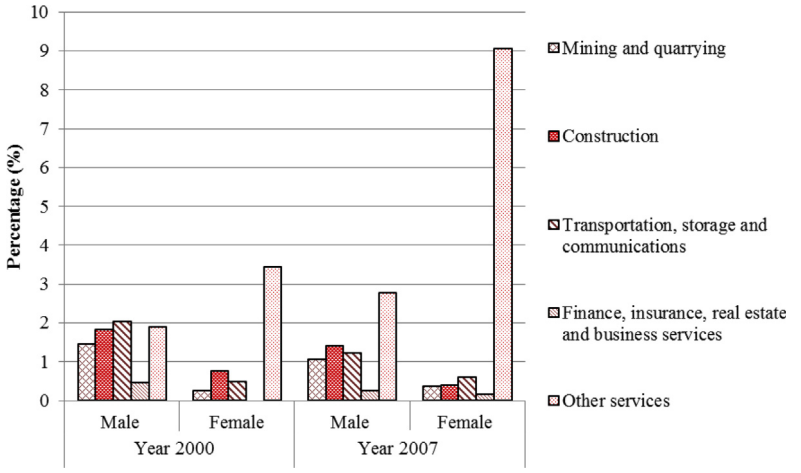


Fig. 2B. *The rest of occupation sectors of child workers 2000 & 2007, by gender. Source: Authors' calculation from Sakernas 2000 and 2007.*

the working status of the individual in 2000, which is equal to one if the individual was working in 2000 and zero otherwise. Our value-added model conditions upon the individual's outcomes in 2000. The exogenous control variables include X_{ijk}, the individual's age and gender; P_{ijk}, the father's education attainment as measured through years of completed schooling; and D_k, a vector of various district characteristics where individual i resided in 2000, as well as the real GDP per capita in 1996; and ε_{ijk} is the residual. [4] Summary statistics are shown in Table 1.

(a) *Instrument*

The economic literature on child labor widely acknowledges that estimating an Ordinary Least Squares (OLS) on Eqn. (1) produces biased estimates due to the endogenous nature of child market work. Studies in the literature (for example Akabayashi & Psacharopoulos, 1999; Beegle *et al.*, 2009; Gunnarsson *et al.*, 2006; Kana, Phoumin, & Seiichi, 2010; O'Donnell *et al.*, 2005; Wolff & Maliki, 2008; more studies mentioned in Edmonds, 2008) use various instrumental variables such as household land holdings, local economy, prices, or labor market conditions, school quality and availability, and compulsory school starting age.

In this paper, we use the provincial legislated minimum wage levels as the instrument. The choice is motivated by the theoretical work by Basu (2000) showing that an increase in minimum wage can either increase or decrease child labor. The main argument for the former is that a rise in minimum wage can increase adult unemployment rate which, in turn, increases child labor incidence because parents only send their children to work if they are on the brink of poverty. Basu (2000) explains further that this adverse effect may amplify if an increased supply of child labor displaces more adult labor, which in effect sends more children to work. This is typically the case in developing countries where unemployment benefits do not exist. On the other hand, increasing the minimum wage can also decrease supply of child labor because increased minimum wage translates to improved conditions of adult workers. Consequently, parents do not have to send their children to work (e.g., Goldin, 1979; Ray, 2000). Magruder (2013) provides further support to use minimum wage as the instrument in this study. Using a difference in spatial difference analysis, he finds that in Indonesia an increase in minimum wage increases formal employment rate and decreases informal employment rate. Therefore, based on above arguments and evidence we should expect minimum wage to be correlated with child labor in Indonesia.

Since IFLS provides information on the year that each child worker began working, we match the minimum wage level in the particular year and province where the child worker began working. The majority of child workers in our sample, 67%,

Table 1. *Summary statistics*

Variables	Full sample			Children not working in 2000			Children working in 2000			Mean difference significant at 5 %
	Mean	Std. dev.	*N*	Mean	Std. dev.	*N*	Mean	Std. dev.	*N*	
Human capital outcomes										
Mathematics score in 2000 (min = 0, max = 5)	3.08	1.34	2,794	3.07	1.35	2,438	3.10	1.26	356	No
Mathematics score in 2007 (min = 0, max = 5)	3.13	1.34	2,794	3.14	1.35	2,438	3.07	1.27	356	No
Cognitive Score in 2000 (min = 0, max = 12)	8.38	2.89	2,794	8.39	2.89	2,438	8.31	2.87	356	No
Cognitive Score in 2007 (min = 0, max = 12)	9.74	2.39	2,794	9.74	2.38	2,438	9.74	2.48	356	No
Lung Capacity in 2000 (l/min)	223.24	63.03	2,794	220.39	61.93	2,438	242.72	67.04	356	Yes
Lung Capacity in 2007 (l/min)	337.13	98.19	2,794	337.15	97.60	2,438	336.95	102.34	356	No
Schooling in 2000 (years)	4.74	1.94	2,794	4.67	1.95	2,438	5.22	1.83	356	Yes
Schooling in 2007 (years)	9.92	2.89	2,794	9.97	2.84	2,438	9.57	3.17	356	Yes
Child labor status (=1)	0.13	0.33	2,794	NA	NA	2,438	1.00	1.00	356	
Work for wage outside family (=1)	0.11	0.31	2,794	NA	NA	2,438	0.21	0.41	356	
Work in family business (=1)	0.03	0.16	2,794	NA	NA	2,438	0.86	0.35	356	
Male (=1)	0.50	0.50	2,794	0.50	0.50	2,438	0.49	0.50	356	No
Age in 2007	18.79	1.86	2,794	18.65	1.84	2,438	19.74	1.72	356	Yes
School attendance in 2000	0.94	0.23	2,764	0.96	0.20	2,414	0.84	0.36	350	Yes
Mother's schooling in 2000 (years)	5.61	4.09	2,794	5.81	4.13	2,438	4.26	3.54	356	Yes
Father's employment status (=1)	0.87	0.25	2,794	0.88	0.25	2,438	0.86	0.24	356	No
Mother's employment status (=1)	0.89	0.23	2,794	0.89	0.23	2,438	0.87	0.22	356	No
Per capita monthly household expenditure in 2000 (hundreds of thousand rupiahs)	2.47	2.31	2,788	2.45	2.22	2,432	2.58	2.85	356	Yes
District GDP per capita in 1996 in 1993 Rupiah (millions)	2.25	2.71	2,794	2.31	2.80	2,438	1.89	1.92	356	Yes
District adult unemployment rate	0.07	0.05	2,794	0.07	0.05	2,438	0.06	0.04	356	Yes
District population (thousand)	938.36	664.94	2,794	942.89	671.67	2,438	907.34	616.91	356	No
Proportion of villages in the district with:										
A market building	0.25	0.18	2,794	0.25	0.18	2,438	0.25	0.16	356	No
Year-round roads	0.96	0.07	2,794	0.97	0.07	2,438	0.96	0.08	356	No
Bank	0.26	0.25	2,794	0.27	0.25	2,438	0.24	0.24	356	No
Public health center	0.20	0.19	2,794	0.20	0.20	2,438	0.18	0.17	356	Yes
A primary and secondary school	0.91	0.55	2,794	0.91	0.56	2,438	0.92	0.50	356	No
Instrument										
Provincial monthly legislated minimum wage (hundreds of thousand rupiahs)	1.43	0.26	2,794	1.42	0.23	2,438	1.50	0.41	356	Yes

Note: Mean difference is calculated from a *t*-test or a chi-squared test for binary variables, where Ho is equality of means.

began working during 1997–99, at the height of the economic crisis in Indonesia. For the non-child workers, we assign the minimum wage values according to their province of residence and imputed year that they would have begun working, based on their birth year. [5]

In order to be a valid instrument, legislated minimum wage must fulfill two conditions. First, it must be relevant, or in other words have a statistically significant relationship with child labor. Second, it must not have a direct causal relationship with the dependent variables or be correlated with the residual in Eqn. (1). This is the exclusion restriction. We now discuss the validity of the instrument with regards to these conditions.

We first present the relevance of the instrument, as shown in Table 2. The results in the first column do not condition for any covariates, and show that a one-standard deviation increase in minimum wage (about Rp. 26,000) is associated with a 3.3 (=0.26 × 0.128) percentage-point increase in the probability of child market work. This accounts for about 25% increase from the base probability.

The positive and statistically significant correlation between minimum wage and child labor remains after we condition on individual characteristics, parental education, and district GDP per capita (Column 2) or various district-level variables (Column 3) that may confound the observed correlation, which we calculate using Podes 2000. [6] We find that the positive correlation between minimum wage and child labor remains robust, even strengthened, after conditioning upon these variables.

In contrast to the relevance condition, the exclusion restriction of an instrument is fundamentally untestable. Therefore, understanding the process in determining provincial minimum wage in Indonesia is important in order to understand whether it may be directly correlated with any component in the residual. According to Suryahadi, Widyanti, Perwira, and Sumarto (2003), minimum wage in Indonesia is calculated based on a bundle of consumption items deemed essential for the livelihood of a single worker, around 2,600 to 3,000 calories per day. Until the end of 2000, each province has a single minimum wage level, determined through a tripartite discussion process attended by employee representatives, employers, and the government. Therefore, the level of legislated minimum wage is the result of province-specific conditions and the between-province variation in minimum wages reflects the variation in prices and negotiation results. From the process described above, minimum wage is unlikely to have a direct correlation with the dependent variables.

Table 2. *Relevance of instrument*

	Child labor (=1)			
	(1)	(2)	(3)	(4)
Provincial monthly legislated minimum wage (hundred thousand Rupiah)	0.128***	0.264***	0.353***	0.379***
	(0.049)	(0.070)	(0.056)	(0.052)
Male (=1)		−0.004	−0.003	−0.002
		(0.012)	(0.013)	(0.013)
Age in 2007		0.044	0.048***	0.049***
		(0.005)	(0.004)	(0.003)
Mother's schooling in 2000 (years)		−0.008***	−0.008***	−0.008***
		(0.002)	(0.001)	(0.001)
Father's employment status (=1)		−0.015	−0.028	−0.036
		(0.067)	(0.059)	(0.067)
Mother's employment status (=1)		(−0.012)	(−0.002)	(0.004)
		(0.068)	(0.062)	(0.069)
District GDP per capita in 1996 (in 1993 Rupiah)		−0.014	−0.012	−0.010
		(0.005)	(0.007)	(0.006)
District adult unemployment rate			−0.837**	−0.777
			(0.368)	(0.355)
District population			−0.000	−0.000
			(0.000)	(0.000)
Share of villages in the district with market			0.052	0.169
			(0.108)	(0.114)
Share of villages in the district with year-round roads				0.137
				(0.125)
Share of villages in the district with banks				−0.140
				(0.058)
Number of primary and secondary schools in the district (thousand)				0.021
				(0.056)
Constant	−0.056***	−0.982**	−1.093***	−1.283***
	(0.069)	(0.163)	(0.129)	(0.149)
Number of observations	2,794	2,794	2,794	2,794
Adjusted *R*-squared	0.010	0.086	0.107	0.110

Notes: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$; estimated using OLS; standard errors are clustered at the province level; the provincial minimum wage depends on the year that a child worker began working or a non-child worker is predicted to have begun working.

To tease out the validity of this hypothesis, we regress dependent variables in 2000 on minimum wage and a host of district control variables. The idea of this exercise is that minimum wages in 2000 or earlier should only affect human capital outcomes in 2007 through child labor status in 2000. Thus, if minimum wage satisfies exclusion restriction we should see insignificant correlation between minimum wage and human capital outcomes in 2000. The results of this exercise support our hypothesis, as shown in Table 3. We do not find statistically significant effects of minimum wage on all dependent variables (Columns 1–4). This implies that minimum wage arguably satisfies exclusion restriction condition. Minimum wage also satisfies relevance condition, as described above. Together, we can claim that minimum wage is an arguably valid instrument for this study.

Our instrumental variable specification is as follows:

$$W_{ijkp,2000} = g(MW_p, X_{ijkp}, P_{ijkp}, D_{kp}, \upsilon_{ijkp}) \tag{2}$$

$$\frac{Y_{ijkp,2007}}{\sigma_{2000}} = f\left(\hat{W}_{ijkp,2000}, \frac{Y_{ijkp,2000}}{\sigma_{2000}}, X_{ijkp}, P_{ijkp}, D_{kp}, \varepsilon_{ijkp}\right) \tag{3}$$

where MW_p is the legislated minimum wage in province p.

5. THE EFFECT OF CHILD MARKET WORK ON HUMAN CAPITAL

The two-stage least squares (2SLS) estimation results are shown in Table 4, while the OLS results are shown in Table 8. Comparing the OLS with the 2SLS estimation results, we find some contrasting results. We compare coefficients of child work on mathematics and lung capacity specifications because these two outcomes are statistically significant in 2SLS results. Following Clogg, Petkova, and Haritou (1995), we use z-test to verify the difference between OLS and 2SLS results, and find that the differences are statistically significant [7].

Examining the 2SLS results, we find that the instrument performs strongly with first-stage F-statistics ranging from 52 to 54. Column 1 shows that children who were engaged in market work in 2000 experienced 0.37 standard deviations lower growth in mathematics skills by 2007 compared to children who were not engaged in market work in 2000. The effect is especially substantial when measured in years of schooling. According to Suryadarma (2010), one additional year of schooling in Indonesia increases mathematics skills by about 0.13 standard deviations. Therefore, the effect of child market work on mathematics skills accumulation is worth about three years of schooling. This effect is large considering our panel is only seven years. Even more importantly, our estimates on the impact of child labor on education attainment (Column 4) are not statistically significant.

Assessing the health effects of child market work, we find growth in the lung capacity among child workers during 2000–07 to be 0.38 standard deviations lower than non-child workers (Column 3). Based on the literature on children lung function growth (He *et al.*, 2010), the estimates indicate that child workers may be working in environments with higher air pollution and excessive physical activity, resulting in lower

Table 3. *Exclusion restriction of instrument*

	Mathematics score in 2000 (1)	Cognitive score in 2000 (2)	Lung capacity in 2000 (3)	Education (years) in 2000 (4)
Provincial monthly legislated minimum wage (hundred thousand Rupiah)	−0.168	0.090	−0.143	−0.047
	(0.142)	(0.084)	(0.171)	(0.034)
Constant	0.422	−1.455	−0.007***	−2.309***
	(0.588)	(0.414)	(0.828)	(0.103)
Number of observations	2,794	2,794	2,794	2,794
Adjusted *R*-square	0.126	0.382	0.133	0.645

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$; estimated using OLS; standard errors are clustered at the province level; the provincial minimum wage depends on the year that a child worker began working or a non-child worker is predicted to have begun working. All regressions include full control variables.

Table 4. *Child labor and human capital accumulation, 2SLS results*

	Mathematics score in 2007 (1)	Cognitive score in 2007 (2)	Lung capacity in 2007 (3)	Schooling in 2007 (years) (4)
Child labor status (=1)	−0.372*	−0.243	−0.384***	−1.305
	(0.191)	(0.282)	(0.124)	(0.860)
Mathematics score in 2000, standardized	0.251***			
	(0.027)			
Lung capacity in 2000, standardized		0.222***		
		(0.027)		
Cognitive score in 2000, standardized			0.462***	
			(0.038)	
Years of education in 2000				1.145***
				(0.050)
Male (=1)	−0.104***	0.035	1.146***	0.096
	(0.035)	(0.035)	(0.034)	(0.074)
Age in 2007	−0.009	0.003	−0.001	−0.523***
	(0.009)	(0.014)	(0.009)	(0.049)
Mother's schooling in 2000 (years)	0.029***	0.031***	0.010***	0.198***
	(0.005)	(0.007)	(0.003)	(0.016)
Father's employment status (=1)	−0.286	−0.226	−0.140	0.609
	(0.264)	(0.253)	(0.156)	(0.752)
Mother's employment status (=1)	0.318	0.136	0.174	−0.933
	(0.280)	(0.301)	(0.171)	(0.854)
Per capita district GDP 1996, millions IDR, at 1993 constant price	−0.006	−0.005	−0.024**	0.010
	(0.007)	(0.007)	(0.012)	(0.017)
District adult unemployment rate	−0.305	−0.495	−0.722	−0.934
	(0.594)	(0.410)	(0.488)	(1.265)
District population (thousand)	0.000	0.000	0.000	−0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Share of villages in the district with market	−0.027	0.107	0.183	0.719
	(0.121)	(0.134)	(0.115)	(0.686)
Share of villages in the district with year-round roads	0.993***	0.325	−0.232	1.352
	(0.326)	(0.475)	(0.308)	(0.834)
Share of villages in the district with banks	−0.028	−0.021	−0.025	0.267
	(0.115)	(0.108)	(0.186)	(0.382)
Number of primary and secondary schools in the district (thousand)	−0.108	−0.147	−0.177*	0.375
	(0.140)	(0.132)	(0.107)	(0.341)
Constant	0.670*	2.113***	1.970***	12.334***
	(0.368)	(0.491)	(0.353)	(0.653)
Number of observations	2,794	2,794	2,794	2,794
Adjusted *R*-square	0.097	0.112	0.528	0.476
First-stage *F*-statistics	54.669	52.413	53.329	52.154

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$; standard errors are clustered at the province level; the instrumental variable used is provincial minimum wage in the year that a child worker began working or a non-child worker is predicted to have begun working; dependent variables are mathematics score in 2007 (Column 1), cognitive score (Column 2), lung capacity (Column 3), and completed years of schooling in 2007 (Column 4); the mathematics score, cognitive score, and lung capacity are standardized to the standard deviation of respective scores in 2000.

respiratory health compared to non-child workers. If this health effect is irreversible later in life, then the associated health costs or the loss from early mortality resulting from market work may be substantial.[8] Effects of child work on cognitive skills and educational attainment are negative, but these estimates are not statistically different from zero (Columns 2 and 4, respectively).

6. EFFECT HETEROGENEITY

(a) *Gender heterogeneity*

As shown in Section 3, we do not observe significant gender differences in terms of child market work participation rate. However, we may still see gender heterogeneity in the effects of child market work due to other reasons, such as participation in different tasks (Edmonds, 2008) or employment in different sectors, as shown in Figures 2A and 2B. We investigate this issue by adding an interaction term between child labor status and a gender indicator variable, which takes a value of one if a child is male and zero if female. Because the interaction term is endogenous, we add another instrument, interaction between provincial minimum wage and gender variable, to our estimation. We cannot draw meaningful inferences from the results, shown in Table 5. Low first-stage *F*-statistics in all specifications suggest that our instruments are weak. Moreover, coefficients on interaction term and child labor status are not statistically significant.

(b) *Location of residence heterogeneity*

The second aspect of heterogeneity that we consider is location of residence. Children may be engaged in different kinds of work depending on whether they live in a rural or an urban area. For example, most of those working in rural areas may be engaged in agriculture, while those working in urban areas may be working in manufacturing. Since working in factories may expose children to more pollution than working in agriculture, these children may suffer worse health effects. Similar to estimation of gender heterogeneity effects, to examine heterogeneity in residence effects of child work, we add interaction term between child labor status and residence location indicator variable. Interaction between residence location and minimum wage serves as an additional instrument. Table 6 shows that our instruments are weak. First-stage F-statistics are very low. Thus, we cannot interpret anything from our estimation results.

Table 5. *Child labor and human capital accumulation by gender, 2SLS results*

	Mathematics score in 2007 (1)	Cognitive score in 2007 (2)	Lung capacity in 2007 (3)	Education (years) in 2007 (4)
Child labor*male	0.247	−0.704	−1.654	2.205
	(0.895)	(1.061)	(1.260)	(1.912)
Child labor status (=1)	−0.504	0.131	0.490	−2.469
	(0.521)	(0.764)	(0.755)	(1.469)
Male (=1)	−0.135	0.125	1.352**	−0.182
	(0.123)	(0.126)	(0.192)	(0.290)
Constant	0.668	2.118**	2.009**	12.477**
	(0.372)	(0.486)	(0.355)	(0.708)
Number of observations	2,794	2,794	2,794	2,794
Second-stage *R*-square	0.098	0.099	0.444	0.466
First-stage *F*-statistics	3.105	3.123	3.114	3.075

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$; standard errors are clustered at the province level; the instrumental variable used are provincial minimum wage and interaction between provincial minimum wage and residence location indicator variable; dependent variables are mathematics score in 2007 (Column 1), cognitive score (Column 2), lung capacity (Column 3), and completed years of schooling in 2007 (Column 4); the mathematics score, cognitive score, and lung capacity are standardized to the standard deviation of respective scores in 2000. All regressions include full control variables.

Table 6. *Child labor and human capital accumulation by location of residence, 2SLS results*

	Mathematics score in 2007 (1)	Cognitive score in 2007 (2)	Lung capacity in 2007 (3)	Education (years) in 2007 (4)
Child labor*Urban	4.368*	−5.403	−19.328*	0.782
	(22.054)	(24.155)	(67.473)	(42.599)
Child labor status (=1)	−2.012	1.830	7.057	−1.566
	(8.527)	(9.254)	(26.007)	(16.588)
Urban (=1)	0.142	0.165	0.145	0.394
	(0.152)	(0.153)	(0.316)	(0.289)
Constant	0.762	1.992**	1.340**	12.280**
	(0.612)	(0.740)	(2.417)	(3.664)
Number of observations	2,794	2,794	2,794	2,794
Second-stage *R*-square	−0.653	−1.026	−9.828	0.473
First-stage *F*-statistics	0.039	0.035	0.042	0.058

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$; standard errors are clustered at the province level; the instrumental variable used are provincial minimum wage and interaction between provincial minimum wage and residence location indicator variable; dependent variables are mathematics score in 2007 (Column 1), cognitive score (Column 2), lung capacity (Column 3), and completed years of schooling in 2007 (Column 4); the mathematics score, cognitive score, and lung capacity are standardized to the standard deviation of respective scores in 2000. All regressions include full control variables.

Table 7. *Child labor and human capital accumulation by type of work, OLS results*

	Mathematics score in 2007 (1)	Cognitive score in 2007 (2)	Lung capacity in 2007 (3)	Education (years) in 2007 (4)
Type of work	−0.013	0.095	−0.118	−1.468*
	(0.081)	(0.074)	(0.104)	(0.320)
Constant	0.230	2.288*	2.740**	16.804**
	(0.740)	(0.927)	(0.712)	(1.851)
Number of observations	356	356	356	356
Second-stage *R*-square	0.167	0.148	0.599	0.546

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$; standard errors are clustered at the province level; dependent variables are mathematics score in 2007 (Column 1), cognitive score (Column 2), lung capacity (Column 3), and completed years of schooling in 2007 (Column 4); the mathematics score, cognitive score, and lung capacity are standardized to the standard deviation of respective scores in 2000. All regressions include full control variables.

(c) *Type of work heterogeneity*

Heterogeneity in the effect of child market work may also take place between child workers who work for the family business and those who work outside their household. As an example, the child workers who are working for their parents, although unpaid, may not work as intensely as those who are working for pay outside the family. [9]

In this section, we examine whether type of work heterogeneity in the effect of child market work on human capital accumulation exists. However, we do not explicitly model the decision to work inside or outside the household. To the extent that the decision is related to the outcomes that we are measuring and have no controls for, the estimates may be inconsistent. However, we believe that this is an important yet largely unexplored aspect in the research of the effect of child labor. To investigate this issue we simply regress our outcomes on type of work indicator variable, which takes one if wage work and zero if family business work, and other control variables. The results are presented in Table 7.

We find that in terms of educational attainment child workers whose jobs are outside of family business suffer worse than those who help their family business. The difference is quite large, about 1.5 years of schooling (column 4). This represents 20% loss in schooling during the period of our study. Columns 1–3 suggest that working for wage and for family business do not differ statistically in terms of other human capital outcomes. Nevertheless, we find suggestive evidence that working outside the family business is a worse form of child labor.

7. CONCLUSION

In this paper we examine the effect of child labor on the long-term growth in human capital, which is widely accepted as an important determinant of earnings. Different from most studies in the literature, we use measures of output of the human capital production: mathematics skills, cognitive skills, and pulmonary function.

We find strong negative effects of child work on the growth of mathematics skills and lung capacity in the next seven years. We are not able to draw meaningful gender and residence heterogeneous effects of child labor. However, we find large adverse effects of working for wage outside the family on educational attainment compared to those who work in family business.

Therefore, departing from many studies that focus on the input to the human capital production function, we discover large negative effects of child labor. Moreover, we observe these substantial negative effects despite the fact that close to 90% of child workers in Indonesia work for the family business. This means two things. First, even the kind of child labor that is considered as relatively acceptable already has large negative effects on long-term human capital accumulation. Second, the results also imply that the effects of child labor on human capital accumulation may be worse in other developing countries at lower levels of development than Indonesia, where a higher share of children are working and more child workers are working for wage in factories or other locations outside the household. Thus, child labor remains a phenomenon that needs to be seriously addressed by policymakers, especially in developing countries.

NOTES

1. Appendix A shows examples of the tests.

2. IFLS uses a device called peak flow meter, which measures expiratory flow rate. Expiratory flow rate depends on gender, age, and height, and measures how well the lungs are working (US Department of Health & Human Services, 2007). Peak flow readings are measured in liters per minute.

3. Formally, Statistics Indonesia includes the following occupations in the other services: government, education, health, social work, international agencies, and domestic duties.

4. As we mention below, close to 80% of the child workers in our sample began working during 1997–99. Therefore, we choose to condition on GDP per capita levels in 1996 in order to ensure the exogeneity of the variable.

5. We impute the year for non-child workers by regressing the year started working on the birth year of the child workers, and then use the estimated coefficient to predict the starting year that the non-child workers would have begun working had they been sent to work.

6. The administrative regions in Indonesia consist of villages, subdistricts, districts, and provinces.

7. z-Score is obtained by calculating the following: $z-score = \frac{\beta_{IV}-\beta_{OLS}}{\sqrt{SE(\beta_{IV})^2+SE(\beta_{OLS})^2}}$. From this formula we get z-score for mathematics is −2.061, and z-score for lung capacity is −3.383.

8. In a study in the United States, Evans and Smith (2005) find that the long-term effects of exposure to air pollution include heart attack and angina. In addition, Jayachandran (2009) finds that air pollution is responsible for early-life mortality in Indonesia.

9. The assumption that working for wage outside the household is worse than working for the household business may or may not be true. As an example, injury rate from child market work in agriculture—which may include working in household-owned land—is higher than the injury rate in child market work in manufacturing—which most likely falls under working for wage (Ashagrie, 1998). However, most of the worst forms of child labor as discussed in ILO (2002), such as bonded labor, prostitution, combat, or involvement in pornography, are done outside the household.

REFERENCES

Akabayashi, H., & Psacharopoulos, G. (1999). The trade-off between child labour and human capital formation: A Tanzanian case study. *Journal of Development Studies, 35*(5), 120–140.

Ashagrie, K. (1998). *Statistics on working children and hazardous child labour in brief*. Geneva: ILO.

Baland, J.-M., & Robinson, JA. (2000). Is child labor inefficient?. *Journal of Political Economy, 108*(4), 663–679.

Basu, K. (1999). Child labor: Cause, consequence, and cure, with remarks on international labor standards. *Journal of Economic Literature, 37*(3), 1083–1119.

Basu, K. (2000). The intriguing relation between adult minimum wage and child labour. *Economic Journal, 110*(March), C50–C61.

Basu, K., & Van, P. H. (1998). The economics of child labor. *American Economic Review, 88*(3), 412–427.

Beegle, K., Dehejia, R., & Gatti, R. (2009). Why should we care about child labor? The education, labor market, and health consequences of child labor. *Journal of Human Resources, 44*(4), 871–889.

Clogg, C., Petkova, E., & Haritou, A. (1995). Statistical methods for comparing regression coefficients between models. *American Journal of Sociology, 100*(5), 1261–1293.

Dessy, S. E., & Pallage, S. (2005). A theory on the worst forms of child labour. *Economic Journal, 115*(500), 68–87.

Dumas, C. (2012). Does work impede child's learning? The case of Senegal. *Economic Development and Cultural Change, 60*(4), 773–793.

Edmonds, E. V. (2008). Child labor. In T. P. Schultz, & J. Strauss (Eds.). *Handbook of development economics* (Vol. 4). Elsevier: North Holland.

Edmonds, E. V., & Pacvnik, N. (2005). Child labor in the global economy. *Journal of Economic Perspectives, 19*(1), 199–220.

Evans, M. F., & Smith, V. K. (2005). Do new health conditions support mortality-air pollution effects?. *Journal of Environmental Economics and Management, 50*(3), 496–518.

Glewwe, P. (2002). Schools and skills in developing countries: Education policies and socioeconomic outcomes. *Journal of Economic Literature, 40*(2), 436–482.

Goldin, C. (1979). Household and market production of families in a late nineteenth-century American town. *Explorations in Economic History, 16*, 111–131.

Grootaert, C., & Kanbur, R. (1995). Child labour: An economic perspective. *International Labour Review, 134*(2), 187–203.

Gunnarsson, V., Orazem, P. F., & Sanchez, M. A. (2006). Child labor and school achievement in Latin America. *World Bank Economic Review, 20*(1), 31–54.

Hanushek, E. A., & Woessmann, L. (2008). The role of cognitive skills in economic development. *Journal of Economic Literature, 46*(3), 607–668.

He, Q.-Q., Wong, T. W., Du, L., Jiang, Z.-Q., Gao, Y., Qiu, H., *et al.* (2010). Effects of ambient air pollution on lung function growth in Chinese school children. *Respiratory Medicine, 104*(10), 1512–1520.

ILO (2002). *Every child counts: New global estimates on child labour*. Geneva: ILO.

ILO-IPEC (2013). *Making progress against child labor: Global estimates and trends 2000–2012*. Geneva: ILO.

Jayachandran, S. (2009). Air quality and early-life mortality: Evidence from Indonesia's wildfires. *Journal of Human Resources, 44*(4), 916–954.

Kana, M., Phoumin, H., & Seiichi, F. (2010). Does child labour have a negative impact on child education and health? A case study in rural Cambodia. *Oxford Development Studies, 38*(3), 357–382.

Kis-Katos, K., & Sparrow, R. (2011). Child labor and trade liberalization in Indonesia. *Journal of Human Resources, 46*(4), 722–749.

Kong, T., & Ramayandi, A. (2008). Survey of recent developments. *Bulletin of Indonesian Economic Studies, 44*(1), 7–32.

Lebowitz, M. D. (1991). The use of peak expiratory flow rate measurements in respiratory disease. *Pediatric Pulmonology, 11*, 166–174.

Magruder, J. (2013). Can minimum wages cause a big push? Evidence from Indonesia. *Journal of Development Economics, 100*, 48–62.

O'Donnell, O., Rosati, F. C., & van Doorslaer, E. (2005). Health effects of child work: Evidence from rural Vietnam. *Journal of Population Economics, 18*(3), 437–467.

Ray, R. (2000). Analysis of child labor in Peru and Pakistan: A comparative study. *Journal of Population Economics, 13*, 3–19.

Rojas-Martinez, R., Perez-Padilla, R., Olaiz-Fernandez, G., Mendoza-Alvarado, L., Moreno-Macias, H., Fortoul, T., *et al.* (2007). Lung function growth in children with long-term exposure to air pollutants in Mexico city. *American Journal of Respiratory and Critical Care Medicine, 176*(4), 377–384.

Schwartz, J. (1989). Lung function and chronic exposure to air pollution: A cross-sectional analysis of NHANES II. *Environmental Research, 50*(2), 309–321.

Strauss, J., Beegle, K., Dwiyanto, A., Herawati, Y., Pattinasarany, D., Satriawan, E., *et al.* (2004). *Indonesian living standards before and after the financial crisis*. Singapore: Institute of Southeast Asian Studies.

Strauss, J., Witoelar, F., Sikoki, B., & Wattie, A. M. (2009). *The fourth wave of the Indonesia family life survey: Overview and field report volume 1* RAND Labor and Population Working Paper WR-675/1-NIA/NICHD. Santa Monica, CA: RAND.

Suryadarma, D. (2010). *Labour market returns, marriage opportunities, or the education system? Explaining gender differences in numeracy in Indonesia* CEPR Discussion Papers 644. Canberra: Centre for Economic Policy Research, Australian National University.

Suryahadi, A., Priyambada, A., & Sumarto, S. (2005). Poverty, school and work: Children during the economic crisis in Indonesia. *Development and Change, 36*(2), 351–373.

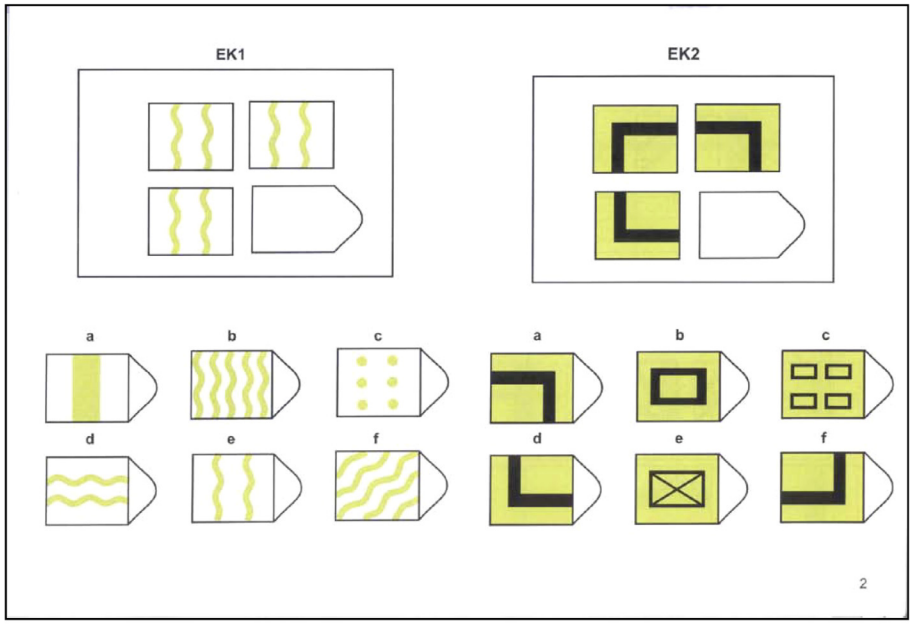
Suryahadi, A., Suryadarma, D., & Sumarto, S. (2009). The effects of location and sectoral components of economic growth on poverty: Evidence from Indonesia. *Journal of Development Economics, 89*(1), 109–117.

Suryahadi, A., Widyanti, W., Perwira, D., & Sumarto, S. (2003). Minimum wage policy and its impact on employment in the urban formal sector. *Bulletin of Indonesian Economic Studies, 39*(1), 29–50.

US Department of Health and Human Services (2007). *National asthma education and prevention program expert panel report 3: Guidelines for the diagnosis and management of asthma*. Rockville, MD: National Heart, Lung, and Blood Institute.

Wolff, F., & Maliki (2008). Evidence on the impact of child labor on child health in Indonesia, 1993–2000. *Economics and Human Biology, 6*(1), 143–169.

APPENDIX A.



EK13. 49 - 23 = . . .

a. 25

b. 26

c. 27

EK14. 267 + 112 - 189 = . . .

a. 180

b. 188

c. 190

EK15. (8 + 9)*3 = . . .

a. 34

b. 45

c. 51

EK16. 56/84 = . . .

a. 4/7

b. 2/3

c. 3/4

d. 5/6

EK17. 1/3 - 1/6 = . . .

a. 2/3

b. 1/3

c. 1/6

d. 1/9

8

Figure A1. *Cognitive and numeracy test examples from IFLS.*

Table 8. *Child labor and human capital accumulation, OLS results*

	Mathematics score in 2007 (1)	Cognitive score in 2007 (2)	Lung capacity in 2007 (3)	Schooling in 2007 (years) (4)
Child labor status (=1)	0.028	0.065	−0.066	−0.120
	(0.041)	(0.044)	(0.048)	(0.124)
Mathematics score in 2000, standardized	0.248***			
	(0.028)			
Cognitive score in 2000, standardized		0.224***		
		(0.027)		
Lung capacity in 2000, standardized			0.458***	
			(0.040)	
Years of education in 2000				1.161***
				(0.048)

Table 8 (*continued*)

	Mathematics score in 2007 (1)	Cognitive score in 2007 (2)	Lung capacity in 2007 (3)	Schooling in 2007 (years) (4)
Male (=1)	−0.103**	0.035	1.147***	0.102
	(0.036)	(0.037)	(0.035)	(0.071)
Age in 2007	−0.023**	−0.008	−0.011	−0.576***
	(0.008)	(0.008)	(0.008)	(0.034)
Mother's schooling in 2000 (years)	0.033***	0.033***	0.013***	0.207***
	(0.005)	(0.006)	(0.003)	(0.022)
Father's employment status (=1)	−0.275	−0.220	−0.132	0.640
	(0.275)	(0.265)	(0.167)	(0.827)
Mother's employment status (=1)	0.314	0.135	0.172	−0.940
	(0.288)	(0.319)	(0.175)	(0.928)
Per capita district GDP 1996, millions IDR, at 1993 constant price	−0.005	−0.004	−0.023*	0.012
	(0.007)	(0.007)	(0.012)	(0.016)
District adult unemployment rate	−0.138	−0.370	−0.589	−0.466
	(0.626)	(0.412)	(0.486)	(1.234)
District Population (thousand)	0.000	0.000	0.000	−0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Share of villages in the district with market	−0.052	0.089	0.163	0.648
	(0.129)	(0.127)	(0.109)	(0.630)
Share of villages in the district with year-round roads	0.987**	0.320	−0.238	1.326
	(0.330)	(0.489)	(0.316)	(0.881)
Share of villages in the district with banks	−0.023	−0.019	−0.021	0.274
	(0.116)	(0.107)	(0.191)	(0.369)
Number of primary and secondary schools in the district (thousand)	−0.133	−0.167	−0.197	0.293
	(0.130)	(0.131)	(0.116)	(0.331)
Constant	0.851**	2.253***	2.109***	13.057***
	(0.350)	(0.466)	(0.372)	(0.736)
Number of observations	2,794	2,794	2,794	2,794
Adjusted *R*-square	0.122	0.129	0.540	0.494

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$; standard errors are clustered at the province level; the instrumental variable used is provincial minimum wage in the year that a child worker began working or a non-child worker is predicted to have begun working; dependent variables are mathematics score in 2007 (Column 1), cognitive score (Column 2), lung capacity (Column 3), and completed years of schooling in 2007 (Column 4); the mathematics score, cognitive score, and lung capacity are standardized to the standard deviation of respective scores in 2000.