

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

ARMAND SIM^a, DANIEL SURYADARMA^{b,c} and ASEP SURYAHADI^{b,*}

^a *Cornell University, Ithaca, USA*

^b *SMERU Research Institute, Jakarta, Indonesia*

^c *Australian National University, Canberra, Australia*

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.
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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

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