The impact of a macroeconomic crisis on child schooling outcomes in Indonesia

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Abstract

I examine the impact of the 1998 East Asian recession on child schooling outcomes in Indonesia over a horizon of 3-10 years. While the adverse effects of idiosyncratic negative household income shocks on schooling outcomes is well-documented, there is less clarity on the effect of an aggregate economic shock on both short-term and long-term human capital formation in developing countries. Recessions are characterised by a large fall in real wages, as a result of which households face both a drop in their real incomes, as well as lower wages in available jobs. The income effect of the recession reduces school enrolment but the price effect of the recession reduces the opportunity costs of schooling, leaving the net impact on school enrolment and labour market participation of children theoretically ambiguous. Using data on 7-15 year-olds from the Indonesian Family Life Survey, I exploit the heterogeneous impact of the economic recession across urban communities as measured by the variation in rice price increases, under the assumption that communities where rice prices increased the most were those where real wages declined the most. I find that higher rice price increases are associated with small declines in school enrolment and hours per week spent in school, and large declines in labour market participation. For the youngest children (aged 7-12 years) there is a larger negative impact of higher rice prices on school attendance and no effect on labour market participation. For older children (aged 13-15 years), schooling enrolment does not respond to rice prices but labour market participation declines sharply in the worst-hit communities. Using data from a follow-up survey in 2007, I find the crisis does not have adverse long-term consequences on human capital formation. On the contrary, children in the communities with the largest price increases were more likely to have an additional year of schooling, and to have graduated junior school, senior school and college.

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1 Introduction

Human capital is a critical determinant of lifetime earnings; consequently, a disruption to schooling in childhood can have important consequences for an individual's well-being. These disruptions in schooling may be permanent or temporary and the adverse effects of these disruptions can potentially persist into adulthood, creating important implications for social policy. For example, dropping out of school early is widely associated with reduced lifetime earnings as an adult. If human capital formation is disproportionately affected in poorer households, then, in countries characterised by convex returns to schooling, schooling disruptions may lead to long-term inequality. One important reason for schooling disruptions is household income volatility. Families that are unable to smooth consumption in the face of income shocks may reduce their expenditure on the schooling of their children, or reallocate the time spent by their children towards income-earning activities, rather than education. A second reason to drop out of school relates to available job opportunities for children, as well as the prevailing child wage rate, which measures the opportunity cost of staying in school. If the wage rate falls, children ought to have a greater incentive to stay in school.

I examine the short-run and long-run impact of a negative aggregate income shock on child schooling outcomes in a developing country. One would expect that a large economy-wide collapse in real wages would invariably have a negative effect on human capital formation but the theoretical predictions of such shocks are ambiguous and the empirical evidence is also mixed. A recession is typically characterised by a large drop in real wages, causing household real incomes to decline, but also leading to a drop in the prevailing wage rate in available jobs for adults as well as children. The net impact of the economy-wide fall in real wages on schooling and labour decisions is ambiguous, and the long-run consequences of aggregate crises might not necessarily lead to reduced levels of human capital attainment. In this paper, I exploit the heterogeneous impact of an aggregate shock across communities to quantify the impact of the crisis on the school and labour market participation of children across a medium-term horizon of three years. I consider children's schooling outcomes both at the extensive margin (school enrolment) and the intensive margin (hours spent in school), and I also consider their labour market participation. I focus on heterogeneous impacts on children by age in order to identify whether the decision to stay in school varies by the relative ability of the child to find employment. I also consider whether the effects of the crisis persist into adulthood.

I analyse these questions in the context of Indonesia, a fast-growing developing economy, which suffered a severe setback in the form of the East Asian financial crisis of 1998. The crisis was characterised by soaring inflation and an extraordinary drop in real wages of over 40% over the course of a year (Frankenberg et al., 2003). High inflation was sparked off by the collapse of the Indonesian rupiah in January 1998 and rapid increases in the price of rice, the single most important expenditure item in the budget of the average Indonesian family. Net consumers of rice – a group which includes urban households – were particularly affected by declining real wages. However, there was considerable variation in rice price increases across the country, with urban households potentially facing the sharpest declines in real earnings in those communities where rice price increases were greatest. Using data from three waves of the Indonesian Family Life Survey (IFLS), I exploit the cross-community variation in the price of rice before and after the crisis to identify the within-community change in child schooling and labour outcomes in urban households as a result of the crisis. I also use data from a follow-up survey taken ten years after the shock to examine its long-term consequences on human capital formation.

The paper makes several contributions to the literature. First, while there is a large literature on the impact of economic distress on investments in human capital in developing countries, much of the research relates to the impact of idiosyncratic household income volatility on child schooling and labour outcomes.[1] Many of these papers study household-level shocks such as crop loss or the household head losing a job, which are arguably not exogenous to household characteristics that affect decisions on human capital investment. Moreover, the impact of these shocks, even if well-identified, measures the effect of idiosyncratic income variation only. By using regional variation in the effect of an unanticipated aggregate economic shock, I identify the within-community impact of income shocks using an instrument that is exogenous to the households living within these communities. Other papers with similar strategies include Edmonds and Pavcnik (2006), who use community variation in rice prices in Vietnam following a period of trade liberalisation to identify the effect of this policy change on child labour. Yang (2006) exploits the heterogeneous impact of the East Asian financial crisis on international immigrants from the Philippines, who were differently affected by the changes in the value of the peso depending on which country they were living in. Chen (2010) uses the differential impact of the East Asian financial crisis on public sector employees (who were particularly hurt by

[1] See, for example, Jacoby (1994); Jacoby and Skoufias (1997); Jensen (2000); Beegle et al. (2006); Guarcello et al. (2010).

the erosion in real wages) and wetland rice farmers in Indonesia (who benefited from the rise in rice prices) to estimate the effect of a household income shock on religious intensity.

Second, the methodological strategy I use allows me to quantify the impact of an economy-wide aggregate shock, the theoretical effects of which are ambiguous, as opposed to a household-specific shock. In the the context of Indonesia, I find that while there is a small decline in schooling enrolment in response to the economic recession of 1998-99, there is an even larger decline in labour market participation in the worst-hit communities.

Third, I identify heterogeneity in the impact of economic distress across different ages and stages of schooling and find that for younger, primary school-aged children, schooling enrolment declined, while for older children, labour market participation declined in response to the crisis. This agrees with previous studies on Indonesia: Thomas et al. (2004) compare enrolment rates and changes in per capita consumption expenditure before and after the crisis and conclude that between 1997 and 1998, real household expenditure on education declined particularly in poor, urban households with more young children (10-14 years old), suggesting that older children were relatively better protected from the crisis at the expense of the young. In Brazil, Duryea et al. (2007) find that older children of about 16 are more likely to enter the workforce in response to the household head losing his or her job than younger children.

Finally, the long length of the dataset allows me to examine the long-term effects of the recession on schooling attainment over a ten-year horizon, which is unusual among developing country studies.[2] Given that children might increase the time spent on schoolwork due to the inability to find wage-employment, it may well be the case that there are no adverse long-term consequences on schooling attainment. By observing children ten years after the initial crisis, I provide evidence that this may have been the case in Indonesia.

The rest of the paper is organised as follows: section 2 provides the background to the crisis and the theoretical motivation for this paper. Section 3 describes the data. Section 4 presents the empirical framework and estimation results on the impact of the economic shock on children's schooling outcomes. Section 5 considers the long-term impact of the economic shock on schooling. Section 6 concludes.

[2]Two other papers that use long-term panel data from developing countries include Beegle et al. (2009), who estimate the effect of child labour on schooling outcomes in Vietnam over a five-year horizon, and Krutikova (2010), who identifies the impact of household income shocks on the schooling distribution in Tanzania over a 10-13 year horizon.

2 Background and theoretical motivation

2.1 Background to the Indonesian crisis

In the second half of 1997, the East Asian currency crisis erupted as international investors launched a speculative attack on the Thai baht. The contraction of credit markets put the currencies of neighbouring countries under pressure as well, and in January 1998, the Indonesian rupiah fell from Rp 4,800/$ to above 16,000/$, plunging Indonesia into a deep and long-drawn economic crisis. While the real exchange rate gradually appreciated over the next two years, in mid-2000 it was still 40% lower than its mid-1997 level. GDP contracted by 13.1% in 1998 and marginally recovered the next year to 0.8%.[3] Real wages were badly hit; Frankenberg et al. (2003) estimate that real wages fell by upto 40% in the market sector in 1998, and, consequently, household per capita spending was reduced by 23%. They find that much of this reduced spending was at the expense of deferrable investments in human capital: household spending on both health and expenditure declined by close to 40% in 1998.

This deep contraction was accompanied by high rates of inflation. Starting in January 1998, the prices of commodities began to soar, with inflation reaching 80% by the end of 1998.[4] Soaring inflation was driven by the sharp fall in the rupiah as well as the removal of subsidies on essential goods such as rice and oil. The price of food, of which rice comprises the largest part, increased by 120% over the next two years.[5] Violent riots broke out in Jakarta in May 1998, leading to the eventual fall of the 32-year Suharto presidency.[6] Figure 1 depicts the sharp and sustained increase in rice prices and the CPI between 1997 and 2007. Frankenberg et al. point to the doubling of the price of rice in the year following the crisis as the main reason for the increase in CPI, since rice expenditure is a large part of the total budget of the average Indonesian family. Thomas and Frankenberg (2007) provide evidence of the rising share of food expenditure, driven by increased expenditure on rice, in the total household budget; this leads, in turn, to reduced spending on non-food items, including health and education. The rise in rice prices, therefore, is an important measure of the extent of the crisis for Indonesian consumers that were net consumers of rice – a rise in the real price of rice is a terms of trade movement against these households.

[3]Data from the IMF's World Economic Outlook database.

[4]Data from the Badan Pusat Statistik (BPS), the central bureau of statistics in Indonesia.

[5]Data from the Food and Agricultural Database of the UN.

[6]See Soesastro and Basri (1998) for a survey of the immediate aftermath of the rupiah collapse.

However, there was significant variation in the increase in rice prices across communities. Levinsohn et al. (2003) point out that geography was the most important determinant of rice price increases between the start of the crisis and the end of 1998, and document large inter-provincial variation in the increase in rice prices in this period (120% to 280%). They discuss some of the reasons for the variation in inflation and commodity prices at this time and conclude that regional inequalities in infrastructure and transport were particularly critical in driving regional disparities in inflation. Frankenberg et al. point out that given the geography of Indonesia, a 13,000-island archipelago, labour and product markets are extremely unlikely to clear across all regions. In general, communities vary by level of development, infrastructure and accessibility. It is this community-level variation in rice price increases that I will exploit to identify the within-community impact of the economic shock on child schooling and labour outcomes.

2.2 Theoretical motivation

In a simple model of educational choice, households invest in child education in expectation of higher future earnings. The opportunity cost of investing in schooling is measured both by the costs of schooling and the lower wage a child without schooling would earn by entering the labour market instead. In the context of recession marked by declining real wages, we would expect that households face both a shock to real income, as a result of which they consume less of all normal goods, including expenditure on schooling. At the same time, children face lower real wages, reducing the opportunity cost of staying in school. In the presence of complete credit markets, households would theoretically be able to smooth spending on education and only the substitution effect or the price effect of a drop in real wages would operate. However, with incomplete credit markets, as in most developing economies, both the income effect and the substitution effect of falling real wages would affect the schooling decision. The net impact of an aggregate shock on households on school attendance would, therefore, be theoretically ambiguous.

Empirical research on developed countries suggests that the impact of an aggregate shock leads to an *increase* in school enrolment, due to fewer available jobs and lower real wages. For example, Goldin (1999) points out that the "one positive effect" of the Great Depression in the United States was that it induced young people to stay in school; US states that saw the highest increase in unemployment, particularly due to the loss of jobs in the manufacturing sector, were those that saw the greatest increase in school enrolment over the 1930s. Using more recent data from the United States,

Betts and McFarland (1995) find that a one per cent increase in the unemployment rate is associated with a four per cent increase in enrolment in community colleges. In developing countries, the evidence is less clear. Binder (1999) estimates the relationship between changes in school participation and changes in GDP to estimate the income-elasticity of schooling, using data across two recessions in Mexico in the 1980s. She finds that the positive effect of schooling enrolment of lower wages cancelled out the negative effect of schooling enrolment of lower incomes, leading to largely stagnant school enrolment rates during this period. Duryea and Arends-Kuenning (2003) exploit regional variation in the decline in real wages in Brazil between 1977 and 1998 to identify the effect of local labour market conditions on schooling enrolment and find that the income effect of lower wages is largely offset by the substitution effect of lower wages. McKenzie (2003) uses a differences-in-differences approach to compare school enrolment increases before, during and after the 1994-95 Mexican recession to find that school enrolment increased during the recession year, due to the falling opportunity costs of schooling. Schady (2004) considers human capital investment during the deep 1988-92 recession in Peru. He identifies the determinants of school enrolment and child labour by using within-district variation across school-going and non school-going cohorts to find no evidence of a drop in school enrolment and some evidence of a drop in child labour. As a result, children exposed to the crisis were more likely to have higher schooling enrolment, four years later.

While I cannot disentangle the income and substitution effects of a fall in real wages with the Indonesian data, I do consider the impact of the rice price shock on both schooling participation as well as labour market participation. I also compare outcomes between children in primary school (aged between 7 and 12) and in junior secondary school (aged between 13 and 15). The distinction is important because 13-15 year-olds face higher opportunity costs of schooling, due to their ability to find employment, and are likely to be more sensitive to the price effect of a decline in real wages, compared to the younger children.

Another factor that affects the schooling decision is a change in school quality. As has been pointed out by Ferreira and Schady (2009), if the aggregate shock causes the state to reduce funding to education, resulting in lower-quality services, the household demand for schooling might decline. I address this concern in the empirical framework in section 4. Further, if the returns to schooling change permanently as a result of the crisis, the demand for schooling would also be affected. This might be a concern in the Indonesian context, where the recession was associated with the loss of jobs in urban areas, particularly in relatively skilled work such as in the financial sector. If

there is a permanent fall in the return to schooling, one would expect a decline in the household demand for schooling. In this paper, I do not account for this effect.

The theoretical predictions would potentially vary across different types of consumers and producers; in particular, the increase in rice prices could be expected to benefit net rice producers. Thomas and Frankenberg (2007) provide some evidence that rice producers in Indonesia were better insulated against the crisis due to favourable movements in relative prices in 1998.[7] Were both the relative price of rice and net production of rice to increase, net producers of rice would experience an income effect leading to higher spending on normal goods such as human capital investment. Since rice farming is a labour-intensive activity, there is also a predicted substitution effect leading to a reallocation of children's time from schooling to labour, due to the increase in the value of rice production. The effect on child school participation would be theoretically ambiguous but the operating effects are very different compared to net consumers of rice. In order to identify more precisely the effect of a terms of trade movement against households and the adverse effects of the prolonged recession, I focus on urban households only, which do not produce rice and can only be adversely affected by a sudden increase in the price of a commodity of which they are net consumers.

3 Data

3.1 Indonesian Family Life Survey

The data I use is from the Indonesian Family Life Survey (IFLS), an ongoing longitudinal socio-economic and health survey that collects information at the level of the individual, the family, the household, and the community on a wide range of topics, including those relevant in this paper – economic well-being, educational attainment and community-level rice prices and other characteristics. The survey is based on an initial sample of 7,224 households (approximately 22,000 individuals) living in 13 of Indonesia's 26 provinces in 1993, and representing 83 per cent of the Indonesian population in that year. These IFLS-1 households were subsequently re-contacted in 1997, 2000 and 2007.[8] Since the IFLS tracks individuals who split off from original

[7]However, this benefit was somewhat mitigated by the occurrence of El Niño-related droughts and severe forest fires that led to the destruction of crops in late 1997 and 1998.

[8]The data for the first wave of the panel was collected between August and November 1993, and between September 1993 and January 1994. The data for the second wave was collected between August and December 1997. The third wave of data was collected between June and October 2000. The fourth wave of data was collected between November 2007 and April 2008. Information on

survey households, the number of surveyed households has increased with every wave, with 13,535 households (approximately 44,100 individuals) interviewed in 2007.

The identifying variation in the empirical analysis is community-level variation in the price of rice between 1997 and 2000. The level at which the community is defined is the district, or *kabupaten*: this unit is small enough to allow for sufficient variation in rice prices across communities but large enough that the price of rice is exogenous to individual households living within the community. The sample contains 124 such communities that were surveyed in 1997 and 2000. The IFLS collects community-level data at the level of the enumeration areas (*kelurahan* or *desas*); I aggregate the information collected at each enumeration area – each roughly the size of a census block – up to the level of the district.[9]

The first part of this paper confines itself to the study of 3,156 children between the ages of 7 and 15 (inclusive) in 1997 and 3,317 children in 2000, living in the 124 urban panel communities.[10] The second part of this paper examines 2,942 children (of the original 3,156 children surveyed in 1997) who lived in panel households that were subsequently surveyed in 2007, to examine the impact of the recession on the long-term educational attainment of children. The Indonesian schooling system is organised into basic, secondary, and higher education. Basic education is a nine-year programme of free, compulsory schooling for all children between the ages of 7 and 15, consisting of elementary school (six years, between the ages of 7 and 12) followed by junior secondary school (three years between the ages of 13 and 15). At the end of basic education, students who have successfully completed a national examination may enter senior secondary school (three years) through either an academic or a vocational track. After completing the senior secondary national exam, students may enter higher education at universities, academies or colleges. The students selected for this analysis are of the age where they ought to be enrolled in basic education.

Surveyed families are asked a number of questions on socio-economic and demographic characteristics of the household as well as on the economic activities of the household head. Information is collected on the schooling outcomes for children – whether they are enrolled in school in the present year, how many hours they spent in school in a typical week, and the level and grade in which they are currently enrolled. Information is also collected on whether a child has been employed in the past year.

all four waves can be found in Frankenberg and Karoly (1995); Frankenberg and Thomas (2000); Strauss et al. (2004, 2009).

[9]Each district contains 6 enumeration areas, on average.

[10]An average of 113 children are surveyed in each community in a given survey round.

At the community level, rice prices are collected from multiple sources in the survey: households are asked how much they pay for a kilogramme of rice, the head of the village or community women's group is asked about the prevailing price of rice, and rice prices were collected directly by the surveyor from three sales outlets in each community. I use the rice prices calculated from the average of the prices at the three outlets and the head of the community women's group (an average of between 1 and 4 data points). I ignore the household reported prices, as these are not exogenous to the household. The price of rice is then deflated by the national consumer price index to reflect prices in Indonesian rupiahs in December 1997.[11] The head of the community women's group is also asked a number of questions about the infrastructure available in the community, as well as the implementation of social security programmes in the area. Community schools are directly surveyed about the block grants they received from the government between 1997 and 2000.

3.2 Overview of the data and summary statistics

Summary statistics for the outcome variables and other child characteristics are presented in table 1. The children surveyed in each year have an average age of 11 and approximately half the surveyed children are girls. School enrolment rates are reasonably high for developing countries, at 95% for the younger age group (7-12 years old) and 83% for the older age group (13-15 years). School enrolment declines marginally on average between survey years but a high standard deviation suggests considerable variation in school-enrolment rates across communities. Average hours spent in school every week declines to a greater extent from 31 hours per week to 25 between 1997 and 2000. Younger children see a larger decline in school hours per week (29 hours to 22 hours); they also spend less time in school compared to older children (for whom hours per week spent in school decline from 35 hours to 32 hours). The labour market participation of school-aged children climbs sharply between the years, particularly for the older age group. In 1997, only 2% of children were reported as being employed in either family businesses or in a wage-paying job; this increased to 10% in 2000. 18% of children aged 13-15 years reported themselves as being employed in 2000.

Socio-economic and demographic characteristics of households and communities are presented in table 2. More then 70% of the households in the survey live in owned homes in families of an average size of six. Household heads are usually male (90%),

[11] Data on consumer price indices are from the BPS, Indonesia.

employed (90%) and almost always married (99%). The level of schooling of the household head is not very high with 60% not having progressed beyond primary school. More importantly, household characteristics do not change substantially between the two survey years. There is a small increase in the modernity index (the calculation of which is explained in section 4). The average schooling of the household head is also lower in 2000, compared to 1997; with a few families with a college-educated household head dropping out of the sample.

In terms of community characteristics, some of the communities have seen infrastructure improvements over the three-year period, particularly with an increase in the availability of local transport services, markets and public telephones. However, there has been a sharp drop in the number of local banks, due to the adverse impact of the crisis on the domestic financial sector. In response to the crisis in 1998, a number of social programmes targeted at the poorest 10% of the population were rolled out in some communities: these are explained in detail in section 4. About 51% of the communities also reported suffering El Niño-related forest fires or drought.

The key source of variation that I exploit is in the price of rice. Figure 2 shows the extent of variation in the real price of rice across communities. On average, rice prices increased by 92% in this period; however, there was considerable variation across communities, with a standard deviation of 33%. Figure **??** depicts the location of the urban IFLS communities as well as the extent of rice price increase in each community. While some provinces such as South Sumatra and West Java are associated with particularly high price increases, there is price variation even within provinces and island groups.

4 The impact of rice price increases on schooling outcomes

4.1 Empirical framework

The descriptive statistics presented in the last section reveal that school enrolment and attendance were both lower in 2000, while labour market participation was higher, compared to 1997. This section examines the relationship between these outcomes and the terms of trade movement induced by rising real rice prices within communities, in a parametric regression framework. The observed variation in the increase in rice prices gives us variation in the extent to which different urban communities are affected by declining real wages. The variation in rice prices by community is

exogenous to households because it is very unlikely that individual households could affect district-level prices. The basic regression equation is the following:

$$y_{ijt} = \beta ln P_{jt} + \mathbf{X'_{ijt}}\gamma + \lambda_j + d_t + \varepsilon_{ijt} \quad (1)$$

where y_{ijt} is the outcome of interest pertaining to child i living in community j at time t, where t is either 1997 or 2000. I consider three outcomes related to schooling – an indicator for whether the child is enrolled in school at time t, the number of hours per week spent by the child in school, and an indicator for whether the child has worked in the past year. lnP_{jt} is the natural logarithm of the real (deflated) price of one kilogramme of rice in community j at time t. X_{ijt} includes child-specific characteristics that affect schooling outcomes – an indicator for whether the child is male and a quadratic function in age. I also include a control for the season in which the interview took place (an indicator for whether it was the wet season, as opposed to the dry season). Finally, Levinsohn et al. (2003) point out that there was substantial price variation across Indonesia's 27 provinces in the aftermath of the financial crisis; finding that product prices tend to covary negatively across provinces. In order to isolate β from province-specific heterogeneity, I include interacted province-year indicators in X_{ijt}. λ_j is a community fixed effect, d_t is a year effect captured by a dummy equal to 1 if the year is 2000, with 1997 as the omitted year, and ε_{ijt} is an error term.

β is the estimated coefficient of interest, which measures the correlation between rice prices and school attendance. If the income effect from a fall in real wages dominates the substitution effect, children will drop out of school as a result of the decline in real wages: β will be negative. If the substitution effect dominates the income effect, more children will stay in school as a result of the lower real wages and a lower opportunity cost of schooling: β will be positive. If the income effect and the substitution effect balance each other out, β will be insignificantly different from zero.

Since the equation includes community fixed effects, β is estimated from the within-community variation in the price of rice between 1997 and 2000 and measures the increase in the probability that a child is enrolled in school associated with a 1% increase in the (log) real price of a kilogramme of rice within the community. Since rice prices vary across years as well as communities, standard errors are clustered by community-year.[12] The identifying assumption for β is that if rice prices

[12]As a robustness check, I also cluster by community, rather than community-year; the inference does not change. These results are not reported in the paper.

had not changed between 1997 and 2000, the probability that a child in a certain community is enrolled in school would remain unchanged across communities.

4.2 Results

Table 3 presents the first set of results. Column 1 shows the estimation of equation (1), which includes controls for child characteristics (functions of age and gender), season effects and province-level variation. I find a negative association between school enrolment and rice prices. A one standard deviation increase in the real price of rice (18%) reduces the probability that a child is enrolled in school by approximately 2 percentage points. A two standard deviation increase in the real price of rice (36%) reduces the probability that a child is in school by approximately 3 percentage points. These effects are significant but are not large; indeed, they seem much smaller than the effects observed by Thomas et al. (2004) in 1998, suggesting either a rapid return to school between the worst of the crisis in 1998 and 2000 or an overestimate of the impact on schooling as a result of the recession.

One methodological concern is that communities are likely to differ in a range of ways that affect both local rice prices as well child schooling outcomes, potentially biasing the estimates of β. The inclusion of community fixed effects identifies the effect of rising rice prices on schooling-related outcomes from within-community variation. As such, the estimation of (1) controls for time-invariant community characteristics. However, changes in community-related characteristics between 1997 and 2000 could arguably take place in such a way so as to affect rice prices as well as child schooling outcomes. The first source of time-varying community level variation is the accessibility of the community. Frankenberg et al. (2003) point out that a lot of the variation in prices across Indonesia is explained by the geography of this island nation and considerable variation in the provision of local transport infrastructure. I control for changes in the accessibility of a community by including indicators for whether a community has its own public transport stop, market, post office, public telephone service, bank and asphalt roads. This data is collected in each of the survey years and the inclusion of these covariates isolates the impact of rice price variation on schooling outcomes from changes in community-level infrastructure that have taken place in the same time period.

A second source of community-level variation is the possibility of varying intensities across communities of social safety net programmes introduced during the economic crisis. As the extent of the downturn become clear, the central government introduced a number of social programmes, known as the JPS (*jaring pengaman sosial*

or 'social safety net') progammes, targeted at the poorest individuals in any community, to mitigate the effects of the sharp drop in economic welfare. The JPS programmes, introduced in 1998, included the following: an assortment of employment generation schemes (*padat karya*) in government departments to bolster purchasing power; the provision of subsidised medical services and food supplements; extension of scholarships and block grants to students and schools; and the sale of subsidised rice to target households. The coverage of these programmes varied greatly – subsidised rice was targeted at 15% of the population, while the coverage of the school scholarships and employment creation programmes was targeted at 8% of the population.[13] The plans were designed and implemented by what was then a powerful central government, with little scope for variation in execution of the schemes at a local level. Nonetheless, one might expect heterogeneity across communities in how the schemes were implemented. To control for this I include indicators for whether one of six schemes were implemented in the district (employment generation, health card distribution, subsidised medical services, provision of food supplements, educational scholarships and the sale of subsidised rice).

A related concern is the possibility that changes in school quality varied substantially across districts between 1997 and 2000 due to the varying extents to which the crisis may have affected government funding to education in different areas. This is addressed in three ways: first, the funding to schools is assigned at the province level, and I include controls for province-year variation. Second, an indicator for whether schools in the district received block funding from the central government in the previous year to pay for student scholarships has been included, which provides a blunt estimate of the extent to which funding to the schooling system had been sustained. Third, the community surveys collect information on the actual amount of block funding received by the schools in the district from the government in the previous year. The rupiah value of financial assistance to schools in a district better measures changes to the quality of schools at the district-level, assuming the receipt of funding is correlated with school quality. I separately include both the district-level block funding indicator and block funding value variables interacted with year, as controls in the schooling regressions (tables not reported). None of the empirical results are sensitive to the inclusion of the funding variables.

[13]Under the subsidised rice programme, 10 kgs of rice per month was sold at a subsidised rate to eligible poor households. Since this amount was well below monthly consumption needs for the average household, the scheme acted as an income transfer programme for the poorest (Sumarto et al., 2002).

A third source of community-level variation comes from El Niño-related forest fires and droughts that affected certain regions in Indonesia in 1997 and 1998. The effect of these natural disasters was to destroy crops, potentially leading to higher prices. While this makes it difficult to isolate the effect of rice price changes as a response to the financial crisis of 1998, the effect of higher prices on schooling outcomes can be still be tested. I control for whether a community suffered a forest fire or a drought by including the interaction of indicators for the occurrence of a shock with a year indicator. This would control for time-varying changes in a disaster-affected community that could potentially affect child schooling outcomes.

Column 2 of table 3 presents estimates of equation (1) with additional controls for community time-varying characteristics, including community social programmes implemented after 1997, infrastructural developments after 1997 and El Niño-related natural calamities. The results are within a 95% interval of the results without these controls suggesting that community time-varying characteristics are not a source of spurious correlation between school enrolment and rice prices.

One reason for selecting the district as the relevant community is to select an area that is large enough to ensure that commodity prices are exogenous to the household. It is extremely unlikely that individual households could affect district-level prices. Nonetheless, as a robustness check, I control for observed household characteristics by including a number of covariates: family characteristics (whether the household lives in its own house, the size of the household, the number of children in the house under the age of 15, the number of children under 15 enrolled in school, the number of old people in the house aged above 70, an index of modernity[14]) and household head characteristics (age of the household head, dummies indicating if the household head is male, married, employed, employed in the public sector, as well as education dummies for his or her highest level of schooling – no or some elementary school, junior secondary school, senior secondary school, college). To control for unobserved household characteristics that could be correlated with both schooling outcomes and rice prices, I also estimate (1) with household fixed effects, using children in panel households that were surveyed in both 1997 and 2000. These results are presented in section 4.5.

Column 3 presents estimates of (1), which further includes household characteristics, in addition to all the controls in the Column 2 model. The estimates of β with

[14]The modernity index takes integer values between 0 and 5 and is calculated, following Chen (2010), by adding together dummies for whether the household has access to electricity, television, a fridge, a stove and its own toilet.

added community-level and household-level characteristics are negative and within the 95% confidence interval of the column 1 and column 2 estimates, suggesting that spurious correlation from observed household characteristics is not a serious concern and that the observed rice price shock was exogenous to individual households.

Table 4 shows estimates of the impact of increased rice prices on the intensive margin of school attendance; that is, estimates of (1) where the dependent variable is hours spent in school by children every week. Variables are added to the estimating equation sequentially, as in table 3. There is a statistically significant decline in hours per week spent in school, but the addition of time-varying community characteristics reduces the size of the estimated β. For a one standard deviation (18%) increase in the real price of rice, students spend 2.7 fewer hours per week in school, which is a 9% decline over the 1997 average of 30 hours per week in school. A two standard deviation (36%) increase in the price of rice leads to students spending 5 fewer hours per week in school, a 16% decline over the 1997 average. This effect is larger than on the extensive margin, particularly in high-inflation communities. The combination of high sustained school enrolment rates but lower effective attendance suggests that households may have continued to enrol children in schools but were less likely to ensure the same level of attendance.

Finally, table 5 presents estimates of the impact of rice price increases on labour market participation of the surveyed children. Participation in labour declines in response to higher rice prices, suggesting that children were less likely to find employment in communities that faced declines in real wages. A one standard deviation (18%) increase in the real price of rice leads to 3 percentage point decrease in the labour market participation of children; a two standard deviation (36%) increase in the price of rice leads to a 5 percentage point decrease in the labour market participation. These observed effects are large, particularly when only 2% of surveyed children were reported to be employed in 1997, and 10% in 2000. However, in this instance, time-varying community characteristics do seem to matter in influencing the labour market participation of children.

In conclusion, higher real rice prices, and the resultant lower real wages, led to declines in school participation on both the extensive and intensive margins; however, the observed effects are larger on the intensive margin with more students reducing attendance in school rather than withdrawing from school altogether. These effects are measured across the medium term horizon of three years, which suggest that some of the steep declines in school enrolment and attendance documented by Thomas et al. in 1998 had reversed themselves to some extent by 2000, but continued to persist in

the worst-hit communities. However, there is a large decline in the labour market participation of young children in response to rising food prices, perhaps in response to the large fall in real wages that occurred as a result of the crisis. The reduced participation of children in both income-earning and school-going activities suggests that they might have been substituting for adult work at home in chores, tending to younger children and other tasks that do not show up as labour market participation but represent a claim on their time. Unfortunately, in the absence of granular data on time-use in 1997, it is not possible to directly test for this effect.

4.3 Heterogeneity by age

Observational data suggests that schooling investments in older children was protected by households at the expense of younger children. I examine this relationship in a formal setting using the exogenous shock (with respect to households) to community rice prices. The distinction in age is of interest because we would expect that older children would be more sensitive to real wage movements in the local labour market due to their relative ability to find work, compared to young children.

To assess whether students of different ages are differentially affected by the change in the price of rice, I include interactions of the (natural log of) the real price of rice with an indicator for whether the student is of elementary school age (7-12 years) or of junior secondary school age (13-15 years old) in an estimation of (1) for each of the three dependent variables of interest. The results are presented in table 6. Column 1 shows the heterogeneity in the impact of inflation across age on school enrolment. The impact of the increase in rice prices is felt most strongly on the youngest age group, with a one standard deviation increase in the real price of rice reducing the probability that 7-12 year-olds attend school by 2 percentage points while the enrolment for the older cohort appears to be unaffected by rice prices altogether. The hypothesis that the two coefficients are statistically similar is rejected at the 95% confidence level.

For hours spent in school per week (column 2), the coefficient on rice prices is larger for younger children but the difference between the two coefficients is not statistically significant. Moreover, older children attend more hours of school per week, on average, so any change in school attendance at the intensive margin could reflect this difference. For labour participation, however, there is a significant difference in the impact of rice prices on labour market participation: older children are significantly more responsive to falling real wages than younger children are in terms of finding labour market work. Older children are more likely to opt into work over schooling if they are offered a high enough wage; the impact of the crisis, however, reduced real wages to to the

extent that children were more likely to remain in school. For younger children, the trade-off is perhaps less acute due to the relative lack of job opportunities.

Taken together, the results suggest that in urban communities hardest hit by inflation, older children were more likely to remain in school: households protected their investments in the schooling of older children and there was an absence of job opportunities offering at least the reservation wage of older children. Instead, households were more likely to save money by reducing the time spent in school by young children, perhaps by delaying entry into the formal school system.

4.4 Heterogeneity by income

The distributional consequences of higher rice prices are potentially very important. Implicit in my focus on urban consumers only is the assumption that rural consumers were potentially sheltered to a greater extent by the rice price increases, at least partly because many rural households are net producers of rice. Looking beyond the distributional consequences of terms of trade movements against urban consumers, there may also be differential impacts on households by level of income. Given that education is a critical determinant of future income earnings, the different impact of an aggregate shock on schooling across households of different income levels has the potential to lead to widening income inequality.

Equation (1) is estimated for each of the three dependent variables but instead of including log real rice prices directly in the estimating equation, I include interactions between the price variable and indicators for the income group to which a household belongs. I construct three income groups: low-income households are those below the 33rd percentile of per capita real monthly household expenditure; mid-income households are between the 33rd and 67th percentile and high-income households are above the 67th percentile. Table 7 presents estimates of the impact of higher rice prices on households from these three categories. For school participation, the coefficient on the interaction between rice price and the highest income group is smaller that for low and middle-income households; in fact, school enrolment in high-income households does not respond at all to rice prices. For school enrolment (column 1), the coefficient on this interaction for the high-income group is significantly different from the other two groups at the 95% level; for school hours per week, the coefficient for the high-income group is significantly different from the middle income group at the 90% level. For the labour market participation of children, the coefficient on high-income households is higher, suggesting that these households have a higher

reservation wage for students to drop out of school and take up paid work. However, I cannot reject that the coefficients are insignificantly different from one another.

There appears to be some heterogeneity in how households responded to rising rice prices when comparing across income. However, the differences are not large or consistent. The standard argument is that relatively wealthy households are able to smooth consumption by running down their assets and accumulated savings. This is likely to have been ameliorated to some extent by the fact that wide-spread job losses took place among high-skilled workers.

4.5 Robustness checks

To identify whether unobserved household characteristics play a role in mediating the impact of rice prices on schooling choices, I estimate equation (1) with household fixed effects, rather than community effects, which would control for unobserved time-invariant household characteristics. Coefficients are now interpreted as the effect of rising prices within a given household on the decision to enrol in school, the hours spent in school per week and the decision to participate in the labour market.

The results are presented in tables 8, for the basic regressions, and in table 9, for the heterogeneity in impact by age. The number of observations is smaller (4,802 child observations) because the sample only includes panel households, which raises potential concerns with respect to non-random attrition. The results for school participation are robust to the inclusion of household fixed effects instead of community fixed effects; however, the coefficients on rice prices in the child labour participation estimations are smaller. One interpretation of this decline in the size of the effect on labour participation could be that some children take up employment within family-owned enterprises, which reduces the sensitivity of the labour market decision to rice price movements. However, labour market participation continues to decline with higher prices and older children are more sensitive to these price movements than younger children.

As a final robustness check of model specification, I re-estimate the models explaining school enrolment and participation in child labour using a probit model, rather than a linear probability model as above. The results are presented in the appendix in table A1. For school enrolment, the sign and magnitude of the coefficients on rice prices is similar; for labour market participation, the coefficients are smaller in size but indicate that in communities with higher prices, labour market participation of children declined.

5 Long term impact of aggregate shock on schooling

The preceding section establishes that the sudden rise in real rice prices in some communities adversely affected child schooling outcomes, at both the extensive and the intensive margins, for younger children (7-12 years), and the decline in the local economy reduced the availability of labour market opportunities at competitive wages for older children (13-15 years). In an environment where students simultaneously hold jobs as well as attend school, the crisis could have a theoretically ambiguous effect on long-term schooling outcomes. On the one hand, if households reduce spending on child schooling, then, depending on the nature of the disruption to schooling, this could have adverse long-term consequences in terms of reduced human capital formation and lower lifetime wages. On the other hand, if students cannot find suitable job opportunities, they might end up focusing on school alone, in which case the fall in wages could actually increase long-term schooling attainment. Even where students are dropping out of school, there may not necessarily be adverse long-term consequences for long-term human capital investments; much will depend on the nature of disruption to schooling. For instance, less able children could be dropping out of school, which may have little impact on their eventual schooling attainment. Moreover, while younger children may be more vulnerable to income shocks, reduced school attendance at a young age may well be less costly than schooling disruptions to a an older child in junior secondary school. For example, entering school a year later than usual could have less of a long-term impact than taking on part-time work during a critical year of schooling (when, say, a student is required to write a school-leaving examination, which forms the basis for entry into senior secondary school).

To analyse whether these short-to-medium term effects have any long-term consequences on educational attainment requires long-term data which follows the same children into adulthood and examines their final schooling attainment. I construct a panel of children observed in both 1997 and 2007 and identify the impact of a sharp increase in rice prices that took place when they were 7-15 years old, on their eventual schooling outcomes ten years later, when they are 17-25 years old. The long-term schooling outcomes I consider are graduation from junior school (typically at age 15-16), graduation from senior secondary school (typically at age 17-18), and graduation from college or higher education (anywhere between age 19 and 25). I consider the impact of rice price increases in the past on eventual schooling outcomes ten years later, I identify the differential impact on younger children, relative to older children,

and I examine heterogeneity with respect to income brackets. I address some concerns with respect to attrition, which could potentially bias the estimates.

5.1 Empirical framework

The fourth wave of the IFLS, conducted in 2007, surveyed the panel households from earlier waves. Since it collected data ten years after the initial crisis broke out, this wave provides insights to the long-term impact of the 1998 economic shock. I construct a panel of students aged 7-15 years old in 1997 and resurveyed in 2007. Of the 3,110 children observed in 1997, 2,852 are found in 2007. I estimate the following equation for this sample:

$$y_{ijt+1} = \alpha y_{ijt} + \beta \Delta ln P_{jt} + \mathbf{X'_{ijt}}\gamma + \varepsilon_{ijt+1} \tag{2}$$

where y_{ijt+1} is the schooling outcome of interest as observed in 2007. y_{ijt} is the baseline schooling outcome of interest (the years of schooling acquired by the student in the baseline year or the level of schooling in which the student was enrolled at the time). X_{ijt} includes baseline child characteristics, household characteristics and community characteristics as in the previous section.

The coefficient of interest is β, which measures the impact of the change in rice prices on any of four long-term schooling outcomes. If the recession of 1998 led to children permanently dropping out of school, β will be negative. If the recession led to children spending more time on schoolwork, or if the disruptions to schooling were temporary, β will be insignificantly different from zero, or even positive. The identifying assumption is that if rice prices had not changed between 1997 and 2000, the schooling trajectory of the student would have remained unchanged.

Any individual-specific time-invariant heterogeneity is captured in the baseline controls for level of schooling of the child in 1997. Additionally, the inclusion of baseline community characteristics identifies the impact of the shock beyond any differences that may have arisen due to infrastructural availability, community programmes and other aggregate shocks. Finally, the introduction of pre-crisis controls for a range of household and household-head characteristics (as in section 4) also controls for any potential endogeneity that could explain schooling outcomes.

Also of interest is whether the long-term impact on schooling outcomes of a period of economic crisis is heterogeneous by the age of the child, as in section 4. Equation (2) is estimated with interactions of the change in rice prices in a particular 1997 community and an indicator for whether the child was 7-12 years old in 1997 or 13-15 years. This permits a comparison of the heterogeneous effects on children who were

differently affected by the crisis in 1998. Finally, (2) is also estimated with interactions of the chance in rice prices and an indicator for whether student belongs to a low, mid or high-income household, to identify heterogeneity in impact by household income.

5.2 Results

The results of the estimation of (2) are presented in Table 10. The measures of schooling outcomes are the following: years of schooling completed by 2007 (Column 1), whether the child has graduated junior school (column 2), whether the child has graduated senior secondary school (column 3) and whether the child has graduated higher college or university (column 4). The estimated results indicate that higher rice prices are associated with more years of schooling, higher rates of graduation from junior school, senior school as well as college, with the coefficient on the change in rice prices significant at the 90% level for years of schooling. If interpreted as causal, this provides evidence that schooling attainment was higher in worst-hit communities, perhaps due to the fact that the depressed real economy kept students in school for a longer period of time due to the lack of available job opportunities. A one standard deviation increase in the real price of rice increased the number of years of schooling by 0.2 (alternatively, every fifth child in badly-affected community will have an additional year of school), and the probability that students graduated junior school and senior school by 2 percentage points, and college by 1.5 percentage points.

There is little evidence that the younger children who bore the brunt of the 1998 crisis have suffered adverse long-term effects relative to older children (table 11). Younger children are less likely to have graduated college compared to older children but it is hard to disentangle this effect from the age effect that older children are more likely to have completed college, even after controlling for a quadratic function of age. In explaining high school graduation, the coefficient on the change in rice prices for younger children is larger than for older children, but the hypothesis of equality of coefficients cannot be rejected.

Finally, results for the heterogeneity of the long term impact of rice price increases by household income are presented in table 12. There is some evidence that middle-income families were more responsive to rice price increases than other income groups but, again, the equality of coefficients cannot be rejected.

The results on the long-term impact of the recession are consistent with a narrative where students remain in school and do not take up additional employment due to the contraction of the local economy and the crash in real wages. As a result of remaining in school through the crisis, children in relatively more affected areas have

higher long-term human capital investments than children in less affected areas. Even the youngest children, who were most most likely to have been pulled out of school in response to the economic shock, did not suffer adverse long-term consequences in human capital formation.

5.3 Robustness checks

The estimates of the impact of the change in rice prices between 1997-2000 on educational attainment in 2007 could be biased if unobserved community characteristics not captured by the baseline controls could be correlated with both the extent of the price increase as well as average schooling investments by children living in those communities. Since the causal variable of interest – the change in rice prices – varies by community, equation (2) cannot be estimated with initial community fixed effects, using the baseline communities of residence. However, the differential effects of the change in rice prices on students by age and income group can be measured with initial community fixed effects. Such a model assumes that in the absence of the price shock, the relative schooling trajectories of children from different age or income groups would be unchanged within a given community. Tables A2 and A3 in the appendix provide estimates of the differential long-term impact of rice price increases on eventual schooling attainment for students of different ages and household income, both with and without initial community fixed effects. Columns 1, 3, 5, and 7 in both tables repeat the estimations from tables 11 and 12, but with coefficients represented in a different form in order to facilitate comparisons with the initial community fixed effects regressions. Columns 2, 4, 6, and 8 in both tables present the estimations of the heterogeneous effect of price changes on long-term schooling attainment, but with initial community fixed effects included. Both sets of results are similar, which lends some support to the assumption that unobserved community characteristics did not influence rice prices and schooling attainments (beyond the controls for baseline community characteristics that have already been included in the estimating equation).

Another potential concern in a long dataset of ten years is the non-random attrition of households from the survey. The IFLS has remarkably low rates of attrition for developing country surveys, with less than ten per cent of all households dropping out between successive surveys. As a robustness check, I estimate (2) while correcting for attrition and find no substantive difference in the estimates (results and methodology reported in the appendix.

6 Conclusion

The impact of an economic recession on schooling outcomes has been recognised as an important research question, particularly in developing countries in the last two decades and in the light of the recent global slowdown. Typically, a negative aggregate shock is characterised by an economy-wide decline in real wages, which affects both household income as well as wage-earning opportunities for children in the labour market. Theoretically, the net impact of the resultant income effect and substitution effect of lower real earnings on the school and labour market participation of children is ambiguous. In this paper, I estimate the impact of an aggregate economic shock on children aged 7-15 in a large developing country, Indonesia, by exploiting the heterogeneous impact of the East Asian financial crisis across communities. Using variation in rice price increases across urban communities, which are plausibly exogenous to individual households, I find that rice price increases are correlated with small declines in school enrolment and hours per week spent in school, and large declines in the labour market participation of children. For the youngest children (aged 7-12 years) there is a larger negative impact of higher rice prices on school attendance and a smaller effect on labour market participation. For older children (aged 13-15 years), the impact goes the other way: their schooling enrolment does not respond to rice prices but their labour market participation declines sharply in the worst-hit communities. Older children, who are more sensitive to changes in the opportunity cost of schooling, withdrew from jobs in those communities where real wages declined the most. I also attempt to identify any long-term effects of this economic crisis by using a panel of children surveyed in both 1997 and 2007. The short and medium-run effects identified do not necessarily have adverse long-term consequences on human capital formation, as is commonly assumed. I find that children in the communities with largest price increases, were more likely to have higher schooling attainment ten years later: they completed more years of school, and were more likely to have graduated junior secondary school, senior secondary school and college. Nor does the younger cohort exhibit any signs of lagging behind the older cohort, despite the larger short-term impacts on school enrolment. I argue that this is supportive of the narrative that older children spent more time on school-work and less time on income-earning activities as a result of the crisis. Younger children were not adversely affected by the crisis because their lower school enrolment largely reflects delayed entry into the formal education system, rather than a severe disruption to schooling. This suggests that even in developing countries, sustaining household demand for schooling in the

face of an aggregate crisis may be less of a concern than is commonly believed. Of greater policy interest may be the state's role in preserving funding for education, maintaining school quality and promoting vocation-specific training, which can help students find employment in the years that follow a deep recession.

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A Appendix

A.1 Data and construction of samples

The IFLS interviewed 7,307 children between the ages of 7 and 15 (inclusive) in 1997 and 7,966 children in 2000, creating a sample of 15,273 observations across both waves. First, I dropped all children living in rural areas, leaving a sample of 6,632 observations of children living in urban areas (3,180 observations in 1997 and 3,452 observations in 2000). Second, I dropped 31 child observations for those children living in communities with no price data, and 128 child observations for those children living in communities with no infrastructure data leaving 6,473 observations in the data set (3,156 in 1997 and 3,357 in 2000).

There was no missing data on school enrolment or labour market participation. For hours spent in school, 412 observations were imputed by the average hours spent in school by school-going children of the same age cohort (aged 7-12 or 13-15 years) in the same district and the same year. Hours spent in school was set to zero for students not enrolled in school. The results with imputed observations were not significantly different from results that excluded missing observations.

For the long-run data, of the 3,156 children observed in 1997, 2,942 are observed in 2007. Of these, data on household income in 1997 is only available for 2,928 students.

A.2 Attrition

One concern is the potential for non-random attrition, whereby respondents who drop out of the survey differ systematically from those who stay in the survey, particularly in the ways in which schooling attainment was affected by the local economy, leading to biased estimates of β. Attrition is a concern for any panel dataset, particularly one which ranges over a period of 10 years. The 2007 dataset loses 214 children from the initial sample of 3,156 – a loss of 6.8%. The resultant sample of 2,942 children are drawn from 110 communities, as opposed to the 124 communities for which data was available in 1997 and 2000. The individual, household and community characteristics of attriters compared to non-attriters are presented in tables A4 and A5. In general, households that attrit from the survey tend to be smaller in size, with higher per capita expenditure, and are less likely to have been living in their own houses in 1997. These households are also disproportionately drawn from communities that were adversely affected by the 1997-98 El Niño shocks.

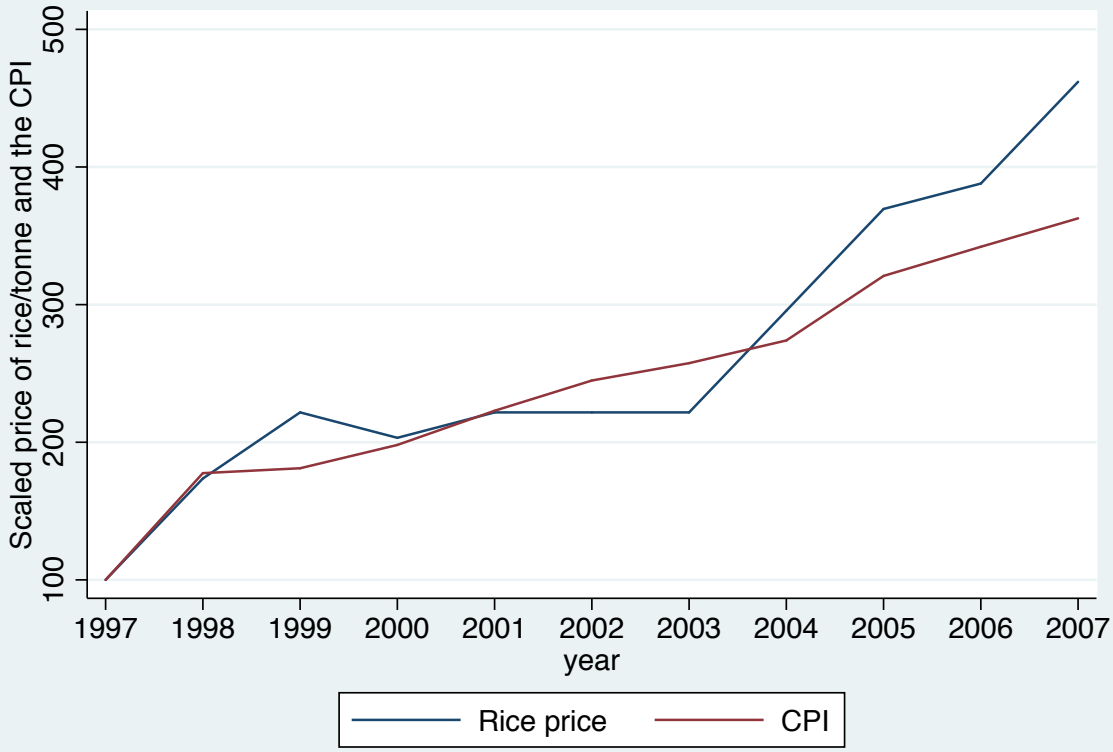
Since attrition is unlikely to be random, I control for the effect of attrition in the following way: I use observed characteristics of surveyed individuals to estimate

inverse probability weights so as to increase the weight on individuals who were more likely to attrit but who remained in the survey. This follows the methodology of Fitzgerald et al. (1998), where attrition is assumed to be based on observable characteristics, an assumption called the ignorability of selection.

The results of the probit to explain selection in 2007 based on individual, household and community characteristics in 1997 are presented in table A6. The results of the probit are quite informative in themselves: households that live in their own homes are more likely to be selected, as are households with many young children, particularly with those enrolled in school. Higher income households that are relatively modern are less likely to be found in 2007, perhaps because of the increased opportunities for such households to migrate away from their 1997 communities. Results that have been corrected for attrition are presented in table A7. All observations are weighted using the inverse probability weights constructed as in Fitzgerald et al.[15] The results are not appreciably different from the uncorrected ones, suggesting that attrition is not a significant concern in this study.

[15]The total number of observations is 2,928, which is lower than the total number of observed children of 2,942 due to the loss of 14 observations for which household income data is not available.

Figure 1: CPI and rice prices in Indonesia (1997-2007)



Source: IMF World Economic Database and the UN FAO

Figure 2: Variation in rice price increases across communities (1997-2000)

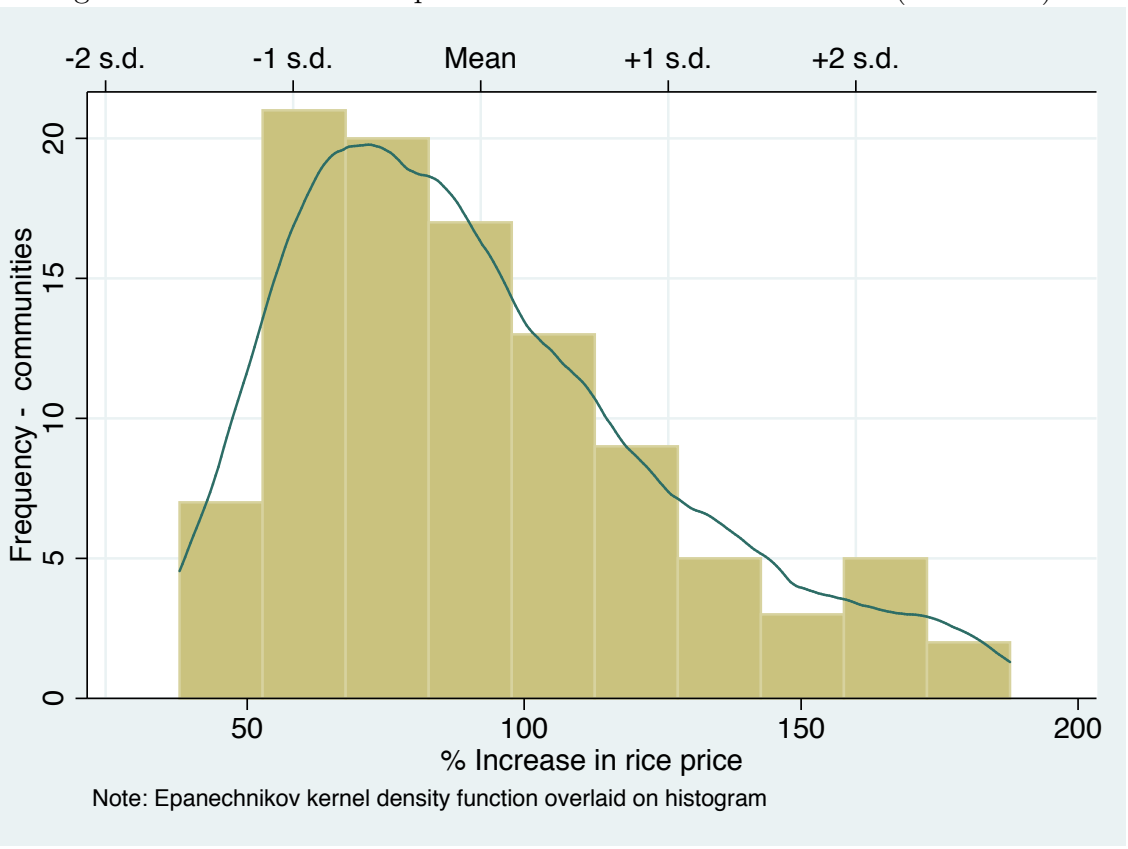


Table 1: Child characteristics and schooling outcomes

	All children		7-12 yr-olds		13-15 yr-olds	
	1997	2000	1997	2000	1997	2000
Age	11.41	11.16	9.60	9.46	14.04	14.10
	(2.62)	(2.66)	(1.76)	(1.69)	(0.80)	(0.81)
Male	0.50	0.50	0.52	0.50	0.48	0.50
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
Enrolled in school	0.90	0.88	0.95	0.94	0.83	0.79
	(0.30)	(0.32)	(0.21)	(0.24)	(0.38)	(0.41)
Schoolhours/week	31.73	25.70	29.71	22.76	34.96	31.27
	(6.81)	(12.71)	(6.92)	(12.08)	(5.19)	(12.01)
In labour market	0.02	0.10	0.01	0.05	0.05	0.18
	(0.16)	(0.30)	(0.09)	(0.22)	(0.22)	(0.39)
Observations	3,156	3,317	1,865	2,100	1,291	1,217

Notes: Sample includes children aged between 7 and 15 surveyed in 124 panel communities in 1997 and 2000. Values reported are sample means with standard deviations in parentheses.

Table 2: Household and community characteristics

	1997	2000
Household characteristics		
Owns home	0.72	0.75
Modernity index (0-5)	3.56	3.67
Household size	5.94	5.82
Number of children<15 yrs	2.73	2.69
Number of children enrolled in school	2.30	2.22
Number of elders>70 yrs	0.21	0.30
Household-head characteristics		
Age	45.00	45.27
Male	0.89	0.87
Married	0.99	0.99
Employed in past year	0.90	0.89
Employed in public sector	0.14	0.13
Highest schooling level		
Primary or less	0.52	0.60
Jr. secondary	0.17	0.16
Sr. secondary	0.23	0.24
College	0.09	0.00
Community infrastructure (=1 if available)		
Local bus stop	0.05	0.27
Market	0.16	0.22
Public telephone	0.45	0.65
Post office	0.09	0.18
Bank	0.22	0.04
Asphalt roads	0.72	0.80
El Niño shock (=1 if affected)		
Shock in 1998		0.53
Community social programmes (=1 if implemented)		
Medical services		0.17
Rice distribution		0.70
Health cards		0.45
Employment generation		0.62
Food supplements		0.63
Student scholarships		0.79

Notes: Sample includes 124 panel communities surveyed in 1997 and 2000. Values reported are sample means with standard deviations in parentheses. All Indonesian rupiah values are deflated to December 1997.

Table 3: Impact of rice price increases on school enrolment

	(1)	(2)	(3)
Ln rice price	–0.103**	–0.103*	–0.105**
	(0.046)	(0.058)	(0.045)
Year = 2000	0.036	0.006	0.008
	(0.024)	(0.035)	(0.030)
Season indicators	Yes	Yes	Yes
Child characteristics	Yes	Yes	Yes
Province-year effects	Yes	Yes	Yes
Community social programmes	No	Yes	Yes
Infrastructure improvements	No	Yes	Yes
El Niño shock	No	Yes	Yes
Household characteristics	No	No	Yes
Community fixed effects	Yes	Yes	Yes
Observations	6,473	6,473	6,473
$Adj.R^2$	0.143	0.143	0.305

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variable is an indicator for whether a child is enrolled in school for the given academic year. Standard errors are in parentheses, clustered by community/survey year.

Table 4: Impact of rice price increases on hours in school

	(1)	(2)	(3)
Ln rice price	–16.143***	–10.589***	–10.682***
	(3.278)	(3.225)	(3.153)
Year = 2000	–5.161***	–14.297***	–14.116***
	(1.590)	(2.783)	(2.757)
Season indicators	Yes	Yes	Yes
Child characteristics	Yes	Yes	Yes
Province-year effects	Yes	Yes	Yes
Community social programmes	No	Yes	Yes
Infrastructure improvements	No	Yes	Yes
El Niño shock	No	Yes	Yes
Household characteristics	No	No	Yes
Community fixed effects	Yes	Yes	Yes
Observations	6,473	6,473	6,473
$Adj.R^2$	0.207	0.217	0.304

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variable is the average number of hours spent in school per week. This is set to zero for students who do not attend school. Standard errors are in parentheses, clustered by community/survey year.

Table 5: Impact of rice price increases on labour market participation

	(1)	(2)	(3)
Ln rice price	–0.077*	–0.166***	–0.170***
	(0.045)	(0.042)	(0.040)
Year = 2000	0.118***	0.179***	0.178***
	(0.024)	(0.026)	(0.025)
Season indicators	Yes	Yes	Yes
Child characteristics	Yes	Yes	Yes
Province-year effects	Yes	Yes	Yes
Community social programmes	No	Yes	Yes
Infrastructure improvements	No	Yes	Yes
El Niño shock	No	Yes	Yes
Household characteristics	No	No	Yes
Community fixed effects	Yes	Yes	Yes
Observations	6,473	6,473	6,473
$Adj.R^2$	0.097	0.099	0.111

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variable is an indicator for whether the child was reported to be employed in the past year. Standard errors are in parentheses, clustered by community/survey year.

Table 6: Heterogeneous impact of rice price increases by age group

	Dependent variable		
	School enrolment	School hours	Child labour
Ln rice price × 7-12 years old	–0.136***	–11.551***	–0.140***
	(0.045)	(3.167)	(0.039)
Ln rice price × 13-15 years old	–0.041	–8.659**	–0.225***
	(0.054)	(3.409)	(0.050)
7-12 years old	0.662**	21.529	–0.584**
	(0.295)	(13.988)	(0.254)
Year = 2000	0.003	–14.118***	0.173***
	(0.029)	(2.673)	(0.027)
Season indicators	Yes	Yes	Yes
Child characteristics	Yes	Yes	Yes
Province-year effects	Yes	Yes	Yes
Community social programmes	Yes	Yes	Yes
Infrastructure improvements	Yes	Yes	Yes
El Niño shock	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes
Community fixed effects	Yes	Yes	Yes
Observations	6,473	6,473	6,473
$Adj.R^2$	0.286	0.282	0.099

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variable in column 1 is an indicator for whether a child is enrolled in school for the given academic year. The dependent variable in column 2 is the average number of hours spend in school per week for students who are enrolled in school. The dependent variable in column 3 is an indicator for whether a child is reported to have worked in the past year. The reference category is children aged between 7 and 12 years. Standard errors are in parentheses, clustered by community/survey year. Hypothesis that the coefficients on the two age groups are equal is rejected at the 5% level in columns 1 and 3 and at the 12% level in column 3.

Table 7: Heterogeneous impact of rice price increases by income group

	Dependent variable		
	School enrolment	School hours	Child labour
Ln rice price × Low-income household	–0.108**	–10.577***	–0.190***
	(0.054)	(3.686)	(0.049)
Ln rice price × Mid-income household	–0.127**	–11.310***	–0.150***
	(0.054)	(3.356)	(0.043)
Ln rice price × High-income household	–0.046	–8.924***	–0.175***
	(0.047)	(3.112)	(0.047)
Low-income household	0.464	12.345	0.104
	(0.358)	(17.881)	(0.316)
Mid-income household	0.598*	17.493	–0.189
	(0.321)	(12.391)	(0.200)
Year = 2000	0.003	–14.029***	0.176***
	(0.030)	(2.696)	(0.027)
Season indicators	Yes	Yes	Yes
Child characteristics	Yes	Yes	Yes
Province-year effects	Yes	Yes	Yes
Community social programmes	Yes	Yes	Yes
Infrastructure improvements	Yes	Yes	Yes
El Niño shock	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes
Community fixed effects	Yes	Yes	Yes
Observations	6,430	6,430	6,430
$Adj.R^2$	0.286	0.281	0.098

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variable in column 1 is an indicator for whether a child is enrolled in school for the given academic year. The dependent variable in column 2 is the average number of hours spend in school per week for students who are enrolled in school. The dependent variable in column 3 is an indicator for whether a child is reported to have worked in the past year. The reference category is the high-income household. The number of observations is lower than the other estimations because 43 child observations have no corresponding household income data. Standard errors are in parentheses, clustered by community/survey year. Hypothesis that the coefficients on income groups are equal is rejected at the 5% level in column 1.

Table 8: Impact of rice price increases with household effects

	Dependent variable		
	School enrolment	School hours	Child labour
Ln rice price	–0.158**	–13.819***	–0.097*
	(0.063)	(4.404)	(0.055)
Year = 2000	–0.059	–17.230***	0.223***
	(0.046)	(3.779)	(0.049)
Season indicators	Yes	Yes	Yes
Child characteristics	Yes	Yes	Yes
Province-year effects	Yes	Yes	Yes
Community social programmes	Yes	Yes	Yes
Infrastructure improvements	Yes	Yes	Yes
El Niño shock	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes
Household fixed effects	Yes	Yes	Yes
Observations	4,802	4,802	4,802
$Adj.R^2$	0.342	0.355	0.194

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variable in column 1 is an indicator for whether a child is enrolled in school for the given academic year. The dependent variable in column 2 is the average number of hours spend in school per week for students who are enrolled in school. The dependent variable in column 3 is an indicator for whether a child is reported to have worked in the past year. Standard errors are in parentheses, clustered by community/survey.

Table 9: Heterogeneous impact of rice price increases by age group with household effects

	Dependent variable		
	School enrolment	School hours	Child labour
Ln rice price × 7-12 years old	–0.171***	–14.432***	–0.083
	(0.060)	(4.167)	(0.054)
Ln rice price × 13-15 years old	–0.107	–12.165**	–0.125*
	(0.081)	(4.909)	(0.067)
7-12 years old	0.391	16.161	–0.288
	(0.415)	(17.138)	(0.295)
Year = 2000	–0.053	–16.849***	0.216***
	(0.047)	(3.744)	(0.049)
Season indicators	Yes	Yes	Yes
Child characteristics	Yes	Yes	Yes
Province-year effects	Yes	Yes	Yes
Community social programmes	Yes	Yes	Yes
Infrastructure improvements	Yes	Yes	Yes
El Niño shock	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes
Household fixed effects	Yes	Yes	Yes
Observations	4,802	4,802	4,802
$Adj.R^2$	0.319	0.335	0.183

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variable in column 1 is an indicator for whether a child is enrolled in school for the given academic year. The dependent variable in column 2 is the average number of hours spend in school per week for students who are enrolled in school. The dependent variable in column 3 is an indicator for whether a child is reported to have worked in the past year. The reference category is children aged between 7 and 12 years. Standard errors are in parentheses, clustered by community/survey year.

Table 10: Long term impact of rice prices increases

	Dependent variable			
	Years of schooling	Grad. jr. school	Grad. sr. school	Grad. college
Δ Ln rice price	1.054*	0.119	0.116	0.082
	(0.545)	(0.081)	(0.074)	(0.058)
Baseline outcomes	Yes	Yes	Yes	Yes
Season indicators	Yes	Yes	Yes	Yes
Child characteristics	Yes	Yes	Yes	Yes
Province effects	Yes	Yes	Yes	Yes
Community social programmes	Yes	Yes	Yes	Yes
Infrastructure improvements	Yes	Yes	Yes	Yes
El Niño shock	Yes	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes	Yes
Observations	2,942	2,942	2,942	2,942
$Adj.R^2$	0.446	0.235	0.326	0.157

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variables are as follows: total years of schooling completed (Col 1), indicator for graduated junior school (Col 2), indicator for graduated senior secondary school (Col 3) and indicator for graduated college (Col 4). Standard errors are in parentheses, clustered by 1997 community of residence.

Table 11: Heterogenous long term impact of rice prices increases by age

	Dependent variable			
	Years of schooling	Grad. jr. school	Grad. sr. school	Grad. college
Δ Ln rice price × 7-12 years old	1.253**	0.128	0.144*	0.053
	(0.584)	(0.091)	(0.085)	(0.066)
Δ Ln rice price × 13-15 years old	0.745	0.105	0.075	0.127*
	(0.667)	(0.097)	(0.092)	(0.068)
7-12 years old	0.179	0.024	0.072*	–0.027
	(0.207)	(0.028)	(0.037)	(0.028)
Baseline outcomes	Yes	No	Yes	Yes
Season indicators	Yes	Yes	Yes	Yes
Child characteristics	Yes	Yes	Yes	Yes
Province effects	Yes	Yes	Yes	Yes
Community social programmes	Yes	Yes	Yes	Yes
Infrastructure improvements	Yes	Yes	Yes	Yes
El Niño shock	Yes	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes	Yes
Observations	2,942	2,942	2,942	2,942
$Adj.R^2$	0.446	0.237	0.327	0.157

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variables are as follows: total years of schooling completed (Col 1), indicator for graduated junior school (Col 2), indicator for graduated senior secondary school (Col 3) and indicator for graduated college (Col 4). The reference category for the 7-12 year-old group of children is the 13-15 year-old group. Standard errors are in parentheses, clustered by 1997 community of residence.

Table 12: Heterogenous long term impact of rice prices increases by income

	Dependent variable			
	Years of schooling	Grad. jr. school	Grad. sr. school	Grad. college
Δ Ln rice price				
× Low-inc. household	0.860	0.133	0.092	0.007
	(0.811)	(0.128)	(0.125)	(0.056)
Δ Ln rice price				
× Mid-inc. household	1.465**	0.126	0.096	0.180**
	(0.699)	(0.089)	(0.099)	(0.080)
Δ Ln rice price × High-income household	0.616	0.072	0.156	0.054
	(0.810)	(0.116)	(0.122)	(0.090)
Low-income household	–0.463***	–0.000	–0.075***	–0.058***
	(0.165)	(0.028)	(0.027)	(0.016)
Mid-income household	–0.071	0.047**	–0.009	–0.048***
	(0.137)	(0.020)	(0.022)	(0.015)
Baseline outcomes	Yes	Yes	Yes	Yes
Season indicators	Yes	Yes	Yes	Yes
Child characteristics	Yes	Yes	Yes	Yes
Province effects	Yes	Yes	Yes	Yes
Community social programmes	Yes	Yes	Yes	Yes
Infrastructure improvements	Yes	Yes	Yes	Yes
El Niño shock	Yes	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes	Yes
Observations	2,928	2,928	2,928	2,928
$Adj.R^2$	0.448	0.238	0.328	0.163

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variables are as follows: total years of schooling completed (Col 1), indicator for graduated junior school (Col 2), indicator for graduated senior secondary school (Col 3) and indicator for graduated college (Col 4). The reference category is the high-income household. Standard errors are in parentheses, clustered by 1997 community of residence. There are fewer observations than in the regressions presented in tables 10 and 11 because household income data is not available for 14 households.

Table A1: Probit models for impact of rice prices on school enrolment and labour market participation

	School enrolment		Child labour	
	(1)	(2)	(3)	(4)
Ln rice price	–0.098***		–0.093**	
	(0.327)		(0.448)	
Ln rice price × 7-12 years old		–0.131***		–0.065
		(0.381)		(0.489)
Ln rice price × 13-15 years old		–0.081**		–0.105**
		(0.342)		(0.468)
7-12 years old		0.373*		–0.275
		(2.124)		(2.214)
Year = 2000	–0.052***	–0.053***	0.165***	0.169***
	(0.189)	(0.186)	(0.292)	(0.294)
Season indicators	Yes	Yes	Yes	Yes
Child characteristics	Yes	Yes	Yes	Yes
Province-year effects	Yes	Yes	Yes	Yes
Community social programmes	Yes	Yes	Yes	Yes
Infrastructure improvements	Yes	Yes	Yes	Yes
El Niño shock	Yes	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes	Yes
Community fixed effetcs	Yes	Yes	Yes	Yes
Observations	6,182	6,182	5,971	5,971

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. Marginal effects are reported. The dependent variables are as follows: indicator for whether a child is enrolled in school for the given academic year (columns 1 and 2), and indicator for whether a child is reported to have worked in the past year (columns 3 and 4). The reference category for the 7-12 year-old group of children is the 13-15 year-old group in columns 2 and 4. Robust standard errors are in parentheses, clustered by community/survey year.

Table A2: Heterogeneous impact of rice price increases by age - with and without community fixed effects

	Dependent variable							
	Years of schooling		Grad. jr. school		Grad. sr. school		Grad. college	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δ Ln rice price	0.647		0.094		0.064		0.120*	
	(0.659)		(0.094)		(0.089)		(0.065)	
Δ Ln rice price × 7-12 years old	0.470	0.486	0.017	0.024	0.065	0.072	–0.072	–0.059
	(0.596)	(0.584)	(0.095)	(0.098)	(0.095)	(0.094)	(0.065)	(0.064)
7-12 years old	0.180	0.255	0.001	0.011	0.072*	0.083**	–0.028	–0.029
	(0.202)	(0.206)	(0.028)	(0.028)	(0.037)	(0.038)	(0.028)	(0.028)
Baseline outcomes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Season indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Child characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province effects	Yes	No	Yes	No	Yes	No	Yes	No
Community social programmes	Yes	No	Yes	No	Yes	No	Yes	No
Infrastructure availability	Yes	No	Yes	No	Yes	No	Yes	No
Household characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Community fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	2,942	2,942	2,942	2,942	2,942	2,942	2,942	2,942
$Adj.R^2$	0.450	0.471	0.240	0.285	0.329	0.345	0.158	0.171

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variables are as follows: number of years of schooling completed (Col 1 and 2), indicator for graduated junior school (Col 3 and 4), indicator for graduated senior secondary school (Col 5 and 6) and indicator for graduated college (Col 7 and 8). The reference category for the 7-12 year-old group of children is the 13-15 year-old group. Standard errors are in parentheses, clustered by 1997 community of residence.

Table A3: Heterogeneous impact of rice price increases by household income - with and without community fixed effects

	Dependent variable							
	Years of schooling		Grad. jr. school		Grad. sr. school		Grad. college	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δ Ln rice price	0.566		0.068		0.148		0.046	
	(0.822)		(0.115)		(0.121)		(0.089)	
Δ Ln rice price × Low-income household	0.179	–0.057	0.049	0.009	–0.069	–0.117	–0.040	–0.039
	(1.004)	(1.067)	(0.154)	(0.161)	(0.161)	(0.175)	(0.091)	(0.093)
Δ Ln rice price × Mid-income household	0.724	0.837	0.036	0.076	–0.073	–0.050	0.128	0.095
	(1.015)	(1.017)	(0.120)	(0.115)	(0.164)	(0.175)	(0.101)	(0.098)
Low-income household	–0.448***	–0.709***	0.002	–0.034	–0.073***	–0.100***	–0.058***	–0.052***
	(0.165)	(0.167)	(0.028)	(0.029)	(0.028)	(0.028)	(0.016)	(0.017)
Mid-income household	–0.073	–0.274*	0.046**	0.013	–0.009	–0.028	–0.049***	–0.043***
	(0.142)	(0.141)	(0.020)	(0.020)	(0.023)	(0.024)	(0.015)	(0.015)
Baseline outcomes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Season indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Child characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province effects	Yes	No	Yes	No	Yes	No	Yes	No
Community social programmes	Yes	No	Yes	No	Yes	No	Yes	No
Infrastructure availability	Yes	No	Yes	No	Yes	No	Yes	No
Household characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Community fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	2,928	2,928	2,928	2,928	2,928	2,928	2,928	2,928
$Adj.R^2$	0.452	0.474	0.242	0.287	0.330	0.347	0.164	0.174

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variables are as follows: number of years of schooling completed (Col 1 and 2), indicator for graduated junior school (Col 3 and 4), indicator for graduated senior secondary school (Col 5 and 6) and indicator for graduated college (Col 7 and 8). The reference category is the high-income household. Standard errors are in parentheses, clustered by 1997 community of residence.

Table A4: Comparing attriters and non-attriters - child characteristics

	Resurveyed in 2007	Attrited in 2007
Age	11.41	11.51
	(2.62)	(2.61)
Male	0.51	0.46
	(0.50)	(0.50)
Enrolled in school	0.91	0.84
	(0.29)	(0.37)
Schoolhours/week	31.77	31.01
	(6.81)	(6.70)
In labour market	0.03	0.02
	(0.16)	(0.13)
In elementary school	0.60	0.56
	(0.49)	(0.50)
In junior school	0.35	0.36
	(0.48)	(0.48)
Observations	2,942	214

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variable in columns 1 and 2 is an indicator for whether a child was re-surveyed in 2007 or whether the child attrited from the survey. Standard errors are in parentheses.

Table A5: Comparing attriters and non-attriters - household and community characteristics

	Resurveyed in 2007	Attrited in 2007
Household characteristics		
Log per capita expenditure	11.53	12.04
Owns home	0.74	0.56
Modernity index (0-5)	3.52	4.17
Household size	5.97	5.54
Number of children<15 yrs	2.75	2.36
Number of children enrolled in school	2.31	2.13
Number of elders>70 yrs	0.21	0.26
Household-head characteristics		
Age	44.98	45.30
Male	0.90	0.86
Married	0.99	0.97
Employed in past year	0.90	0.85
Employed in public sector	0.14	0.13
Highest schooling level		
Primary or less	0.53	0.36
Jr. secondary	0.17	0.17
Sr. secondary	0.22	0.29
College	0.08	0.18
Community infrastructure (=1 if available)		
Local bus stop	0.05	0.07
Market	0.16	0.19
Public telephone	0.44	0.57
Post office	0.09	0.08
Bank	0.22	0.21
Asphalt roads	0.72	0.72
El Niño shock (=1 if affected)		
Shock in 1997	0.52	0.64
Shock in 1998	0.42	0.54
Community social programmes (=1 if implemented)		
Medical services	0.16	0.11
Rice distribution	0.72	0.72
Health cards	0.47	0.44
Employment generation	0.62	0.75
Food supplements	0.62	0.53
Student scholarships	0.77	0.71
Observations	2,942	214

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variable in columns 1 and 2 is an indicator for whether a child was re-surveyed in 2007 or whether the child attrited from the survey. Standard errors are in parentheses.

Table A6: Probit predicting non-attrition by baseline variables

	Selection in 2007 based on 1997 variables
Enrolled in school	0.046***
	(0.139)
In elementary school	0.021
	(0.209)
In junior school	0.019
	(0.163)
Age	–0.022
	(0.155)
Male	0.004
	(0.075)
Log per capita expenditure	–0.023***
	(0.055)
Owns home	0.051***
	(0.085)
Modernity index (0-5)	–0.024***
	(0.050)
Household size	–0.002
	(0.027)
Number of children<15 yrs	0.016***
	(0.045)
Number of children enrolled in school	–0.004
	(0.045)
Number of elders>70 yrs	–0.011
	(0.076)
Age	0.000
	(0.005)
Male	0.008
	(0.133)
Married	0.048
	(0.301)
Employed in past year	0.027*
	(0.134)
Employed in public sector	0.032**
	(0.128)
Household head highest schooling level	
Primary or less	0.014
	(0.142)
Jr. secondary	0.017
	(0.147)
Sr. secondary	0.008
	(0.132)
Season indicators	Yes
Province effects	Yes
Community social programmes	Yes
Infrastructure improvements	Yes
El Niño shock	Yes
Observations	3,136

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. Marginal effects are reported. The dependent variable in column 1 is an indicator for whether a child observed in 1997 was re-surveyed in 2007. Robust standard errors are in parentheses, clustered by 1997 community of residence.

Table A7: Attrition-corrected long term impact of rice prices increases

	Dependent variable		
	Grad. jr. school	Grad. sr. school	Grad. college
Δ Ln rice price	0.128	0.131*	0.085
	(0.080)	(0.074)	(0.060)
Season indicators	Yes	Yes	Yes
Child characteristics	Yes	Yes	Yes
Province effects	Yes	Yes	Yes
Community social programmes	Yes	Yes	Yes
Infrastructure improvements	Yes	Yes	Yes
El Niño shock	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes
Observations	2,928	2,928	2,928
$Adj.R^2$	0.236	0.324	0.161

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variables are as follows: total years of schooling completed (Col 1), indicator for graduated junior school (Col 2), indicator for graduated senior secondary school (Col 3) and indicator for graduated college (Col 4). Standard errors are in parentheses, clustered by 1997 community of residence.

Table A8: Attrition-corrected heterogenous long term impact of rice prices increases by age

	Dependent variable			
	Years of schooling	Grad. jr. school	Grad. sr. school	Grad. college
Δ Ln rice price × 7-12 years old		0.127	0.154*	0.050
		(0.092)	(0.084)	(0.067)
Δ Ln rice price × 13-15 years old		0.130	0.098	0.139**
		(0.097)	(0.092)	(0.069)
7-12 years old		0.004	0.072*	–0.024
		(0.027)	(0.037)	(0.029)
Baseline outcomes	Yes	Yes	Yes	Yes
Season indicators	Yes	Yes	Yes	Yes
Child characteristics	Yes	Yes	Yes	Yes
Province effects	Yes	Yes	Yes	Yes
Community social programmes	Yes	Yes	Yes	Yes
Infrastructure improvements	Yes	Yes	Yes	Yes
El Niño shock	Yes	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes	Yes
Observations	2,880	2,928	2,928	2,928
$Adj.R^2$	0.451	0.233	0.325	0.161

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variables are as follows: total years of schooling completed (Col 1), indicator for graduated junior school (Col 2), indicator for graduated senior secondary school (Col 3) and indicator for graduated college (Col 4). The reference category for the 7-12 year-old group of children is the 13-15 year-old group. Standard errors are in parentheses, clustered by 1997 community of residence.

Table A9: Attrition-corrected heterogenous long term impact of rice prices increases by income

	Dependent variable			
	Years of schooling	Grad. jr. school	Grad. sr. school	Grad. college
Δ Ln rice price × Low-income household	0.661	0.132	0.090	0.003
	(0.799)	(0.127)	(0.125)	(0.057)
Δ Ln rice price × Mid-income household	1.526**	0.145	0.120	0.183**
	(0.716)	(0.090)	(0.100)	(0.080)
Δ Ln rice price × High-income household	0.517	0.075	0.162	0.063
	(0.861)	(0.116)	(0.126)	(0.092)
Low-income household	–0.432**			
	(0.169)			
Mid-income household	–0.062	0.048**	0.068***	0.009
	(0.144)	(0.023)	(0.024)	(0.012)
o.Low-income household		0.000	0.000	0.000
		(.)	(.)	(.)
Baseline outcomes	Yes	Yes	Yes	Yes
Season indicators	Yes	Yes	Yes	Yes
Child characteristics	Yes	Yes	Yes	Yes
Province effects	Yes	Yes	Yes	Yes
Community social programmes	Yes	Yes	Yes	Yes
Infrastructure improvements	Yes	Yes	Yes	Yes
El Niño shock	Yes	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes	Yes
Observations	2,880	2,928	2,928	2,928
$Adj.R^2$	0.449	0.236	0.327	0.166

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variables are as follows: total years of schooling completed (Col 1), indicator for graduated junior school (Col 2), indicator for graduated senior secondary school (Col 3) and indicator for graduated college (Col 4). The reference category is the high-income household. Standard errors are in parentheses, clustered by 1997 community of residence.