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The Effect of Trade Liberalization on Child Labor*

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Abstract

The question of how trade liberalization affects the employment of children in developing economies is at the core of the debate on globalization. Trade theory predicts that an increase in the price of an exported good could either increase or decrease child labor depending on the magnitudes of the substitution and income effects. In this paper, we study the relationship between changes in the relative price of an exported commodity and child labor using household level data from within a poor country. In particular, we relate child labor to regional and intertemporal variation in the real price of rice surrounding national and international rice market integration in Vietnam. We find that higher rice prices are associated with declines in child labor. Income effects play an important role in this relationship. Rice price increases are associated with the largest declines in child labor in households that are large net producers of rice. These findings show that greater market integration can be associated with less child labor. Moreover, our results suggest that the use of punitive trade sanctions on exports from developing countries to eradicate child labor is unlikely to yield the desired outcome.

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1. Introduction

The effect of international trade on the employment of child labor in poor, predominately agricultural countries has stirred a heated debate.[1] The opponents of globalization argue that market integration, by increasing labor demand, expands the earnings opportunities of children and thereby inevitably leads to more child labor. Some even propose the use of trade sanctions against the exports of countries with high levels of child labor as a way to eradicate child labor.[2] However, the proponents of globalization point out that income gains associated with free trade could potentially reduce child labor if child labor is a bad in parental preferences as in Basu and Van (1998) and Bommier and Dubois (2004) or if households face credit constraints as in Baland and Robinson (2000) and Ranjan (2001).

At the heart of this debate is the relationship between movements in relative prices and child labor. Trade theory predicts that product market integration affects domestic labor markets through changes in relative product prices. Consequently, product price movements have been used extensively to estimate the potential effects of trade liberalization on labor markets (see Leamer and Levinsohn (1995)). However, the existing empirical literature provides no evidence on how product prices affect child labor (see Basu (1999), Brown, Deardorff, and Stern (2001)).

In this study, we take a first step to empirically examine the relationship between relative price movements of an exported good and child labor. We begin with a theoretical discussion of how trade liberalization (via relative price shifts) can affect child labor. We consider an environment where households both produce and consume the product that will be exported after

[1]For example, the current WTO negotiations in part focus on liberalizing trade in agriculture and bringing poor (primarily agricultural) countries into the world market. Krueger (1996) finds that most child labor occurs in countries with extremely low GNP per capita. However, the implications of market integration on well-being in these countries are poorly understood.

[2] See Maskus (1997), Brown (2000), Dixit (2000), and Ranjan (2001) for theory on the impact of trade sanctions on child labor.

liberalization. This reflects the reality of many developing countries that export staples such as rice, corn, coffee, etc. The theory suggests that the net effect of liberalization on child labor is ambiguous. It depends on changes in the value of child's time and whether there is an income effect on child labor. Moreover, if there is a positive income effect on child labor through a household's net production of the commodity, child labor should decline by more (or increase by less) in households that are large net producers of the liberalized commodity whose relative price has increased.

We next consider the link between relative price movements and child labor empirically by studying the response of child labor to changes in the price of rice in Vietnam during its episode of rice market liberalizations in the 1990s. Between 1993 and 1998 the real price of rice increased on average by almost 30% relative to the consumer price index in Vietnam. Brandt and Benjamin (2004) find that much of this increase in the relative price of rice can be attributed to international and national rice market integration. They highlight two policies as being particularly important. First, by 1998 Vietnam's rice export quota was no longer binding. Out of a concern for domestic food security, Vietnam imposed stringent export controls on its rice exports in 1989. Coupled with internal restrictions on the flow of rice across regions, these trade restrictions suppressed the domestic price of rice and lowered the relative incomes of rice producing households. The government gradually liberalized its export regime by increasing the quota from less than 1 million metric tons in 1992 to a non-binding 4.5 million metric tons in 1998. Second, the government lifted internal barriers to rice trade across regions of Vietnam in early 1997. Thus, rice-producing communities could easily export their rice to other communities, raising the real price of rice in rice surplus communities. Because communities differ in the demand and supply of rice and the degree of integration into national and

international markets, rice price changes vary across communities. Rice is the dominant commodity in the Vietnamese economy and the primary staple in the Vietnamese diet, so these rice price movements could at least in principle have an effect on child labor.

We relate this regional and intertemporal variation in the relative price of rice to variation in child labor using household level data on over 3,000 rural households collected in 1993 and 1998 from the Vietnam Living Standards Survey (VLSS). The basic idea behind our empirical approach is to compare changes in child labor across communities that experience different changes in the relative price of rice over time. Obviously, not all price changes in our data stem from product market integration. However, to the extent that trade liberalization affects the price of a commodity, our analysis illustrates the potential impact of integration on child labor. Moreover, the panel structure and the detail of our data enable us to control for differences across communities and households that may be correlated with changes in the relative price of rice and child labor. We consider the use of the household level data from within a country an attractive alternative to studies that consider the effect of globalization on various outcomes such as growth and inequality with cross-country data.

We find that increases in the relative price of rice are associated with large declines in child labor. The observed 30 percent increase in the price of rice is associated with about a 9 percentage point decline in child labor in rural Vietnam. Moreover, our results emphasize the importance of accounting for the income effect of relative price changes through household net production of rice. The response of child labor to rice price increases varies with household exposure to rice prices through production and consumption. Children in households with landholdings such that the household is a large net producer of rice experience especially large reductions in child labor. The observed income effect on child labor is sufficiently large in

magnitude that even child participation in agriculture declines despite the increased earnings opportunities in agriculture that accompany rice price increases in households that are large net producers. In contrast, a negative income effect associated with higher rice prices actually increases child labor in households that are large net consumers of rice. However, land is sufficiently equitably distributed in Vietnam such that most households are positioned to gain from rice price increases. Overall, rice price increases can explain almost half of the decline in child labor in rural Vietnam between 1993 and 1998. Our results suggest that trade liberalization, to the extent that it affects relative price movements, does not necessarily lead to an increase in child labor and can actually be associated with a decline in child labor. As a consequence, policies such as trade sanctions that limit or contract integration may, at least in the short-term, lead to higher levels of child labor.

The rest of the paper is structured as follows. Section 2 provides the theory motivation. Section 3 discusses the data. Section 4 describes our empirical methodology and presents the results of the overall relationship between rice prices and child labor. Section 5 estimates the income effect of rice prices on child labor through net production. Section 6 concludes.

2. Theory Motivation

This section briefly discusses how trade liberalization *via relative price movements* might affect child labor. Several theory models address the relationship between product prices, trade policy, and child labor (Maskus (1997), Brown (2000), Dixit (2000), Ranjan (2001)). In addition, Basu and Van (1998) emphasize the importance of household income in determining child labor in a setting where child labor is considered a bad in parental preferences, while Baland and Robinson (2000) focus on the role of liquidity constraints.[3] These models differ in

[3] In addition, Bommier and Dubois (2004) explicitly introduce disutility in child labor in a Baland and Robinson type of setting.

the assumptions on the structure of the economy, labor market, and household decision on child labor supply, but they ultimately encompass similar channels through which product prices might affect child labor.[4] We review these main channels for the case of the increase in relative price of agricultural product (potentially instigated by the relaxation of the quota on the agricultural good) studied in this paper.[5]

We consider a situation (as it is the case of the rice export quota in Vietnam) where the country is a small exporter of an agricultural product, but where the existence of trade and transportation costs drives a wedge between world and domestic prices. The relaxation of the export quota will then lead to an increase in the relative domestic price of the agricultural product. This change in the relative price of rice might affect the probability that a child works by affecting the demand for and supply of child labor. On the production side, let us assume that the economy consists of two sectors – agriculture and nonagriculture - that are produced by child labor and land and that agriculture is a child labor intensive sector. On the consumption side, consider a household whose welfare depends on consumption of agricultural and nonagricultural goods (a numeraire) and consumption of child leisure. Child labor is considered a bad (as, for example in Basu and Van (1998)). In this set up, child labor supply is thus an outcome of a household welfare maximizing decision. The increase in the relative price of agricultural product following trade liberalization will affect child labor through the changes in the value of child time (the substitution effect) and through the income effect.

Changes in the value of child time can work through consumption and production. First, if agriculture is child labor intensive, relative rice price increases will then raise the demand for child labor and lead to higher child wages. Hence, we expect to see children work more (this is a

[4] See Edmonds and Pavcnik (2002) for a more detailed description of individual models.
[5] A formal model is available from the authors upon request.

main argument of globalization opponents). Second, if child labor is a bad in parental preferences, increase in the relative price of rice makes consumption of child leisure relatively cheaper and leads to a shift toward less child labor.

Rice price increases might also have an income effect through consumption while they also change household income from rice production. On the consumption side, 44 percent of food expenditure is on rice in 1993. Hence, we expect a negative income effect through consumption which should increase child labor if child labor is a bad. On the production side, 70% of households and 98 percent of all communities produce rice in 1993. Households that are net producers of rice should experience a net increase in household income with increases in rice prices. Moreover, given the scope of the rice sector in the local economy, it seems likely that rice price increases will also increase the wages of agricultural day laborers following rice market liberalization. Thus, household income can increase even in households that are net consumers of rice. These increases in income may lower child labor if it is a bad in parental preferences or if liquidity constraints result in higher levels of child labor than is efficient.

The above discussion suggests that the net effect of a trade liberalization induced increase in the relative price of the agricultural commodity on child labor is ambiguous and depends on the magnitudes of the individual channels. Theory cannot predict the relative importance of these channels. Ultimately, how child labor responds to relative price shifts is an empirical question. The goal of our empirical analysis is thus first, to examine the overall relationship between child labor and rice prices and second, to identify income effect of rice prices on child labor through net production.

3. Data description and preliminary evidence

We examine the relationship between product prices in the rice sector and child labor using two rounds of the Vietnam Living Standards Survey (VLSS), a multi-purpose household survey. The two rounds of the VLSS span the period of rice market liberalization in Vietnam. The first round of the VLSS was conducted between September 1992 and October 1993 and the second round of the VLSS was conducted between December 1997 and December 1998.[6]

The survey has two panel dimensions. First, 115 rural communities are visited both in the first and second round of the VLSS, and our analysis focuses on children in these rural panel communities. This leads to a sample size of 4,850 children ages 6-15 in the first round and 4,703 children ages 6-15 in the second round. Within panel communities, the selection of households is a random sample for each round of the survey. Second, 3,397 households with children are also revisited in these rural panel communities. When our discussion looks at variation in the effects of rice price changes within a community, we restrict our analysis to the 4,586 children ages 6-15 in the first round and the 4,441 children ages 6-15 in the second round that reside in the 3,397 *panel* households from rural panel communities.[7] Note that for children residing in panel households one could in principle also create a panel of children that are in the sample of 6-15 in both survey rounds. However, this would limit our analysis only to children ages 6-10 in the first survey round (children younger (older) than 6 (10) in the first survey round would not satisfy the age criteria) and reduce the sample to 2423 children in each survey year. Limiting the sample to these panel children would also make it difficult to disentangle age and time effects. Moreover, there is no obvious advantage to restricting the sample as such given that our identifying variation comes from differences in community price changes through time.

[6] See General Statistical Office (1994) and General Statistical Office (1999) for details.
[7] Glewwe and Nguyen (2004) argue that the restricted sample of panel households appears nationally representative. They document a 90 percent retention rate. In the rural sample of panel households with children used in this study, there is a 94 percent retention rate. Attrition is discussed further in section 5 and in Edmonds and Turk (2004) who document very little attrition among children within retained households.

Our analysis uses data from several parts of the VLSS. First, the VLSS includes a detailed price survey conducted in a community's market at the same time as the household survey. We use the consumer price of a kilogram of ordinary rice in 1993 and 1998 collected in the community price survey as our source of price variation.[8] We deflate the price of rice with the monthly consumer price index so that all prices are in 000s of 1998 (January) Dong.[9] Throughout this paper, whenever we refer to rice price changes, we mean changes in the real (deflated) price of a kilogram of rice. Second, the household survey includes information on the economic activities of each resident child between the ages of 6 and 15 within the last seven days. The VLSS documents whether each child works outside of the household for pay (cash or in-kind), works in agriculture for the household, works in a household business, or participates in household production activities such as collecting water and wood, building and maintaining the house and livestock enclosures, making or repairing tools, vehicles, and means of production, and household chores. We focus on an aggregation of these categories of work as a definition of child labor. Namely, a child engages in child labor if it works for seven or more hours per week in household production or if the child works in agriculture, wage employment, or a family business.[10] In addition to participation, we use the data on total hours worked in all these

[8] We have also compared the prices reported in the price survey with the average community price based on unit values of purchased rice from the household survey. The correlation between the two is .68. Moreover, 6 communities do not report a price in at least one of the survey rounds. We have replicated the results of this paper omitting these communities, but in the present draft, we impute rice prices for these communities. Based on the unit value of rice purchased by households reported in the VLSS, we calculate the mean unit value of a kg of rice for a community in a given survey year. We regress the price of rice reported in the price survey on a third order polynomial of the mean unit value of rice in a community. We replace the missing price data with the predicted community price based on this regression.

[9] One U.S. dollar corresponds to approximately 14,000 Dong in 1998. The price deflator does not vary by region, because we do not want the deflator to drive the variation in rice prices.

[10] This definition of child labor matches the definition employed by the International Labor Organization in many of its SIMPOC country studies. Moreover, it overcomes three main conceptual problems that would arise from failing to consider the activities performed by children in the production of nontradable goods (home production). First, when a child works outside of its household as a paid domestic servant or a slave that child is classified as a child laborer under the most stringent of definitions. Reclassifying the child's production activities as something other than work if the child's employer changes (even if it changes to a parent) seems arbitrary. Second, treating the

categories by a child during the last week. Unfortunately, between survey rounds the VLSS questionnaire changed how it collects information on time spent in agricultural work within the child's household (participation questions and hours in all other types of work are identical between rounds of the VLSS). This might affect the reported hours worked in agriculture and bias our results if changes in reporting are correlated with changes in rice prices in a systematic fashion. Finally, the survey also provides information on household annual cropland assignments and household net rice production in 1992/93. These data are used below to identify the income effects or rice price changes through net production in the framework of section 2.

Table 1 reports basic summary statistics for the data. The fraction of children working declines from 60 percent in 92/93 to 48 percent in 97/98. A decline in total hours worked accompanies this drop in participation. During the same time, the average domestic price of rice in rural areas increases by 27 percent relative to the rise in the consumer price index. The main goal of our empirical work in the next section is to examine whether these observed declines in child labor are associated with the observed increases in rice prices. Prior to that analysis, we consider the relationship nonparametrically on a community level. For each community, we compute the fraction of children working in 1993 and 1998 and subtract the 1998 participation rate from the 1993 rate to obtain the decline in the share of children working in the community. We plot the decline in child labor in a community against the increase in the community real rice prices in figure 1. The regression line pictured in figure 1 is the result of a nonparametric (local) regression of the decline in child labor against the increase in rice prices where we have

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production of nontradables as "not-working" makes it difficult to interpret the meaning of the state of "not working." For example, if home production is ignored in the definition of child labor, a child that stops limited work in a family business to take over extensive household responsibilities (say, because of the absence of a parent) would appear to stop working. Third, an assertion that child participation in the production of nontradables is not an economic phenomenon (or of economic interest) implies that including home production in a definition of child labor should attenuate our results. To the extent that participation in the production of nontradables varies with changes in the relative price of a market good, it clearly is of economic importance.

weighted observations by the number of children in each community in 1993. The figure suggests that rice price increases are associated with declines in child labor for most of the distribution of increases in the relative price of rice. Thus, an extreme outlier is not driving the results below. Moreover, when we turn to a parametric regression framework, we expect that small increases in rice prices are associated with declines in child labor.

4. Empirical Analysis: The overall relationship between rice prices and child labor

The theory discussion provides an ambiguous prediction on the overall sign of the relationship between child labor and rice prices depending on the relative magnitude of the income and substitution effects. In this section, we begin our empirical analysis by examining the overall association between rice prices and child labor. We lay out the basic empirical framework, discuss the main result, and conclude with robustness analysis of our findings that shows that our results are not spurious. In section 5, we focus on separately identifying the magnitude of the net income effect of rice prices on child labor through net production.

4.1 Basic Empirical Framework

We consider the relationship between child labor and rice prices using a linear probability model.[11] For a *child j* in community *i* at time *t*, we estimate:

$$(1) \qquad y_{ijt} = \beta_1 RP_{it} + \alpha_1 X_{jt} + \alpha_2 T_t + \lambda_i + \varepsilon_{ijt}.$$

y_{ijt} is the indicator for whether the child *j* living in community *i* at time *t* engages in child labor. Several features of this framework should be highlighted. First, RP_{it} is the natural logarithm of the real price of a kilogram of ordinary rice in *community i* at time *t*. We rely on the community-level measure of rice prices (rather than the household-level) because community-level prices are more apt to be exogenous to a household (and thus not affected by an individual child's labor

[11] Alternatively, we could use a probit model. Our conclusions are not sensitive to the choice of assumption about the regression error distribution.

supply decision or individual household characteristics).[12] Because the rice price measure only varies across community-year dimension (rather than child-year dimension), all standard errors account for clustering at the community/survey round level (in addition to allowing for general forms of heteroskedasticity). The coefficient on rice prices β_1 is the change in the probability that a child works associated with a 1 percent increase in the price of rice in the child's community.

Second, the unit of analysis is the child, and we control for gender and age differences in child labor using a third order polynomial in child's gender and age and all of their interactions. We capture seasonal variation in rice prices and child labor by including season indicators in our regression. In addition, we control for the harvesting time by an indicator that is one if the interview took place during the harvest. We similarly control for the planting period. All of these factors (and a constant) are represented in vector X_{jt}. Third, economy-wide time differences in the probability a child works are captured by a year indicator T_t that is one if the survey year is 1997/98 (1992/93 is the omitted year).

Fourth, communities differ in many characteristics (such as the availability of schooling, school quality, returns to education, labor market conditions, land and resource endowments, integration into the Vietnamese economy) that might independently affect the relative price of rice and child labor and thus bias our estimate of the coefficient on rice prices. To the extent these community characteristics are time-invariant, their effects are captured by community fixed effects λ in (1). Our analysis thus relies *solely* on the changes in rice prices and child labor within a community over time (as opposed to between communities at a point in time) to identify the effect of rice prices on child labor. We estimate equation (1) for all children in households

[12]For example, household-specific rice prices would not only reflect the market value of rice but also the household quality choice (i.e. households that are better off might purchase higher quality rice). Obviously, the quality choice is likely affected by household income (which depends in part on a child's labor supply).

residing in panel communities (and not just the children living in panel households in these communities).[13]

4.2 Results

Table 2 provides the results. Column 1 presents estimates of β_1 and α_2 from (1). We find a positive and significant association between increases in rice prices and declines in child labor. The magnitude of the association is large. A 30 percent increase in price of rice is associated with an almost 10 percentage point decline in child labor. Moreover, rice prices changes are significant in explaining the overall decline in child labor observed in rural Vietnam. Conditional on rice prices (and other controls), the coefficient on the year indicator is -.104. This coefficient increases in absolute value to -.188 when we exclude rice prices from the regression in (1). Thus, rice price increases can account for 45 percent (i.e. (.188-.104)/.188) of the decline in child labor in rural Vietnam between 1993 and 1998.

The obvious concern with the finding that increased rice prices are associated with less child labor is whether we can interpret this positive correlation as a causal effect of rice price movements on child labor. The identifying variation in rice prices is at the community level. Time-varying community factors could generate a spurious correlation between child labor and rice price increases. Differences in household characteristics are an unlikely source of bias in this analysis of community level changes in rice prices.[14]

[13] Note that we do not control for household characteristics or household fixed effects in equation (1). The exclusion of such variables might bias the coefficient on rice prices if household characteristics are correlated with rice prices and also affect child labor independently of rice prices. Because our price measure is the community-level price of rice, it is likely to be exogenous to a household. It is thus highly unlikely that the exclusion of household characteristics would bias our results. Nevertheless, to check for this possibility, we have estimated equation (1) with household fixed effects on a subsample of our data that consists of children living in panel households and obtained similar conclusions to those presented in table 2.

[14] Note that because our measure of rice prices varies on community-year level, we cannot control directly for community-specific time-varying shocks by inclusion of community-year indicators.

We are mostly concerned about two sources of a spurious correlation between rice prices and child labor. First, rice price increases vary across regions in Vietnam. Benjamin and Brandt (2004), for example, show that regions account for 56 percent of the variation in changes in rice prices between 1998 and 1992. Likewise, regions differ in both the types and scope of the reforms experienced in Vietnam in the 1990s, and might differ in changes in the returns to schooling if labor mobility is limited across the regions.[15] We control for these unobserved, region-specific time-varying shocks by including the interactions of each region indicator with a year indicator in (1).[16] Second, rice price increases vary with a community's accessibility. More accessible communities might experience larger rice price changes, because they are more integrated into regional and international markets. Likewise, children in more accessible communities might have better access to schools or employment opportunities. We control for differences in child labor associated with accessibility by interacting a community's accessibility with year indicators.[17] Estimates of (1) with additional controls for time variation associated with the community's region or accessibility are reported in column 2 of table 2. If there is spurious correlation between rice price changes and child labor associated with accessibility or regional differences, we should observe a significant change in our estimates of the effect of rice prices on child labor, but column 2 estimates of the coefficient on rice prices are well within the 95 percent confidence interval of the coefficient in column 1.

[15] Foster and Rosenzweig (1996) find changes in the return to education to be a primary determinant of changes in educational enrollment in Green Revolution India. Glewwe and Jacoby (2004) rule out differential changes in the return to education as an explanation for increases in school enrollment in Vietnam. Instead, they find that increases in household income drive Vietnam's increases in secondary school enrollment.

[16] There are between 4 to 35 sampled communities per region (the mean and median are both 25 communities per region).

[17] In the VLSS, we measure a community's accessibility by an indicator for whether regular transportation is available to a community and an indicator for whether the road to a community is paved. Data on accessibility (and infrastructure in general) is only available in the 1998 survey.

Although we are mostly concerned with region-specific and community accessibility related time-varying unobserved shocks, we nonetheless consider other sources of time-varying factors that could bias our results. First, infrastructure improvements might be an additional source of omitted heterogeneity yielding spurious results, because Van de Walle (1998) observes that public infrastructure (and in particular, irrigation) improvements could dramatically enhance living standards in Vietnam.[18] Second, child labor might change differentially over time in communities that experience pest problems, natural disasters, or use high-yields seeds.[19] Finally, we allow for differential changes in child labor on the province level which Glewwe and Jacoby (2004) argue is the relevant unit for defining the local labor market or for measuring returns to education in Vietnam.[20] The inclusion of the province*year indicators controls for considerable location specific time-varying factors. The estimate of equation (1) that includes the above infrastructure controls, controls for agricultural characteristics, community accessibility indicators, and province-year indicators is presented in column 3 of table 2. The estimated relationship between child labor and rice prices is within a 95 percent confidence interval of our estimate in column 1. Overall, we do not find any evidence in table 2 that suggests that spurious correlation drives the relationship between rice prices and child labor.[21]

[18] The 1998 community survey asks whether the community has experienced any infrastructure improvements since the 1993 in roads, irrigation, health facilities, electricity, schools, and "other" public infrastructure separately. It does not distinguish between new infrastructure and physical or quality improvements in existing infrastructure. In estimation, we allow communities to experience differential changes in child labor through time with each of these infrastructure improvements by interacting each infrastructure improvements with the year effect.

[19] We control for these factors by including indicators for whether the community has experienced a flood, draught, pest problem, typhoon, or other natural disasters in the last year in the regression. We also observe whether the community uses high yield seed varieties of rice in 1998, and include this in the regression by interacting it with the year indicator.

[20] There are 61 provinces in Vietnam, and there are on average two communities per province in the VLSS data.

[21] We have also repeated the analysis in column 3 of table 2 using total hours worked in a week rather child labor participation as a dependent variable. A large share of observations reports zero hours worked so we estimated equation with OLS and Tobit. The data suggest a negative association between hours worked and rice price increases. The OLS estimates suggest that a 30 percent increase in the price of rice is associated on average with a 2.5 hour decline in total hours worked in a week. This corresponds to a 19 percent decline in hours worked over the

In sum, this section suggests a negative relationship between product price increases and child labor. The data do not contain any suggestion that these results are driven by likely sources of spurious correlation between child labor declines and rice price increases. The estimates are economically significant: our results imply that the observed 30% increase in the average price of rice leads to about 9 percentage point decline in the probability that the child works. These findings suggest that greater product market integration can be associated with less child labor.

5. Empirical Analysis: Income effects of rice prices on child labor through net production

The theoretical discussion in section 2 suggests that the association between rice prices and child labor depends on a household's exposure to rice prices through production and consumption. In particular, everything else equal (including the value of child time), higher rice prices should be associated with declines in child labor in households that are large net producers of rice and increases in child labor in households that are net consumers of rice. In this section we examine this net income effect. The section first describes the empirical framework, then presents basic results, and concludes with some robustness analysis.

In order to investigate the net income effect of rice prices on child labor, we augment equation (1) and allow the relationship between rice prices and child labor to vary across households with household net production in 1992/93. For a child *j* in household *h* resident in community *i* at time *t*, we estimate:

$$y_{ihjt} = \beta_1 RP_{it} + \beta_2 RP_{it} * M_h + \alpha_1 X_{ijht} + \alpha_2 T_t + \mu_h + \varepsilon_{ihjt}. \qquad (2)$$

M_h denotes household net production in 1993, $RP_{it} * M_h$ is the interaction of rice prices with household net production in 1993, μ_h is a household fixed effect, and all other notation follows the notation in equation (1). Note that unlike in equation (1), it is important to control for

1993 base. However, these results should be interpreted with caution given the changes in the way the VLSS collects information on time spent in household agriculture between the survey rounds discussed in section 3.

household fixed effects in equation (2) because we are identifying income effect by looking at within community variation in household exposure to rice price changes. Unobserved household characteristics could be a concern.[22] β_1 is the change in the probability a child works associated with a 1 percent increase in rice prices in a household with no net production of rice (the net effect of both substitution effects), $\beta_2 * M_h$ is the extra increment in the probability a child works associated with a rice price increase in a household with net production of M_h. $\beta_2 * M_h$ provides an estimate of the income effect of rice prices through net production. Note that the theoretical discussion suggests that β_2 should be negative, so that $\beta_2 * M_h$ is negative for net rice producers (i.e. households with $M_h > 0$) and positive for net price consumers (i.e. households with $M_h < 0$).

The above analysis allows the change in child labor with rice price movements to vary across households based on household net production in 1993 rather than contemporaneous net production (M_h rather than M_{ht}) to avoid endogeneity bias associated with M_{ht}.[23] Instead, our identification requires that 1993 household net production is exogenous to factors associated with changes in child labor between 1993 and 1998 (conditional on time invariant household characteristics and seasonal, age, and gender patterns in child labor). It seems unlikely that households would choose their net production in 1993 in anticipation of changes in child labor 5 years hence.

[22] With household fixed effects, we cannot include household net production in 1993 independently in the regression because it does not vary within household through time. However, the inclusion of the household fixed effects controls for the impact of observable and unobservable time-invariant household characteristics (including the direct effect of M_h) on child labor.

[23] Because equation (2) conditions on household fixed effects, an empirical specification that interacts rice prices with M_{ht} in (2) would identify the coefficient β_2 based on *changes* in net production. If household production depends on own-household labor supply (as in a non-separable farm household model like Strauss 1986) or rice consumption depends on work effort, then changes in child labor could drive changes in net production.

However, the reliance on net production in 1993 and the inclusion of household fixed effects in (2) limits our analysis to children living in panel households. Our results might thus potentially suffer from bias attributable to panel attrition. This is unlikely the case. First, as discussed in section 3, Glewwe and Nguyen (2004) argue that the restricted sample of panel households appears nationally representative, and the attrition rate among rural households with children is even lower than in the nationally representative sample at 6 percent. Second, the correlation coefficient between changes in rice prices and attrition of households is tiny (0.002) and statistically insignificant. Edmonds and Turk (2004) document that there is almost no attrition of children from recaptured households. Thus, attrition does not appear to be a large problem in the data. Moreover, we can check whether attrition is substantive by comparing our panel community results which are based on a random sample within each community-year to the household panel results where attrition is potentially a concern. We would expect our estimates of the overall relationship between rice prices and child labor based on children living in panel household to differ widely from the estimates obtain in table 2 if attrition was substantive.

5.1 Basic Results

Table 3 presents our results. In column 1, we reestimate (1) with children living in panel households. The coefficient on rice prices is -.28, similar to the coefficients in table 1. Thus, the focus on children in panel households is unlikely problematic. The estimated coefficients on rice prices and the interaction of rice prices with net production from (2) are reported in column 2. Several interesting findings emerge. First, the coefficient β_2 on the interaction of rice prices with household net production is negative and significant. The negative sign is exactly what the theoretical discussion suggests: everything else equal, rice price increases are associated with

declines in child labor in households that are net producers of rice (i.e. $\beta_2 * M_h$ is negative for net rice producers) and increases in child labor in households that are net consumers of rice (i.e. $\beta_2 * M_h$ is positive for net rice consumers). Moreover, differences in net production are associated with large differences in how households respond to rice price increases. Moving from the 10th to the 90th percentile of the net production distribution about doubles the decline in child labor associated with an increase in rice prices.[24]

Second, the coefficient on rice prices drops from -.291 in column 1 (that does not condition on net production) to -.234 in column 2 (that conditions on net production). The theory discussion yields ambiguous predictions on the sign of the coefficient on rice prices conditional on net production. The negative coefficient on rice prices could reflect that parents substitute towards the consumption of child leisure as rice becomes relatively more expensive. It could also reflect the income effects of rice prices on child labor associated with increases in wages for day laborers. Alternatively, this negative coefficient may reflect a substitution effect away from child labor in production. This could occur because our definition of child labor includes work in household production, work outside household, and work for household nonfarm business in addition to work in agriculture.[25] Most children work either in agriculture or in household production. Although agriculture is child labor intensive relative to household nonfarm business activities, the data suggest that agriculture is actually less child labor intensive than household production. Thus, the overall labor demand for child labor could decline after rice price increases.

[24] Table 1 reports summary statistics on net production.
[25] Household production activities are defined in the dataset as collecting water and wood, building and maintaining the house and livestock enclosures, making or repairing tools, vehicles, and means of production, and various household chores.

To explore this further, we estimate equation (2) separately for work in agriculture and work in household production activities. Results for participation in agriculture and household production are in columns 3 and 4 of table 3, respectively. Consistent with the idea that rice price increases lead to different changes in household labor demand in agriculture and household production, the coefficient on the rice price is negative in the case of household production and positive (albeit insignificant) in the case of agricultural work. Moreover, the coefficient on the interaction of rice prices with net production is negative and significant in both regressions, which again confirms the importance of the income effect through net production. That is, everything else equal, higher rice prices are associated with less child labor in agriculture and household production in households that benefit from rice price increases as net rice producers. In addition, in column 5, we estimate equation (2) for participation in market work (defined as work in agriculture, work for household nonfarm business, or work outside the household). This definition of work abstracts from household production. As in the case of agriculture only, we find that the coefficient on rice prices is positive (albeit insignificant), and the negative and significant coefficient on the interaction of rice prices with net production confirms the importance of the income effect. These results illustrate that even in sectors directly experiencing growth as a result of relative price movements (or product market integration), income effects can be large enough to affect a decline in child labor.

Given that child labor in agriculture may increase with increased earning opportunities for children in agriculture (i.e. the coefficient on rice prices conditional on net production is positive), the question arises which households experience declines in agricultural child labor. Overall, the increases in rice prices are associated with declines in child labor in agriculture in households that have net production greater than 2 thousand kg of rice per year, which

corresponds to households above the 83rd percentile of the net production distribution. However, column 2 suggests that overall child labor actually declines throughout all but the bottom percentile of the net production distribution despite these increases in agricultural work in most households.

5.2 Robustness Analysis

One potential concern with the above analysis is that net rice production in 1993 proxies for some household characteristic (other than exposure to rice price movements) that is associated with larger declines in child labor in communities that experience larger rice price increases. This concern is not borne out in the data.

First, one concern might be that the coefficient β_2 could capture the fact that households with greater net rice production in 1993 are wealthier and thereby better positioned to experience declines in child labor through time. However, wealthier households experience smaller declines in child labor between 1993 and 1998 in Vietnam (Edmonds 2004). Moreover, there is no strong correlation between household expenditure per capita in 1993 and net rice production in 1993 (the Spearman correlation coefficient is 0.15).

Second, the empirical evidence in section 4 suggests that the association between rice price movements and child labor is not driven by some omitted time-varying community attribute. Consequently, any interpretation problem associated with the coefficient β_2 on the interaction of M_h and rice prices would likely stem from time variation in child labor associated with M_h. In order to examine this possibility, we consider whether child labor patterns vary through time with M_h in communities that experience small rice price changes (i.e. less than a 10 percent change in rice prices). In particular, we regress the child labor indicator on all the controls in (6) except for rice prices. Instead, we include the interaction of the year indicator

with net production in 1993, M_h. This framework enables us to test the hypothesis that changes in child labor are not associated with net production in 1993 in the absence of large rice price increases by testing whether the coefficient on the interaction is different from zero. The data fail to reject our assumption that household net production in 1993 is unrelated to changes in child labor absent large rice price changes.[26]

Finally, variation in net production in 1993 across households appears to be driven by household land assignments under the 1988 land redistribution program.[27] 40 percent of the variation in net production in 1993 can be explained by household land assignments during the 1988 reform. As of 1993, households did not have the ability to transfer the assigned land under the 1988 land redistribution. In this sense, household land assignments under the land law do not represent a household choice. Thus, a possible robustness check is to use household land assignments as an instrumental variable for net production in 1993. Because of the strong correlation between net rice production in 1993 and household land assignments, our results do not change substantively with this robustness check.

In particular, we instrument for the interaction of net production and rice prices in equation (2) with the interaction of rice prices and the total annual landholdings. Since 401 children-year observations come from households that have missing observations on landholdings, we exclude these observations from the analysis. This is not likely to be a problem. We have repeated the analysis reported in table 3 on this sample and obtained findings similar to those in table 3. The first stage results are column 1 of table 4. For the interaction of rice prices and land assignments to be a valid instrument, it needs to be strongly correlated with

[26] The coefficient on the interaction of net rice production with the year indicator is -.007 with a t-statistic of -1.2.
[27] The decollectivization of agriculture in Vietnam in 1988 was accompanied by a land redistribution program that assigned households long-term use rights. Implementation of the law was decentralized so that local authorities had considerable discretion about how land was allocated across households in 1988 (Ravallion and van de Walle 2001).

the interaction of rice prices and net production in 1993. In fact, the F-statistics associated with the null that the instrument is insignificant in the first stage is 76.41. The second assumption necessary for the interaction of rice prices and landholdings to be a valid instrument for the interaction of rice prices and net production in 1993 is that the instrument has no effect on child labor except through the interaction of rice prices and net production. This is not the same as an assumption that landholdings have no effect on child labor except through net production. We do not need the latter assumption, because the direct effects of both landholdings and net production on child labor are captured by the household fixed effect that is included in both first and second stage regressions.[28]

Column 2 of table 4 presents the 2SLS results. The coefficient estimates are virtually the same as those in column 2 of table 3. Moreover, columns 3, 4, and 5 present 2SLS results for work in agriculture, work in household production, and market work, and yield similar conclusions as the results in table 3.

In sum, the evidence in this section suggests that the relationship between rice prices and child labor varies across households based on household net production. Everything else equal, higher rice prices are associated with declines in child labor in households that are net producers of rice and increases in child labor in households that are net consumers of rice. Overall, our results emphasize the importance of accounting for the income effects of relative price changes when considering the effects of market integration on child labor.

6. Conclusions

[28] One possible source of trouble for our identification assumption is if the value of child time changes with the interaction of rice prices and landholdings. Thus, we have (in unreported regressions) included measures of child and adult wages (as in Edmonds and Pavcnik 2002) or a proxy for the value of child time in the household (as in Appendix 3 of Edmonds 2004). In practice, given the strong correlation between land assignments and net production, the inclusion of these controls has no effect on our second stage results.

This paper provides some empirical evidence on the relationship between trade liberalization and the incidence of child labor in poor, relatively unskilled-labor abundant economies through exploiting regional and intertemporal variation in the relative price of an agricultural staple. We find that in the present case, increases in the relative price of rice result in declines in child labor. A thirty percent rise in the relative price of rice (as experienced in Vietnam) is associated on average with a 9 percentage point decrease in child labor. Rice price increases can account for 45 percent of the decline in child labor experienced in rural Vietnam between 1993 and 1998 in Vietnam. In considering the mechanisms through which rice prices affect child labor, our results suggest the households that are net producers of rice experience larger reductions in child labor when rice prices increase.

Because relative price changes are at the core of the debate on child labor and globalization, this study has several policy implications. First, the increased earnings opportunities associated with globalization for children working in export-oriented sectors do not necessarily lead to more child labor. In the present case, households that are large net producers of rice appear to have taken advantage of higher income after the rice price increase to reduce child labor despite increased earnings opportunities for children. The pure income effect is large enough that child work declines in agriculture in households that are large net producers of rice. Second, many globalization opponents and trade policy-makers advocate that higher income countries employ trade sanctions to force domestic policies in poor countries to eradicate child labor. These trade measures likely lower the price of the exported good, so our results suggest that sanctions could instigate more rather than less child labor.[29] Our results are also consistent

[29] It is possible, of course, that punitive sanctions may induce countries to adopt reforms that benefit children in the long run. Opponents of globalization often advocate sanctions to induce official bans on child labor. Whether or not these benefit children is an open question. Vietnam was one of the first developing countries (in the late 1980s) to officially ban all forms of child labor.

with a model by Ranjan (2001), where trade measures not only lower the returns to child labor, but also adversely affect adult income (or how credit constrained households are), and hence increase the incidence of child labor. Third, the impact on child labor of punitive trade sanctions against a country's exports depends on the distribution of the resources used in production of the exported good. In the present case, rice production is so widespread in Vietnam (most household produce rice directly or as hired labor) that the lower prices of the exported good associated with trade sanctions would affect most households. It is possible to imagine a world where production was so concentrated that the "costs" of any such sanctions were restricted to a relative minority. Finally, the sign of the effect of international market integration on local prices is obviously of great importance. Integration lowers prices of import-competing goods and might have different implications for child labor in households associated with the production of an import-competing product. However, as in the present case, most child (and adult) labor in poor, relatively unskilled labor abundant economies occurs in either nontraded sectors or export-oriented sectors. Integration leads to higher prices in export sectors. These price increases appear to be associated with a substantial reduction in child labor in the Vietnamese households studied in this paper.

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Figure 1: Community Level Rice Price Increases and Declines in Child Labor

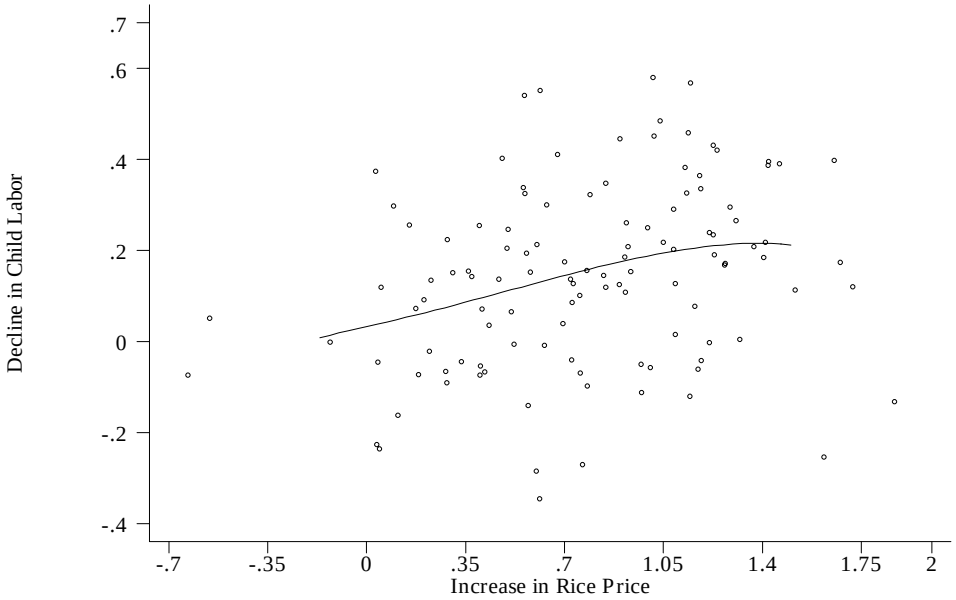

Table 1: Descriptive Statistics for Rural Children 6-15 and their Households

		1992/93	1997/98
Child Attributes			
Age		10.34	10.67
Female		0.49	0.48
Child labor indicator		0.60	0.48
Hours in the Last week		13.32	9.83
Household / Community Attributes			
Ln(Rice Price)		0.92	1.19
Net Production			
	Mean	1.09	
	10th Percentile	-0.73	
	25th Percentile	-0.15	
	Median	0.49	
	75th Percentile	1.42	
	90th Percentile	2.98	

Notes: Sample restricted to children 6-15 in rural households in communities visited in both survey rounds. All means weighted to reflect sample design. Net production is based on 1992/93 data. Net rice production is in 1000s of kg in last 12 months. Rice prices are deflated by the monthly national consumer price index to be in 000s of Jan 98 Dongs.

Table 2: Child Labor and Rice Prices, Basic Results
Children 6-15 in households in rural panel communes

	(1)	(2)	(3)
Ln(Rice Price)	-0.308	-0.244	-0.26
	[0.068]**	[0.072]**	[0.104]**
Time=1998	-0.104	-0.341	-0.374
	[0.020]**	[0.034]**	[0.076]**
Community Fixed Effects	Yes	Yes	Yes
Season Effects	Yes	Yes	Yes
Age*Gender Series	Yes	Yes	Yes
Region*Year Effects	No	Yes	No
Province*Year Effects	No	No	Yes
Accessibility*Year Effects	No	Yes	Yes
Infrastructure Improvements *Year Effects	No	No	Yes
Agricultural Attributes	No	No	Yes
Observations	9553	9553	8559
R-squared	0.37	0.38	0.4

Notes: Columns 1-3 are estimated using linear probability model. All regressions also include a constant. Robust standard errors, corrected for community/year clustering, in brackets. * significant at 10%; ** significant at 5%. The sample size decreases between columns 2 and 3, because agricultural information is missing for several communities.

Table 3: Child Labor Participation, Rice Prices, and Net Production
Children 6-15 in rural panel households

	(1)	(2)	(3)	(4)	(5)
	Child Labor	Child Labor	Work in Agriculture	Work in HH production	Market Work
Ln(Rice Price)	-0.291	-0.234	0.07	-0.271	0.026
	[0.085]**	[0.087]**	[0.083]	[0.114]**	[0.089]
Ln(Rice Price)*Net Production		-0.054	-0.035	-0.04	-0.038
		[0.015]**	[0.009]**	[0.019]**	[0.010]**
Time=1998	-0.175	-0.174	-0.134	-0.112	-0.143
	[0.025]**	[0.026]**	[0.031]**	[0.031]**	[0.033]**
Household Fixed Effects	Yes	Yes	Yes	Yes	Yes
Season Effects	Yes	Yes	Yes	Yes	Yes
Age*Gender Series	Yes	Yes	Yes	Yes	Yes
Observations	9027	9027	9027	9021	9027
R-squared	0.61	0.61	0.58	0.54	0.59

Notes: All regressions also include a constant. Robust standard errors, corrected for community/year clustering, in brackets. * significant at 10%; ** significant at 5%. 6 children that participate in agricultural work have missing data on work in household production and are omitted from column 4.

Table 4: Child Labor Participation, Rice Prices, and Net Production (2SLS)
Children 6-15 in rural panel households

	(1)	(2)	(3)	(4)	(5)
	First stage	Second Stage			
		Child labor	Work in Agriculture	Work in Hh Production	Market work
Ln(Rice Price)	-0.333	-0.221	0.079	-0.253	0.023
	[0.179]*	[0.086]**	[0.087]	[0.115]**	[0.091]
Ln(Rice Price)*Net Production		-0.061	-0.044	-0.051	-0.039
		[0.019]**	[0.014]**	[0.023]**	[0.014]**
Ln(Rice Price)*Landholdings	0.290				
	[0.033]**				
Time=1998	0.038	-0.172	-0.139	-0.112	-0.142
	[0.038]	[0.025]**	[0.031]**	[0.031]**	[0.032]**
Household Fixed Effects	Yes	Yes	Yes	Yes	Yes
Season Effects	Yes	Yes	Yes	Yes	Yes
Age*Gender Series	Yes	Yes	Yes	Yes	Yes
Observations	8626	8626	8626	8620	8626
R-squared	0.99	0.6	0.58	0.54	0.59

Notes: All regressions also include a constant. Robust standard errors, corrected for psu/time clustering, in brackets. * significant at 10%; ** significant at 5%. IV regressions instrument for Ln(Rice Price)*Net Production with Ln(Rice Price)*total annual land holdings. 6 children that work in agriculture have missing observations on work in household production and are omitted from column 4.