The Effects of Industrialization on School Enrollment and Child Labor

Maya Federman
Pitzer College
and
David I. Levine*
University of California, Berkeley

Abstract

This study examines the relationship between growth in manufacturing employment and youth outcomes in Indonesia from 1985 to 1995, a time of rapid industrialization. In comparison with cross-national studies, this study has a larger sample size of regions, defines data more consistently, and conducts better checks for causality and specification. We also distinguish between the effects of manufacturing employment in the region and in the household and explore potential causal mechanisms underlying the observed correlations. Overall, manufacturing employment in the region modestly increases enrollment and decreases labor force participation for male and female young teens. At the household level, employment of adult females in manufacturing is associated with lower enrollment, higher labor force participation, and more household responsibilities for female youth.

Keywords: Education, Industrialization, Child labor, Indonesia.

JEL codes: O1, J24, J82, O53

From Adam Smith (1776) and Marx and Engels (1848) in centuries past to the "Washington Consensus" of the 1980s and 1990s (Williamson 1990), many analysts have made the case that industrialization brings "development." The implicit assumption is that industrialization improves a nation's well-being along a number of dimensions, including education quality and attainment. At the same time, Smith, Marx, and the originator of the term "Washington

* Haas School of Business, #1900, University of California, Berkeley, CA 94720-1900, (510) 642-1697, levine@haas.berkeley.edu.

We appreciate comments from participants at seminars at U.C. Berkeley and from the authors of a companion paper with Paul Gertler and Ted Miguel (2002). Kok-Hoe Chan provided data from Podes, Jules Reinhart assisted with data from Susenas, and Garrick Blalock provided data from the Industrial Survey.

Consensus" (Williamson 1999) have warned of the potential downside of industrialization, including increased pollution, growing inequality, and lower social cohesion. Some concerns focus specifically on how industrialization can reduce investments in youth; industrialization may reduce school enrollments by drawing youth into factory work or by increasing the need for youth to help in the home.

The most encouraging evidence of the effect of industrialization on education is that, on average, those nations with high GDP and those that have largely completed the shift from agriculture to industry have healthier and better-educated children. But it is difficult to be sure of the causality in these correlations. For example, nations with above-average increases in GDP per capita from 1960 to 1990 did not enjoy above-average increases in enrollment (Easterly 1999). Similarly, the process of industrialization often, though not always, reduced child health (Steckel and Floud 1997: 425). Many authors have posited that industrialization's initially increases child labor, even if later industrialization reduces child employment (e.g., Hindman 2002). Apparently, sometimes industrialization has brought more "dark Satanic mills" than good jobs that increase family incomes.

While cross-national studies are the basis for most social scientists' understanding of how industrialization and development interact, they have a familiar set of problems: sample sizes are modest; variations in data sources and data collection methods across countries can lead to incomparable and unreliable results; results are often sensitive to variations in specifications; and the studies often examine partial correlations of growth and education without examining the causal channels that link them. Given that the cross-sectional evidence suggests industrialization is correlated with enrollment and the cross-national time series evidence does not find a relation between economic growth and enrollment, it is crucial to perform studies that look at the relation

more closely and with new sources of data. This is the first study to use data from a large nation to examine the relation between industrialization and education.

We use Indonesian individual-level data for 1985 and 1995 to examine the relationship between industrialization and investments in children, specifically school enrollment. We examine the effects of both district-level and household-level manufacturing employment. In addition to school enrollment, we also examine labor force participation and household responsibilities for youth. As in other studies of sub-national regions within a country (e.g., Barro and Sala-i-Martin in the United States (1992a) and in Japan (1992b); and Murthi, Guio, and Dreze (1995) in India), this strategy provides a number of advantages. We employ a large sample of individual- and household-level survey data from 274 districts (districts are larger than counties in the United States but smaller than states).

The uniformity of data collection across the surveys, all conducted by Indonesia's Central Bureau of Statistics (BPS), makes it possible to compare data across time and space. In addition, we check that our results are robust to a number of variations in specification. Finally, economic theory suggests that manufacturing growth will affect enrollment because it affects the costs and benefits of education. We examine potential causal channels to identify which, if any, contribute to the overall relationship of manufacturing employment on enrollments that we observe.

Offsetting these strengths are the limitations of examining a single nation over a single decade, issues we return to below. Thus, just as studies of industrialization in Great Britain or the United States must be thought of as case studies of industrialization in general, this study provides a data-rich case study of the effects of industrialization on Indonesian investments in children's human capital.

We find that at the district level, growth in manufacturing employment is associated with overall higher enrollment and lower labor force participation for young male and female teens. This effect was largely associated with rising male, as opposed to female, employment in manufacturing. At the household level, however, the employment of adult females in manufacturing is associated with lower enrollments, higher labor force participation, and more household responsibilities for young female teens. Lower transport costs to school due to better road quality, higher school density, and higher population density, as well as higher household consumption, all appear to explain a modest portion of the observed benefits of manufacturing.

The Setting

From 1967 to 1997, Indonesia was one of the world's economic success stories, with real GDP growth averaging 4.8 percent per year. The number of people living on $1 dollar a day dropped from 87.2 million in 1970 to 21.9 million in 1995 (World Bank 1999). Other indicators of development showed great progress as well: literacy rates rose, immunization rates rose, and infant mortality declined.

We study the period 1985 to 1995, a period of rapid industrialization just preceding the 1997–1998 financial crisis. This rapid growth makes Indonesia a natural case study of the effects of industrialization. From a low base of about 6 percent of the labor force in 1985, manufacturing employment more than doubled in absolute terms in the next decade. At the same time, after a generation of increasing, enrollments for teens largely stagnated: remaining constant for males age 13-15 and females age 16-17, rising only modestly for females age 13-15, and falling slightly for males age 16-17.

Schooling in Indonesia is formally free, although families must often pay for uniforms, books, and various fees. While most schools are secular, some private and publicly funded

schools have a largely Islamic curriculum. However, the centralization of education funding during this period also has important implications for generalizing these results. During this period almost all taxes were routed through Jakarta. Thus, prosperous regions did not have the option of collecting high tax revenues and expanding public services. Instead, funding was distributed to provinces and then to districts within provinces based on a complex set of budgetary rules (Gertler and Molyneaux 1994). Nationalized public finance may attenuate the relation between local economic development and enrollment that would show up across nations or in a less centralized nation (which Indonesia is becoming).[1]

Methods

Our basic methodology is to predict individual-level outcomes using family characteristics, time-varying district characteristics (such as percent manufacturing), year effects, and district fixed effects. Including district fixed effects in a two-period panel is similar to measuring the effects of changes in the percent manufacturing, holding constant all fixed factors in the region. We seek to determine the relationship between manufacturing employment in the district and the household and the youth outcomes of school enrollment, youth employment, and household responsibilities.

A first specification assumes that school enrollment of a child in household i in district d at time t depends on the presence of manufacturing employment in the district ($\%manufacturing_{dt}$), manufacturing employment in the household ($manufacturing_{idt}$), features of the household such as its size and demographic composition (X_{idt}), relatively stable features of the district (Z_{dt}), and a random error (ε). We include separate measures of female employment in

[1] Industrialization might be particularly harmful to children in a decentralized setting if regions bid for factories, at the expense of investments in children. Figlio and Blonigen find support for such costly bidding in the competition among states in the United States (2000).

manufacturing in the district and household to allow for differing effects when the employment is of females.

$$Enrollment_{idt} = \alpha + \beta_1 \% \ total\ manufacturing_{dt} + \beta_2 \% \ female\ manufacturing_{dt} + \gamma_1 \ total\ manufacturing_{idt} + \gamma_2 \ female\ manufacturing_{idt} + \delta X_{idt} + \lambda Z_{dt} + \phi \text{Year} + \varepsilon_{idt} \quad (1)$$

If we assume the model is linear and the district characteristics Z are constant over time ($Z_{dt} = Z_d$), we can eliminate all bias from unobserved district characteristics by adding a vector of district fixed effects ($\boldsymbol{District_d}$). For example, if good ports, raw materials, or dense schools influence both where factories locate and enrollment decisions, the stable portion of these regional characteristics will be absorbed by the district fixed effects.

$$Enrollment_{idt} = \alpha' + \beta'_1 \% \ total\ manufacturing_{dt} + \beta'_2 \% \ female\ manufacturing_{dt} + \gamma'_1 \ total\ manufacturing_{idt} + \gamma'_2 \ female\ manufacturing_{idt} + \delta' X_{idt} + \boldsymbol{District_d} + \phi' \text{Year} + \varepsilon_{idt} \quad (2)$$

Equation 2 is our primary specification. Problems arise because people migrate and factories do not locate at random, complications addressed in the next section.

To the extent that features of the household such as its size and demographic composition (X_{idt}) may be affected by manufacturing, we will also run versions of equation (2) without such controls. For example, if manufacturing encourages movement away from grandparents, then it may be correlated with fewer children growing up in multi-generational households. We will also examine how industrialization affects household composition and size (extending our companion paper Miguel, Gertler and Levine 2003).

We are concerned that By next week we hope to have some results with an manufacturing employment in a household ($total\ manufacturing_{idt}$ and $female\ manufacturing_{idt}$) may be endogenous as well. For example, advantaged people work in factories and have better-

educated children, it would be erroneous to conclude that factory work is beneficial to children. We will experiment with an instrument for household manufacturing employment based on the interaction of household characteristics likely to lead to manufacturing employment times manufacturing employment in a district. Intuitively, having the characteristics that make one work in manufauctring should matter more in predicting actual manufacturing employment if one is in a district with high manufauctring share of employment. That is, we will run a first stage equation for each adult person p:

$$manufacturing_{pidt} = \varphi \; Z_{pidt} + district\ fixed\ effects_i + residua_{pidt}l$$

and estimate the propensity to work in manufacturing for each person ($mfg\hat{}_{pidt} = \varphi\hat{} \cdot Z_{pidt}$). The interaction of $mfg\hat{}_{pidt}$ and % $total\ manufacturing_{dt}$ is then an instrument for actual manufacturing employment ($manufacturing_{pidt}$).

Time-varying district characteristics and reverse causality

A potential problem with this specification is that the district characteristics Z_{dt} may not be fixed over time. If other characteristics that change over time affect both factory construction and schooling, then omitting important time-varying covariates Z_{dt} from the first difference specification will bias the estimates of interest, β' and γ'. It is possible that the arrival of factories could be correlated with other district characteristics that are related to rising enrollment. Also, factories may decide to locate in a district if they expect education levels to increase.

We address this potential problem of omitted factors by controlling for potential confounding covariates that may affect both schooling and industrialization. Additionally, Appendix Table 1 provides evidence that other variables that may lead to increased enrollment, such as Duflo's measure of school building in the previous generation (2001), road quality and

returns to education, do not seem to attract factories. Most potentially important variables are not correlated with manufacturing growth. One exception is the education of adults in 1985, which does correlate with manufacturing growth when added as a quadratic: that is, districts with very high and very low education had a smaller increase in manufacturing employment than did districts with a more typical education level. Thus, the average education in the district and its square (for both adults and young adults) are included as controls in all regressions. The total number of junior high schools (private + government) in a district has no effect on future industrialization. At the same time, the mix of schools between private and public appears to matter a bit, with factories a bit more likely to locate where a higher share of the junior high schools are private. Finally, to address the concern that 1985 manufacturing employment may over-control for important factors, results were similar when we did not control for baseline manufacturing in the district (not shown).

Migration may also lead to specification problems in that factories attract a non-random set of migrants; specifically, in Indonesia young people and those with more education are more likely to migrate to work in factories than are others (Miguel, Levine, and Gertler 2002). To lessen sample selection issues due to migration, we include measures of migration as control variables. Also, as discussed further below, we check all results by running analyses once with district-level characteristics coded by the child's district of birth (instead of current district) and once coded by the adult head female's district of birth.

Potential Causal Channels

If we find a relationship between manufacturing employment and school enrollment, we are interested in understanding the potential causal paths underlying it. Thus, we consider a variety of additional endogenous factors that may change as a result of district manufacturing

growth or household manufacturing employment and whose change may help explain the observed change in enrollment patterns. We choose potential causal channels based on Becker and Tomes' classic theory of investments in children (1986), a theory which emphasizes the cost of education, the returns to education, and liquidity constraints. As detailed below, these forces suggest a set of potential mediating variables that are affected by industrialization and, in turn, can affect education: household- and district-level consumption, returns to education, school density, urbanization, and road quality. Measurement of these variables is discussed in more detail after the presentation of the results of the basic model.

We first analyze whether manufacturing growth predicts changes in the potential mediating variables. Then, for those potential mediators correlated with manufacturing growth, we add these variables to see if they reduce the estimated effects of manufacturing employment in the household and district (β' and γ'). The causal interpretation of apparently mediating relations must be examined with care because some of these potentially mediating variables may have an independent effect on manufacturing employment.

Data

We analyze data from a variety of sources collected by Indonesia's Central Bureau of Statistics (BPS). The primary source of data is the Supas Intercensal Population Survey. Additional data are drawn from the Susenas National Socio-Economic Survey, the Podes: Village Potential Statistics, and the Industrial Survey (SI). The datasets are described in Appendix A.

Most data are from the household survey and are measured at the individual or household level. Some district-level measures are constructed from the individual-level data using Supas population weights. Other district-level data are constructed by summing across local factories

(measured in the industrial survey, SI) or summing across communities (measured in the village survey PODES). To create a consistent series of districts, we combine districts that merged or split between 1985 and 1995. Because of limited data validity we drop the (now-former) province of East Timor and the province known during this period as Irian Jaya.

The primary outcome of interest is school enrollment, although we also analyze whether the teenage youth population works and whether the primary activity for females is helping in the home. We focus our analysis on outcomes for teenage youth: young teens age 13–15 and older teens age 16–17. We focus on teenagers because they are more likely than younger children to drop out of school, and we would expect potential employment to be a larger draw for these youth. Because school enrollment rates for children 8–12 are very high (over 96 percent during our sample period), we cannot easily study their variation. As expected in a nation with mandatory and near-universal enrollment, there do not appear to be important effects of manufacturing employment on younger children.[2] Enrollment rates remain modest for teens 16-17 in Indonesia; thus, it is less likely that non-enrollment of this age group represents a social problem or under-investment. As a result, our main focus is on teens 13-15, though initial results are presented for both.

Summary statistics are presented in Tables 1A and 1B. Enrollment rates for female teens did not rise much during this decade and fell slightly for males.[3] About three-fourths of youth age 13–15 were enrolled and slightly more than half of those age 16–17; both rates were higher

[2] There do not appear to be significant effects of manufacturing employment on children 8-12. If anything, female manufacturing employment in the household and district is correlated with improved enrollments for the youngest children, age 6-7, though the results are not robust to all specifications.

[3] Enrollment is defined as school attendance. Results are robust to alternate definitions of enrollment such as being in school and in the age-appropriate grade.

for young men than for young women. Similarly, young teens' labor force participation was roughly constant over the period.

The main explanatory variables of interest are manufacturing employment measured from the Supas survey. We count someone as a manufacturing worker if he or she is an employee or employer in the manufacturing sector.[4] Total and female manufacturing employment is measured at the district level as the share of potential employment among adults age 18–60. A household has a manufacturing worker if any adult age 18-60 works in manufacturing; a household has a female manufacturing worker if any adult female works in manufacturing. From 1985 to 1995, manufacturing as a share of 1985 adult population increased from 3.3 to 5.3 percent for men and from 1.9 to 3.4 percent for women. To control for possible changes in labor force participation and in-migration due to industrialization, we focus on the change in manufacturing employment as a share of total adults in the district in the base year of 1985. Because not all adults work, these rates are smaller than the manufacturing share of employment presented above.

Results

Table 2 presents results for enrollments for female and male teens age 13–15 and age 16–17. We present probit estimates of enrollment, reported as marginal effects (how the predicted probability of enrollment changes with a one-unit change of the independent variable). The probit regressions are weighted and the standard errors are adjusted for the clustering of observations at the district-year level. All regressions include district fixed effects as well as a

[4] Thus, we eliminate the self-employed and family workers.

full set of youth and household control variables.[5] The effects of the household control variables are as expected: enrollments are higher for youth who are long-time residents of the district, who live in urban areas, and who live with older and more educated household heads. Households with more children generally have lower enrollment. The proportion of adults that are male is associated with lower enrollment rates for females in both age groups.

Youth Age 13 to 15

Enrollment for youth age 13 to 15 rises with the proportion of manufacturing employment in the district (Table 2, columns 1 and 2). The effect is modest: a one standard deviation increase in manufacturing (about three percentage points of the potential labor force, almost doubling the mean 1985 level) predicts 3.8 percentage points higher enrollment (about one-third of a standard deviation). For males, this positive effect is almost entirely due to a region's male manufacturing employment; the coefficient on female manufacturing employment in the district is almost as large as that for total manufacturing employment and negative.

In contrast, manufacturing employment in the household has different effects for male and female teens. For female youth, having an adult female manufacturing employee in the household predicts 5.7 percentage points lower enrollment. The effect for male youth is opposite; having an adult female manufacturing worker in the household predicts 3.4 percentage

[5] Urban location, district average adult and young adult education and their squares, age and squared age of household head, number of household members, education of male and of female head, proportion adults and proportion children in household, proportion of children and of adults who are male, and indicator variables for age, urban, whether the youth migrated since birth or in the last five years, no male household head, no female head, year is 1995.

points higher enrollment for males. Having an adult male manufacturing worker in the household is not associated with changed enrollments for younger teens.[6]

We examine two possible explanations for the connection between employment of an adult female in the household and declining enrollments for young female teens. First, girls' responsibilities at home may increase when their mothers work in manufacturing. Second, employment of a woman in the household may increase the opportunities for the younger females to work in factory jobs. These possibilities are explored in Tables 3 and 4, respectively. Together, these channels appear to account for much of the observed difference in enrollments associated with having a female manufacturing worker in the household.

Having an adult female manufacturing worker in the household raises the likelihood that a girl age 13–15 responded to a survey question that her "primary activity" the previous week was housekeeping (as opposed to school or paid work) by 2.1 percentage points (Table 3).[7] Thus, female adult employment does appear to increase girls' responsibilities at home.

> *The next draft will also emphasize the responsibilities of the oldest daughter, as emphasized in the qualitative literature:*
>
> *school enrollment versus housekeeping = normal stuff*
>
> *+ I am the oldest daughter & there are younger kids in the household*

Female adult employment in manufacturing is also correlated with younger women's employment. Having an adult female manufacturing worker in the household raises the likelihood that a girl works more than 20 hours per week by 4.8 percentage points. This is a

---

[6] The increases in enrollment for male youth associated with an adult female manufacturing worker in the household could be a result of working women having both more bargaining power and a higher preference for youth education than that of the adult male in the household (the husband), although we have no direct evidence on this point.

[7] Some female youth who reported their main activity was housework were also enrolled in school.

substantial increase, over half the mean probability of working (9 percent), and close to the decline (5.7 percentage points) in enrollments predicted for female youth in having an adult woman in her household work in manufacturing. The correlation between adult female and young women employment could be causal if the working woman provides a role model or job linkages to the young woman. The correlation may also be due to factors that affect them both such as good local job opportunities for women; a family's high need for earnings, or a head of household who approves of women working outside the home.

The relationship between district level manufacturing employment and participation in the labor force by female and male youth is also examined in Table 4. Consistent with the result that district manufacturing employment is associated with higher enrollments, it is also associated with decreased labor force participation of youth 13-15.[8] The decrease in youth employment is primarily associated with increased male manufacturing employment. A three percentage point increase in manufacturing employment predicts two percentage points fewer young male workers and 1.5 percentage points fewer young female workers.

Youth Age 16 to 17

By age 16, average enrollment rates are much lower; only 52 percent of those age 16–17 are enrolled versus 75 percent of those age 13–15. Work is also more prevalent: roughly twice the proportion of older youth as younger youth worked more than 20 hours a week (see Table 1A). Lower enrollment and higher employment rates for those 16 and over are not generally considered a social problem in Indonesia.

[8] We focus on employment of over 20 hours per week; results are similar if we examine youth who had any paid employment.

Unlike for those age 13–15, average manufacturing employment in a district is not a statistically significant predictor of enrollment levels for older youth. The coefficients are of the same sign as for the younger teens, but are not statistically significant. Manufacturing employment in the household now predicts lower enrollment for both sexes, though for female youth only adult female manufacturing employment predicts statistically significant lower enrollment. A manufacturing worker in the household is associated with a 4.4 percentage point decline in enrollment for older male youth; the effect for females is roughly double.

Not surprisingly, manufacturing employment at the district and household level is positively related to work for these older youth, though the pattern of results for young men and young women is different (Table 4). Male manufacturing in the district is positively related to employment levels for older male youth; a one percentage point increase raises employment by one percentage point. District manufacturing employment does not predict increased employment for females age 16–17. At the household level, the presence of a manufacturing worker is associated with roughly 4 percentage points greater work participation for both male and females. The increase in work is especially large for female youth if the household manufacturing worker is an adult female, an increase of 14 percentage points.

Finally, increased female manufacturing in the district is associated with a decrease in the likelihood that the primary activity of young women age 16–17 is housekeeping (Table 3). This result may imply that these young women are drawn out of household production into formal work. Having an adult female manufacturing worker in the household is not associated with increased household responsibilities for older teens. The increased employment options for these young women may offset the increased need for household working resulting from other women in the household working in manufacturing.

Do Potential Causal Channels Contribute to the Observed Relationship Between Manufacturing and Enrollment?

We next consider variables that are candidate channels for the positive relationship between industrialization and enrollment that is observed for young teens. These include district-level consumption, urbanization, various measures of school accessibility, and the returns to education and consumption expenditures at the household level. To mediate the observed relationship between industrialization and enrollments, two relationships must hold: (1) the mediating variable must vary with industrialization; and (2) enrollments must vary with the variable. We first discuss the various potential mediators that we consider and then present estimates of the relationship between industrialization and the mediators. Finally, we re-estimate the relationship between enrollment and manufacturing employment with the inclusion of those potential mediators that are related to manufacturing growth.

Potential causal channels

We examine several potential causal channels for the relationship between industrialization and education:

Returns to education

The returns to education may rise or fall as a region industrializes, depending on the type of production. Some labor-intensive assembly plants demand low skills and may also hire under-age workers, but even such plants do not demand lower skills than agriculture. Working in the other direction, industrialization in Indonesia may have led firms to begin producing products that require more medium-skilled workers, in which case physical and human capital are complementary (Feenstra and Hanson 1996). Because only one-third of Indonesians who work receive wages (as opposed to being self-employed, farmers, or informal employees in family and

other small businesses), it is not possible to use a wage equation to estimate the returns to education. Instead, we estimate the returns to education in each district based on consumption expenditures of their household. That is, we estimate an equation of the form:

$$ln(consumption_{idt}) = a_d * district_d + b_{1d}\, male\ head's\ education_{idt} * district_d + X_{idt,} \qquad (3)$$

where $district_d$ is a dummy equal to one in district d and X_{idt} is a broad set of controls for household characteristics. The vector of coefficients b_{1d} represents the estimated returns to education for men in that district.[9] An analogous equation replacing the education of the male head with the education of the female head provided estimates of women's return to education.[10] For men and women in both 1985 and 1995 the mean return across districts was approximately 4% per year, with a standard deviation across districts of 1.3% in 1985 and 1.1% in 1985 (Table 1B).

Access to schools

To the extent that industrialization promotes urbanization or population density more generally, industrialization may indirectly affect enrollment by increasing school accessibility through decreased travel costs or other means (Duflo 2001). For measures of density and school accessibility, we use urbanization, the share of the district's youth living in the same community as a junior high or high school, and the number of private and the number of government junior

[9] As is true in all OLS estimates of the returns to education, the estimated return to education can be biased up if those with the highest levels of education would have done well in the labor market or marriage market even if they had not attended more school. To the extent that this bias is constant across Indonesia it will not affect our analyses.

[10] This measure of consumption returns to education differs from the more traditional wage returns. In Indonesia, as in most countries, the family background and academic achievement of spouses tend to be correlated. Unlike a wage equation, this method includes the fact that more-educated people have a higher likelihood of marrying a more prosperous spouse. That is, this measure indicates the entire private return to education (including the benefits of marrying a higher-earning spouse) that is appropriate when choosing whether to invest in additional education.

high schools per 1,000 students. We also consider road quality because improvements may reduce travel costs.

Regional living standards

Industrialization both employs people directly and increases employment in related business services and among some suppliers too small to be picked up as manufacturing by our definitions. Higher incomes for these employed people can in turn increase employment for those who provide locally made goods and services. To the extent that migration or capital mobility take time to equilibrate wages in different regions, industrialization in a local labor market will push up average incomes. If Indonesian enrollment is responsive to incomes, then industrialization may increase enrollment by increasing median expenditures. As poor people may be particularly likely to face binding liquidity constraints, we consider expenditures at the twentieth percentile in addition to median expenditures as a potential mediator.[11]

Household consumption levels and liquidity constraints

If children's educational attainment is reduced by some families' liquidity constraints, then higher household income and consumption should predict higher education. Moreover, to the extent that education is a normal consumption good (and is not just an investment), education expenditures will rise with total household expenditures. Liquidity constraints are more likely to reduce enrollment for the poor. If so, any rise in inequality or poverty that accompanies industrialization can offset the benefits of rising average ability to pay. We use household consumption as our measure of household resources.

[11] District medians and 20th percentiles are calculated from the log expenditure per capita of households. Household expenditure data are available in the 1985 Supas. For 1995, we draw expenditure data from the Susenas because consumption data were not collected in Supas for that year.

Which of the potential mediators are related to manufacturing growth?

Tests of whether each candidate mediator varies with industrialization are found in Table 5. At the district level, growth in the log of median consumption expenditures, growth in the 20th percentile of expenditures (proxying for poverty), urbanization, improved road quality, and increases in the number of private junior high schools per 1,000 students are all correlated with growing manufacturing employment.[12] The odds of living in the same community as a junior high school, government junior high schools per capita, and returns to education for both men and women are not related to rising manufacturing employment.

> The next draft will have examine which, if any, measures of household size and composition are correlated with %mfg. xx

Do these factors mediate the relationship between manufacturing and enrollment?

Table 6 presents evidence on whether the several potential mediating variables contribute to the observed relationship between manufacturing employment and school enrollments. We are looking for a reduction in the effects of enrollment when controlling for the potential mediating variable. We present only enrollment of those age 13–15 because district manufacturing is not statistically significantly correlated with enrollment for older youth.[13]

Columns 1 and 4 duplicate the analysis from Table 2 for the females and males, respectively. Columns 2 and 5 add in district measures of expenditures at the 20th percentile, the

---

[12] One concern is that number of private junior high schools in a district both predicts factory arrival (Appendix Table A1) and is predicted by factory arrivals (Table 5). Thus, from these correlations it is possible that a fixed factor leads both to private schools and to industrialization or that a region with a high trend in new private junior high construction has been attracting factories both before and since 1985. In fact, these alternative causal paths do not appear important because private junior high school building is negatively autocorrelated. Thus, the causal interpretation we have been using, where factories attract schools, appears most consistent with the data.

[13] The relationship between the candidate channels and enrollments for youth age 16-17 are similar to those reported for youth age 13-15.

number of private junior high schools per 1,000 students, and road quality in predicting enrollments. Consumption growth measured at either the median or the 20th percentile was negatively related to enrollment growth.[14] Both private junior high schools per 1,000 youth and road quality are positively correlated with growing enrollment. With the inclusion of these three district level controls, the coefficient on percent manufacturing in the district declines somewhat from 1.26 to .80 for females and from 1.23 to .92 for males though the declines are not statistically significant. Columns 3 and 6 test for the importance of population density by removing urbanization from our initial set of control variables. As expected, the coefficient on percent manufacturing rises, from 1.23 to 1.35 for males and from 1.26 to 1.5 for females. Again, these changes are small and not statistically significant.[15] Overall, this evidence is consistent with the hypothesis that manufacturing affects enrollment through these channels, but the evidence is not strong.

We look at the effect of adding household-level consumption in columns 7 though 10. Household consumption is available in the 1985 Supas we have been analyzing, but not the 1995 Supas. Thus, we turn to the 1995 Susenas, a similar household survey. Columns 7 and 9 recreate the initial analysis but with Supas data for 1985 pooled with Susenas data for 1995.[16] Household consumption is then added in columns 8 and 10. As expected, households with high expenditure have higher enrollments. The coefficient for manufacturing employment drops by

---

[14] The result for median expenditures is similar and thus not reported.

[15] This evidence is consistent with the hypothesis that manufacturing may affect enrollment partly by bringing people near schools. At the same time, urbanization presumably attracts factories, so some of the apparent mediating effect may be due to alternative causality; that is, population growth for an exogenous increase may increase both factory growth and enrollment growth.

[16] Thus, column one uses the 1985 and 1995 Supas, while columns 7 and 8 use the 1985 Supas and the 1995 Susenas. Although the survey questions are similar, the season of the survey differs, making it more difficult to compare enrollment across survey years. This measurement error may explain the lower coefficient on the percent manufacturing in the district. The positive relationship between the presence of a female manufacturing worker in the household and enrollment of male youth is not robust to the switch in datasets.

one-fifth (change not significant). That is, only a modest share of the effect of manufacturing appears to operate by increased consumption.

In short, the evidence on which causal channels matter is suggestive but inconclusive. That is, adding in measures of most of the potential causal channels reduces the coefficient on manufacturing in predicting enrollments. Collectively, the measures of the supply and demand for education reduce the estimated effect of manufacturing by roughly one-third. Nevertheless, the changes are not estimated with sufficient precision to be statistically significant.

> The next draft will have results when we remove the potentially endogenous measures of household size and composition. Xx

> The next draft will have results on our instrumental variables strategy for household manufacturing employment.

The role of foreign ownership

We were also interested in whether the relationship between school enrollment and manufacturing varies with the ownership of the manufacturing in the area. An important issue in debates concerning globalization is how direct foreign investment (DFI) affects children in poor nations, including concern that young workers may leave school in favor of employment.[17] The period 1985 to 1995 was a period of enormous reduction in trade and investment barriers for

[17] Nike, for example, received substantial censure when it was revealed that some of its factories employed very young workers (Connor 2001).

Indonesia, leading to a rapid expansion of international trade and foreign investment. Direct foreign investment may demand different skills than domestically owned firms and thus may have distinct effects on the demand for education. In addition, because foreign-owned plants are often visible to citizens, regulators, and the foreign press, they may have above-average incentives to avoid hiring child workers.

The share of manufacturing employees working in plants with substantial direct foreign investment at the district level is added in Table 6, columns 11 and 12. This share is measured using data from the establishment-level Industrial Survey.[18] The share of district manufacturing employment that is DFI is positively related to enrollment for males, but not females. The relationship between youth employment and the share of manufacturing that is DFI was insignificant.[19]

Robustness checks

An important concern is that migration may lead to selection bias. For example, if highly skilled people migrate to be near factories and also enroll their children in school at higher rates than lower-skilled workers, then some of the correlation between industrialization and enrollment may be explained by omitted parental skills (even after we control for parental education).[20]

We are able to deal with the issue of migration thoroughly because we know both the current district and the district of birth of our sample. First, measures of whether a youth has moved since birth or in the previous five years are included in all regressions. In addition, we re-

[18] The relative scarcity of foreign-owned plants led to the estimates on foreign-owned factories to be quite imprecise.

[19] Results not shown.

[20] Migration rates are positively correlated with higher education and with manufacturing employment.

ran regressions with the district-level characteristics coded by district of birth of both the youth and the head female in the household rather than by the child's current residence. We also estimated the relationship between enrollment and manufacturing, dropping all families that did not live in the head female's district of birth. In all cases, results were similar to those reported.

Another concern is that manufacturing employment might merely be a proxy for the beneficial effects of formal-sector employment more generally. We defined formal-sector employment as any employment paying a wage (as opposed to family and self-employment and most agriculture). Formal employment covers about a third of the economically active adults. Like manufacturing employment, formal-sector employment in the district is also positively correlated with school enrollment. The coefficient on manufacturing employment, however, remains roughly the same after controlling for formal employment.

We also examined whether the district effect comes from the effects of manufacturing employment in the same town or village, or whether the entire district matters. To address this point we include a measure of manufacturing employment within the enumeration area to capture whether the local area had manufacturing employment.[21] For young men, the positive effect of manufacturing employment on enrollment in the enumeration area is about one-fifth of the effect in the district. This result suggests that the local market has an effect above and beyond the effect of the district. Given the high measurement error using the enumeration area to capture the local market, this result is also consistent with the possibility that the estimated effect of district manufacturing employment is proxying for the more local labor market. The coefficients on both district and household manufacturing remain the same with the inclusion of

[21] Manufacturing employment at this level is measured with considerable error because of the small number of households (sixteen) in each enumeration area sample.

neighborhood manufacturing. Similarly, coefficients for district manufacturing and household manufacturing employment are of the same sign and similar magnitude with fewer controls.

A final concern is that the manufacturing share of employment in a district may be measured with error. Although sample sizes are large, the percent manufacturing in each district is small. To address this concern, we instrumented the measure of manufacturing employment share from the Supas survey with a measure of manufacturing employment and a measure of factories per capita from the establishment-level Industrial Survey. These measures of manufacturing employment correlated highly with the Supas measure both in levels and changes. Results were similar when correcting for measurement error in the share of manufacturing employment.

Summary

One of the concerns with industrialization is that youth will be drawn out of school due to lower returns to education, higher need for children to care for younger siblings, and higher demand for youth labor in factories. Yet, in investigating the relationship between manufacturing employment at the district level and youth outcomes, we find a modestly positive correlation. Growth in industrial employment at the district level is positively correlated with higher enrollments and lower youth labor force participation, supporting a more optimistic view. Still, at the household level, having an adult female manufacturing worker in the household is correlated with lower enrollment and increased responsibilities in the home for female youth. Though having an adult female manufacturing worker in the household is also somewhat related to higher enrollment for male youth age 13–15

We investigated several possible causal channels for the observed positive relationship between a region's growing manufacturing employment and enrollments. Districts with more

manufacturing growth have more household-level consumption, higher urbanization, higher school density, and better roads. While all are related to enrollment, none of these factors strongly mediates the district-level correlation between industrial employment and enrollment changes. The continuing importance of industrialization in a region even after controlling for the several causal channels may be due to measurement error on our measures of the supply of and demand for education. At the same time, more sociological forces other than traditional supply and demand factors may also play a role. For example, Akerlof and Kranton (2002) discuss the potentially important role of social construction of identity. It is possible that industrialization is associated with a shift to a more stereotypically "modern" outlook and that families who live in modern-oriented communities are more likely to send their children to school. While provocative, this possibility remains untested.

This study covers a single nation during a single decade. Thus, one must be cautious about generalizing. For example, during this period education financing was highly centralized. Thus, industrialization that increased tax revenues in the nation could be spent on education nationally, not necessarily in the industrializing region. In a less centralized regime, industrialization might affect local enrollments much more strongly by increasing public sector revenues. In 2002, Indonesia largely shifted to a decentralized model of public finance, where districts retain most of the tax revenue they collect. It is plausible that this shift in tax policy will strengthen the relation between industrial development and school enrollment. Additionally, Indonesian industrialization has had a distinctive industrial mix; it is plausible that other industrial mixes would affect enrollment differently.

Overall, the relatively benign effects of industrialization on school enrollment are reassuring. What remains to be understood is what drives the relationship—an important area

for future research in Indonesia and in other nations. Similarly, it is also important to understand how industrialization affects other outcomes for children and youth, including health, where the benefits of higher incomes may or may not outweigh the costs of potentially higher pollution. These topics remain active areas of research.

Appendix: Data Sources

Supas: The Intercensal Population Surveys

The primary sources of data are the 1985 and 1995 Intercensal Population Surveys (Supas), each of which has responses from roughly 240,000 households. The Supas 1995 contains data on more than 200,000 households that include almost 950,000 people; this represents almost 104,000 youth age 13–17 from 74,000 households. The Supas 1985 includes 124,000 households with almost 600,000 people, including 66,000 youth from 45,500 households. Households are interviewed to obtain information regarding household characteristics and individual characteristics such as work, school attendance and attainment, and migration. The Supas sample was selected to be representative for each of Indonesia's roughly 300 districts. The survey over-samples smaller districts to increase precision.

Susenas: National Socio-Economic Survey

The National Socio-Economic Survey (Susenas) is an annually repeated cross section. It surveyed between 20,000 and 50,000 households per year in the mid-1980s and approximately 200,000 households per year by the mid-1990s. Susenas collects information on the general welfare of each household member in areas such as school enrollment, health, and mortality. Sampling rules follow those of the Supas. We used the Susenas survey to obtain household consumption data and derive district consumption data for 1995.

PODES: Village Potential Statistics

The Village Potential Statistics (PODES) survey provides information about the characteristics of villages or urban neighborhood. Roughly 65,000 village heads complete the survey about their villages. Data on road quality and school density were derived from the 1986 and 1996 Podes surveys. For most measures we average the village-level responses to the district level, typically weighting by population.

The Industrial Survey

The Industrial Survey is an annual census of employers with over 20 employees. Data on factories, employment, and direct foreign investment employment were derived from the 1985 and 1995 Industrial Survey.

References

Akerlof, George, and Rachel Kranton. 2002. "Identity and Schooling." *Journal of Economic Literature,* 40(4) (Dec): 1167–1201.

Becker, Gary S., and Nigel Tomes. 1986. "Human Capital and the Rise and Fall of Families." *Journal of Labor Economics,* 4(3): S1–39.

Barro, Robert J., and Xavier Sala-i-Martin. 1992. "Convergence." *Journal of Political Economy*, 100(2) (April): 223–251.

Barro, Robert J. and Sala-i-Martin, Francesc Xavier, "Regional Growth and Migration: A Japan-U.S. Comparison" (March 1992). NBER Working Paper No. W4038.

Connor, Tim. 2001. *Nike's Labor Practices in the Three Years since CEO Phil Knight's Speech to the National Press Club*. San Global Exchange, San Francisco, May. [http://www.globalexchange.org/economy/corporations/nike/NikeReport.pdf]

Duflo, Esther. 2001. "Schooling and Labor Market Consequences of School Construction in Indonesia: Evidence from an Unusual Policy Experiment." *American Economic Review*, 91(4) (Sept): 795–813.

Easterly, William. 1999. "Life during Growth: International Evidence on Quality of Life and Per Capita Income," World Bank WPS 2110 (May).

Feenstra, Robert C., and Gordon H. Hanson. 1996. "Globalization, Outsourcing, and Wage Inequality." *American Economic Review*, 86(2) (May): 240–245.

Figlio, David N. and Bruce A. Blonigen, "The Effects of Foreign Direct Investment on Local Communities," *Journal of Urban Economics*, Vol. 48 (September 2000), pp. 338-363.

Gertler, Paul J., and John W. Molyneaux. 1994. "How Economic Development and Family Planning Programs Combined to Reduce Indonesian Fertility. *Demography*, 31(1) (Feb.): 33–63.

Goldin, Claudia, and Lawrence F. Katz. 1998. "The Origins of Technology-Skill Complementarity." *Quarterly Journal of Economics*, 113(3) (August): 693–732.

Hindman, Hugh D., *Child Labor: An American History.* Armonk NY, M.E. Sharpe, 2002.

Krueger, Alan B., and Mikael Lindahl. 2001. "Education for Growth: Why and for Whom?" *Journal of Economic Literature*, 39(4) (Dec.): 1101–1136.

Miguel, Ted, Paul Gertler and David I. Levine. 2002. "Did Industrialization Destroy Social Capital in Indonesia?" mimeo, University of California, Berkeley.

Murthi, Mamata, Anne-Catherine Guio, and Jean Dreze. 1995. "Mortality, Fertility, and Gender Bias in India: A District-Level Analysis." *Population and Development Review*, 21(4), (Dec): 745–782.

Marx, Karl, and Friedrich Engels. [1848] 1955. *The Communist Manifesto*. Arlington Heights, Ill.: Harlan Davidson.

Narayan, Navin. 1997. "Stolen Childhoods: Tackling the Health Burdens of Child Labor." *Harvard International Review*, 19(4) (Fall): 50–51+.

Smith, Adam. [1776] 1982. *The Wealth of Nations*. New York: Penguin Books.

Steckel, Richard, and Roderick Floud, eds. 1997. *Health and Welfare during Industrialization.* National Bureau of Economic Research Project Report. Chicago: University of Chicago Press.

Stiglitz, Joseph E. 1998. “More Instruments and Broader Goals: Moving toward the Post-Washington Consensus.” Helsinki: UNU/WIDER.

------. 1999. "The World Bank at the Millennium." *Economic Journal*, 109 (459), F577–97.

Williamson, John. 1990. "What Washington Means by Policy Reform." In J. Williamson, ed., *Latin American Adjustment: How Much Has Happened?* Washington: Institute for International Economics.

------. 1999. “What Should the Bank Think about the Washington Consensus?” Institute for International Economics, Washinsgton, D.C., July [http://www.iie.com/papers/williamson0799.htm]

World Bank. 1999. “Indonesia and Poverty” in *Social Policy and Governance in the East Asia and Pacific Region*, [http://www.worldbank.org/poverty/eacrisis/countries/indon/pov1.htm]

Table 1A: Summary Statistics
Means and standard deviations

Dependent Variables

Females

School enrollment	1985	1995	Growth
age 13-15	70.5%	74.4%	3.9%
	14.7%	12.4%	11.6%
age 16-17	48.4%	48.5%	0.0%
	19.1%	18.5%	14.2%

Work more than 20 hrs/week	1985	1995	
age 13-15	10.4%	7.9%	-2.6%
	6.7%	5.3%	7.0%
age 16-17	20.0%	19.0%	-1.0%
	12.0%	10.2%	10.8%

Helping at home is primary activity			
age 13-15	8.2%	11.7%	3.6%
	6.4%	7.9%	6.6%
age 16-17	18.2%	24.4%	6.2%
	12.0%	14.9%	12.4%

Males

School enrollment	1985	1995	Growth
age 13-15	76.8%	77.3%	0.6%
	14.0%	12.3%	10.6%
age 16-17	58.3%	54.1%	-4.3%
	18.8%	17.6%	14.8%

Work more than 20 hrs/week	1985	1995	
age 13-15	13.3%	12.0%	-1.3%
	8.7%	7.6%	8.3%
age 16-17	29.4%	29.9%	0.6%
	15.2%	13.4%	13.4%

Measures of Manufacturing Growth

Growth in Mfg (1995	1.96%
%mfg - 1985 %mfg)	0.026
Growth in Female Mfg	1.48%
(1995 %mfg - 1985	0.022
Growth in Mfg ((1995 -	3.39%
1985 mfg workers)/	0.044
	N = 274

District Manufacturing Employment

	1985 Sample	1995 Sample	85/95 Pooled Sample
Proportion mfg.	3.30%	5.34%	4.30%
workers in district	0.030	0.049	0.042
Proportion female	1.88%	3.40%	2.62%
mfg. workers	0.024	0.038	0.032
N =	274	274	548

Note: District means are weighted by population. Individual means are weighted by Supas sample weights.

Table 1B: Summary Statistics

Means and standard deviations

District Characteristics	1985 Sample	1995 Sample	Pooled Sample
Private jr. high /	2.194	1.996	2.114
1000 youth	0.897	0.840	0.891
Govt. jr. high /	1.050	1.206	1.142
1000 youth	0.622	0.652	0.652
% of youth in same	0.486	0.528	0.506
community as a jr. high	0.236	0.210	0.223
District 20th percentile	2.299	2.409	2.353
ln(expenditures/capita)	0.245	0.279	0.267
District median	2.644	2.736	2.689
ln(expenditures/capita)	0.245	0.312	0.283
District returns to	0.042	0.040	0.041
education (Male)	0.013	0.011	0.012
District returns to	0.042	0.042	0.042
education (Female)	0.013	0.011	0.012
	0.273	0.361	0.315
Urban	0.302	0.304	0.305
Education of adults	5.017	6.730	5.864
(age 25-50)	1.594	1.550	1.790
Education of young	7.007	8.503	7.745
adults (age 18-22)	1.473	1.343	1.602
	1.240	1.586	1.411
Road Quality	0.400	0.323	0.404
#districts	274	274	548

Individual/Family Characteristics	1985 Sample	1995 Sample	Pooled Sample
	0.065	0.087	0.077
Migrated since birth	0.247	0.282	0.266
	0.029	0.037	0.033
Migrated since 5 yrs ago	0.167	0.189	0.179
	44.075	43.901	43.956
Age of Head	10.424	10.195	10.268
Number of household	6.439	5.520	5.810
members	2.161	1.801	1.969
	5.234	6.245	5.926
Education of head male	3.709	3.714	3.742
	3.922	5.167	4.774
Education of head female	3.418	3.575	3.574
No male spouse in	0.085	0.075	0.078
household	0.279	0.263	0.268
No female spouse in	0.025	0.025	0.025
household	0.155	0.157	0.156
Proportion adults in the	0.413	0.460	0.445
household	0.142	0.149	0.149
Proportion kids in the	0.562	0.511	0.527
household	0.144	0.147	0.148
	0.515	0.512	0.513
Proportion of kids male	0.298	0.335	0.324
	0.477	0.481	0.480
Proportion of adults male	0.176	0.172	0.173

Notes: Returns to education are estimated from a consumption expenditures equation, as described in the text. District means are weighted by population. Individual means are weighted by Supas sample weights.

Table 2: Predicting School Enrollment

	Females		Males	
	Age 13-15	Age 16-17	Age 13-15	Age 16-17
Proportion mfg. workers in district among those 18-60	**1.264** **(3.29)*** **	0.689 (1.34)	**1.229** **(3.63)*** **	0.682 (1.17)
Proportion female mfg. workers in district	-0.607 (1.32)	-0.924 (1.50)	**-0.908** **(2.05)** **	-1.147 (1.65)*
Manufacturing worker is present in the household	-0.002 (0.22)	-0.025 (1.27)	-0.009 (0.77)	**-0.044** **(2.66)*** **
Female manufacturing worker is present in the	**-0.057** **(2.61)*** **	**-0.088** **(2.86)*** **	**0.034** **(2.05)** **	0.004 (0.16)
Urban	0.109 (11.07)***	0.224 (15.77)***	0.088 (12.27)***	0.193 (16.00)***
Education of Adults (age 25-50)	0.025 (1.26)	-0.009 (0.26)	0.011 (0.60)	-0.03 (0.95)
Square of Adult Education	-0.004 (2.13)**	-0.004 (1.57)	-0.003 (2.07)**	-0.002 (0.83)
Education of Young Adults (age 18-22)	0.001 (0.05)	-0.005 (0.12)	0.022 (1.02)	0.021 (0.46)
Square of Young Adult Education	0.004 (1.89)*	0.007 (2.17)**	0.002 (0.98)	0.005 (1.77)*
Migrated since birth	-0.07 (5.21)***	-0.099 (4.23)***	-0.027 (2.12)**	-0.049 (2.76)***
Migrated since 5 yrs ago	-0.362 (12.71)***	-0.308 (11.38)***	-0.109 (4.61)***	-0.136 (4.57)***
Age of Head	0.002 (6.26)***	0.005 (10.99)***	0.002 (8.74)***	0.003 (6.19)***
Square of Age of Head	-0.005 (2.42)**	-0.006 (2.18)**	-0.001 (0.66)	0.004 (1.52)
Number of Household Members	0.002 (1.22)	0.006 (2.24)**	0.002 (1.24)	fv (2.53)**
Education of Male Household Head	0.022 (19.93)***	0.028 (15.22)***	0.023 (27.31)***	0.04 (25.71)***
Education of Female Household Head	0.021 (18.65)***	0.034 (17.61)***	0.02 (19.80)***	0.032 (18.87)***
No male spouse in household	-0.065 (6.31)***	-0.01 (0.68)	-0.068 (7.68)***	-0.086 (6.44)***
No female spouse in household	-0.068 (4.14)***	0.001 (0.03)	-0.05 (3.39)***	-0.001 (0.04)
Proportion adults in the household	-0.023 (0.66)	0.183 (3.27)***	-0.001 (0.04)	0.064 (1.26)
Proportion kids in the household	-0.162 (3.86)***	0.022 (0.36)	-0.104 (3.30)***	-0.088 (1.50)
Proportion of kids male	-0.012 (0.97)	-0.031 (1.71)*	-0.004 (0.44)	0.041 (2.18)**
Proportion of adults male	-0.032 (2.16)**	-0.195 (8.29)***	0.002 (0.14)	0.001 (0.03)
Age 13 (Age 16)	0.207 (34.64)***	0.118 (16.79)***	0.161 (36.50)***	0.105 (13.61)***
Age 14	0.093 (17.20)***		0.08 (15.71)***	
Year is 1995	-0.082 (6.96)***	-0.133 (5.85)***	-0.085 (6.80)***	-0.205 (9.49)***
Observations	51966	31004	54665	31835

Robust z statistics in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Weighted probits reported as marginal effects (dp/dx); 273 district fixed effects included; standard errors are robust to heteroskedasticity and to clustering at the district-year level.

Table 3: Predicting Helping at Home as the Primary Activity for Females

	Age 13-15	Age 16-17
Proportion mfg. workers in district among those 18-60	0.387 (1.89)*	0.166 (0.46)
Proportion female mfg. workers in district	-0.557 (2.28)**	-0.921 (2.09)**
Manufacturing worker is present in the household	-0.008 (1.22)	-0.006 (0.58)
Female mfg. worker is present in the household	0.021 (1.78)*	-0.01 (0.53)
Urban	-0.036 (7.81)***	-0.082 (8.94)***
Observations	51878	31004

Robust z statistics in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4: Predicting Working More than 20 Hours per Week

	Females		Males	
	13-15	16-17	13-15	16-17
Proportion mfg. workers in district among those 18-60	-0.499 (2.57)**	-0.222 (0.52)	-0.65 (3.38)***	-1.036 (2.29)**
Proportion female mfg. workers in district	0.397 (1.74)*	0.764 (1.54)	0.472 (1.87)*	1.252 (2.34)**
Manufacturing worker is present in the household	0.005 (0.68)	0.037 (2.78)***	0.012 (1.39)	0.047 (2.96)***
Female mfg. worker is present in the household	0.048 (4.01)***	0.113 (5.38)***	-0.013 (1.06)	0.005 (0.25)
Urban	-0.02 (4.23)***	-0.073 (7.33)***	-0.048 (9.47)***	-0.142 (11.85)***
Observations	51966	31004		31835

Robust z statistics in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

Notes to Tables 3 and 4: Weighted probits reported as marginal effects (dp/dx); 273 district fixed effects included as well as the full set of control variables in Table 2: average and square education of adults and young adults, age and squared age of household head, number of household members, education of male and of female head, proportion adults and proportion children in household, proportion of children and of adults who are male, and indicator variables for age, urban, migrated since birth, migrated since 5 years ago, no male household head, no female head, year is 1995. Standard errors are robust to heteroskedasticity and to clustering at the district*year level.

Table 5: Does Growth in Manufacturing Employment Predict the Potential Moderators

	Growth in 20th %ile ln(exp/cap)	Growth in median ln(exp/cap)	Growth in road quality	Growth in % near a junior high	Growth in % near a high school	Growth in govt junior highs/1000 youth	Growth in private junior highs/1000 youth	Growth in female returns to education	Growth in male returns to education	Growth in urbanization
Growth in total manufacturing	1.82	1.406	0.697	0.296	0.134	-0.531	15.143	-0.055	-0.047	2
	(2.52)**	(2.08)**	(1.27)a	(0.92)	(0.26)	(0.22)	(2.48)**	(1.47)	(0.97)	(2.80)**
Growth in female manufacturing	0.464	1.092	1.112	0.03	0.455	-3.813	-17.343	0.051	0.032	-0.143
	(0.51)	(1.25)	(1.39)a	(0.06)	(0.52)	(0.81)	(1.56)	(1.17)	(0.52)	(0.22)
Value of dependent variable in 1985	-0.775	-0.697	-0.364	-0.217	-0.36	-0.583	-0.619	-0.871	-0.863	-0.146
	(15.37)***	(10.40)***	(5.88)***	(3.56)***	(4.96)***	(6.50)***	(10.16)***	(16.74)***	(11.79)***	(7.32)***
Percent of district urban in 1985	0.32	0.353	-0.064	-0.043	0.094	0.059	0.367	0.008	0.009	0.109
	(7.28)***	(5.59)***	(0.98)	(0.92)	(1.53)	(0.25)	(0.74)	(6.22)***	(3.70)***	
Constant	1.729	1.771	0.605	0.282	0.167	1.474	2.075	0.028	0.027	
	(16.71)***	(10.67)***	(12.42)***	(19.65)***	(24.59)***	(8.12)***	(12.40)***	(11.71)***	(9.80)***	(20.71)***
Observations	274	274	274	274	274	274	274	274	274	274
R-squared	0.64	0.53	0.55	0.59	0.47	0.37	0.5	0.67	0.65	0.33

Robust t statistics in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%, [a] jointly significant at 1%

Weighted regressions with province fixed effects. Standard errors are robust to clustering at the province level. Growth in manufacturing is measured as 1995 percent manufacturing -1985 percent manufacturing. Returns to education are estimated from a consumption expenditures equation as described in the text.

Table 6: Moderators in Predicting School Enrollment

	Adding District Channels						Adding Household Channels				Adding DFI	
	Females			Males			Females		Males		Females	Males
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Proportion mfg. workers in district among those 18-60	1.264 (3.29)***	0.797 (2.07)**	1.501 (3.86)***	1.229 (3.63)***	0.923 (2.68)***	1.346 (4.08)***	0.955 (2.27)**	0.751 (1.71)*	1.179 (3.29)***	0.877 (2.38)**	1.263 (3.29)***	1.224 (3.65)***
Proportion female mfg. workers in district	-0.607 (1.32)	-0.243 (0.55)	-0.707 (1.56)	-0.908 (2.05)**	-0.692 (1.6)	-0.855 (1.96)*	0.306 (0.60)	0.363 (0.67)	-0.423 (1.29)	-0.301 (0.88)	-0.625 (1.35)	-0.955 (2.17)**
Manufacturing worker is present in the household	-0.002 (0.22)	-0.002 (0.22)	0.005 (0.46)	-0.009 (0.77)	-0.009 (0.78)	-0.002 (0.21)	0.009 (0.80)	0.01 (0.85)	0.001 (0.12)	0 (0.01)	-0.002 (0.22)	-0.009 (0.78)
Female manufacturing worker is present in the household	-0.057 (2.61)***	-0.057 (2.61)***	-0.056 (2.51)***	0.034 (2.05)**	0.034 (2.05)**	0.034 (2.00)**	-0.063 (3.05)***	-0.058 (2.84)***	-0.021 (1.24)	-0.013 (0.79)	-0.057 (2.61)***	0.035 (2.05)**
District 20th percentile ln(expenditures /capita)		-0.05 (1.70)*			-0.045 (1.69)*							
Private jr. high /1000 youth		0.024 (4.63)***			0.022 (4.30)***							
Road Quality		0.078 (3.49)***			0.052 (2.46)**							
Urban	0.109 (11.07)***	0.109 (11.05)***		0.088 (12.27)***	0.087 (12.29)***		0.109 (13.31)***	0.094 (10.92)***	0.099 (12.72)***	0.083 (10.35)***	0.109 (11.07)***	0.087 (12.27)***
Household ln(expenditures/capita)								0.105 (11.93)***		0.122 (17.70)***		
Pct of Manufacturing Employment that is DFI											0.017 (0.61)	0.042 (2.08)**
Observations	51966	51966	51966	54665	54665	54665	49585	49585	52238	52238	51966	54665

Robust z statistics in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

Notes: Weighted probits reported as marginal effects (dp/dx); 273 district fixed effects included as well as the full set of control variables in Table 2: average and square education of adults and young adults, age and squared age of household head, number of household members, education of male and of female head, proportion adults and proportion children in household, proportion of children and of adults who are male, and indicator variables for age, urban, migrated since birth, migrated since 5 years ago, no male household head, no female head, year is 1995. Standard errors are robust to heteroskedasticity and to clustering at the district*year level. Data is from Supas 1985 and 1995, except for columns (7) - (10) which use 1995 data from Susenas.

		[1.01]
% Near a Junior High (1985)	-0.015	-0.005
	[1.44]	[0.50]
Private jr. high /1000 youth	0.003	0.003
	[2.02]**	[1.85]*
Govt jr. high /1000 youth	-0.004	-0.002
	[1.80]*	[1.02]
Road Quality 1985	0.001	0
	[0.18]	[0.08]
Log Median Per Capita Income (1985)	0.007	0.004
	[0.70]	[0.45]
Male Returns to Education (1985)	0.028	
	[0.25]	
Female Returns to Education (1985)		-0.002
		[0.02]
Education of Adults (age 25-50)	0.018	0.018
	[2.25]**	[2.47]**
Square of Adult Education	-0.002	-0.002
	[2.38]**	[2.72]***
Education of Young Adults (age 18-22)	-0.001	-0.006
	[0.11]	[0.67]
Square of Young Adult Education	0	0.001
	[0.17]	[0.80]
Urban	0.012	0.021
	[1.10]	[2.15]**
Change in number of primary and junior high	1.024	1.502
schools per child in 1973 from 1974-1984	[0.67]	[1.05]
Sumatera	-0.014	-0.017
	[2.87]***	[3.92]***
Kalimantan	-0.012	-0.015
	[1.58]	[2.10]**
Sulawesi	-0.011	-0.014
	[1.75]*	[2.43]**
Outer islands	-0.009	-0.013
	[1.16]	[1.82]*
Constant	-0.045	-0.024
	[1.36]	[0.79]
Observations	274	274
R-squared	0.3	0.24

Absolute value of t statistics in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%
Average road quality is the district-level mean across communities
where 1=dirt, 2=gravel, 3=asphalt, 1986 (PODES).