

UNIVERSITY OF CALIFORNIA, BERKELEY

Department of Economics

Berkeley, California 94720-3880



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**Does Industrialization = "Development"? The  
Effects of Industrialization on School Enrollment  
and Youth Employment in Indonesia**

**Maya Federman**  
Pitzer College

**David I. Levine**  
University of California, Berkeley

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Abstract

This study examines the relationship between rising manufacturing employment and school enrollment 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. Overall, enrollment is slightly higher and youth labor force participation slightly lower in regions with more manufacturing. The causal links between manufacturing and enrollments remain unclear. 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.

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From Adam Smith (1776) and Marx and Engels (1848) in centuries past to the “Washington Consensus” of the 1980s and 1990s as discussed by Williamson in 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 Consensus” (Williamson 1999) have warned of the potential downside of industrialization, including increased pollution, growing inequality, and lower social cohesion. An additional concern is that industrialization may reduce school enrollments by increasing child labor and 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, but not always, reduced child health (Steckel and Floud 1997: 425). Apparently, sometimes industrialization has brought more “dark Satanic mills” than good jobs that increase incomes.

While cross-national studies such as Easterly’s are the basis for most social scientists’ understanding of how industrialization and development interact, they have a familiar set of problems: sample sizes are limited; 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 promotes 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 growth.

This study uses Indonesian individual-level data for 1985 and 1995 to examine the relationship between industrialization and investments in children, specifically school enrollment. We are able to examine the effects of 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, this strategy provides a number of advantages.<sup>1</sup> We employ a large sample of individual- and household-level survey data from almost 300 districts. (Districts in Indonesia 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 national statistical office, 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 these causal channels to identify which, if any, are responsible for the overall effect 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

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<sup>1</sup> Examples include Barro and Sala-i-Martin (1992) for the United States; Blanchard and Katz (1992) for Germany; and Murthi, Guio, and Dreze (1995) for India.

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 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 portion of the observed benefits of manufacturing. In contrast, the largely beneficial effects of manufacturing on school enrollment do not appear to be due to higher returns to education in regions with manufacturing growth.

## **Industrialization and the demand for education**

There are numerous potential links between industrialization, children's education, and child labor. Economic theories about the demand for education typically have the returns to education and the costs of education as their building blocks. When education is a normal consumption good (not just an investment) or when families cannot easily borrow based on children's expected future earnings, then parents' ability to pay can also affect children's level of education (Becker and Tomes 1986). Industrialization can affect all of these channels.

**The costs of education:** The costs of education are largely influenced by three factors: out-of-pocket costs, travel costs, and the opportunity costs of children's time. Industrialization does not directly affect the out-of-pocket costs for enrolling a child in school. To the extent that

industrialization promotes urbanization or population density more generally, travel costs are likely to decline. Substantial research indicates that the cost of commuting to school has an important influence on enrollment (e.g., Duflo 2001). The opportunity cost of time is influenced by opportunities for youth labor and expected wages. In general, enrollment will move in the opposite direction from youth employment. Industrialization may decrease enrollments by increasing the demand for youth labor; alternatively, though, it is possible that modern manufacturing produces a lower demand for child labor than Indonesia's traditional sectors.

Industrialization may also affect the opportunity cost of adolescents' time by increasing the value of their work within the home. The shift to manufacturing may increase mothers' demand for childcare and assistance in the household because it is more difficult for mothers to combine childcare with work for pay in formal-sector manufacturing jobs than in most cottage industry and agriculture. This line of reasoning leads to the hypothesis that, for a household, the employment of an adult in manufacturing, particularly the employment of a woman, is likely to reduce school enrollments among youth who can provide childcare, typically daughters.

**Liquidity constraints:** If children's educational attainment is reduced by some families' liquidity constraints, then higher income and consumption should predict higher education. Moreover, to the extent that education has a consumption component (and is not just an investment), we expect education expenditures to 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.

**The returns to education:** The returns to education may rise or fall as a region industrializes, depending on the type of production. Plants that do nothing but labor-intensive

assembly are likely to demand relatively low skills and may also hire under-age workers. 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).

**Direct foreign investment:** The period 1985 to 1995 was a period of enormous reduction in trade and investment barriers for 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 young workers.

In short, there are numerous possible connections between manufacturing and school enrollment. Thus, we turn to the data to examine the relationship between changes in manufacturing employment in a region and changes in school enrollment. We then examine whether these potential causal channels appear important in explaining the relationship.

## **The Setting**

From 1967 to 1997, Indonesia was one of the world's economic success stories, with GDP growth averaging 4.8% 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. During this period manufacturing employment more than doubled in absolute terms.

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 Molyneux 1994). This form of public finance may attenuate the relation between economic development and enrollment that would show up across nations or in a less centralized nation (which Indonesia is becoming).

## **Methods**

Our basic methodology is to predict individual-level outcomes using family characteristics, district characteristics (such as percent manufacturing), year effects, and district fixed effects. Including district fixed effects in a two-period panel is very similar to measuring the effects of changes in the percent manufacturing, holding constant all fixed factors in the region. We seek to determine if the presence of manufacturing employment in the district or household is associated with improved youth outcomes. The outcomes we analyze are 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 ( $e$ ):

$$Enrollment_{idt} = \alpha + \beta \%manufacturing_{dt} + \gamma manufacturing_{idt} + \delta X_{idt} + \eta Z_{dt} + \phi Year + e_{idt} \quad (1)$$

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 (***District<sub>d</sub>***). 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.

$$Enrollment_{idt} = \alpha' + \beta' \%manufacturing_{dt} + \gamma' manufacturing_{idt} + \delta' X_{idt} + \mathbf{District}_d + \phi' Year + e_{idt} \quad (2)$$

This is the primary specification used. We also include separate measures of female employment in manufacturing in the district and household to allow for differing effects when the employment is of females. A potential problem arises if people migrate or if factories do not locate at random, complications addressed in this section.

### ***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,  $\beta'$  and  $\gamma'$ . 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 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) is included as a control in all regressions.

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 change in enrollment patterns. We choose potential causal channels that relate to changes in the cost of education, returns to education, and liquidity constraints. These mediating variables include 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 ( $\beta'$  and  $\gamma'$ ). Of course, 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.

Data are measured at the individual and household level. The district-level and some household-level data are constructed from the individual-level data using Supas population weights. 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 youth 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.<sup>2</sup>

The main explanatory variables of interest are manufacturing employment measured from the Supas survey. We count someone as a manufacturing employee if he or she is an employee or employer in the manufacturing sector.<sup>3</sup> A household has a manufacturing worker if any adult works in manufacturing; a household has a female manufacturing worker if any adult female

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<sup>2</sup> There do not appear to be significant effects of manufacturing employment on younger children. If anything, female manufacturing employment in the household and district is correlated with improved enrollments for the youngest children, though the results are not robust to all specifications.

<sup>3</sup> Thus, we eliminate the self-employed and family workers.

works in manufacturing. Total and female manufacturing employment is also measured at the district level as a share of potential employment among those age 18–60.

## Results

After first presenting summary statistics, we present estimates of the correlation between industrialization and enrollments and between industrialization and youth labor. We then present tests of several hypotheses examining possible causal channels. Summary statistics are presented in Tables 1A and 1B. 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 1985, which increased from 3.3 to 5.3 percent for men and from 1.9 to 3.4 percent for women. Manufacturing employment as a share of the 1985 full-time economically active population (those working over 20 hours per week or looking for work) grew from 6.3 to 13.1 percent.

Enrollment rates for female teens did not rise much during this decade and fell slightly for males.<sup>4</sup> About three-fourths of youth age 13–15 were enrolled and slightly more than half of those age 16–17; both rates were higher for young men than for young women. Similarly, young teens' labor force participation was roughly constant over the period.

### ***Industrialization and Education, Labor Force Participation, and Household Responsibilities***

Table 2 presents results for enrollments for youth age 13–15 and for older youth age 16–17. Enrollment rates remain modest for teens 16–17 in Indonesia; thus, it is unlikely that non-enrollment is a social problem or represents under-investment. Thus, our main focus is on teens

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<sup>4</sup> We define enrollment as school attendance. We also used measures of being in school and in the age-appropriate grade. Results were robust to alternate definitions of enrollment.

13-15 because they are most at risk of early school leaving. We present probit estimates of enrollment. 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 full set of control variables.<sup>5</sup> 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. Tables 3 and 4 present results for household responsibility and youth employment.

### **Youth Age 13 to 15**

Enrollment for youth age 13 to 15 rises with the proportion of manufacturing employment in the district (columns 1 and 2). The effect is modest: a one standard deviation increase in manufacturing (about three percentage points of the potential labor force, or an almost doubling of the 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 and negative.

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<sup>5</sup> 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.

In contrast, manufacturing employment in the household has different effects for boys and girls. For female youth, having an adult female manufacturing employee in the household predicts lower enrollments, a decrease of 5.7 percentage points. The effect for male youth is opposite; having an adult female manufacturing worker in the household predicts 3.4 percentage points higher enrollment for males. Having an adult male manufacturing worker in the household is not associated with changed enrollments for younger teens.<sup>6</sup>

One possible explanation for the relationship between the presence of a female manufacturing worker and lower enrollments for girls is that girls' responsibilities at home increase when their mothers work in manufacturing. Another possible explanation is that adult female employment in the household reduces enrollment by increasing the opportunities for the girls to work in a female-dominated job in factories. 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.

We find that 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.<sup>7</sup> Having an adult female manufacturing worker in the household raises the likelihood that a girl

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<sup>6</sup> 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.

<sup>7</sup> Some young women who reported their main activity was housework were also enrolled in school.

works more than 20 hours per week by 4.8 percentage points.<sup>8</sup> This is a 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 of female adult and daughter employment could be due to many causes: good local job opportunities for women; the working adult acting as a role model for the teenager; the working adult providing job linkages (perhaps at her own place of employment) for the teen, or a family characteristic such as high income need or men who approve of women working outside the home.

The relationship between manufacturing employment at the district level and participation in the labor force by 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.<sup>9</sup> 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

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<sup>8</sup> This result could be either because of improved opportunities or because of some other unmeasured characteristic of the household that encourages women to work.

<sup>9</sup> We focus on employment of over 20 hours per week; results are similar if we examine youth who had any paid employment.

1A). Lower enrollment and higher employment rates for those 16 and over are not generally considered a social problem in Indonesia.

Unlike for those age 13–15, for older youth average manufacturing employment in a district is not a statistically significant predictor of enrollment levels. The coefficients are of the same sign as before, but are not 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 is especially large for female youth if the household manufacturing worker is an adult female. The presence of an adult female manufacturing worker is associated with a large increase in work of 14 percentage points for females age 16–17.

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.

### **What Causal Channels Explain the Relationship Between Manufacturing and Enrollment?**

We next consider variables that are candidate channels for the relationship between industrialization and enrollment, including district-level consumption, urbanization, various measures of school availability, and the returns to education. We also consider consumption expenditures at the household level. To mediate the relation 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 these potential mediators that are related to manufacturing growth.

**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.

Similarly, if school enrollment in low-income households is more likely to be sensitive to income, it may be particularly likely to face binding liquidity constraints. Thus, we consider expenditures at the twentieth percentile in addition to median expenditures as a potential mediator.<sup>10</sup>

**Returns to education:** 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:

$$\ln(\text{consumption}_{idt}) = a_d * \text{district}_d + b_{1d} \text{male head's education}_{idt} * \text{district}_d + X_{idt}, \quad (3)$$

where  $\text{district}_d$  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.<sup>11</sup> 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.<sup>12</sup>

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<sup>10</sup> District medians and 20<sup>th</sup> 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.

<sup>11</sup> 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.

<sup>12</sup> 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

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). We examine whether the apparent manufacturing effect is due in part to its correlation with other components of population density. 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 government) junior high schools per 1,000 students. We also consider road quality because improvements might reduce travel costs.

**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 junior high schools per 1,000 students are all correlated with growing manufacturing employment.<sup>13</sup> The odds of living in the same community as a junior high

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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.

<sup>13</sup> 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

school, government junior high schools per capita, and returns to education for both men and women are not related to rising manufacturing employment.

**Do these factors mediate the relationship between manufacturing and enrollment?**

Tables 6a and 6b present evidence on whether the several potential mediating variables actually mediate enrollment. We are looking for a reduction in the effects of enrollment when controlling for the potential mediating variable. We examine only enrollment of those age 13–15 because district manufacturing is not statistically significantly correlated with enrollment for older youth. The first column in each table replicates the analysis from Table 2 for the relevant group.

Columns 2, 3, and 4 add in measures of expenditures at the 20th percentile, the number of private junior high schools per 1,000 students, and road quality, respectively, in predicting enrollments. Consumption growth measured at either the median or the 20th percentile was negatively related to enrollment growth.<sup>14</sup> The coefficients on manufacturing were unchanged with the inclusion of expenditures in the district. In contrast, both private junior high schools per 1,000 youth and road quality are positively correlated with growing enrollment. With the inclusion of each of these controls, the coefficient on percent manufacturing in the district declines slightly from 1.2 to 1; the decline is not statistically significant.

Column 5 tests for the importance of population density by removing urbanization from our set of control variables. As expected, the coefficient on percent manufacturing rises, from 1.2 to 1.35 for males and from 1.3 to 1.5 for females. Again, these changes are small and not

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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.

<sup>14</sup> The result for median expenditures is similar and thus not reported.

statistically significant.<sup>15</sup> Finally, all of these potential district moderators are added in column 6. Comparing columns 5 and 6, the addition of all the district moderators reduces the district manufacturing relationship by 45 percent for females and 30 percent for males. 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 and 8. 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. Column 7 recreates the analysis in column 1 but with Supas data for 1985 and Susenas for 1995.<sup>16</sup> Household consumption is then added in column 8. As expected, households with high expenditure have higher enrollments. The coefficient for manufacturing employment drops by one-fifth (change not significant). That is, only a modest share of the effect of manufacturing appears to operate by increased consumption.

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<sup>15</sup> 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.

<sup>16</sup> 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.

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. Nevertheless, no single change is estimated with sufficient precision to be statistically significant.

## **The role of foreign ownership**

We were also interested in whether the relationship between school enrollment and manufacturing varied 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.<sup>17</sup> The share of manufacturing employees working in plants with substantial direct foreign investment at the district level is added in Table 6, column (9). This share is measured using data from the establishment-level Industrial Survey.<sup>18</sup> The share of district manufacturing employment that is DFI is positively related to enrollment for males, but not females, though the effect is only weakly significant. The relationship between youth employment and the share of manufacturing that is DFI was insignificant.<sup>19</sup>

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

<sup>18</sup> The relative scarcity of foreign-owned plants led to the estimates on foreign-owned factories to be quite imprecise.

<sup>19</sup> Results not shown.

## 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).<sup>20</sup>

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 reran 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.

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<sup>20</sup> Migration rates are positively correlated with higher education and with manufacturing 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 immediate neighborhood had manufacturing employment, though manufacturing employment at this level is measured with considerable error. 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.

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. Correcting for measurement error in the share of manufacturing employment did not substantially change the results.

## **Summary**

Optimists expect industrialization to predict higher enrollments due to higher returns to education, higher parental ability to pay for education, and lower costs of commuting to school. Pessimists expect industrialization to predict lower enrollments due to lower returns to

education, higher need for children to care for younger siblings, and higher demand for youth labor in factories. In fact, the relation between industrialization and enrollment is not strong.

Supporting the optimists, growth in industrial employment is positively correlated with higher enrollments and lower youth labor force participation. Supporting the pessimists, having an adult female manufacturing worker in the household is correlated with lower enrollment and increased responsibilities in the home for female youth. 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 positive relationship between a region's growing manufacturing employment and enrollment. A striking finding is the lack of strong support for the causal channels that economic theory suggests should link industrialization and school enrollment. 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, the failure of traditional supply and demand factors leaves room for more sociological forces. 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, cautions are needed before 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.

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**Table 1A: Summary Statistics**  
**District Means and (standard deviations) -- Weighted**

**Dependent Variables**

		1985	1995	Growth			1985	1995	Growth
School enrollment					School enrollment				
Females	age 13-15	70.5%	74.4%	3.9%	Males	age 13-15	76.8%	77.3%	0.6%
		14.7%	12.4%	11.6%			14.0%	12.3%	10.6%
	age 16-17	48.4%	48.5%	0.0%		age 16-17	58.3%	54.1%	-4.3%
		19.1%	18.5%	14.2%			18.8%	17.6%	14.8%
Work more than 20 hrs/week		1985	1995		Work more than 20 hrs/week	1985	1995		
Females	age 13-15	10.4%	7.9%	-2.6%	Males	age 13-15	13.3%	12.0%	-1.3%
		6.7%	5.3%	7.0%			8.7%	7.6%	8.3%
	age 16-17	20.0%	19.0%	-1.0%		age 16-17	29.4%	29.9%	0.6%
		12.0%	10.2%	10.8%			15.2%	13.4%	13.4%
Helping at home is primary activity									
Females	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%					

**District Manufacturing Employment**

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

**Measures of Manufacturing Growth**

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

**Table 1B: Summary Statistics**  
Means and (standard deviations)

<b>District Characteristics</b>	1985 Sample	1995 Sample	Pooled Sample	<b>Individual/Family Characteristics</b>	1985 Sample	1995 Sample	Pooled Sample
Private jr. high / 1000 youth	2.194 0.897	1.996 0.840	2.114 0.891		0.065	0.087	0.077
Govt. jr. high / 1000 youth	1.050 0.622	1.206 0.652	1.142 0.652	Migrated since birth	0.247	0.282	0.266
% of youth in same community as a jr. high	0.486 0.236	0.528 0.210	0.506 0.223	Migrated since 5 yrs ago	0.029	0.037	0.033
District 20th percentile ln(expenditures/capita)	2.299 0.245	2.409 0.279	2.353 0.267	Age of Head	0.167	0.189	0.179
District median ln(expenditures/capita)	2.644 0.245	2.736 0.312	2.689 0.283	Number of household members	44.075 2.161	43.901 1.801	43.956 1.969
District returns to education (Male)	0.042 0.013	0.040 0.011	0.041 0.012	Education of head male	5.234 3.709	6.245 3.714	5.926 3.742
District returns to education (Female)	0.042 0.013	0.042 0.011	0.042 0.012	Education of head female	3.922 3.418	5.167 3.575	4.774 3.574
Urban	0.273 0.302	0.361 0.304	0.315 0.305	No male spouse in household	0.085 0.279	0.075 0.263	0.078 0.268
Education of adults (age 25-50)	5.017 1.594	6.730 1.550	5.864 1.790	No female spouse in household	0.025 0.155	0.025 0.157	0.025 0.156
Education of young adults (age 18-22)	7.007 1.473	8.503 1.343	7.745 1.602	Proportion adults in the household	0.413 0.142	0.460 0.149	0.445 0.149
Road Quality	1.240 0.400	1.586 0.323	1.411 0.404	Proportion kids in the household	0.562 0.144	0.511 0.147	0.527 0.148
#districts	274	274	548	Proportion of kids male	0.515 0.298	0.512 0.335	0.513 0.324
				Proportion of adults male	0.477 0.176	0.481 0.172	0.480 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	<b>1.264</b> <b>(3.29)***</b>	0.689 (1.34)	<b>1.229</b> <b>(3.63)***</b>	0.682 (1.17)
Proportion female mfg. workers in district	-0.607 (1.32)	-0.924 (1.50)	<b>-0.908</b> <b>(2.05)**</b>	-1.147 (1.65)*
Manufacturing worker is present in the household	-0.002 (0.22)	-0.025 (1.27)	-0.009 (0.77)	<b>-0.044</b> <b>(2.66)***</b>
Female manufacturing worker is present in the	<b>-0.057</b> <b>(2.61)***</b>	<b>-0.088</b> <b>(2.86)***</b>	<b>0.034</b> <b>(2.05)**</b>	0.004 (0.16)
Urban	0.109 <b>(11.07)***</b>	0.224 <b>(15.77)***</b>	0.088 <b>(12.27)***</b>	0.193 <b>(16.00)***</b>
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 <b>(2.13)**</b>	-0.004 (1.57)	-0.003 <b>(2.07)**</b>	-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 <b>(5.21)***</b>	-0.099 <b>(4.23)***</b>	-0.027 <b>(2.12)**</b>	-0.049 <b>(2.76)***</b>
Migrated since 5 yrs ago	-0.362 <b>(12.71)***</b>	-0.308 <b>(11.38)***</b>	-0.109 <b>(4.61)***</b>	-0.136 <b>(4.57)***</b>
Age of Head	0.002 <b>(6.26)***</b>	0.005 <b>(10.99)***</b>	0.002 <b>(8.74)***</b>	0.003 <b>(6.19)***</b>
Square of Age of Head	-0.005 <b>(2.42)**</b>	-0.006 <b>(2.18)**</b>	-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 <b>(19.93)***</b>	0.028 <b>(15.22)***</b>	0.023 <b>(27.31)***</b>	0.04 <b>(25.71)***</b>
Education of Female Household Head	0.021 <b>(18.65)***</b>	0.034 <b>(17.61)***</b>	0.02 <b>(19.80)***</b>	0.032 <b>(18.87)***</b>
No male spouse in household	-0.065 <b>(6.31)***</b>	-0.01 (0.68)	-0.068 <b>(7.68)***</b>	-0.086 <b>(6.44)***</b>
No female spouse in household	-0.068 <b>(4.14)***</b>	0.001 (0.03)	-0.05 <b>(3.39)***</b>	-0.001 (0.04)
Proportion adults in the household	-0.023 (0.66)	0.183 <b>(3.27)***</b>	-0.001 (0.04)	0.064 (1.26)
Proportion kids in the household	-0.162 <b>(3.86)***</b>	0.022 (0.36)	-0.104 <b>(3.30)***</b>	-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 <b>(2.16)**</b>	-0.195 <b>(8.29)***</b>	0.002 (0.14)	0.001 (0.03)
Age 13 (Age 16)	0.207 <b>(34.64)***</b>	0.118 <b>(16.79)***</b>	0.161 <b>(36.50)***</b>	0.105 <b>(13.61)***</b>
Age 14	0.093 <b>(17.20)***</b>		0.08 <b>(15.71)***</b>	
Year is 1995	-0.082 <b>(6.96)***</b>	-0.133 <b>(5.85)***</b>	-0.085 <b>(6.80)***</b>	-0.205 <b>(9.49)***</b>
Observations	51966	31004	54665	31835

Robust z statistics in brackets

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

Weighted regressions include district fixed effects; 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**

	<u>Age 13-15</u>	<u>Age 16-17</u>
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%

Notes: Linear probability model that includes district fixed effects as well as the full set of control variables in Table 1: 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. Weighted regressions.

**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: Linear probability model that includes district fixed effects as well as the full set of control variables in Table 1: 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. Weighted regressions.

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

	<i>Growth in 20th %ile ln(expcap)</i>	<i>Growth in median ln(expcap)</i>	<i>Growth in road quality</i>	<i>Growth in % near a junior high</i>	<i>Growth in % near a high school</i>	<i>Growth in govt junior highs/1000 youth</i>	<i>Growth in private junior highs/1000 youth</i>	<i>Growth in female returns to education</i>	<i>Growth in male returns to education</i>	<i>Growth in urbanization</i>
Growth in total manufacturing	1.82 (2.52)**	1.406 (2.08)**	0.697 (1.27) <sup>a</sup>	0.296 (0.92)	0.134 (0.26)	-0.531 (0.22)	15.143 (2.48)**	-0.055 (1.47)	-0.047 (0.97)	2 (2.80)**
Growth in female manufacturing	0.464 (0.51)	1.092 (1.25)	1.112 (1.39) <sup>a</sup>	0.03 (0.06)	0.455 (0.52)	-3.813 (0.81)	-17.343 (1.56)	0.051 (1.17)	0.032 (0.52)	-0.143 (0.22)
Value of dependent variable in 1985	-0.775 (15.37)***	-0.697 (10.40)***	-0.364 (5.88)***	-0.217 (3.56)***	-0.36 (4.96)***	-0.583 (6.50)***	-0.619 (10.16)***	-0.871 (16.74)***	-0.863 (11.79)***	-0.146 (7.32)***
Percent of district urban in 1985	0.32 (7.28)***	0.353 (5.59)***	-0.064 (0.98)	-0.043 (0.92)	0.094 (1.53)	0.059 (0.25)	0.367 (0.74)	0.008 (6.22)***	0.009 (3.70)***	0.109
Constant	1.729 (16.71)***	1.771 (10.67)***	0.605 (12.42)***	0.282 (19.65)***	0.167 (24.59)***	1.474 (8.12)***	2.075 (12.40)***	0.028 (11.71)***	0.027 (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%, <sup>a</sup> 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 6a: Moderators in Predicting School Enrollment Females 13-15**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Proportion mfg. workers in district among those 18-60	1.264 (3.29)***	1.314 (3.43)***	1 (2.59)***	1.016 (2.69)***	1.501 (3.86)***	0.797 (2.07)**	0.955 (2.27)**	0.751 (1.71)*	1.263 (3.29)***
Proportion female mfg. workers in district	-0.607 (1.32)	-0.58 (1.27)	-0.355 (0.77)	-0.521 (1.17)	-0.707 (1.56)	-0.243 (0.55)	0.306 (0.60)	0.363 (0.67)	-0.625 (1.35)
Manufacturing worker is present in the household	-0.002 (0.22)	-0.002 (0.22)	-0.002 (0.22)	-0.002 (0.22)	0.005 (0.46)	-0.002 (0.22)	0.009 (0.80)	0.01 (0.85)	-0.002 (0.22)
Female manufacturing worker is present in the household	-0.057 (2.61)***	-0.057 (2.60)***	-0.057 (2.61)***	-0.057 (2.62)***	-0.056 (2.51)**	-0.057 (2.61)***	-0.063 (3.05)***	-0.058 (2.84)***	-0.057 (2.61)***
District 20th percentile ln(expenditures /capita)		-0.065 (2.19)**				-0.05 (1.70)*			
Private jr. high /1000 youth			0.023 (4.40)***			0.024 (4.63)***			
Road Quality				0.085 (3.90)***		0.078 (3.49)***			
Urban	0.109 (11.07)***	0.109 (11.04)***	0.109 (11.14)***	0.108 (11.00)***		0.109 (11.05)***	0.109 (13.31)***	0.094 (10.92)***	0.109 (11.07)***
Household ln(expenditures/capita)							0.105 (11.93)***		
Pct of Manufacturing Employment that is DFI									0.017 (0.61)
Observations	51966	51966	51966	51966	51966	51966	49585	49585	51966

Robust z statistics in brackets

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

Notes: Includes district fixed effects as well as the full set of control variables in table 1: 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. Weighted regressions. Data is from Supas 1985 and 1995, except for columns (7) and (8) which use 1995 data from Susenas.

**Table 6b: Moderators in Predicting School Enrollment Males 13-15**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Proportion mfg. workers in district among those 18-60	1.229 (3.63)***	1.285 (3.80)***	1.011 (3.07)***	1.086 (3.13)***	1.346 (4.08)***	0.923 (2.68)***	1.179 (3.29)***	0.877 (2.38)**	1.224 (3.65)***
Proportion female mfg. workers in district	-0.908 (2.05)**	-0.898 (2.01)**	-0.722 (1.71)*	-0.893 (1.99)**	-0.855 (1.96)*	-0.692 (1.6)	-0.423 (1.29)	-0.301 (0.88)	-0.955 (2.17)**
Manufacturing worker is present in the household	-0.009 (0.77)	-0.009 (0.77)	-0.009 (0.76)	-0.009 (0.78)	-0.002 (0.21)	-0.009 (0.78)	0.001 (0.12)	0 (0.01)	-0.009 (0.78)
Female manufacturing worker is present in the household	0.034 (2.05)**	0.034 (2.04)**	0.034 (2.04)**	0.035 (2.06)**	0.034 (2.00)**	0.034 (2.05)**	-0.021 (1.24)	-0.013 (0.79)	0.035 (2.05)**
District 20th percentile ln(expenditures/capita)		-0.053 (1.94)*				-0.045 (1.69)*			
Private jr. high /1000 youth			0.021 (4.17)***			0.022 (4.30)***			
Road Quality				0.057 (2.70)***		0.052 (2.46)**			
Urban	0.088 (12.27)***	0.087 (12.26)***	0.088 (12.35)***	0.087 (12.21)***		0.087 (12.29)***	0.099 (12.72)***	0.083 (10.35)***	0.087 (12.27)***
Household ln(expenditures/capita)							0.122 (17.70)***		
Pct of Manufacturing Employment that is DFI									0.042 (2.08)**
Observations	54665	54665	54665	54665	54665	54665	52238	52238	54665

Robust z statistics in brackets

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

Notes: Includes district fixed effects as well as the full set of control variables in table 1: 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. Weighted regressions. Data is from Supas 1985 and 1995, except for columns (7) and (8) which use 1995 data from Susenas.

**Appendix Table A1: Predicting Industrialization**

	(1)	(2)
	Manufacturing growth	Female Manufacturing Growth
Proportion manufacturing workers in district	0.222 [3.81]***	
Proportion female mfg. workers in district		0.05 [0.92]
% Near a Junior High (1985)	-0.015 [1.41]	-0.004 [0.45]
Private jr. high /1000 youth	0.003 [2.08]**	0.003 [1.94]*
Govt jr. high /1000 youth	-0.004 [1.69]*	-0.002 [0.78]
Road Quality 1985	0.001 [0.14]	-0.001 [0.14]
Log Median Per Capita Income (1985)	0.007 [0.76]	0.005 [0.55]
Male Returns to Education (1985)	0.023 [0.21]	
Female Returns to Education (1985)		-0.005 [0.05]
Education of Adults (age 25-50)	0.018 [2.32]**	0.019 [2.56]**
Square of Adult Education	-0.002 [2.45]**	-0.002 [2.81]***
Education of Young Adults (age 18-22)	-0.002 [0.16]	-0.007 [0.75]
Square of Young Adult Education	0 [0.21]	0.001 [0.86]
Urban	0.012 [1.12]	0.021 [2.20]**
Sumatera	-0.013 [2.80]***	-0.016 [3.78]***
Kalimantan	-0.01 [1.44]	-0.012 [1.84]*
Sulawesi	-0.011 [1.70]*	-0.013 [2.33]**
Outer islands	-0.009 [1.15]	-0.012 [1.80]*
Constant	-0.043 [1.32]	-0.023 [0.74]
Observations (districts)	274	274
R-squared	0.3	0.24

Absolute value of t statistics in brackets

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