

Can Education Explain Changes in Income Inequality in Mexico?

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Abstract

In 1984–94 Mexico experienced a sharp increase in inequality in earnings and household income. This chapter uses an empirical framework to identify the contributions of microeconomic factors to the observed rise in inequality. The analysis indicates that changes in the levels of and returns to education account for about two-fifths of the increase in inequality (as measured by the Gini coefficient) and divergence in fixed effects between urban and rural areas for another fifth. The results are consistent across decompositions of the changes in inequality in earnings and household income.

JEL Classification D1: Household Behavior and Family Economics; I2: Education; I3: Welfare and Poverty; R2: Urban, Rural and Regional Economics, Household Analysis

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Social institutions must combat, as much as is possible, this inequality [in education] which produces dependency.

—Cordorcet

Mexico experienced a sharp increase in inequality in earnings and household income in 1984–94. The ratio of average to low-skilled earnings, for example, rose by 27 percent for wage earners and by 25 percent for self-employed workers. Those at the bottom of the earnings distribution experienced severe losses in earnings, and those at the top substantial gains (figure 1). Those in the middle were mostly unaffected. The Gini coefficient for earnings increased by 8 percentage points, and that for household income by 6 percentage points (table 1).

We use an empirical framework to identify the contributions of microeconomic factors to the observed rise in inequality in earnings and household income. Briefly, the framework consists of estimating a labor market model at two (or more) points in time and simulating the effect on the distribution of earnings and household income from observed changes in behavior (such as labor force participation), changes in the returns to particular factors (such as education), and changes in the structure and distribution of those factors (Bourguignon, Fournier, and Gurgand, 2000).

Among the factors that we analyze are changes in demographic structure (including changes in the level and distribution of education), geographic location, and labor supply decisions. Our prior is that education and the returns to it explain a large portion of the change in income distribution. Based on the results of a previous study, we also believe that divergence in conditions between rural and urban areas plays an important role (Bouillon, Legovini, and Lustig, 2001). A comparison of the effect of these factors on inequality in individual earnings with their effect on inequality in household income provides useful insights into the role of the family and its response to labor market conditions.

Changes in demographics and labor force behavior in 1984–94

Significant demographic changes in the 10 years between 1984 and 1994 may have affected the distribution of income. The Mexican labor force became younger and more educated. Average education increased, and the distribution of years of schooling improved. Female labor force participation rose markedly at the top and bottom of the skill distribution. And wage work replaced self-employment.

The proportion of young people in the labor force increased as a result of declining labor force participation in the age group 56–65 and growing participation among young women (table 2). Education among workers rose from an average of 5.6 years of schooling in 1984 to 6.9 years in 1994. The share of workers with secondary or higher education increased by half (from 30 percent of the workforce to 45 percent).

The improvement in the distribution of years of education—with the Gini coefficient falling from 0.42 to 0.37—appears to arise from a better than average performance by the middle of the income distribution rather than the bottom. While the middle four deciles of the household per capita income distribution experienced a 31 percent increase in schooling, the bottom three deciles had a 19 percent increase and the top three a 22 percent increase.

But this statement is not necessarily descriptive of what happened to individuals. Since education and income are highly correlated, those who achieved higher levels of education than others in their decile moved upward, and vice versa. Thus a person living in a poor household in 1984 who became highly educated would be recorded in a higher decile in 1994, while a person from a richer household who obtained less education would be found in a lower decile. This implies that people in the lower deciles appear to have gained less than they actually did, but this issue is difficult to investigate without panel data. (Later we present results from a simulation of educational gains across the distribution using a clustering method.)

Education levels lagged in rural areas. Rural workers had an average of only 4.5 years of schooling (less than a primary education) in 1994—and almost 80 percent had a primary education or less. These results are affected by rural-urban migration, however. While primary schools are available to most in rural areas, secondary schools are scarce. Students have to move away to continue their studies and may never return. In addition, more educated people are attracted to the cities, which promise better paying jobs.

Fertility rates fell during the period, reducing family size by 9 percent and dependency ratios by 17 percent. Low-income families declined somewhat more in size (by 11 percent), and urban households more than rural. The drop in fertility coincides with women's larger than average gains in education and a solid increase in their labor force participation.

The increase in women's labor force participation is perhaps the most salient change in labor market behavior during the period. In 1984 only 33 percent of working-age women were in the labor force. In 1994, 41 percent were. The greatest increase (88 percent) was among women with very high levels of education—probably in response to the greater market incentives and opportunities for highly skilled individuals (figure 2). Women with little education also entered the labor force in greater numbers—in this case to supplement spouses' dwindling real incomes and to substitute for migrating agricultural workers. The changes in women's participation are even sharper when broken down by cohort: participation by women ages 18–35 increased from 33 percent to 43 percent between 1984 and 1994, while participation by women ages 56–65 declined. Participation by men ages 56–65 declined even more (by 8 percentage points), while participation by those ages 18–35 increased. The higher participation by younger cohorts generates a proportional increase in wage employment, since younger cohorts are less likely to enter self-employment.

As we will see, all these changes in demographics and labor force behavior, combined with the sharp increase in the skill premium (which we take as given in our empirical analysis), help to explain the rising inequality in earnings and household income observed in the period.

Method and data

From a microeconomic point of view, changes in income distribution can derive from changes in labor force participation decisions, in demographic characteristics, and in the returns to those characteristics. The method we use is designed to measure the relative importance of these different sources of change. It provides a complete description of the effect of these microeconomic determinants on the entire vector of incomes. In other words, the method computes whole new sets of vectors of earnings and household incomes under different assumptions, and differences between these vectors describe the composition of different effects across the entire sample of observations.

We proceed in three steps. First, we estimate a standard labor market model for individual earners for 1984 and 1994, a model that includes labor choice and earnings functions for men and women in urban and rural locations and in the wage employment and self-employment sectors.

Second, we simulate the contribution of the labor choice effect, price effect, population effect, and effect of unobservables to the change in the distribution of individual earnings. *Labor choice effect* refers here to the effect of changes in the probabilities of participation and occupational choice decisions; *price effect* to the effect of changes in the returns to education and experience; *population effect* to the effect of changes in the distribution of education, experience, and location; and the *effect of unobservables* to the effect of changes in the distribution of the errors in the earnings equations.

We perform this simulation by reestimating the vector of incomes, changing one microeconomic factor at a time. Say, for example, that we have estimated the vector of earnings for 1984 as:

$$\hat{y}_{84} = \hat{a}_{84} + \hat{b}_{84}X_{84}$$

and that we are interested in determining the effect of the changes in the price of X on the distribution of y . We simply replace the estimated parameter for 1984 with that for 1994 to obtain a new vector of y :

$$\hat{y}_{84}^{b94} = \hat{a}_{84} + \hat{b}_{94}X_{84}$$

The differences between the two vectors describe the changes in income due to changes in b across the entire distribution. We do this for each parameter and independent variable in the labor choice and earnings equations for both 1984 and 1994. The exercise provides us with a full description of the impact of each microeconomic determinant on the distribution of individual earnings in the two years.¹ These descriptions can be visualized using graphs. Alternatively, we can use conventional measures of income inequality reestimated for each simulated vector of income to obtain estimates of the proportional contribution of each factor.

Third, we obtain a description of the impact of microeconomic determinants on the distribution of household income. To do this, we aggregate the already calculated vectors of individual incomes by household and add nonlabor household income. Again, these vectors can be compared graphically, or indicators of income inequality can be calculated and compared.

We use four conventional measures of income inequality to summarize our results: the Gini coefficient and three measures from the generalized entropy class—the mean log deviation (E_0), the Theil index (E_1), and the transformed coefficient of variation (E_2). Because the mean log deviation gives greater weight to observations at the bottom, the Theil index equal weight to observations across the distribution, and the transformed coefficient of variation greater weight to observations at the top (Cowell, 1977), differences among the results for the three measures provide insight into the portion of the distribution responsible for the change, just as observing the entire distribution would.

The analysis relies on data from the Mexican national household income and expenditure surveys for 1984 and 1994, conducted by the National Institute of Statistics, Geography and Informatics (INEGI). The surveys have national coverage, with a sample size of 4,735 households in 1984 and 12,815 households in 1994. Income data were adjusted to account for regional differences in inflation using the regional consumer price indexes estimated by the Bank of Mexico. This adjustment facilitates the interpretation of changes in interregional differences.

¹ The simulations are path dependent. The estimated effects in each year represent an upper and a lower bound for each factor's effect.

Empirical specification of the labor market model

Occupational choice. We assume that individuals can choose one of $J (= 4)$ options: to not participate in the labor market or to pursue wage work, self-employment, or multiple occupations. We assume that the decision to participate and the choice of occupation will differ among heads of household, spouses, and other members of the family, and between rural and urban dwellers. We assume that the implicit (latent) reservation earnings depend on potential household income, on household size and composition, on the education level of other household members, and on the characteristics of household assets. The labor choice decisions of spouses and other members of the family are controlled for the labor status of the head of household, in the belief that the activity of the head of household may influence these decisions (for example, a self-employed head of household might offer work to other family members, and an unemployed one might induce his spouse to enter the market). To estimate the probability of each occupational choice j , we fit multinomial logit equations for each category (heads of household, spouses, and other members of the family, in urban and rural areas) and in each period (1984 and 1994). Individual i in period t will select option j whenever the utility of option j exceeds the utility of any other option k , including inactivity.

$$P_{ij} = \text{prob} (u_{ij} > u_{ik}) = \text{prob} (Z_{ij} \mathbf{I}_{ij} - Z_{ik} \mathbf{I}_{ik} > 0) \quad \dots \quad \text{for all } k \neq j \quad (1)$$

where Z is the matrix of independent variables and \mathbf{I} the vector of coefficients.

Earnings equations. We assume that earnings are a function of skills as proxied by education and experience and control them for regional variation. We fit earnings equations separately for 12 labor categories based on gender, urban or rural location, and wage employment, self-employment, and mixed activity employment.² Except for separate error terms, this is equivalent to running a single

² The 12 categories are wage-earning urban men and women, mixed-employment urban men and women, self-employed urban men and women, wage-earning rural men and women, mixed-employment rural men and women, and self-employed rural men and women.

regression with fully interacted dummies for gender, location, and activity. We estimate the following using ordinary least squares:³

$$\log(y) = X\mathbf{b} + \mathbf{e} = \mathbf{a} + Edu\mathbf{b}_1 + Edu^2\mathbf{b}_2 + Exp\mathbf{b}_3 + Exp^2\mathbf{b}_4 + R\mathbf{g} + \mathbf{e} \quad (2)$$

where:

y = individual monthly earnings

Edu = years of schooling

Exp = work experience ($age - Edu - 6$)

$R = \{R_1, R_2, R_3, R_5, R_9, R_{so}\}$ regional dummy variables (excluded category: $R_4 =$
Center-West [Aguascalientes, Colima, Guanajuato, Jalisco, Michoacán])

R_1 = North-West (Baja California, Baja California Norte, Sinaloa, Sonora, Nayarit)

R_2 = North-East (Tamaulipas, Nuevo León)

R_3 = North (Coahuila, Chihuahua, San Luís Potosí, Zacatecas, Durango)

R_5 = Center (Hidalgo, Querétaro, Tlaxcala, México, Morelos, Puebla)

R_9 = Federal District

R_{so} =Southern region dummy variable; includes South (Tabasco, Veracruz); South-East (Chiapas, Guerrero, Oaxaca) and South-West (Campeche, Quintana Roo, Yucatán)

We convert school achievement (degrees earned) into years of schooling and estimate the model assuming a quadratic relationship between earnings and education. But to ensure that the resulting convexity and convexification of returns to education are not driven by higher education alone, we reestimate our model using school achievement dummies. The results are nearly unchanged.

Simulation of the distribution of education, experience, regional location, and unobservables. To simulate changes in years of schooling and experience, we cluster observations by gender and location, estimate the distribution of these factors in each cluster (mean and standard deviation), and replicate the distribution of the cluster in 1984 in the corresponding cluster in 1994 and vice versa. In other words, for each x in cluster j , we apply a simple transformation:

³ We tried estimating the earnings equations using a Heckman procedure to control for self-selection. But because we were unable to find good instruments for explaining self-selection in the different activities, we decided to drop the procedure.

$$x_{j84}^{distr94} = (x_{j84} - m_{j84}) \frac{s_{j94}}{s_{j84}} + m_{j94}$$

where the μ s and s s are the means and standard deviations in each cluster.

To simulate regional distribution, we use the weights from the household surveys and reweigh observations of one survey—say, that for 1984—with the weights of the other—say, 1994—to ensure that the resulting regional distribution of the population across all regions matches that observed in 1994, and vice versa.

The distribution of the residual terms can be modified in several ways—for example, by randomly drawing error terms for each observation given an assumed distribution, or modifying the original estimated error terms by assuming a different variance. Juhn, Murphy, and Pierce (1993) compute residuals based on the actual income percentile of a household in a particular year and the average cumulative distribution over time. If we assume a normal distribution, this procedure, which we use here, is equivalent to scaling the error terms in one year by the standard deviation in the other year.

Decomposition method

Let $D(y,P)$ be any measure of income distribution where y is earnings and P is the probability of labor force participation and occupational choice decisions (as defined in equations 2 and 1). Let β be the estimated parameters in the earnings equations; X the independent variables education, experience, and regional location; ε the error terms in the earnings equations; and λ the estimated parameters in the occupational choice equations. We can then rewrite $D(y,P)$ as $D(\beta,X,\varepsilon,\lambda)$. The decomposition exercise consists of estimating the effects on the joint distribution of income and labor choice by changing one or more arguments of $D\{\cdot\}$. The labor choice effect is estimated by modifying λ , (the estimated parameters in the occupational choice equations). The price effect is estimated by changing β , (the estimated returns to education, experience, and location in the earnings equations); the population effect by modifying the

structure of X , (such as the distribution of years of schooling, experience, and location); and the effect of unobservables by simulating the distribution of residuals, as described above.

Let y and P be income and the probability of an occupation in the initial year 0 (1984), and y' and P' income and occupation in final year 1 (1994). We are interested in explaining the change in income distribution between year 0 and year 1:

$$\Delta D = D(y', P') - D(y, P) = D(\beta', X', \varepsilon', \lambda') - D(\beta, X, \varepsilon, \lambda)$$

This can be decomposed into the effect of changing prices, the effect of changing unobservables (after having changed prices), the effect of changing the X s (after having changed prices and unobservables), and the effect of changing labor choice behavior (after having changed all other factors). This can be stated as:

$$\Delta D = [D(\beta', X', \varepsilon', \lambda') - D(\beta, X', \varepsilon', \lambda')] + [D(\beta, X', \varepsilon', \lambda') - D(\beta, X, \varepsilon, \lambda')] + [D(\beta, X, \varepsilon, \lambda') - D(\beta, X, \varepsilon, \lambda)] + [D(\beta, X, \varepsilon, \lambda') - D(\beta, X, \varepsilon, \lambda)]$$

which, simplifying notation, can be expressed as:

$$\Delta D = D_{\beta}(X', \varepsilon', \lambda') + D_{\varepsilon}(\beta, X', \lambda') + D_X(\beta, \varepsilon, \lambda') + D_{\lambda}(\beta, X, \varepsilon)$$

where each D subscript represents the change in the distribution resulting from changing the subscript variable.

This is an exact “sequential” decomposition of price, unobservables, population, and labor choice effects. This decomposition does not, however, keep final (1994) conditions constant at each step of the simulation. To keep final conditions unchanged, we apply a simple transformation and rearrange terms to obtain:

$$\begin{aligned}
\Delta D = & D_{\lambda} (\beta', X', \varepsilon') && \text{labor choice effect} \\
& + D_{\beta} (X', \varepsilon', \lambda') && \text{price effect} \\
& + D_{\varepsilon} (\beta', X', \lambda') && \text{effect of unobservables} \\
& + D_X (\beta, \varepsilon, \lambda') && \text{population effect} \\
& + [D_{\varepsilon} (\beta, X') - D_{\varepsilon} (\beta', X')] + [D_{\lambda} (\beta, X, \varepsilon) - D_{\lambda} (\beta', X', \varepsilon')] && \text{remainder} \tag{3}
\end{aligned}$$

Or, alternatively, to keep initial (1984) conditions unchanged:

$$\begin{aligned}
-\Delta D = & D_{\lambda} (\beta, X, \varepsilon) + D_{\beta} (X, \varepsilon, \lambda) + D_{\varepsilon} (\beta, X, \lambda) + D_X (\beta', \varepsilon', \lambda) \\
& + [D_{\varepsilon} (\beta', X) - D_{\varepsilon} (\beta, X)] + [D_{\lambda} (\beta', X', \varepsilon') - D_{\lambda} (\beta, X, \varepsilon)] \tag{4}
\end{aligned}$$

Equations 3 and 4 say that the total change in the joint distribution of y and P can be expressed as the sum of the effects due to labor choice changes, price changes, and change in the distribution of unobservables—given final (initial) conditions—plus the effect of changes in population—given initial (final) conditions.

The interpretation of the two remainder terms in this formulation is that of an interaction term between different factors being simulated. In other words, the combined effect of modifying two or more factors at the same time—say, prices and X s—is not equal to the sum of the components (that is, the effect of changing prices while keeping education, experience, and location fixed and the effect of changing education, experience, and location while keeping prices fixed).

The results from decompositions 3 and 4 represent the upper and lower bounds for the estimates if we make the reasonable assumption of monotonicity of the decomposition relative to changes in those factors.⁴ Using this assumption, we base the analysis of the results on the average of the upper and lower bounds.

⁴ We have tested monotonicity by calculating the population effect using average 1984–94 returns.

The decomposition described here is a simplification of what is actually applied. Because we simulate the effect of each price and independent variable in turn, all things equal, the results will include several different remainders, each being the difference between the effect of simulating two or more prices or factors at the same time and the separate effect of each price or factor. Empirically, the most notable remainder is that of the overall population effect. The reason is that the overall population effect is calculated as the observed change in distribution minus the calculated effects of labor choice, prices, and unobservables. In turn, the overall population remainder is calculated as the overall population effect minus the calculated effects of those factors being simulated—education, experience, and regional location. Thus the overall population remainder term incorporates all other effects that we cannot account for from within our framework.

Changes in labor choice and earnings functions in 1984–94

For the purposes of this chapter, we discuss only major changes shown by the estimation results for the 1984–94 period—those most relevant to understanding the changes in distribution. Among them are significant changes in labor force participation, in returns to skills, and in regional conditions.

Labor force participation

The results of the multinomial labor choice equations indicate that there were some significant changes in labor force participation behavior and in choice of activity in 1984–94.⁵ One important change relates to experience. For heads of household, the positive elasticity between experience and inactivity increased tremendously in the period. A head of household with more experience than the average was more likely to be inactive in 1994 than in 1984. Experience clearly proxies for age, and the increased speed with which skills become obsolete makes older workers less attractive in the market. This change was more marked in urban areas, where greater technological change has taken place.

⁵ Full estimation results can be obtained from the authors.

Another important change is in the relationship between women's education and their occupational choices. Generally, an increase in years of schooling reduced the probability of inactivity for all household members, and this effect was stronger in 1994 than in 1984. But for spouses—most of whom are women—the effect was more often than not in the opposite direction. In 1984 urban spouses at all levels of education who experienced a marginal increase in education were more likely to revert to inactivity and away from self-employment—and the effect was stronger at higher levels of education. In 1994, however, women experiencing an increase in education were more likely to enter self-employment. Those with primary education were more likely to become active, and those with higher levels of education less likely to be inactive. Apparently, the urban woman of 1994 was more independent—that is, she was more likely to respond to market opportunities for her human capital. This interesting development may reflect cultural changes more than economic ones.

In contrast, a rise in the potential income of the household—which controls for characteristics of other household members—increased the probability of inactivity for spouses (and for other members of the household) more in 1994 than in 1984. This is not a general result. Because this elasticity is evaluated at the mean, it reflects the decisions of women with secondary education, whose participation dropped. One interpretation of this drop in participation is that these are women in support positions—for example, secretarial jobs—who may have seen their opportunities reduced as they were replaced by slightly more educated and computer-skilled people.

Some changes across regions are also of interest. In rural areas a working head of household increased the probability of self-employment for other members of the household in 1994 but not in 1984. We usually think of self-employed heads of household as providing work for the rest of their family. One interpretation of the change is that, as conditions in rural areas deteriorate, job opportunities become more segmented, more of the people who stay must work, and these people resort to the family business while the others migrate to urban areas. Another part of this interpretation is that the uneducated women who join the labor market—usually without formal work experience—do so by working in the family business (which counts as self-employment). Finally, living in Mexico City significantly reduced the probability of inactivity, with the effect much stronger in 1994 than in 1984.

This result reflects major changes in the relative availability of job opportunities together with self-selection in migration, which ensures that the most entrepreneurial people move to cities while those with less potential stay behind.

Returns to skills

Results from the earnings equations show that the most important change between 1984 and 1994 is the convexification of the returns to schooling (table 3). As observed in other economies, in Mexico the wage gap related to skills, as measured by the returns to education, widened in the period. The curvature of the functions for returns to education increased (that is, the functions became more convex), and the returns to low and medium levels of education declined while those to high levels of education increased.⁶ For example, for all male workers, except men in self-employment in rural areas, the marginal private returns to any year of primary education fell, while those to higher and college education rose. For male workers in self-employment in rural areas, marginal returns to education fell at all levels of schooling (figure 3). These changes were not driven by a dramatic increase in the returns for a few people at the top. When the quadratic specification for education is replaced by one with dummies for schooling levels, the change in curvature closely resembles that in the quadratic specification.

The widening gap in the returns to education reflects the timing of demand and supply factors affecting the labor market. In the short run technological change increases the demand for skills. This raises the relative wages of the skilled because it takes time for more educated cohorts to enter the workforce—even when the public policy response is immediate, which has not been the case in Mexico.

As many authors have argued, trade liberalization may also raise the demand for skills, contrary to the predictions of the two-sector Heckscher-Ohlin model. Hanson and Harrison (1995), for example, found that 23 percent of the increase in relative wages for skilled workers in Mexico during 1986–90 can be attributed to the reduction in tariffs and the elimination of import license requirements. Revenga (1995) suggests that employment and wages for unskilled labor are more sensitive/liable to reductions in

⁶ Indeed, the quadratic term is highly significant in 1994 in almost all regressions but barely significant in 1984.

protection than are those for skilled labor, because of the concentration of unskilled workers in sectors more affected by liberalization. Tan and Batra (1997) find that investments in technology and export orientation have a large impact on wages for skilled workers and a relatively smaller effect on wages for the unskilled. Cragg and Epelbaum (1996) present evidence that suggests that the effect of skill-biased technological change is to expand the wage premium for skilled workers. And Robertson (2000) points to empirical evidence suggesting that trade liberalization in Mexico has sharpened the demand for skilled workers and increased wage inequality.

Several forces at work explain these results. First, Mexico has tended to protect less skill-intensive industries, and as a result trade liberalization increased the relative price of skill-intensive goods. Second, foreign investors tend to outsource tasks that are relatively less skill intensive in the United States but are nonetheless relatively skill intensive in Mexico. And third, domestic firms themselves invest in technology, thereby increasing the demand for complementary skills. Trade liberalization and technology absorption may thus explain in part the observed increases in income inequality through a change in the rewards to skills as proxied by education. They may also have contributed to the increased divergence of conditions between urban and rural labor markets, as foreign investment remains concentrated in cities on the U.S.-Mexico border (Hanson 1996).

The increased returns to higher education are mirrored by falling returns to experience in wage employment. This is consistent with technological innovation, the obsolescence of older cohorts' skills, and the greater likelihood that young cohorts will enter wage work. Younger cohorts, for example, are more likely to have acquired the computer skills required in the modern work environment. With technological innovation, these skills become more important to an employer than work experience. Among the self-employed, however, experience was valued more in 1994 than in 1984, perhaps as a result of a shift in demand toward goods requiring more experience.

Regional conditions

In 1984 most regional effects were insignificant at 95 percent or greater confidence. In 1994 most were

negative and highly significant. This change indicates that conditions diverged across regions and that growth was uneven. Indeed, the central regions of Mexico have been growing at a faster pace than the rest of the country, with Mexico City in particular doing better. Poor agricultural areas in the south have suffered the greatest relative decline, in part as a result of falling crop prices. The northern regions have shown uneven growth: while the northwest has seen growth spurred by significant foreign investment, the northeast has lagged behind.

Unobservables

The variance of the residuals of the earnings function for men increased during the period. A standard interpretation would be that the dispersion of the unobservable talents of men, such as innate ability and entrepreneurship, increased. This interpretation is an appealing one for Mexico, where market-oriented reforms increased economic competition and reduced protection. The value of entrepreneurship in determining outcomes must have risen, and this shows up in the increased variance of the residuals.

For women, however, the variance of the residuals of the earnings function declined. Here the change in the variance may capture the dispersion in the hours worked. The strong participation of younger women, who are more likely than older women to work full time, should reduce the dispersion in hours of work.

Results from decomposing changes in earnings inequality

We now present the results from the decomposition, which estimates the proportional contribution of changes in labor choice, prices, and observed and unobserved labor characteristics to the changes in income distribution. Here we give the results for individual earnings; the results for household income follow in the next section. Comparison of the two sets of results provides added insight into household dynamics and decisionmaking.

As mentioned, each set of results represents the average of the results from two separate simulations—one relating to the contributions of each factor with 1984 as the base year, and the other relating to

those with 1994 as the base year.

Earnings inequality rose markedly in 1984–94. The Gini coefficient rose by 8 percentage points, the mean log deviation (E_0) by a third, the Theil index (E_1) by a half, and the transformed coefficient of variation (E_2) by one and a half times. Changes in labor choice, in education and the returns to education, and in rural-urban disparities explain more than two-thirds of this increase in earnings inequality (table 4). The largest contributions came from the changes in the education price and population effects, which together explain 41 percent of the change in the Gini coefficient (24 percent and 17 percent). Also very important are the growing disparities in returns between rural and urban areas, which accounted for 21 percent of the change in the Gini coefficient (table 5). Finally, labor choice effects, driven by the choices of the increasing number of working women, accounted for 6 percent of the change in the Gini coefficient.

Labor choice effect

The first simulation modifies the structure of parameters in the labor participation and occupational choice equations while keeping the structure of earnings unchanged. The question addressed is this: What would the distribution of earnings be like if labor participation and occupational choices in 1984 were modified to reflect labor participation and occupational choices in 1994, and vice versa?

Overall, the effect of changes in labor participation and occupational choices is unequalizing, especially at the top of the distribution. It represents 6 percent of the change in the Gini coefficient and as much as 28 percent of the change in the transformed coefficient of variation. Driving this result is the effect of increased female labor force participation. Male occupational choice decisions temper the result.

Changes in female participation decisions have a large and unequalizing effect on the distribution of earnings, while changes in male participation decisions have an equalizing effect at the bottom of the distribution and an unequalizing one at the top (figure 4). The reason for this difference is that women enter at the two extremes of the skill distribution. Those with little education enter self-employment in agriculture to substitute for poorly educated men moving out of agriculture and into the wage sector.

Women's entry into the least remunerated activity increases inequality, while men's movement out of agriculture and into better paid activities reduces it.

At the top of the skill distribution, highly educated women increase their participation greatly, entering self-employment (once the domain of women with low education) in services (see figure 2). Similarly, highly educated men flee wage employment in manufacturing to enter self-employment in services, which explains why the male labor choice effect is unequalizing at the top of the earnings distribution (see the results for E_2 in table 4).

Price and population effects

The second step in the decomposition is to modify returns (to skills and location) and independent variables in the earnings equations to investigate what the impact of these factors would be on the distribution of income if participation and occupational choice decisions were left unchanged. Not surprisingly, the dominant factor is the change in the structure of returns to education. Unexpected, however, are the results for years of education.

The unequalizing effect of education. The change in the structure of returns to education engenders a large, unequivocal increase in inequality. But it is not only the change in the returns to schooling that produces higher income inequality—the improvement in the distribution of schooling does as well.

Two elements contribute to this surprising result. As we saw in the comparison of educational achievement across the distribution in 1984 and 1994, there was a larger proportional increase in years of schooling in the middle of the distribution than at the bottom or the top (see table 2). As we have also seen, marginal rates of return are higher for higher levels of education. That means that someone with little education gains less from an additional year of schooling than does someone who is more educated. Only much larger educational gains at the bottom would have resulted in increased income equality.

Why is the bottom of the distribution slow to adjust? One explanation is that poor people face greater constraints in adjusting to increased demand for skills. These constraints may be on both the demand

side (inability to afford the costs of attending school) and the supply side (unavailability of schools in poor areas). Thus greater efforts are needed to provide access to education and to stimulate demand for education across the distribution. Among cohorts already in the workforce, those with some education may find it easier to acquire additional skills than those with no education to start with. The importance of universal basic education for increased flexibility in responding to changing labor market conditions cannot be overstated.

But there are also other interpretations of the slow adjustment at the bottom: cohort and mobility effects. Older, less educated cohorts do not invest in additional education, and end up swelling the bottom of the distribution. Indeed, the first decile of the income distribution is the only one in which the average age of the labor force increased. Younger individuals from poor households who become more educated move upward in the income distribution. Both effects lower the recorded gains in education at the bottom.

To gain a better understanding of the ex ante changes in education across the distribution, we simulate educational gains while keeping the ranking of individuals by earnings as in 1984. We then calculate the effect of that change on the distribution of earnings. The results, presented in figure 5, are quite interesting. The jagged line in the figure represents proportional gains in education by percentile. Educational gains are about 15–20 percent for the bottom half of the distribution, significantly larger than the 10–15 percent gains for the top half. The smoother, upward sloping curve represents the effect of educational gains on earnings. Up to the sixtieth percentile these gains are distributionally neutral. Above that, the very high marginal returns to higher education contribute to increasing inequality. At the very top of the income distribution relatively small educational gains translate into a 20 percent increase in earnings (compared with only a 10 percent increase for the bottom three quintiles).

Another interpretation of why the bottom may be slow to adjust is offered by Heckman, Lochner, and Taber (1998), in the context of a heterogeneous agent, general equilibrium model. The authors' interpretation relates to the time people spend actually working and investing in learning-by-doing (neither of which is observed empirically). In their model the best response for the poorly educated to an expected fall in the relative returns to unskilled labor is to work now (when the returns are high) and

invest in learning later (when the returns are low). For the more educated, who expect their returns to improve in the future, the optimal choice is to invest in learning now and work more later. These strategies would increase measured income inequality in the medium term. They would also lead to a smaller increase in education levels at the bottom of the income distribution than would be necessary to avoid an increase in the earnings gap associated with skills.

The distribution of schooling also affects occupational choice—a participation-induced effect. This effect is consistently equalizing and somewhat tempers the inequality-increasing earnings effect.⁷ As the distribution of education improves, the relatively less educated get more benefit from it—in terms of expanding opportunities—than do more educated people. This result makes sense. Overcoming illiteracy, for example, enlarges opportunities more than does staying in high school or college for one more year. Indeed, the participation-induced effect is strongest at the bottom of the distribution.

If upward sloping convex returns to education lead to improvements in the distribution of schooling and thus contribute to income inequality, the more pronounced convexity in the returns observed in 1994 cannot but contribute even more to inequality. As we noted, returns to lower education fell while returns to higher education increased in every labor category. The convexification of returns is highly unequalizing. The changes in returns to education led to some gains at the bottom of the distribution, substantial losses in the middle, and very large gains at the top (figure 6).

Together, changes in schooling and in returns to schooling account for 41 percent of the change in earnings inequality as measured by the Gini coefficient, and about a third of the change in other inequality measures.

The weakly unequalizing effect of experience. The price and population effects of experience tend to cancel each other out and, combined, account for barely 1 percent of the increase in the Gini coefficient. The price effect is small and equalizing because returns to experience fell overall and became more concave. In contrast, the distribution of experience became more unequal during the period (the Gini

⁷ The participation-induced effect of education is calculated by substituting the distribution of education into the labor participation and occupational choice equations. The earnings effect is calculated by substituting the distribution of education into the earnings equations.

coefficient for years of experience increased from 0.39 to 0.41), and this contributed to the increase in earnings inequality.

The large and unequalizing effect of urban-rural disparities. The constant term effect from the earnings equations is large and unequalizing. This effect captures the changes in the differences between the constant terms of the regressions in the 12 labor categories. Our guess was that the fall in real labor earnings in rural areas in absolute terms and relative to real earnings in urban areas was responsible for this effect. Applying a static decomposition of inequality within rural and urban areas and between them, we find that the inequality between rural and urban areas was rising (see table 1).

To confirm this change and calculate its proportional effect on the increase in inequality within our framework, we reestimate the earnings equations, this time combining urban and rural earners (though separating them by gender and occupation) yet leaving all rural coefficients unrestricted. Although this procedure is identical to regressing rural and urban data separately except for the common error term, it does allow us to isolate the marginal effect of rural returns from the effect of overall returns in the decomposition.

The results confirm that the deterioration of conditions in rural areas relative to those in urban areas explains a large part of the increase in income inequality (see table 5). In particular, the fixed effect of living in rural areas, as reflected by the rural constant term, has a large unequalizing impact, only partially counterbalanced by the convergence of urban and rural returns to education and experience. The effect represents 22 percent of the change in the Gini coefficient. When we plot the simulated change in income by percentile due to the urban-rural effect, we find that the urban-rural effect heavily penalizes the bottom half of the distribution (figure 7). The bottom half experiences an earnings loss of 10–25 percent, compared with 5–10 percent for the top half.

The mildly unequalizing effect of regional disparities. The coefficients of regional dummy variables have an equalizing effect, but this effect is outweighed by the change in the geographic distribution of the population. An appropriate description of these results might be “voting with their feet.” As conditions

change, people move to compensate for those changes. The reverse may hold as well: as people move to take advantage of opportunities, returns equalize across regions.

Evidence suggests that there were significant migratory flows in the period. For example, the 1990 census showed that an estimated 30 percent of the people in the northern border regions were immigrants from other regions, and urbanization rates in the northern cities far exceeded those in other major urban centers (Anguiano 1998).

The large and unequalizing remainder population effect. The size of the remainder term in the population effect calls for explanation. Once education, experience, and interregional migratory effects are taken into consideration, the unexplained portion of the population effect remains very large and unequalizing. Part of this effect comes from sampling errors in the surveys: the 1994 survey significantly oversamples rural areas relative to the 1984 survey, and this may bias population effects upward.⁸ But most of the effect reflects our inability to capture urbanization and interregional migratory movements. The importance of selection in explaining migration is widely recognized: more entrepreneurial and resourceful people are more likely to migrate. Without panel information or a variable relating migrant status, it is impossible to satisfactorily simulate the effect of migratory movements. But there is a strong presumption that the population effects from migration are very important in explaining increased income inequality. As the best and the brightest leave depressed areas to migrate to more successful areas, the depressed areas lose and the successful ones gain even more.

Effect of unobservables

The last step in the decomposition is to modify the distribution of residuals to investigate the impact of unobservables on the distribution of income if other factors in the earnings equations and in participation and occupational choice decisions remain unchanged.

⁸ Census data show that the proportion of the population living in urban areas grew from 66 percent to 74 percent between 1980 and 1999. Household survey data, however, report that this proportion fell from 63 percent to 58 percent between 1984 and 1994 (and that the urban labor force fell from 64 percent to 60 percent in the same period).

The effect of unobservables is small (except at the top of the distribution) and ambiguous. This is not surprising, since, as we have seen, the increase in the variance of the residuals of the male earnings equations is counterbalanced by the decline in the variance of the residuals of the female earnings equations. The relatively large equalizing effect of unobservables at the top of the distribution is interesting. One possible interpretation is that the female entrants at the top of the distribution work full time, reducing the variance in overall hours of work.

Results from decomposing changes in household income inequality

Household income inequality rose less than earnings inequality in 1984–94, yet the increase was still substantial. The Gini coefficient rose by 6 percentage points, the mean log deviation (E_0) by a quarter, the Theil index (E_1) by a third, and the transformed coefficient of variation (E_2) by a half.

By grouping individuals back into their own household and adding nonlabor sources of income, we obtain household income vectors and can observe the changes in the distribution of household income. The decomposition of the change in household income inequality in 1984–94 is consistent overall with the decomposition of the change in earnings inequality (see table 4). The differences, however, point to the household as an important mechanism for tempering the rise in earnings inequality. Because the two decompositions are based on the same econometric estimations, and merely reflect a different grouping of individuals, any difference between them is by definition statistically significant.

The largest single contribution to the increase in household income inequality remains that due to education price and population effects, which together explain about 40 percent of the change in the Gini coefficient (25 percent and 15 percent; see table 4). The effect on household income of the growing disparities in returns between rural and urban areas is comparable to the effect on earnings (19 percent of the change in the Gini coefficient; see table 5). Much less important and ambiguous are labor choice effects (–3 percent of the change in the Gini coefficient and 5 percent of the change in E_2). And much greater is the impact of unexplained population effects (44 percent of the change in household income inequality, compared with 29 percent for earnings inequality).

Labor choice effect

The most important result is that household dynamics eliminate the unequalizing effect of labor participation and occupational choice decisions on individual earnings. Female labor choices that are very unequalizing for individual earnings become equalizing for household income. Two factors are at play.

First, the highly educated women who entered the labor force in large numbers come not from the richest households (those with very high nonlabor income) but from upper-middle-class households. Their high wages contribute to the increase in earnings inequality (since they are among the highest earners). But their wages also help close the gap with the households that have the highest nonlabor income, since women from the richest households tend not to participate in the labor market.

Second, at the opposite end of the income distribution, women with little or no education, who belong to the poorest households, contribute to earnings inequality by earning wages lower than those of unskilled male workers. But as they enter agricultural activity to substitute for male labor moving to wage employment, they complement their spouses' income and raise household income closer to that of less poor households—and thus reduce household income inequality.

The changes in the male participation effect are similar to those in the female participation effect for educated men, but not for uneducated men. Participation increases for men with higher education, and these highly educated men contribute to the increasing inequality in earnings—just as highly educated women do—but the effect is hampered at the household level because these men do not belong to households with high nonlabor income. Men with little education tend to contribute to the equalizing of earnings by moving to the wage sector, but they have no effect on the distribution of household income. The reason is that the wage sector offers better and less unequally distributed earnings than self-employment. The more equal distribution in the wage sector reduces overall earnings inequality.

Price and population effects

The more unequalizing effect of education. The effect of the changes in returns to education is more unequalizing at the household level. This result is intuitive: since the correlation between schooling levels is positive and very high among family members, the change in relative wages tends to affect all members of a household in the same direction. For example, an educated man is more likely than an uneducated one to have an educated spouse. When the earnings gap associated with skill increases, both educated spouses will benefit and both uneducated spouses will be harmed. Indeed, it is surprising that the difference in effect between individuals and households is not larger. This may reflect the still relatively low participation of women in the labor force.

The more unequalizing effect of experience. The effect of experience differs more markedly between individual earnings and household incomes than does the effect of education (relative to the size of the effect). This reflects the fact that spouses age together. As returns to experience fall, older couples lose relative to younger ones. And their combined loss is greater relative to the household income distribution than their individual losses in the earnings distribution.

The less unequalizing effect of urban-rural disparities. The effects of the divergence between urban and rural areas are less marked at the household level. The reason is that household income includes nonlabor income, and any change in earnings affects total income by a smaller proportion than it would labor income. In addition, reported nonlabor income falls more in urban than in rural areas, countering the decline in rural labor income.

The more unequalizing remainder population effect. The remainder population effect is more important in explaining changes in household income inequality than it is in explaining changes in earnings inequality. One reason is that this term captures the distributional effects of nonlabor income (not modeled here). Nonlabor income contributes to increasing inequality because its distribution has become more unequal and because the correlation between labor and nonlabor per capita income almost doubled between 1984 and 1994, from 16 percent to 27 percent, according to our calculations.

The effect of unobservables

The effect of unobservables is more equalizing for household income than for earnings. This probably reflects diversification in the activities of working household members, such that the variance of the sum of their residuals is lower than the sum of the variances of those residuals.

Conclusion

Our analysis of the microeconomic determinants of the marked rise in inequality in earnings and household income in Mexico during 1984–94 indicates that changes in the levels of and returns to education are responsible for about two-fifths of the increase in inequality (as measured by the Gini coefficient). Divergence between rural and urban fixed factors accounts for another fifth. These results are consistent across decompositions of the changes in inequality in earnings and household income.

The first result points to the importance of education—in particular, structural shifts that affect the labor market returns to education—in determining the changes in income distribution. Most earners, all except those with a university or higher education, experienced falling marginal returns to their education. The consequences for private incentives to invest in education pose a policy dilemma: To reverse the trend of falling returns to lower levels of education, more has to be invested in education, not less. But the market incentives for all but those with the highest levels of education work in the opposite direction.

In what may at first seem a paradox, the gains in average education and the more equal distribution of education across the working population contribute to rising income inequality. The reason is that marginal returns to education increase at higher education levels, so that a marginal increase in education brings smaller rewards for the less educated than for the more educated. Part of the effect is due to the behavior of older cohorts: because these cohorts no longer invest in education (and at the same time are not rewarded for their greater experience), they end up lagging behind, swelling the bottom of the income distribution.

Despite the paradoxical effects of the gains in education and its distribution, one conclusion is that too little emphasis has gone to improving education for all, particularly those least able to do so on their own. Education helps to reduce poverty no matter what its consequences are for distribution. Moreover, educating children at the bottom of the income distribution is necessary to outweigh the convexity of the returns to education.

The observed drop in marginal returns to primary—and, in some cases, secondary—education implies weaker private incentives to invest in education for all parents who would expect to be able to provide their children with only basic education. Facing constraints on their ability to meet the direct and opportunity costs of schooling, more parents may choose to delay or cut short their children's education. These considerations raise important policy issues.

First, skill-biased technological innovation and, possibly, trade liberalization may have caught Mexico unprepared. To avoid negative repercussions for poverty and income distribution requires building the human capital asset base, particularly of the poor and least educated. This takes time as well as a substantial investment. And the investment needs to be multisectoral—in health, nutrition, and schooling—to improve children's ability to learn and their educational achievement.

Second, as the marginal returns to primary and secondary education in the labor market fall, the gap between social and private returns to education is probably expanding. While most parents send their children to school because they value learning beyond what is strictly captured by the present value of future earnings, policy may need to address the needs of families too poor to provide their children with even minimal schooling, nutrition, and health care.

Although most school-age children in Mexico today are already enrolled in primary school, a small but significant number is not, particularly in poor, isolated rural areas. The ultimate challenge, of course, is to ensure that the new generation acquires an education enabling them to meet the increasing demands for skills—whether a technical or a college education. But it is also critical to ensure universal basic education, so that children's opportunities to obtain higher education are as equal as possible.

The other important source of inequality is the divergence in conditions between rural and urban areas and the absolute fall in rural real incomes. While countries that have made substantial efforts to liberalize trade have reaped significant gains (Ingco 1997), these gains do not necessarily benefit all workers. This pattern reveals itself in Mexico: although trade liberalization has contributed to higher average wages, the increase is not uniform across workers (Revenge 1995). Agricultural workers suffered a severe decline in real income—on the order of 45 percent—as a result of terms of trade reversals in their principal crops, including coffee and cocoa, and the elimination of agricultural price support schemes. This outcome for agricultural workers may reflect in part the relative lobbying power of sectors benefiting from large foreign direct investment flows. Self-selection in migration also contributed to the fallout for rural economies: the most entrepreneurial workers may have moved to the city, leaving behind those least able to adjust to changing rural conditions.

These trends point to clear public policy objectives: expanding nonfarm productive opportunities in rural areas and building rural households' seriously lagging asset base, particularly their human capital. Such a policy might include resolving coordination failures in the production and export of local manufactures and processed foods, developing incentives and partnerships for private sector investment in rural areas, and providing technical training for rural populations that responds to private sector demands. Failure to address rural poverty increases the incentives for migration and urbanization, worsening the already pressing problems of overcrowding and urban violence. The economic integration with the United States might well be part of such a policy because it may contribute to the “industrialization” of rural areas—at least in the northern regions,.

To help improve poor people's acquisition of human capital, in 1997 the Mexican government pioneered a poverty reduction program—Progresa (Programa de Educación, Salud y Alimentación). Targeted to poor rural households, the program is aimed at improving nutrition and increasing the demand for education and health care for children. It provides monetary and nutritional transfers to families that make a commitment to sending their children to school and completing periodic health care visits—and monetary transfers to pregnant women for pre- and postnatal care. By September 1999 the

program had been implemented in all 31 states, in 51,300 localities, reaching 2.3 million poor rural households.

Progresa focuses on two of the problem areas we identify. It targets the schooling, health, and nutrition of poor children, aiming to accelerate improvements in the distribution of human capital and in the productive capacity of the next generation. And it targets poor rural areas, which both lag behind in average human capital and have lost ground relative to the rest of the country. Impact evaluation studies attest to Progresa's important impact on poverty.

Because we are interested in the effect such a program could have on distribution, we use the framework of this chapter to perform a simple simulation exercise. Using the 1994 survey as a base, we simulate household income by artificially awarding an increase in income equivalent to the Progresa transfer to the poorest 40 percent of rural households (mimicking Progresa coverage levels); this increase is equal to an average of 18.6 percent of household income in the bottom two quintiles, or 124.4 pesos (1994 pesos). The exercise assumes perfect targeting, 100 percent compliance by beneficiaries, and no change in the amount of education or in any other variable or price. Under these assumptions, we find that the Gini coefficient for household income would have fallen by less than half a percentage point. The largest effect would have been in the mean log deviation (E_0), which would have fallen from 0.54 to 0.52. In other words, if Progresa were only a transfer program, however perfectly targeted, it would have had little effect on the distribution of income. Once the human capital gains of the poor start to affect their earnings—as children come of age and enter the labor force—Progresa may have a stronger effect on distribution.

References

- Almeida dos Reis, Jose Guilherme, and Ricardo Paes de Barros. 1991. "Wage Inequality and the Distribution of Education: A Study of the Evolution of Regional Differences in Inequality in Metropolitan Brazil." *Journal of Development Economics* 36: 117–43.
- Anguiano Téllez, María Eugenia. 1998. "Migración a la frontera norte de México y su relación con el mercado de trabajo regional." Working paper. El Colegio de la Frontera Norte, Population Studies Department, Tijuana, Mexico.
- Bouillon, César, Arianna Legovini, and Nora Lustig. 2001. "Rising Inequality in Mexico: Household Characteristics and Regional Effects" Inter-American Development Bank, Sustainable Development Department, Washington, D.C.
- Bourguignon, François, Francisco Ferreira, and Nora Lustig. 1998. "The Microeconomics of Income Distribution Dynamics in East Asia and Latin America." Research proposal. Inter-American Development Bank, and World Bank, Washington, D.C.
- Bourguignon, François, Martin Fournier, and Marc Gurgand. 2000. "Distribution, Development and Education in Taiwan, 1979–1994." Delta, Crest and Universite de Paris I, Paris, France.
- Coorey, Sharmini. 1992. "Financial Liberalization and Reform in Mexico." In Claudio Loser and Eliot Kalter, eds., *Mexico: The Strategy to Achieve Sustainable Economic Growth*. Washington, D.C.: International Monetary Fund.
- Cowell, Frank. 1977. *Measuring Inequality*. London School of Economics Handbooks in Economic Series. London School of Economics and Political Science, London.
- Cragg, Michael Ian, and Mario Epelbaum. 1996. "Why Has Wage Dispersion Grown in Mexico? Is It the Incidence of Reforms or the Growing Demand for Skills?" *Journal of Development Economics* 51: 99–116.

- Cruz Piñeiro, Rodolfo. 1997. "Situación demográfica de la frontera norte." El Colegio de la Frontera Norte, Population Studies Department, Tijuana, Mexico.
- Gomez de León, José. 1999. "Correlative Dimensions of Poverty in Mexico: Elements for Targeting Social Programs.", PROGRESA, Mexico City, Mexico.
- Hanson, Gordon H. 1996. "U.S.-Mexico Integration and Regional Economies: Evidence from Border-City Pairs." NBER Working Paper 5425. National Bureau of Economic Research, Cambridge, Mass.
- Hanson, Gordon H., and Ann Harrison. 1995. "Trade, Technology and Wage Inequality in Mexico." NBER Working Paper 5110. National Bureau of Economic Research, Cambridge, Mass.
- Heckman, James J., Lance Lochner, and Christopher Taber. 1998. "Explaining Rising Wage Inequality: Explorations with a Dynamic General Equilibrium Model of Labor Earnings with Heterogeneous Agents." NBER Working Paper 6384. National Bureau of Economic Research, Cambridge, Mass.
- Ingo, Merlinda D. 1997. "Has Agricultural Trade Liberalization Improved Welfare in the Least-Developed Countries? Yes." World Bank, Washington, D.C.
- Juhn, Chihui, Kevin Murphy, and Brooks Pierce. 1993. "Wage Inequality and the Rise in Returns to Skill." *Journal of Political Economy* 3(3): 410–48.
- Lustig, Nora. 1998. *Mexico: The Remaking of an Economy*. Washington, D.C.: Brookings Institution Press.
- Lustig, Nora, and Miguel Székely. 1998. "Economic Trends, Poverty and Inequality in Mexico." Inter-American Development Bank, Sustainable Development Department, Washington, D.C.

- Progresa (Programa de Educación, Salud y Alimentación). 1999. *Mas oportunidades para las familias pobres: Evaluación de resultados del Programa de Educación, Salud y Alimentación—Primeros avances*. Secretaria de Desarrollo Social, Mexico City, Mexico.
- Revenga, Ana. 1995. "Employment and Wage Effects of Trade Liberalization: The Case of Mexican Manufacturing." Policy Research Working Paper 1524. World Bank, Latin America and the Caribbean Region, Country Department 2, Washington, D.C.
- Robertson, Raymond. 2000. "Trade Liberalization and Wage Inequality: Lessons from the Mexican Experience." Macalester College, St. Paul, Minn.
- Tan, Hong, and Geeta Batra. 1997. "Technology and Firm Size-Wage Differentials in Colombia, Mexico, and Taiwan (China)." *World Bank Economic Review* 11(1): 59–83.
- World Bank. 1996. "Mexico: Rural Poverty." Report 15058-ME. Washington, D.C.

Tables and Figures

Table 1
Inequality in earnings and household income in Mexico, 1984 and 1994

	1984				1994				Percentage change			
	Gini Coefficient	E_0	E_1	E_2	Gini Coefficient	E_0	E_1	E_2	Gini Coefficient	E_0	E_1	E_2
Earnings inequality	49.4	53.5	45.5	76.4	57.3	71.4	68.8	193.0	16.0	33.5	51.1	152.6
Household income inequality	49.1	42.8	45.6	87.5	54.9	54.0	60.2	130.1	11.7	26.2	32.0	48.7
Static decomposition of between- and within-group inequality in earnings												
<i>All labor categories (by gender, occupation, and location)</i>												
Between group	42.0	16.8	16.9	9.2	50.0	23.7	20.7	7.0	19.2	41.8	22.6	-24.3
Within group	58.0	83.2	83.1	90.8	50.0	76.3	79.3	93.0	-13.9	-8.4	-4.6	2.5
<i>Occupation</i>												
Between group	17.1	2.8	3.2	1.9	15.6	2.6	2.6	0.9	-9.0	-5.5	-19.3	-53.3
Within group	82.9	97.2	96.8	98.1	84.4	97.4	97.4	99.1	1.9	0.2	0.6	1.0
<i>Location (urban and rural)</i>												
Between group	29.7	10.5	11.1	6.1	37.8	17.5	15.6	5.0	27.0	66.9	40.8	-17.6
Within group	70.3	89.5	88.9	93.9	62.2	82.5	84.4	95.0	-11.4	-7.8	-5.1	1.1
<i>Gender (male and female)</i>												
Between group	14.5	2.7	3.0	1.7	14.8	2.6	2.5	0.8	2.1	-5.2	-15.7	-49.2
Within group	85.5	97.3	97.0	98.3	85.2	97.4	97.5	99.2	-0.4	0.1	0.5	0.8

Note: E_0 is the mean log deviation, E_1 the Theil index, and E_2 the modified coefficient of variation.

Source: Authors' calculations based on data from the 1984 and 1994 national household income and expenditure surveys (INEGI).

Table 2
Characteristics of the labor force in Mexico, 1984 and 1994

	Total			Men			Women		
	1984	1994	Percentage change	1984	1994	Percentage change	1984	1994	Percentage change
Age structure (percent)									
Age group 18-35	55.1	57.0	3.5	54.8	55.9	2.0	55.8	59.4	6.4
Age group 36-55	35.8	35.4	-1.2	35.7	35.8	0.3	36.1	34.5	-4.3
Age group 56-65	9.1	7.6	-16.7	9.5	8.3	-12.5	8.1	6.1	-24.9
Education structure (percent)									
National									
Primary and below	70.3	54.8	-22.0	70.9	56.8	-19.9	68.7	50.7	-26.1
Secondary and preparatory	22.6	34.4	51.8	21.6	32.3	49.4	25.3	38.8	53.1
More than preparatory	7.1	10.8	52.5	7.5	10.9	46.0	6.0	10.5	75.2
Urban									
Primary and below	60.4	39.2	-35.1	60.6	40.6	-33.0	60.0	36.7	-38.9
Secondary and preparatory	29.1	43.9	50.6	27.9	41.5	48.6	32.0	48.3	51.0
More than preparatory	10.4	16.9	62.1	11.4	17.9	56.3	8.0	15.0	88.3
Rural									
Primary and below	87.4	77.7	-11.2	87.4	78.0	-10.7	87.5	76.7	-12.4
Secondary and preparatory	11.3	20.4	81.1	11.4	20.2	76.3	10.8	21.2	95.8
More than preparatory	1.3	1.9	49.7	1.1	1.8	58.1	1.7	2.1	27.9
Years of schooling									
Total	5.6	6.9	23.8	5.6	6.8	22.9	5.7	7.1	25.2
Urban	6.7	8.5	27.4	6.7	8.5	26.8	6.6	8.5	29.2
Rural	3.6	4.5	24.6	3.6	4.6	25.4	3.6	4.5	22.5
Deciles 1-3	3.1	3.7	19.2	3.2	3.9	22.7	2.8	3.1	9.6
Deciles 4-7	4.6	6.1	30.9	4.7	6.2	31.4	4.5	5.9	30.9
Deciles 8-10	8.0	9.8	22.0	8.2	9.8	19.7	7.6	9.6	27.5
Participation (percent)									
Working age	61.8	66.0	6.8	93.9	93.9	0.0	33.1	41.0	23.9
Age group 18-35	60.7	67.2	10.7	92.1	93.9	2.0	32.8	43.3	32.1
Age group 36-55	63.7	66.8	4.9	96.7	95.8	-0.9	34.2	40.6	18.4
Age group 56-65	61.6	55.8	-9.5	94.7	86.4	-8.7	30.2	27.9	-7.4
Occupation (percent)									
Wage employment	55.5	62.1	11.9	54.5	63.0	15.7	58.1	60.0	3.4
Mixed activities	9.0	4.7	-47.7	11.4	6.0	-47.9	2.7	2.1	-22.4
Self-employment	35.5	33.2	-6.4	34.1	31.0	-9.0	39.2	37.8	-3.4
Earnings									
Wage earners									
Average hourly real earnings (1994 pesos)	5.9	6.9	15.4	6.0	6.9	15.1	5.7	6.6	16.5
Earnings premium (ratio)									
Average to low-skilled earnings	1.6	2.0	27.3	1.5	1.9	29.2	2.0	2.4	19.7
High to low-skilled earnings	3.9	6.1	57.8	3.8	6.7	75.8	4.4	5.5	24.9
Self-employed									
Average hourly real earnings (1994 pesos)	4.7	5.0	6.6	4.5	5.5	20.5	4.9	4.0	-19.3
Earnings premium (ratio)									
Average to low-skilled earnings	1.4	1.8	25.5	1.3	1.5	17.2	1.5	1.4	-2.7
High to low-skilled earnings	5.3	7.9	47.7	5.3	7.8	46.4	0.9	6.5	603.3
Family size (number of individuals)									
Total	5.16	4.68	-9.1						
Rural	5.40	5.05	-6.4						
Urban	5.02	4.45	-11.4						

Source: Authors' calculations based on data from the 1984 and 1994 national household income and expenditure surveys (INEGI).

Table 3
Selected results from earnings equations for Mexico

	Wage earners		Self-employed	
	1984	1994	1984	1994
Urban men				
Years of schooling	0.099 *	0.051 *	0.138 *	0.044 **
Years of schooling squared	0.000	0.004 *	-0.001	0.004 *
Years of experience	0.078 *	0.064 *	0.073 *	0.079 *
Years of experience squared	-0.001 *	-0.001 *	-0.001 *	-0.001 *
Southern region	-0.040	-0.226 *	0.333 *	-0.228 *
Mexico DF	0.162 *	0.106 *	0.141	0.275 *
Constant	5.150 *	5.404 *	4.525 *	5.156 *
R-squared	0.376	0.468	0.215	0.292
Urban women				
Years of schooling	0.193 *	0.113 *	0.144 *	0.034
Years of schooling squared	-0.004 *	0.001 *	-0.004	0.006 *
Years of experience	0.065 *	0.057 *	0.047 *	0.053 *
Years of experience squared	-0.001 *	-0.001 *	-0.001 *	-0.001 *
Southern region	0.034	-0.173 *	0.140	-0.238 *
Mexico DF	0.312 *	0.196 *	0.482 *	0.530 *
Constant	4.620 *	4.922 *	4.248 *	4.537 *
R-squared	0.341	0.411	0.108	0.192
Rural men				
Years of schooling	0.135 *	0.071 *	0.177 *	0.159 *
Years of schooling squared	-0.001	0.003 *	-0.005 **	0.001
Years of experience	0.095 *	0.069 *	0.069 *	0.087 *
Years of experience squared	-0.001 *	-0.001 *	-0.001 *	-0.001 *
Southern region	-0.179 **	-0.363 *	-0.064	-0.649 *
Constant	4.632 *	5.044 *	4.435 *	3.903 *
R-squared	0.370	0.250	0.215	0.209
Rural women				
Years of schooling	0.232 *	0.129 *	0.132	0.132 *
Years of schooling squared	-0.004	0.002 **	0.002	0.003
Years of experience	0.068 *	0.060 *	0.078 *	0.037 *
Years of experience squared	-0.001 *	-0.001 *	-0.001 *	0.000 *
Southern region	0.128	-0.252 *	-0.145	-0.623 *
Constant	3.690 *	4.564 *	3.168 *	3.865 *
R-squared	0.453	0.343	0.079	0.112

*: Significance at the 5 percent level, **: Significance at the 10 percent level

Note: Excludes results for some regional dummy variables and mixed employment.

Source: Authors' calculations based on data from the 1984 and 1994 national household income and expenditure surveys (INEGI).

Full estimation results available from the authors on request.

Table 4**Decomposition of changes in inequality in earnings and household income in Mexico, 1984-94**

(average; percent)

	Gini	E_0	E_1	E_2
	Coefficient			
Earnings				
Labor choice effect	6.4	5.5	10.7	27.6
Male	-1.0	-4.4	4.4	19.2
Female	7.8	10.4	6.4	8.3
Price effect	38.7	44.7	34.7	31.8
Education	24.0	19.0	23.7	21.5
Experience	-0.9	-1.4	-0.1	2.5
Regions	-4.3	-4.5	-3.4	3.8
Constant	21.7	32.8	17.9	14.0
Remainder	-1.9	-1.3	-3.4	-10.1
Population effect	53.4	42.5	54.1	51.8
Education	16.5	13.8	10.7	6.7
Earnings-induced effect	19.6	18.0	13.2	8.0
Labor-choice-induced effect	-2.3	-3.7	-2.5	-2.2
Remainder	-0.7	-0.4	0.0	0.8
Experience	1.7	1.5	1.7	1.9
Earnings-induced effect	2.2	1.7	2.0	2.4
Labor-choice-induced effect	-0.5	-0.1	-0.4	-0.5
Remainder	0.0	-0.1	0.0	0.0
Regions	6.2	6.2	5.0	1.7
States	5.4	6.7	4.1	0.6
Remainder	28.9	20.9	36.7	41.5
Effect of unobservables	-0.6	2.5	-2.7	-9.0
Remainder	2.1	4.8	3.3	-2.2
Household income				
Labor choice effect	-2.6 *	-1.5 *	0.6 *	5.1 *
Male	-0.7	0.0	2.5 *	8.4 *
Female	-2.0 *	-1.6 *	-1.9 *	-3.5 *
Price effect	38.7 *	42.5 *	33.6 *	29.4 *
Education	24.5	23.0	24.7	25.3
Experience	1.5	2.0	2.1	6.2
Regions	-4.2	-4.4	-5.7 *	-10.4 *
Constant	18.8 *	23.6 *	16.1 *	16.5
Remainder	-2.0 *	-1.7 *	-3.7 *	-8.1
Population effect	64.5	58.4	66.2	69.2
Education	15.4 *	15.1	11.9	5.4 *
Earnings-induced effect	13.1 *	14.6 *	11.2 *	8.2
Labor-choice-induced effect	2.4	1.0	0.1	-5.6 *
Remainder	-0.1	-0.4	0.6	2.8
Experience	3.6	3.1	2.6	1.5 *
Earnings-induced effect	3.2	3.1	2.5	1.8 *
Labor-choice-induced effect	0.3	-0.1 *	0.0	-0.4
Remainder	0.1	0.1	0.1	0.1
Regions	1.9 *	1.3 *	2.8 *	4.7
States	-0.4 *	-1.1 *	1.8 *	5.8
Remainder	43.6	38.8	48.9	57.6
Effect of unobservables	-3.4 *	-2.5 *	-5.0 *	-13.7 *
Remainder	2.0 *	5.7	0.2 *	-3.3 *

* Effects that are less unequalizing for household income than for individual earnings.

Note: E_0 is the mean log deviation, E_1 the Theil index, and E_2 the modified coefficient of variation.

Source: Authors' calculations based on data from the 1984 and 1994 national household income and expenditure surveys (INEGI).

Table 5

Rural effect in the decomposition of changes in inequality in earnings and household income in Mexico, 1984-94

(average; percent)

	Gini Coefficient	E_0	E_1	E_2
Earnings				
Price effect	38.9	44.9	34.8	31.9
Average prices	18.9	10.4	20.9	25.6
Education	21.2	15.0	20.8	18.2
Experience	0.5	0.0	1.2	4.2
Regions	1.0	1.6	1.7	9.1
Constant	-2.4	-5.2	-0.6	0.8
Remainder	-1.3	-0.8	-2.3	-6.7
Rural prices	20.6	35.9	15.1	8.3
Education	1.4	2.6	1.5	2.2
Experience	-0.2	-0.1	0.0	0.0
Regions	-1.3	-1.4	-1.0	-0.7
Constant	21.5	35.2	15.6	8.8
Remainder	-0.9	-0.4	-1.1	-2.0
Household income				
Price effect	38.9 *	42.7 *	33.7 *	29.6 *
Average prices	20.3	18.8	20.2 *	19.9 *
Education	21.2 *	18.9	21.3	20.9
Experience	2.1	2.8	3.0	7.6
Regions	-0.1 *	0.8 *	-1.5 *	-4.1 *
Constant	-1.9	-2.8	-0.6 *	0.1 *
Remainder	-1.0	-0.9 *	-2.0	-4.5
Rural prices	18.9 *	24.6 *	14.3 *	11.0
Education	2.4	3.0	2.6	2.9
Experience	0.1	0.3	0.0	0.0
Regions	-1.0	-1.4	-0.9	-0.8 *
Constant	18.3 *	23.6 *	14.0 *	11.4
Remainder	-1.0 *	-0.9 *	-1.5 *	-2.5 *

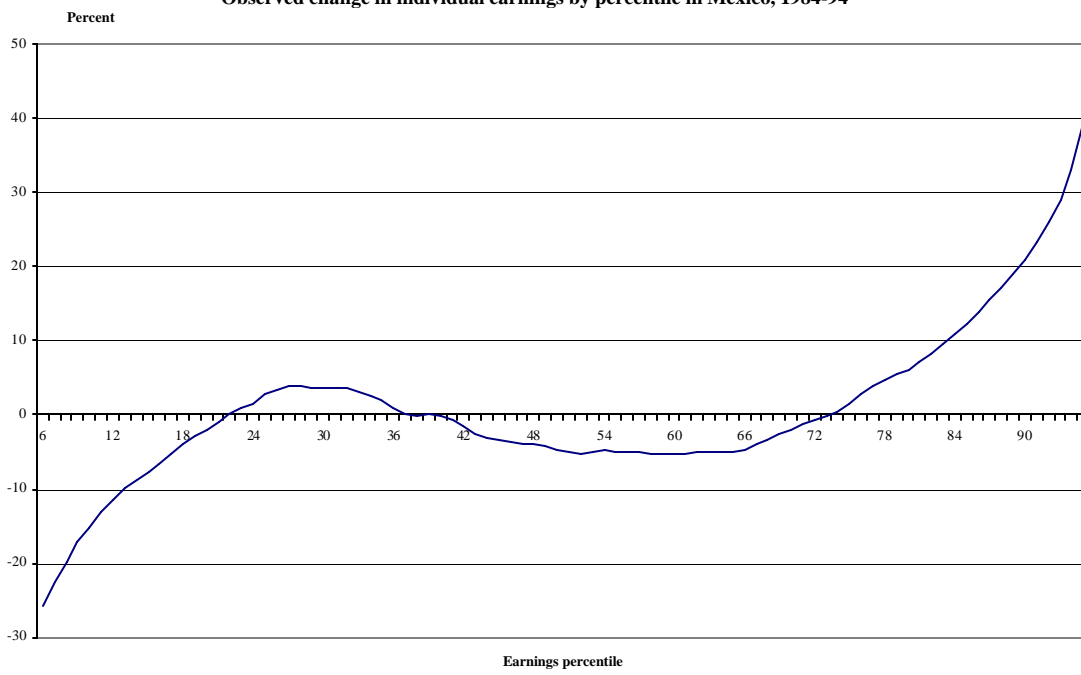
* Effects that are less unequalizing for household income than for individual earnings.

Note: The overall price effects differ slightly from those in table 4 because of the restrictions imposed on the error terms.

 E_0 is the mean log deviation, E_1 the Theil index, and E_2 the modified coefficient of variation.

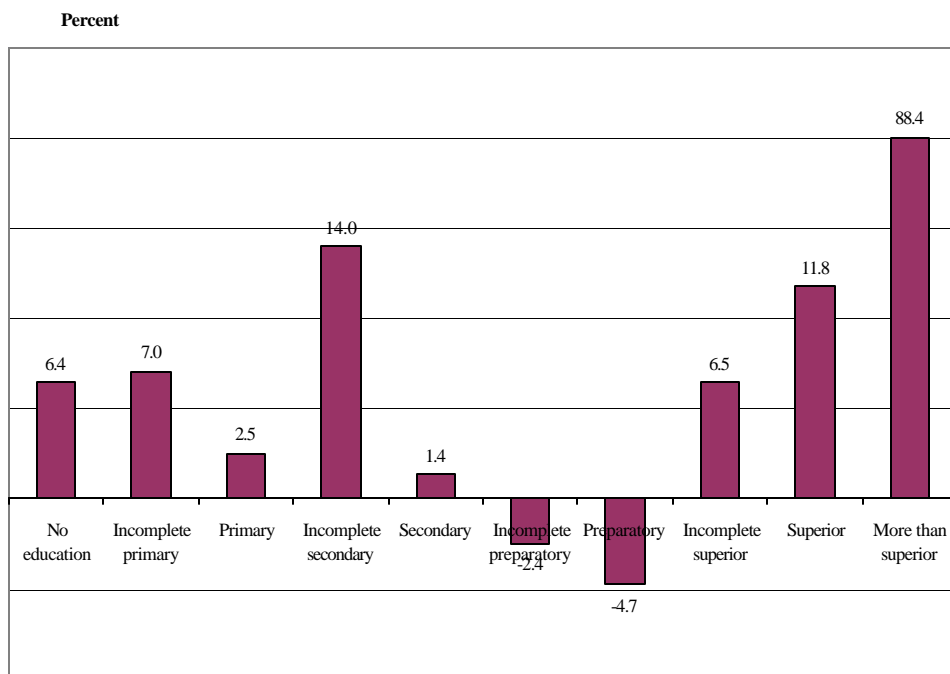
Source: Authors' calculations based on data from the 1984 and 1994 national household income and expenditure surveys (INEGI).

Figure 1
Observed change in individual earnings by percentile in Mexico, 1984-94



Source: Authors' calculations based on data from the 1984 and 1994 national household income and expenditure surveys (INEGI).

Figure 2
Change in women's labor force participation by education level in Mexico, 1984-94



Source: Authors' calculations based on data from the 1984 and 1994 household income and expenditure surveys (INEGI).

Figure 3
Returns to education for men by location, education level, and type of employment in Mexico, 1994

Urban men in wage employment

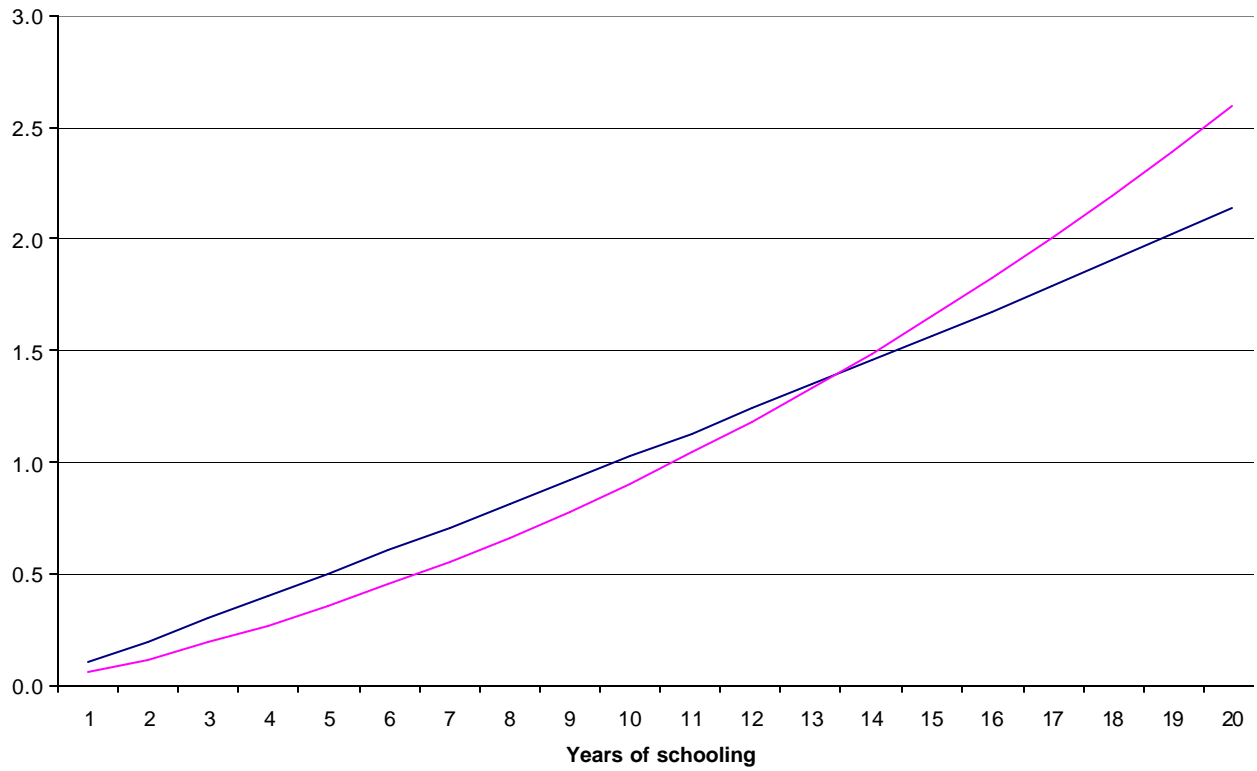
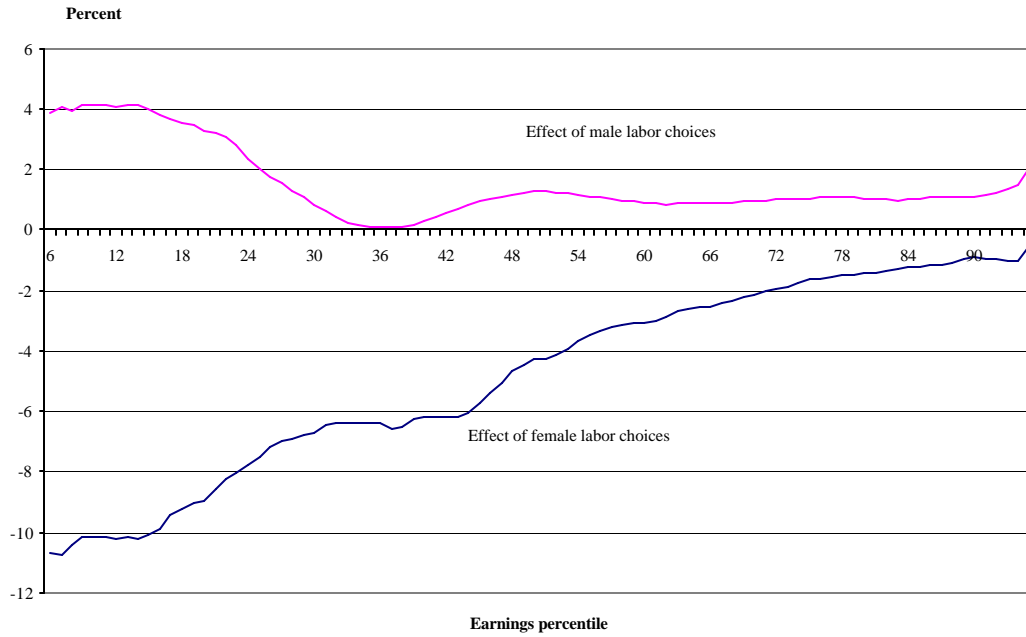
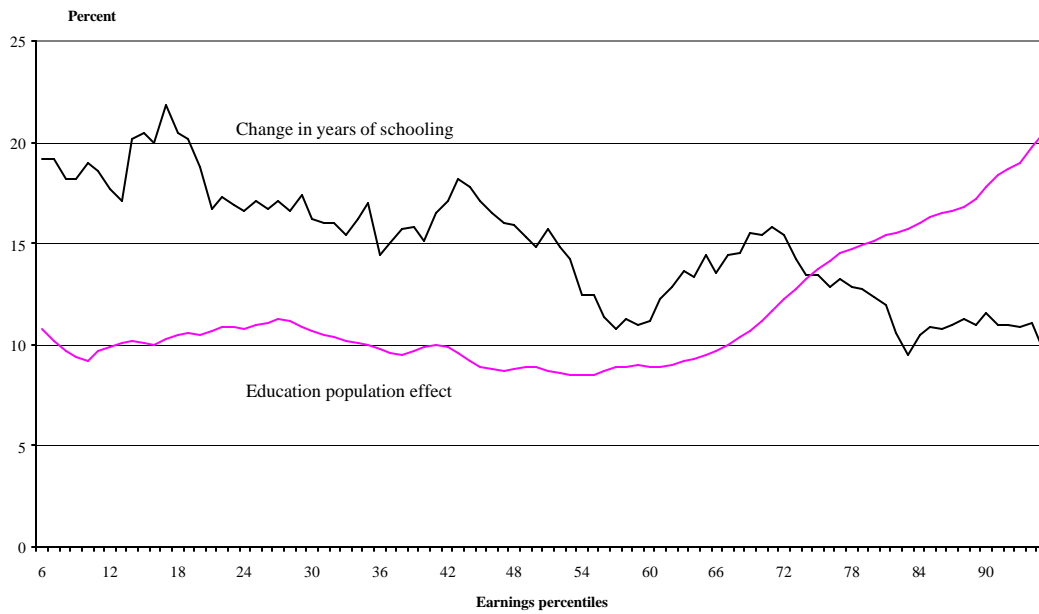


Figure 4
Effect of labor choices in earnings by percentile in Mexico, 1984-94
 (base year 1984)



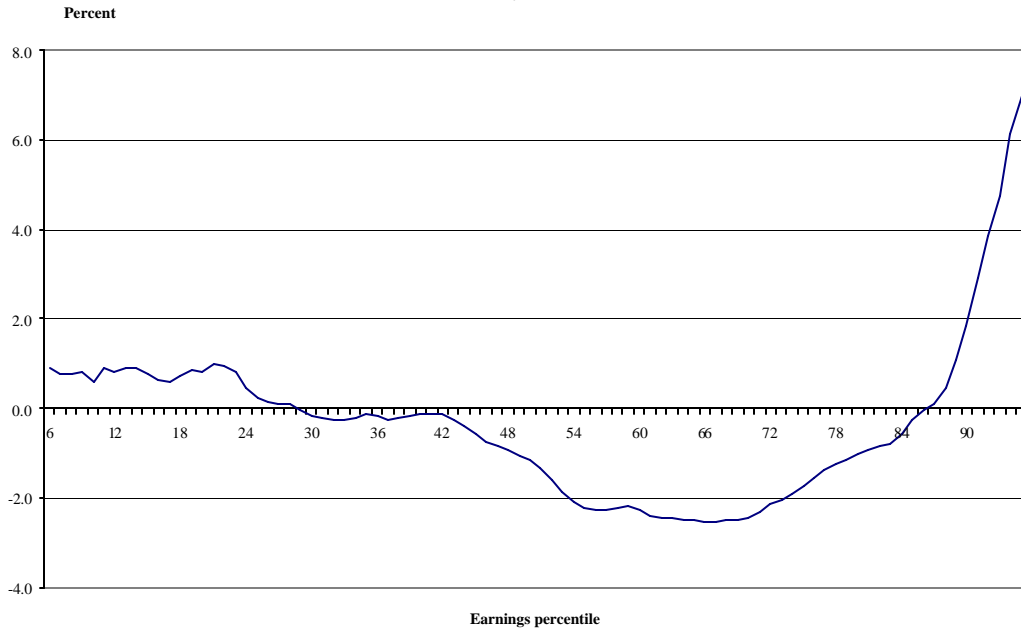
Source: Authors' calculations based on data from the 1984 and 1994 national household income and expenditure surveys (INEGI).

Figure 5
Effect of educational gains on earnings by percentile in Mexico, 1984-94
(individuals ranked by 1984 earnings; base year 1984)



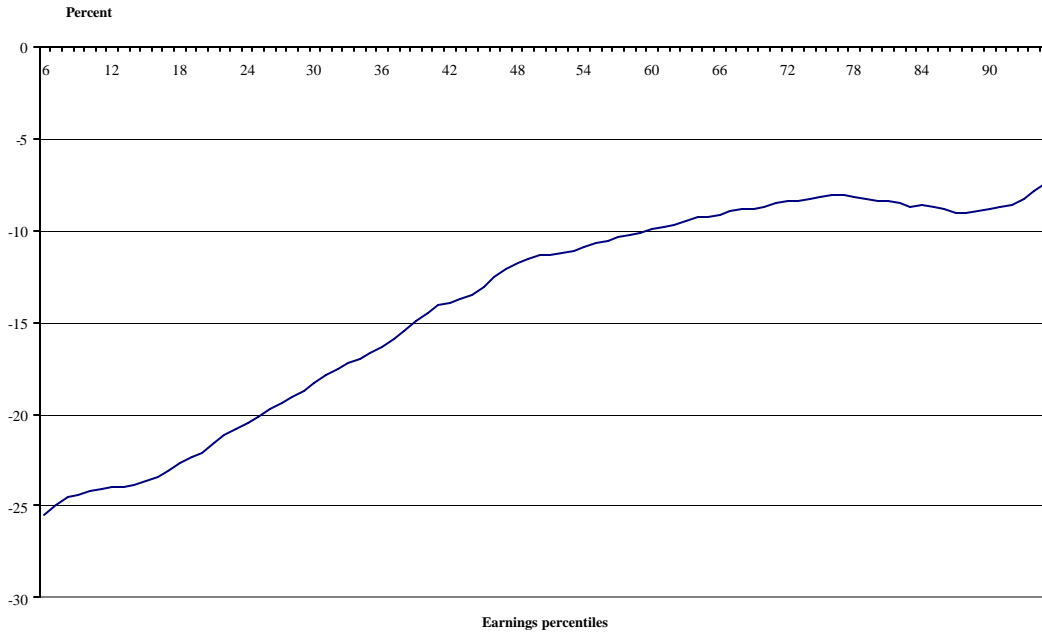
Source: Authors' calculations based on data from the 1984 and 1994 national household income and expenditure surveys (INEGI).

Figure 6
Effect of changes in returns to education on earnings by percentile in Mexico, 1984-94
(base year 1984)



Source: Authors' calculations based on data from the 1984 and 1994 national household income and expenditure surveys (INEGI).

Figure 7
Effect of urban-rural disparities on earnings by percentile in Mexico, 1984-94
(base year 1984)



Source: Authors' calculations based on data from the 1984 and 1994 national household income and expenditure surveys (INEGI).