Accounting for Mexican Income Inequality During the 1990s

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The present study measures the extent to which income disparities in Mexico can be attributed to sectoral asymmetries and differences in skill endowments. The results show that close to 40 per cent of per capita household income inequality in Mexico during the 1990s is attributable to incomes derived from formal self-employment; this refers to entrepreneurial activities, an income factor rarely analyzed in the inequality literature. We show that education endowments (skills) are unevenly distributed among the Mexican population, with positive shifts in the market returns to schooling being associated with increases in inequality. Asymmetries in the distribution of education endowments explain around 20 per cent of overall household income disparities in Mexico during the 1990s. Moreover, the results show that the proportion of inequality attributable to education endowments increased during stable periods and reduced during the 1994–1995 economic crisis. This pattern is mostly explained by shifts in returns to schooling rather than changes in the distribution of skills. Applying the same techniques to decompose within-sector income differences, the study show that skill endowments can account for as much as 25 per cent of differences in earnings, but as little as 10 per cent of income dispersion among formal self-employed workers.

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Introduction

During the 1990s, Mexico experienced profound economic changes. The decade started with a new economic order placing the market at the centre of the development strategy and reducing the role played by the State. In the mid 1990s, the North American Free Trade Agreement (NAFTA), a trilateral tariff reduction agreement between Canada, Mexico, and the United States (US), was enacted. The agreement was seen as the starting point of a long and sustained period of economic growth benefiting, in particular, less skilled labourers in Mexico. At the end of 1994, the same year when NAFTA was enacted, the Mexican peso suffered a massive devaluation which triggered the economic crisis of 1995. The shrinking domestic

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economy, combined with an expensive foreign currency (*i.e.* the US dollar) within the framework of the new trade agreement turned the Mexican economy into an export oriented one. The sectoral composition of the economy changed significantly during those years (see Figure **??**). As a proportion of Gross Domestic Product (GDP), the non-tradable service sector grew steadily between 1990 and 1995. Nevertheless, after the peso crisis and NAFTA, there was a redistribution equal to 2 percentage points of GDP between the shrinking non-tradable service sector and the dynamic manufacturing sector.[2]

The economic reforms undertaken at the beginning of the 1990s in addition to the profound economic crisis of 1995 and its subsequent sectoral redistribution, could have had a significant impact on income distribution. For instance, Székely (1995) finds that the market oriented reforms undertaken in Mexico during the second half of the 1980s increased the dispersion among household incomes. Undertaking conventional inequality decomposition analysis *a la* Shorrocks (1980) and Shorrocks (1982), Székely (1995) concludes that the inequality enhancing impact is explained by the reduction in the government's scope for implementing redistributive policies after the privatization and liberalization of the Mexican economy during those years. Other studies that use decomposition methods to identify the factors that account for Mexican income inequality during the late 1980s and early 1990s, had stressed the importance played by the distribution of skills in reshaping distribution (Lopez-Acevedo, 2000 and Legovini *et al.*, 2005). Another strand of the literature had concentrated in the impact that trade liberalization has had on relative wages in the manufacturing sector. The results of this research point towards a skill biased technological change as the explanation behind the unfavourable distributional impact on countries that are relatively abundant in unskilled labour.[3]

Given the sectoral changes in the Mexican economy and the findings from previous studies, we argue that a sound decomposition analysis aiming to account for inequality in Mexico during the 1990s should consider the following aspects:

1. income asymmetries across sectors and income sources
2. the distribution of skills
3. the market rewards for those skills.

By combining orthodox non-parametric inequality decomposition (Shorrocks, 1980; Shorrocks, 1982) with a more recent regression based (semi-parametric) approach, the present study measures the amount of total per capita household income inequality that can be accounted by a framework that considers these three components.

We revisit the existing methods of inequality decomposition, pointing out their strengths and pitfalls. Following our methodological discussion, as a first ap-

proach, we undertake orthodox, utilizing non-parametric inequality decompositions (Shorrocks, 1980; 1982). The advantage of this method over other decomposition techniques is that it does not impose any *a priori* functional form on the income generating process. The main shortcoming of the orthodox approach is the lack of economic structure behind the decomposition, which makes its interpretation somewhat difficult. Therefore, to complement the non-parametric analysis, we implement a recent methodology developed by Morduch and Sicular (2002) and Fields (2003) which combines the traditional inequality decomposition by income factors with a regression-based estimation determining household income.

Our results show that, on average, during the 1990s, close to 40 per cent of total income inequality in Mexico is accounted for by formal self-employed incomes. Personal and household characteristics, in turn, explain only around 10 per cent of income disparities among the formal self-employed. This leaves a significant proportion of total inequality without any structural interpretation, and therefore opens a mandatory line for future research. Regarding skill endowments, the present study shows that this asset accounts for 20 per cent of total income dispersion in Mexico during the 1990s. We found that higher returns to schooling have a positive impact on both total inequality and income disparities within-sectors, thereby showing that education endowments are unequally distributed across the population. Moreover, the sectoral asymmetries brought about by NAFTA and the peso devaluation made skill endowments a more important factor contributing, positively, to income inequality both overall and within the tradable sector. This last result corroborates previous findings suggesting that the liberalizing reforms had a positive effect on relative (skilled to unskilled) wages in the tradable sector (Hanson, 2003).

This paper contributes to our understanding of the relative importance played by the most relevant factors explaining income disparities during times of liberalizing reforms. For instance, a considerably large amount of literature had concentrated its analysis in the impact of trade reforms on relative wages in the manufacturing sector; using the methodology presented in this paper, we can quantify the proportion of total household income inequality that can be explained by relative wages in the manufacturing sector. Uncovering these issues can inform policy makers on the extent to which household income inequality can be deemed to be a problem associated with the distribution of skills or an outcome of sectoral asymmetries. Furthermore, our results can prompt scholars to move towards a new research agenda where income factors different from relative wages (*e.g.* formal self-employed incomes) are used to explore the distributional impact of liberalizing or other types of economic reforms.

The paper is organized as follows. To give the reader an idea of the macroeconomic context prevailing during the 1990s, in the following section we present a brief description of the major macroeconomic changes which took place in Mexico during that period. In the same section, we show inequality trends and major

changes in tradable and non-tradable labour markets. A revision and discussion of existing decomposition methodologies is presented in the section *Methodological Aspects*. The inequality decomposition results are shown in the section *Decomposition Results*. Finally the conclusions can be found in the last section.

Macroeconomic and Inequality Performance during the 1990s

Macroeconomic Changes

Mexico had suffered from instability and a lack of sustained growth starting from the debt crisis in 1982 and continuing to the peso crisis of 1994–95. Figure **??** shows the rate of growth of GDP and yearly inflation from 1981 to 2000. From 1989 to 1994 the macroeconomic performance was stable. Inflation reached a peak of 153 per cent in 1988, but by 1994 it was within the one-digit figures. In December 1994 the Mexican peso devaluated by more than 60 per cent against the US dollar. This was the beginning of the 1995 crisis where GDP decreased by almost 8 per cent and inflation jumped from 7 per cent to 42 per cent. The last period under analysis (1996–2000) was characterised by a rapid recovery with GDP growing at an average yearly rate of more than 5 per cent and annual price changes reducing to 7 per cent.

In 1985 Mexico joined the General Agreement on Tariff and Trade (GATT). The unilateral reduction on trade barriers within the accession of Mexico to the GATT made Mexican products more competitive in international markets. In Figure **??** we can see that total trade (measured as the sum of exports plus imports as the proportion of GDP) increased from 26 per cent in 1985 to 36 per cent in 1988. The second major trade reform came in 1994 when the North American Trade Agreement was enacted. As we mentioned above, in December of that year the Mexican peso suffered a major devaluation (see the decline in the real exchange rate from Figure **??**) making the exporting sector, mostly manufactured products, the most dynamic sector in the economy.[4] Between 1994 and 1996 the importance of international trade in the Mexican economy almost doubled, passing from a pre-crisis and NAFTA level of 38 per cent to 63 per cent in 1996.[5]

The peso devaluation together with the trade opportunities brought about by NAFTA, had a significant sectoral redistribution impact on the Mexican economy. The proportion of GDP that was generated in the tradable manufacturing sector experienced an average annual expansion of 3 per cent between 1994 and 1998. By the year 2000 the manufacturing sector accounted for 20 per cent of the economy compared with a ratio of 17.5 per cent in 1994. The counterpart of this increase was a reduction of the same scale in the proportion of GDP that was generated in the service sector, passing from 77 per cent in 1994 to 75 per cent in 2000 (see Figure **??**).

Inequality Levels

The macroeconomic turbulence just described affected microeconomic agents (*i.e.* households, firms and individuals) potentially affecting overall income distribution. This section describes the distributional changes that took place during the 1990s and propose possible explanations for them. In the following section, we will quantify how much inequality is accounted for by these possible explanations.

To compute and decompose total income inequality, we use micro data from the household income survey series *La Encuesta Nacional de Ingresos y Gastos de los Hogares* (ENIGH) conducted by the National Institute of Statistics in Mexico, known as *Instituto Nacional de Estadística y Geografía* (INEGI). Using the same methodology, hence making surveys comparable across time, ENIGH surveyed more than 11,000 households during the years 1989, 1992, 1994, 1996, 1998 and 2000. ENIGH's survey design was taken into account while constructing all statistics and inequality indexes; therefore, all the figures presented in this paper account for ENIGH's stratification, clustering and sampling weights.[6]

Following the literature, our inequality measures used the household as the unit of analysis (Cowell 2000). Given the difficulty of identifying intra-household distribution, our preferred welfare measure is *monthly household per capita incomes after taxes and transfers*; therefore, we assume no intra-household economies of scale and constant costs across adults and children within the household. Finally, to reduce the amount of volatility captured by our welfare measure, monthly per capita household incomes are computed as a 6 month average of current and past monthly incomes (as declared by the survey respondents).

Table 1 shows the value of four popular income inequality indexes: the Gini coefficient, the Theil index, and two instances of the generalized entropy index, with inequality aversion parameter equal to -1 and 2, respectively. Table 1 shows that, although there was a distributional improvement between 1992 and 1994, we can't conclude anything about inequality changes occurring between 1989 and 1994. Our inference about the distributional changes observed between 1989 and 1994 depend on the weights given to the different parts of the income distribution; in other words, there is no Lorenz-dominance.[7] Surprisingly, three out of four inequality measures imply that the severe peso crisis of 1994–95 had a favourable distributive effect.[8] Between 1996 and 1998, there was a considerable increase in income dispersion (regardless of the inequality measure used) and this trend continued to the year 2000. To summarize, distribution was more or less stable between 1989 and 1994, showing some marginal deterioration; the 1994–95 crises had a favourable distributive effect which was eliminated during the recovery phase 1996–2000.

The persistent high income inequality and the changes registered after the peso crisis might be explained by sectoral redistributions caused by the 1994–95 macro shocks (see Figure **??**). To explore this possibility, let us divide total household

Table 1
Income Inequality Indexes

	1989	**1992**	**1994**	**1996**	**1998**	**2000**
Gini	0.518	0.537	0.534	0.515	0.527	0.528
Theil	0.593	0.598	0.568	0.531	0.559	0.548
Entropy$_{(\varepsilon=-1)}$	0.724	0.769	0.751	0.694	0.796	0.782
Entropy$_{(\varepsilon=2)}$	2.855	1.655	1.211	1.284	1.369	1.121

Data source: Own calculations with data from ENIGH.

incomes into five mutually exclusive income sources capturing remunerations from different sectors: the urban manufacturing (tradable) sector, urban service (non-tradable) sector, agricultural (rural tradable) sector, the formal self-employed, and the informal sector. Figure **??** shows the performance of average real personal income in the five income source derived from different sectors.[9]

Figure **??** shows that average real income in the informal and agricultural sectors (where poverty concentrates) were decreasing even before the peso crisis. In fact, during the peso crisis (1994–1996) real incomes of heads of households working in the agricultural sector, the lowest remunerated sector, decreased proportionally less than in other sectors. Perhaps more relevant is the sharp reduction in real incomes for self-employed professional workers and employers, who enjoy the highest incomes in Mexico. This helps explain the improvements in distribution after the 1994–1996 peso crisis.

The descriptive statistics showed the important role played by disparities in sectoral remunerations and incomes from different sources as possible explanations of the persistently high levels of household income inequality observed during the 1990s in Mexico. The relatively stable incomes in the agricultural and informal sectors even in the presence of a negative shock combined with a more than proportional reduction of incomes in the highest income cohorts (self-employed) explains the reduction in inequality after the 1994–1995 peso crisis. On the other hand, the distribution of education endowments and their market remunerations might be an important source behind the inequality levels we observe in Mexico. In order to explore these hypotheses further, in the next section we will implement conventional non-parametric decomposition methods to quantify the importance of sectoral disparities in accounting for overall household income dispersion. Furthermore, we will combine orthodox non-parametric decomposition by factor components with regression analysis to quantify the importance of skills distribution and their market remuneration in explaining the high levels of household income inequality observed in Mexico during the 1990s.

Methodological Aspects

Let us define $\boldsymbol{Y}$ as a vector containing $(1,\ldots,N)$ household incomes as elements. In turn, income of household i is defined as the sum of K mutually exclusive household income components $Y_i = \sum_{k=1}^{K} Y_{ik}$. An income inequality index, $I(\boldsymbol{Y})$, measuring household income dispersion can be defined as the sum of the contributions, $S_k(\boldsymbol{Y}_k)$, made by the K different income components:

$$I(\boldsymbol{Y}) = \sum_{k=1}^{K} S_k(\boldsymbol{Y}_k) \quad \boldsymbol{Y}_k = (Y_{1k},\ldots,Y_{Nk}) \tag{1}$$

This type of decomposition can answer the question: *what proportion of total income inequality, $I(\boldsymbol{Y})$, is explained by income factor $\boldsymbol{Y}_k$?* Several decomposition methods had been developed, ranging from Shorrocks' (1982) axiomatic approach to the more recent techniques based on microeconometric models with endogenous behaviour like the one developed in Bourguignon, Fournier and Gurgand (2001) and the more general decomposition framework developed in Shorrocks (1999).[10] Shorrocks' (1982) seminal paper shows that, given a set of desired decomposition properties and under several assumptions, there is a unique factor decomposition rule. This decomposition rule is independent of the inequality index used and defines the proportion of total inequality that is attributable to income factor k in the following way:

$$s_k = \frac{cov(\boldsymbol{Y},\boldsymbol{Y}_k)}{\sigma^2(\boldsymbol{Y})} \tag{2}$$

where $cov(\boldsymbol{Y},\boldsymbol{Y}_k)$ is the covariance between total income and income from source k and $\sigma^2(\boldsymbol{Y})$ is the variance of total income. The main advantage of this non-parametric technique lies in the absence of assumptions regarding structural relationships, *i.e.* no formal model or econometric estimation is involved. This advantage is, however, the source of its weakness. In the absence of economic structure very little can be said about the causal mechanisms driving the results. Two more recent studies try to overcome this problem while keeping Shorrocks' (1982) decomposition principle. In two separate studies, Fields (2003) and Morduch and Sicular (2002) develop a semi-parametric method combining Shorrocks' (1982) technique with regression analysis. The authors show that income sources, $\boldsymbol{Y}_k$ within Shorrocks' (1982) framework, can be analogous to the market value of personal characteristics within a human capital regression framework. In particular, define household or individual income as a function of a matrix of observable characteristics at the personal and/or household level $\boldsymbol{X}$, a vector of regression parameters, $\boldsymbol{\beta}$ and a set of unobservable components $\boldsymbol{\epsilon}$:

$$\boldsymbol{Y} = g(\boldsymbol{X},\boldsymbol{\beta},\boldsymbol{\epsilon}) \tag{3}$$

The main difference between Fields (2003) and Morduch and Sicular (2002) is that the former decomposes the variance of the *log of income* (the author regress $\ln(\boldsymbol{Y})$ instead of $\boldsymbol{Y}$ in Equation 3) while the latter decomposes inequality of income levels. Fields (2003) shows that his result applies for any inequality index, however, as we already mentioned, it is only valid for decomposing inequality of the log of incomes, which makes it a rather unattractive method.[11] Furthermore, based on an axiomatic approach, Morduch and Sicular (2002) define the so-called "property of uniform additions", which leads to the result that the regression-based decomposition formula will vary both with the inequality index used and the factor decomposition rule.[12] The authors show that in the particular case where the inequality measure used is the squared coefficient of variation (Entropy$_{(\varepsilon=2)}$ in Table 1), the natural decomposition rule is defined by Equation 2. Assuming the functional form of Equation 3 is given by $Y = \alpha + \beta_k X_k + \varepsilon$, defining $Y_k = \hat{\beta}_k X_k$ and substituting it into Equation 2:

$$s_k = \frac{\hat{\beta}_k \, \sigma(\boldsymbol{X}_k) \, cor(\boldsymbol{Y}, \boldsymbol{X}_k)}{\sigma(\boldsymbol{Y})}. \tag{4}$$

Equation 4 combines Shorrocks' natural decomposition rule with a regression-based human capital approach. Using Equation 4 one can compute the proportion of total inequality that is attributable to the distribution of personal characteristics (*e.g.* education endowments) and their market returns ($\hat{\beta}$). Notice that Equation 4 has several desired properties. First, the contribution of X_k will depend not merely on the correlation between this and total income (as in Equation 2) but it will also be a function of the conditional correlation between these two variables ($\hat{\beta}$). Second, the magnitude of s_k will increase, *ceteris paribus*, with the size of the regression parameter and/or the degree of dispersion of endowment $\boldsymbol{X}_k$ among the population $\sigma(\boldsymbol{X}_k)$.

Morduch and Sicular (2002) show that the squared coefficient of variation's natural decomposition rule (Equation 4) does not satisfy the "property of uniform additions". A decomposition rule satisfies the "property of uniform additions" when for an equally-distributed income factor, say, Y_k, its contribution to inequality, s_k, is negative. Clearly, the decomposition rule defined by Equation 2 does not satisfy this property since, for an equally-distributed factor Y_k, $cov(\boldsymbol{Y}, \boldsymbol{Y}_k) = 0$ and hence $s_k = 0$. Morduch and Sicular (2002) proposed the following alternative decomposition rule for the squared coefficient of variation (pg. 98):

$$s_k^* = \frac{\hat{1}}{nCV^2\bar{y}^2} \sum_{i=1}^{n} \frac{(y_i^2 - \bar{y}^2)}{y_i} y_{i,k} \tag{5}$$

where $\bar{y} = \sum_i y_i / n$. Equation 5 satisfies the "property of uniform additions" (this could be easily verified by substituting $y_{i,k} = \bar{y_k} \; \forall \; i$, in Equation 5). As shown by

Morduch and Sicular (2002), the conclusions reached by two alternative decomposition exercises using Equation 4 and Equation 5 can be diametrically different. The final interpretation of two quite different results would thus depend on how desirable the analyst considers the "property of uniform additions". There are two reasons why the present study chooses Equation 4 as the preferred decomposition rule. Firstly, in our view, an evenly distributed factor ($y_{i,k} = \bar{y}_k \ \forall \ i$) should have a zero contribution to total inequality but not a negative one. After all, in a hypothetical world of a single equally-distributed income factor, y_k, inequality would be zero. An income factor $y_k > 0$, that is disproportionally owned by the poor should contribute negatively to total inequality, as it is captured by $cor(\boldsymbol{y}, \boldsymbol{y}_k) < 0$ in Equation 4. Secondly, the interpretation of results based on Equation 4 is more transparent and in line with intuition (see interpretation above).[13]

Decomposition Results

Non-Parametric Approach

Based on the advantages and disadvantages of the different decomposition methods, the present study undertakes conventional non-parametric decompositions (Equation 2) and complement them with the regression based approach just described.

Let us define household incomes as the sum of incomes derived from manufacturing earnings ($\boldsymbol{Y}_m$), earnings in other sectors ($\boldsymbol{Y}_s$), agricultural incomes ($\boldsymbol{Y}_a$), incomes from informal activities ($\boldsymbol{Y}_i$), incomes from self-employment (formal) activities ($\boldsymbol{Y}_{se}$), and other incomes ($\boldsymbol{Y}_o$). Agricultural incomes include earnings and incomes from self-employment farming activities. Self-employed incomes includes incomes derived from professional services and formal (small and large) entrepreneurial remunerations. Other incomes include things such as transfers, rents, and financial remunerations. Workers are classified as part of the informal sector when they are non-professional self-employed labourers, excluding family employees with no monetary remuneration (See Maloney, 1999).[14]

The top part of Table 2 shows the proportion of inequality explained by the elements defining household per capita incomes using Shorrocks' (1982) decomposition rule (Equation 2). The middle part of Table 2 shows the proportion of per capita household incomes that derives from the different income sources. This proportion captures the importance of the different income components for the average Mexican household. The lower part of Table 2 displays the degree of income dispersion, measured by the squared coefficient of variation divided by two, $CV^2/2$ or $(\sigma/\mu)^2/2$, within each income component.

During the 1990s, the element explaining the highest proportion of inequality are self-employed incomes. On average, this element accounted for almost 40

Table 2
Inequality Decomposition by Factor Components

Proportion of Inequality

	1989	1992	1994	1996	1998	2000	Average
s_m	2.44	4.78	7.36	7.38	4.66	8.59	5.87
s_s	10.58	16.85	36.84	24.44	25.02	31.76	24.25
s_a	0.33	0.14	-0.13	-0.05	1.21	0.18	0.28
s_i	3.15	0.92	3.89	2.74	1.38	3.81	2.65
s_{se}	56.53	59.46	27.02	17.61	46.12	26.05	38.80
s_o	26.96	17.86	25.02	47.87	21.60	29.61	28.15

Proportion of Per-Capita Household Income

	1989	1992	1994	1996	1998	2000	Average
$\sum Y_m/\sum Y$	11.65	10.43	10.05	10.95	10.30	12.45	10.97
$\sum Y_s/\sum Y$	39.50	32.84	37.06	34.53	35.18	35.59	35.78
$\sum Y_a/\sum Y$	7.04	3.56	3.58	3.48	3.92	3.41	4.16
$\sum Y_i/\sum Y$	10.41	7.40	8.97	8.45	8.37	7.99	8.60
$\sum Y_{se}/\sum Y$	9.67	14.66	8.61	9.32	12.29	10.74	10.88
$\sum Y_o/\sum Y$	21.74	31.25	31.60	32.97	30.18	29.75	29.58

Within-Income Source Inequality

	1989	1992	1994	1996	1998	2000	Average
CV_m	6.46	7.65	8.80	8.10	7.00	7.19	7.53
CV_s	2.02	2.45	2.99	2.46	2.68	2.74	2.56
CV_a	7.22	12.14	8.66	9.07	19.34	12.45	11.48
CV_i	10.61	5.49	6.94	6.82	4.81	9.07	7.29
CV_{se}	173.23	45.08	43.44	25.14	39.86	23.21	58.33
CV_o	16.32	2.16	2.19	4.98	2.55	2.96	5.19

Source: Own calculations with data from ENIGH.
Note: m=earnings from manufacturing; s=other earnings; a=agricultural incomes; i=incomes from informal activities; se=incomes from self employed formal activities; o=other incomes.

per cent of total household income inequality in Mexico during the 1990s. This is not surprising given that self-employed incomes includes profits derived from entrepreneurial activities where the highest incomes are concentrated (see the high inequality level within this income component). Although incomes from sources not classified in the present study ($\boldsymbol{Y}_o$) show a relatively low dispersion, this residual is responsible for 28 per cent of Mexican inequality during the 1990s on average, making it the second most important component explaining income dispersion in Mexico. Earnings in formal sectors outside manufacturing are the third income component accounting for household income inequality. In the typical Mexican household, this relatively equally distributed income factor represents around 35 per cent of household per capita income, making it the single most important component in terms of household income contribution (see middle part of Table 2). On the other hand, incomes from agricultural and informal activities, $\boldsymbol{Y}_a$ and $\boldsymbol{Y}_i$,

jointly account for, at most, 4 per cent of total income inequality. This is due to the poor correlation between these income components and total per capita household income.

Between 1989 and 1994, within the context of a growing economy, the proportion of inequality attributable to self-employed incomes decreased, and this came together with an increase in the proportions of inequality accounted for by earning components, $\boldsymbol{Y}_m$ and $\boldsymbol{Y}_s$. Incomes derived from earnings (manufactures and non-manufactures) accounted for an average 30 per cent of total household income inequality, with this proportion increasing in periods of stabilization. The decomposition results uncovered the magnitude of the redistribution taking place during the crises years of 1994–1996 when the residual, $\boldsymbol{Y}_o$, accounted for almost half (47.87 per cent) of total income inequality in Mexico. The importance played by the residual was reversed during the post-crisis years of 1998–2000 when the earnings sectors increased their importance in overall distribution, particularly earnings in the manufacturing sector. Incomes from agricultural activities made a negative contribution to total household income inequality during years 1994 and 1996 a result that suggests that agricultural-dependent households, located in the bottom part of the overall income distribution, were somehow cushioned from the peso crisis of 1994.

Regression-based decomposition approach

The trade versus relative wages literature and some of the broader inequality decomposition studies had emphasized the importance of the distribution of skills (education) in shaping income distribution. To quantify how much inequality can be accounted for by the distribution of education (and other personal and household characteristics) we use the regression-based decomposition approach described in Section . Taking CV^2 as our inequality measure and using Equation 4 as our regression-based decomposition method, let us define the following human capital regression model:

$$\boldsymbol{Y} = \boldsymbol{X}\boldsymbol{\beta} + \boldsymbol{\varepsilon} \tag{6}$$

where $\boldsymbol{X}$ is a $(N \times K)$ matrix containing $(K-1)$ personal and household characteristics plus a constant for N *heads of household*; $\boldsymbol{\beta}$ is a $(K \times 1)$ vector with the 'prices' of those characteristics, and $\boldsymbol{\varepsilon}$ is a vector of random components assumed to be normally distributed with zero mean.[15] The elements forming $\boldsymbol{X}$ include three personal characteristics; these include years of schooling, years of schooling interacting with a dummy variable for higher education, experience,[16] experience squared, and gender; There are also three household characteristics; these include household size, the ratio of dependants to total household members, and two regional dummy variables for households located in the north and south[17] of Mexico, respectively.[18] Equation 6 is a rather rigid specification imposing a constant 'price'

of characteristics $\boldsymbol{X}$ and the same functional form across all sectors of the economy. It also assumes no labour supply effects on $\boldsymbol{Y}$.[19] Finally, Equation 6 uses per capita household incomes in *levels* as a dependent variable rather than in logs as it customary in the human capital literature. This is a common drawback in the regression based decomposition literature where there is a trade off between a correct log-linear specification in the income generating model as in Fields and Yoo (2000) and Fields (2003) and decomposing income inequality in levels rather than in logs as it is done in Redmond and Kattuman (2001) and Morduch and Sicular (2002). Bearing these constraints in mind, the regression results are shown in the top part of Table 3. All the variables included in our regression are highly significant and show the expected sign, with the exception being the dummy for the gender of the head of household which turned out to be not-significant. Heads of household with more education and more experience tend to have higher incomes. At some points in time, particularly during the post-1994 recovery NAFTA years, households located in the north of Mexico enjoyed an income premium with respect households in other regions. On the other hand, larger households and especially those with a high dependency ratio have significantly lower per capita incomes compared with smaller households.

In the bottom part of Table 3 we show the contribution to total income inequality in percentage terms (using Equation 4 as the decomposition rule) of each element included in the income equation, Equation 6. The results show that, on average, a simple regression framework can account for 26 per cent of total inequality observed in Mexico throughout the 1990s. Notice that the amount of inequality explained by our regression model increases during the stable period 1989–1994; this increase is shown by an increase in the regression R^2 or a reduction in the residual of the regression based decomposition. The increase in explanatory power is accounted for by schooling and household characteristics. During the years of the peso crisis, the goodness of fit of the model reduces marginally, again explained by a reduction in the importance of schooling.[20]

The distribution of educational and household characteristics, together with their respective 'prices', account for 22 per cent and 6 per cent of total household income inequality in Mexico during the 1990s. Experience, on the other hand, has a negative, though small contribution to inequality. Therefore, higher rewards to experience, holding all other elements in Equation 4 constant, help ameliorate income disparities. This result is driven by the fact that experience is an endowment that is relatively well distributed among the population. As we would have expected given their lack of significance in the regression model, the gender and regional dummies do not help to explain much of the differences in incomes. Indeed, the significance of the elements included in $\boldsymbol{X}$ is related to their regression-based decomposition rule (Equation 4) in a way such that total inequality explained by elements in Equation 6 (excluding the residual) is equal to the proportion of variance of $\boldsymbol{Y}$ explained

Table 3
Regression-Based Decomposition Results

	1989	1992	1994	1996	1998	2000
Schooling	129.9**	218.8**	231.2**	131.7**	150.2**	180.2**
Schooling*(H)	100.2**	132.1**	147.9**	105.3**	110.0**	139.6**
Experience	67.4**	125.6**	112.1**	45.4**	62.9**	100.8**
Experience Sq.	-0.7**	-1.3**	-1.0**	-0.3*	-0.5**	-0.9*
Gender	-12.4	294.0*	139.4	147.6*	85.5	-27.5
HH Size	-116.9**	-166.1**	-180.7**	-145.0**	-147.0**	-188.0**
Dep. Ratio	-1954.2**	-2356.7**	-2478.1**	-1385.9**	-1856.5**	-1798.3**
North	181.7	42.4	-229.2	41.7	216.0*	185.8
South	-37.9	-283.5*	-599.3**	-245.5**	-122.3	-471.3**
Intercept	1409.7**	492.0	1082.9**	1164.7**	1109.3**	732.3
R-squared	0.100	0.248	0.314	0.302	0.297	0.323
N	10,005	9,181	11,123	12,220	9,430	8,593

% Contribution to total inequality							**Average**
Education	8.56	20.20	26.82	24.94	25.00	27.08	**22.10**
Experience	-1.36	-3.06	-3.43	-2.94	-3.11	-2.37	**-2.70**
Gender	0.00	0.14	0.04	0.07	0.04	0.00	**0.05**
HH charact.	2.70	7.08	6.76	7.45	7.16	6.11	**6.18**
Region	0.10	0.42	1.21	0.69	0.61	1.49	**0.77**
Residual	90.00	75.20	68.60	69.80	70.30	67.70	**73.60**

Dependent variable: per capita household incomes; the reference category for the regional dummy variables are households located in the center of Mexico. *, **: significant at the 5% and 1% level respectively.

by $\boldsymbol{X}$, *i.e.* R^2 in Table 3 (Fields, 2003).

From Equation 4, we know that the contributions shown in the bottom part of Table 3 are the outcome of the distribution of characteristics $\boldsymbol{X}$ and their respective market rewards, $\hat{\boldsymbol{\beta}}$. Therefore, the documented pattern followed by the contribution to inequality made by schooling and household characteristics between 1989 and 2000, could be the outcome of shifts in market returns to those characteristics. From the upper part of Table 3 we can corroborate that, regarding education endowments, this is indeed the case. Market returns to schooling (and the premium for higher education) showed a positive trend between 1989 and 1994, decreased during the crisis, and then recovered between 1996 and 2000. This was exactly the same patterned followed by the proportion of inequality accounted for by education endowments (schooling). Therefore, most of the changes in the proportion of inequality that is attributable to education is, indeed, explained by changes in returns to schooling and not changes in the distribution of skills. These results show that increases in returns to schooling are inequality increasing, implying that skills or education endowments are unequally distributed among the Mexican population.

So far we have shown that the distribution of education, household characteristics, and their respective market 'prices' can account for around 26 per cent of

total income inequality during the 1990s. This is a significant proportion of total income disparities, however, the importance of these characteristics could differ within each income component, $\boldsymbol{Y}_k$. For instance, it might be the case that the distribution of education endowments plays a much more important role in explaining earnings disparities than do income differences in the informal sector. More importantly, given the tradable/non-tradable asymmetries occurring during the period under analysis, returns to education could have had a heterogeneous effect in different sectors.[21] To quantify the proportion of total inequality within income sources that can be explained by differences in education endowments and other characteristics, let us define income components $\boldsymbol{Y}_k$, where $k = \{m, s, a, i, se\}$, as a function of $\boldsymbol{X}_k$, in the following way:

$$\boldsymbol{Y}_k = \boldsymbol{X}_k \boldsymbol{\beta}_k + \boldsymbol{\varepsilon}_k \quad \forall \quad \boldsymbol{Y}_k > 0. \tag{7}$$

Equation 7 allows for some flexibility in the functional form used to explain the distribution of income within each factor k, *i.e.* explanatory variables as well as the value of the parameters can differ across income components. Though, estimation of Equation 7 still involves some restrictive assumptions. The conventional human capital equation regresses the log of hourly wages (or self-employed incomes) against vector $\boldsymbol{X}$; in our specification, the dependent variables are the incomes from each income component in *levels*, $\boldsymbol{Y}_k$. Hence $\boldsymbol{Y}_k$ includes a labour supply effect that is not being accounted for in an explicit manner.[22] Furthermore, while regressing incomes from agricultural and informal activities ($\boldsymbol{Y}_a$, $\boldsymbol{Y}_i$) we are implicitly assuming that their respective labour markets are complete and free of other production inputs, in other words, we are assuming separability in their production function. In the case of urban informal activities, the assumption is justified by empirical evidence supporting the existence of complete labour markets in the Mexican informal sector (see Maloney, 1999).

Bearing these assumptions in mind, we regress income factor components $\boldsymbol{Y}_k$ against matrix $\boldsymbol{X}_k$ where $\boldsymbol{X}_k$ is defined as in our previous regression estimates (Equation 6). The regression results are presented in Tables A1 to A5 in the Appendix. Although the income regressions show some interesting results, given the objective of this paper, we will centre our discussion in the contribution of personal and household characteristics in explaining income disparities within income components. These results are shown in Table 4.

As the human capital theory would predict, differences in years of formal education are much more related to differences in earnings (both in the manufacturing and non-manufacturing earnings sectors, $\boldsymbol{Y}_m$ and $\boldsymbol{Y}_s$, respectively) than they are to differences in other sources of income. Distribution of education endowments account for around 25 per cent of total earnings inequality, whereas the same factor accounts for only around 9 per cent of total inequality among informal workers and self-employed, and as little as 5 per cent of income inequality within the agricul-

Table 4
% Contribution (s_k) to Total Within Y_k Inequality

	1989	1992	1994	1996	1998	2000	Average
$\boldsymbol{Y}_m$							
Education	27.70	25.90	26.70	26.40	24.40	32.70	27.30
Experience	-3.90	-3.30	-3.80	0.30	-1.80	-3.80	-2.72
Gender	0.00	0.00	0.10	0.10	0.10	0.10	0.07
HH charact.	8.10	8.90	4.90	5.40	7.50	6.00	6.80
Region	0.20	0.00	0.80	0.30	0.40	0.60	0.38
Residual	68.00	68.40	71.40	67.50	69.60	64.40	68.22
$\boldsymbol{Y}_s$							
Education	23.85	23.22	24.48	25.07	23.79	26.96	24.56
Experience	-3.57	-2.44	-2.87	-2.68	-2.17	-2.07	-2.63
Gender	0.00	0.19	0.00	0.00	0.00	0.00	0.03
HH charact.	11.48	10.06	6.28	9.12	7.96	8.57	8.91
Region	0.33	0.28	0.81	0.69	0.62	1.24	0.66
Residual	67.90	68.70	71.30	67.80	69.80	65.30	68.47
$\boldsymbol{Y}_i$							
Education	1.93	13.73	11.42	7.08	9.84	7.18	8.53
Experience	0.97	-1.74	-1.62	-0.84	-1.25	-1.08	-0.93
Gender	0.10	0.00	0.00	0.00	0.00	0.36	0.08
HH charact.	5.51	8.32	9.04	9.32	9.65	7.36	8.20
Region	0.10	0.29	0.95	0.93	1.16	0.27	0.62
Residual	91.40	79.40	80.20	83.50	80.60	85.90	83.50
$\boldsymbol{Y}_a$							
Education	1.80	1.80	2.12	6.38	14.19	1.16	4.58
Experience	0.00	-0.20	-0.10	-0.21	-0.57	0.10	-0.16
Gender	0.09	0.00	0.00	0.11	0.38	0.10	0.11
HH charact.	4.65	5.80	6.46	5.53	2.67	4.83	4.99
Region	0.85	1.90	2.41	4.89	1.33	2.51	2.32
Residual	92.60	90.70	89.10	83.30	82.00	91.30	88.17
$\boldsymbol{Y}_{se}$							
Education	2.64	12.45	8.67	9.79	16.23	14.93	10.79
Experience	-0.10	-2.54	-0.88	-0.29	-3.25	-1.34	-1.40
Gender	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HH charact.	0.78	4.95	2.19	3.04	6.90	5.25	3.85
Region	1.37	0.64	1.31	1.66	1.01	1.96	1.33
Residual	95.30	84.50	88.70	85.80	79.10	79.20	85.43

tural sector. On the other hand, notice how the distribution of household characteristics are more important to determine income differences in the informal sector ($\boldsymbol{Y}_i$). This result suggests that the variables included as household characteristics represent relevant factors of production in the urban informal sector. A second interesting result is given by the distributional impact of regional differences. Despite the fact that regional differences account for around 1 per cent or less of total within-sector inequality in all urban sectors, regional differences can account for up to 5 per cent of total income dispersion within the agricultural sector. This is

not a surprising result given the huge differences between rural areas in the north of Mexico (basically large cattle fields) compared with the south of the country (small parcels of *ejidos* or communal agricultural production).

Are the contributions made by the different characteristics to within-sector inequalities explained by their market returns?

From Table 4 we can see that the proportion of within sector inequality explained by education endowments increased between 1989 and 1994 for all sectors. These results are partly explained by an increase in the returns to schooling during the same period (see Tables A1 to A5 in the Appendix. An increase in the returns to schooling have an adverse within-sector distributive impact in all sectors of the economy. Hence, as it is the case for the whole population, skill endowments are unevenly distributed within sectors.

How much inequality can we explain?

The short answer is, very little. As it was shown in the previous section, the most important income component explaining inequality in Mexico are incomes from self-employment activities. This is where the highest incomes are concentrated, and where 38 per cent of total household income inequality is explained. Nevertheless, our results show that a simple human capital framework is not capable of giving clear answers as to what determines incomes of the formal self-employed in Mexico and hence a great proportion of the inequality we observed. The disproportionally large entrepreneurial (self-employed) incomes could be the outcome of a lack of competition, creating abnormal rents for those who have the financial capability or access to a very limited credit market (see Levy and Walton, 2009).

Summary and Conclusions

The present study identifies the underlying factors explaining the high levels of Mexican household income inequality during the 1990s. In order to capture the sectoral disparities observed during this period, total household income was divided into income derived from activities taking place in different sectors of the economy. Our discussion focused in the importance played by sectoral disparities, skill endowments, and their market returns to account for total income inequality.

Our results show that more than 38 per cent of the inequality that we observed throughout the 1990s, are accounted for by formal self-employed incomes (basically entrepreneurial rents). We find that skill endowments accounted for, at most, 25 per cent of total household income distribution in Mexico during the 1990s. Our results show that the proportion of inequality attributable to skill endowments

increased during periods of macroeconomic stability and economic growth and reduced during the crisis. This pattern is, to a great extent, explained by shifts in returns to schooling rather than changes in the distribution of skills. Positive shifts in the market returns to schooling are associated with increases in the proportion of inequality accounted for by skill endowments, hence indicating that skills are unevenly distributed among the population in Mexico.

Applying the same semi-parametric model to decompose within-sector income inequality, we show that skill endowments are also unevenly distributed within sectors, hence increases in the market results to schooling, have an adverse within-sector distributional impact. Differences in educational endowments and their market returns account for as much as one quarter of total income inequality in the earnings sectors, but as little as 5 per cent in the non-earnings sectors. The currency crisis of December 1994, together with the enactment of NAFTA, caused a sectoral redistribution favouring the tradable sectors. This redistribution was associated with lower returns to schooling in the non-tradable sectors and a higher premium for well-educated workers in the tradable sector. Given the positive relationship between returns to schooling and within-sector income inequality after 1994, skill endowments had a lower contribution to income inequality in the non-tradable sectors and and a higher in the tradable sectors. These results corroborate the results found by the literature on trade versus relative wages, supporting the view of a skill biased shift in labour demand brought about my the Mexican liberalizing reforms of the 1990s.

These results show how little we actually know about the causes behind the high levels of income inequality in Mexico. More than 38 per cent of total income dispersion is accounted for by incomes from formal self-employed activities. These are incomes where few structural interpretations can be found, and are certainly not explained by a concentration of human capital. If we want to identify the factors behind high levels of inequality in Mexico, it is mandatory that the future research agenda focus on the determinants of entrepreneurial incomes and how these interact with competition conditions.

Appendix: Regression Results for Household Income Components $\boldsymbol{Y}_k$

Regression results for household income components $\boldsymbol{Y}_k$ are given in Tables A1 to A5.

Notes

[1]*Acknowledgements:* I am grateful to the comments and suggestions made by Paul Kattuman, Ajit Singh, Jaime Ruiz-Tagle, Hans Timmer, and Adrian Wood. The usual disclaimer applies. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors they do not necessarily reflect the views of the The World Bank.

Table A1
Earnings from Manufacturing, Y_m

	1989	1992	1994	1996	1998	2000
Schooling	86.5**	127.7**	148.9**	67.2**	65.0**	129.3**
Schooling*(H)	57.3**	84.0**	89.1**	87.0**	80.6**	124.2**
Experience	16.3	32.9	47.2	-27.8	0.6	72.0**
Experience Sq.	-0.1	-0.2	-0.4	0.5*	0.1	-0.6*
Gender	4.6	-102.3	-106.7	-46.7	-94.3	-137.8
HH size	-83.2**	-131.4**	-79.6*	-72.8**	-99.7**	-157.1**
Dep. Ratio	-494.9*	-753.5**	-952.9**	-413.1	-424.5**	63.7
North	158.9*	9.6	-276.4	19.1	148.5*	26.9
South	43.7	-19.8	-163.0	-105.7	26.6	-231.6
Intercept	774.8*	869.9*	483.0	1364.3**	1135.7**	-359.2
R-squared	0.321	0.313	0.288	0.323	0.302	0.349
N	1,779	1,525	1,831	2,134	1,681	1,524

*,** significant at the 5% and 1% level respectively.

Table A2
Earnings from Other Sectors, Y_s

	1989	1992	1994	1996	1998	2000
Schooling	74.0**	109.3**	128.2**	82.2**	88.4**	85.4**
Schooling*(H)	60.1**	70.1**	124.7**	66.6**	78.3**	84.7**
Experience	29.8*	32.5**	60.5**	18.3*	22.8*	4.7
Experience Sq.	-0.3	-0.3	-0.5*	-0.1	-0.1	0.2
Gender	-24.3	218.0*	-54.2	88.5	0.7	5.9
HH size	-91.5**	-87.3**	-147.6**	-88.9**	-97.8**	-111.9**
Dep. Ratio	-1703.5**	-1756.9**	-1917.2**	-1404.0**	-1498.5**	-1638.1**
North	-49.5	-74.1	-145.1	-16.6	81.6	-77.6
South	-105.0	-126.1	-399.3**	-232.7**	-168.1**	-369.5**
Intercept	1814.3**	1270.0**	1482.2**	1291.9**	1359.4**	1955.3**
R-squared	0.286	0.329	0.315	0.326	0.290	0.258
N	5,167	4,704	5,602	6,257	4,786	4,462

*,** significant at the 5% and 1% level respectively.

[2]The importance of the agricultural sector in GDP remained practically unchanged during this period.

[3]See Feenstra and Hanson (1997), Revenga (1997), Wood (1997), and Harrison and Hanson (1999).

[4]Between 1994 and 2000 manufacturing exports accounted for 95 per cent of total exports.

[5]International trade is measured in nominal terms, therefore its increase importance in the Mexican economy during the second half of the 1990s is explained by a combination of the peso devaluation and the increase in real exports.

[6]For a more detailed description of ENIGH's survey design and the methodology followed to construct inequality indexes see De Hoyos (2005a). Descriptive statistics of all the variables included in the present paper can be found in De Hoyos (2011).

[7]Distribution D_1 Lorenz-dominates D_2 if and only if all the points in the Lorenz curve corresponding to D_1 lie closer to the 45^o line than the points corresponding to D_2.

[8]Lopez-Acevedo and Salinas (2000) documented the possible causes behind the reduction in inequality during the 1995 economic crisis.

[9]Figure **??** includes only the active population and excludes transfers and other, non-personal, household

Table A3
Income from Informal Activities, Y_i

	1989	1992	1994	1996	1998	2000
Schooling	45.9**	81.5**	82.2**	36.4**	52.8**	90.8**
Schooling*(H)	-13.5	9.2	35.5*	28.7*	1.6	0.9
Experience	-15.6	12.9	31.1	31.0**	8.6	33.4
Experience Sq.	0.1	-0.1	-0.3	-0.4**	-0.0	-0.2
Gender	-106.8	-99.1	14.4	11.2	-39.3	-249.8*
HH size	-80.5**	-75.2**	-114.1**	-77.4**	-69.0**	-158.2**
Dep. Ratio	-1115.4	-303.6*	-690.6**	-452.0**	-353.3**	-352.4
North	138.2	19.9	-53.9	57.4	33.5	33.3
South	143.0	-48.2	-239.9**	-102.8*	-108.4**	-68.4
Intercept	2295.3*	767.1**	883.6**	525.4**	747.6**	809.3**
R-squared	0.088	0.207	0.204	0.167	0.198	0.142
N	2,034	1,973	3,028	3,190	2,467	1,859

*,** significant at the 5% and 1% level respectively.

Table A4
Income from Agricultural Activities, Y_a

	1989	1992	1994	1996	1998	2000
Schooling	18.9	37.9**	29.4**	13.8**	72.9	19.4*
Schooling*(H)	50.6	3.7	12.7	71.8**	159.1	19.7
Experience	7.3	4.4	-1.3	4.9	15.5	10.8
Experience Sq.	-0.1	-0.0	0.0	-0.0	-0.2	-0.1
Gender	-67.3	-20.6	-22.5	-49.8*	278.1	-74.4
HH size	-47.0**	-52.2**	-32.8**	-27.4**	-31.9**	-53.2**
Dep. Ratio	-513.4**	-345.6**	-581.6*	-256.0**	-470.5*	-289.9**
North	225.2**	246.3**	271.2**	252.1**	281.6**	299.1**
South	120.8**	42.1	100.3**	67.9**	210.7*	20.5
Intercept	967.5**	778.3**	857.0**	414.7**	-149.0	559.2**
R-squared	0.077	0.093	0.113	0.171	0.187	0.087
N	2,174	2,041	2,523	2,565	1,851	1,858

*,** significant at the 5% and 1% level respectively.

incomes.

[10] For a recent applications of Shorrocks (1999) unified framework using the Shapley decomposition see Gunatilaka and Chotikapanich (2005) and Kolenikov and Shorrocks (2005).

[11] The variance of the log of incomes is an inequality index that violates the transfer principle (Jenkins, 1991).

[12] Notice that this aspect was first pointed out in Shorrocks (1982 and 1983). Shorrocks (1982) shows that given the large range of possible decomposition rules, the contribution assigned to any factor can be made to take any value from minus to plus infinity.

[13] Notice that, as pointed by Wan (2002), an important difference between Equation 4 and Equation 5 is that in the former the contribution to inequality of the constant term of the regression model (an evenly-distributed factor), will always be positive whereas in the latter it will always be negative.

[14] An alternative approach to the one undertaken in this study would have been to classify heads of households in the different sectors as forming different population subgroups and then undertaking between- and within-subgroups inequality type of analysis (for an application of this methodology to the USA see Cowel and Jenkins, 1995). Although useful, this approach cannot be combined with the regression based techniques described in the last section. Therefore, we treat incomes derived from the different sectors as different household income sources.

Table A5
Income from Self-Employment, Y_{se}

	1989	1992	1994	1996	1998	2000
Schooling	161.6*	349.2**	339.2**	111.3**	149.1**	165.0*
Schooling*(H)	119.5	180.6*	3.6	49.1	97.1*	115.2*
Experience	87.9	411.1*	-22.9	5.6	137.8*	120.8
Experience Sq.	-1.4	-5.2*	1.0	-0.0	-1.6*	-1.3
Gender	-345.3	-50.8	185.5	-88.3	-99.3	96.1
HH size	-292.6**	-397.8**	-207.9**	-159.0*	-353.7**	-274.4*
Dep. Ratio	82.0	-2204.2	-1831.1	-693.6	-1406.7	-1635.8*
North	3402.8	-358.1	-987.6	449.5	621.2	1323.0*
South	340.2	-1150.1	-1424.0	-363.2	27.8	-50.4
Intercept	995.6	-2534.5	2989.4	1947.8	912.0	171.2
R-squared	0.048	0.159	0.121	0.144	0.210	0.208
N	501	807	765	1,019	772	721

*,** significant at the 5% and 1% level respectively.

[15]In this context, each element $X_k\beta_k$ and ε can be interpreted as an income factor Y_k within Shorrocks' (1982) framework.

[16]Experience is measured as age subtracting for years of schooling and then subtracting another six years.

[17]Households are classified as being part of the north of Mexico when they are located in the following States: Aguascalientes, Baja California, Baja California Sur, Coahuila, Chihuahua, Durango, Nuevo León, Sinaloa, Sonora, Tamaulipas, Zacatecas and Quintana Roo. They are classified as part of the south when they belong to Campeche, Chiapas, Guerrero, Tabasco, Michoacán, Oaxaca, Veracruz and Yucatán. The rest are classified as being part of the center of Mexico, our reference category in the regression analysis.

[18]Notice that since we are relating total household income inequality with personal characteristics such as education, we are constraint to use only the heads of the household. Nevertheless, to preserve a representation of the entire population, the weights used in all estimations are the household weights multiplied by the household size. An alternative approach (as the one used in Morduch and Sicular, 2002) is to regress household incomes with average personal characteristics of the household members as oppose to the characteristics of the head of household. The results presented in this section do not change using this alternative approach.

[19]For a discussion on labour supply effects in Mexico during the 1990s see De Hoyos (2011).

[20]The contribution of elements that enter more than one time in the regression equation is simply the sum of their individual contribution as computed by Equation 4.

[21]Allowing for a degree of short-term labour market segmentation.

[22]In a fully parameterized income generating model, $\ln(\boldsymbol{Y}_k) = (\beta_k \boldsymbol{X}_k + \varepsilon_k) + \ln(L_k|_{L_k>0})$, where $L_k|_{L_k>0}$ is a labour supply function and $(\beta_k \boldsymbol{X}_k + \varepsilon_k)$ is a function estimating the log of hourly wages. See De Hoyos (2005b) for an estimation of this kind.

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