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Minimum Wages and Earnings Inequality in Urban Mexico

Revisiting the Evidence

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Abstract
This paper explores the contribution of the minimum wage to the well documented rise in earnings inequality in Mexico between the late 1980 and the late 1990s. In contrast to the view that sees minimum wages as an ineffective redistributive tool in developing countries, we find that the deterioration in the real bite of the minimum wage is responsible for the entire rise in inequality at the bottom of the distribution. Our result challenges the widespread perception that trade induced shocks are the single most important factor behind the recent rise in earnings inequality in several less developed economies.

Keywords: Minimum Wage, Inequality, Informality, Mexico
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1. **Introduction**

A very large number of papers analyze the trends in the earnings structure in Mexico, especially following the liberalization episodes of the mid 1980s. A simple search on Econlit for the keywords "inequality" and "Mexico" delivers 199 records. A search for "wage*" and Mexico" delivers 475 records. It is well known that wage inequality and the returns to skills increased markedly in Mexico since the mid 1980s up at least the mid 1990s. This evidence is confirmed by a variety of data sets and samples. Hanson and Harrison (1999), using manufacturing plant level data from the Secretariat of Trade and Industrial Promotion (SECOFI), report that between 1984 and 1990 the ratio of average hourly white to blue-collar wages increased from 1.93 to 2.55. Airloa and Juhn (2005), using data from the *Encuesta Nacional de Ingresos y Gastos de los Hogares* (ENIGH), show that between 1984 and 1994, the 90-10 log wage differential among men increased from 1.86 to 2.16, to decrease to 2 by 2000. This pattern of increase in inequality up to the mid 1990s, and decrease afterwards is also found by Robertson (2004) and Duvall-Hernandez (2006) based on data from the *Encuesta Nacional de Empleo Urbano* (ENEU), that only refers to urban workers. Verhoogen (2007), using manufacturing plant data from the *Encuesta Industrial Anual* (EIA), documents a rise in the white-blue collar wage differential of around 50 log points between 1984 and 1997, after which differentials taper down. Using population Census data for 1990 and 2000, Hanson (2004) shows that the returns to education rose during the 1990s, although, at least for men, this rise was largely concentrated among those with high levels of education.

Although these trends are incontrovertible, there is still no consensus about the determinants of the fast rise in inequality in Mexico up at least to the mid 1990s. Starting in the mid 1980s, the Mexican government pushed a strong agenda of trade and capital market reforms (for all, see Hanson, 2004) and embarked on a massive privatization program

(Lopez-de-Silanes and La Porta, 1999), while labor market institutions were on the whole weakened (see for example Popli, 2006). These changes happened at a time of rising internal and international migration to the US, that affected the supply of labor in Mexico (Chiquiar and Hanson, 2005; Mishra, 2007) and generated very sizeable remittance flows (Hanson and Woodruff, 2003; Hanson, 2005). These changes also happened against the backdrop of increasing outside competition from Asian economies in less-skilled intensive industries (Hanson and Harrison, 1999), and a generalized trend toward rising wage inequality in several OECD economies, perhaps induced by technological advancements (Katz and Autor, 1999). Because of this concurrence, disentangling the role of different factors is far from an easy task.

Certainly the area where more and more convincing research has been produced relates to the effect of trade and FDI (for an excellent survey see Hanson, 2004). Our Econlit search delivers 168 records for research papers simultaneously including the keywords "trade", "wage*" and "Mexico". Effectively, there is ample empirical evidence that returns to education, overall inequality and regional wage differentials in Mexico responded to the trends in trade openness and capital market liberalization, especially between the mid 1980s and the mid 1990s. Feenstra and Hanson (1997) argue that intermediate production outsourcing by US firms (via the so-called *maquilladoras*) raised the demand for workers who - according to Mexican standards - were relatively skilled, hence increasing the demand for skills in Mexico. The empirical evidence is consistent with this hypothesis, since the areas where *maquilladoras* expanded most were also the ones that experienced the largest rise in the demand for skills. As an additional channel, Hanson and Harrison (1999) argue that Mexico offered relatively high trade protection to low-skill industries and that the unilateral trade liberalization in 1985 exposed these industries to competition from China and other countries with abundant supply of unskilled labor, hence leading to a rise in inequality. In a

companion paper, Harrison and Hanson (1999) additionally emphasize the role played by export orientation and foreign direct investment in driving wage inequality in Mexico.[1]

Comparatively little attention has been devoted in the literature to the effect of labor market institutions - and in particular the minimum wage - in shaping the wage distribution in Mexico. For example an Econlit search for the keywords "minimum", "wage*" and "Mexico" only delivers 24 records. Probably, this is not only to be imputed to the fact that US-based researchers have long regarded Mexico as an ideal testing ground for theories of trade and economic integration - a fact easily explained by the circumstance that close to 90% of Mexican exports and 50% of its imports are traded with the United States and Canada - somewhat overshadowing some of the specificities of its labor market, but also to the fact that many economists hold a rather pessimistic view on the distributional effect of labor market institutions in developing countries. One popular view is that these institutions are responsible for severe labor market distortions (for an excellent discussion see Freeman, 2007; with specific reference to Latin America, see Heckman and Pages, 2004). An admittedly simplistic summary of this argument is that excess labor market regulation in a dualistic labor market – typical of many developing countries - leads to employment losses in the covered sector and hence widespread informality, with workers moving to low productivity jobs, in turn harming economic development. A corollary to this view is that the minimum wage is potentially an ineffective re-distributive tool, since, with a covered and an uncovered sector, its effect on the wage distribution gets "undone" by market forces, with potential efficiency losses.

[1] A different mechanism is highlighted by Verhoogen (2007) who shows that the exchange rate shock of 1994 (and 1985-87) led to differential quality upgrading across firms. Firms that were initially more productive were the first to respond to the devaluation, by increasing exports and product quality with an ensuing increase in the demand for skilled workers. Although potentially very interesting, this mechanism though, is - by the author's own admission - unable to account for the trends in inequality in Mexico over the mid 1980s-early 2000s. Other authors have dismissed explanations related to the effect of trade in favor of explanations based on of skill biased technological change (Esquivel and Rodriguez-Lopez, 2003).

Indeed, Bell's (1997) seminal study on minimum wages in Mexico shows that between 1984 and 1990 the minimum wage was too low to have an effect on the formal (manufacturing) wage distribution. This early finding - together with evidence of widespread non compliance - has sometimes been taken to imply that the minimum wage cannot be held responsible for the trend in wage inequality in Mexico. Hanson and Harrison (1999, p.273) for example read Bell's (1997) results to suggest "that the decline in Mexican minimum wages during the late 1980s cannot account for the increase in wage inequality" although in a companion paper (Harrison and Hanson, 1999, p.143) they explicitly state that that "alternative explanations for increasing wage inequality in Mexico include […] falling real minimum wages […]".

Effectively, both causal observation and existing empirical evidence suggest that the role of the minimum wage in shaping the trend in the earnings structure in Mexico since the mid 1980s might have been underestimated. In Mexico (like elsewhere in Latin America) minimum wages are an important institutional feature of the labor market and the economy as a whole. Traditionally, not only wages but also pensions, prices, tax brackets and even fines have been indexed to the minimum wage (Fairris at al., 2005). Interestingly, using ENEU data, Bell (1997) finds some evidence that minimum wages create a floor to the distribution of wages among all workers (formal plus informal). More recently, Maloney and Nunez (2004), using the same data, show a pronounced spike at the minimum wage in Mexico (and elsewhere in Latin America) among both formal and informal workers. Castellanos et al. (2004) using social security data show that wage increases among formal workers are strongly related to minimum wage increases, even among those workers with wages well above the minimum wage (a phenomenon called "lighthouse" effect). A similar argument is made by Fairris et al. (2005) who show that the cross-sectional distribution of wages among

all wage workers (formal plus informal) tends to bunch at multiples of the minimum wage, with a large spike precisely at the minimum wage.

It is well known that - not very differently from the US - since at least the mid 1980s the real bite of the Mexican minimum wage has been declining monotonically (Fairris et al., 2005). The evidence that the minimum wage is a non-ignorable feature of the cross-sectional distribution of wages in Mexico coupled with the observation that its decline throughout the mid 1980s and 1990s happened at a time of rising wage dispersion begs for a more thorough analysis of its effect on the trend in the wage structure. Although we do not dispute that other forces might have shaped the distribution of wages - especially at the top, where the minimum wage is deemed to have little or not effect - we show below that a significant share of the increase in inequality in Mexico over the last decade is due to the decline in the real bite of the minimum wage.

Despite the relative paucity of analysis, especially if compared to studies concentrating on trade, admittedly, ours is not the first paper to analyze the effect of labor market institutions - and in particular minimum wages - on the trend in the wage distribution in Mexico. Fairris (2003) shows that the decline in unionization and trade unions' reduced ability to push for wage compression explain a non negligible proportion of the rise in inequality among formal workers between the mid 1980s and the mid 1990s. Fairris et al. (2005) show a clear correlation between the trend in inequality and the erosion in the real value of the minimum wage while Popli (2005) argues that the timing of changes in the wage structure in Mexico is more consistent with trends in labor market reforms than with other reforms trends, notably trade and financial liberalization due to NAFTA.[2] Although suggestive, this evidence is far from conclusive, being based on a simple time series correlation between policy reforms and inequality.

[2] Cortez (2001) comes to different conclusions but admittedly the evidence in this paper is at most suggestive. Other authors have focused on the effect of minimum wages on employment in Mexico. Feliciano (1998) finds that the minimum wage has little effect on male employment with negative effects on female employment.

In order to estimate the effect of the minimum wage on the distribution of earnings in Mexico, in this paper we borrow from the methodology proposed by Lee (1999) for the US. Similar to Lee, we assume that inequality would have changed similarly across areas if not for the effect of the minimum wage. Differences in average wages across areas - that are assumed exogenous - induce useful variation in the real bite of the minimum wage that allow the identification of its effect net of other confounding forces. We implement this strategy using data from the Mexican *Encuesta Nacional de Empleo Urbano* (ENEU) from 1989 to 2001. Since minimum wages in Mexico can vary across municipalities in the same State, our units of observation are individual municipalities. By using the variation at the municipality level (as opposed to the variation by State, as in Lee, 1999) we are also able to account for unrestricted State X time effects. This - among other things - allows us to control for the differential exposure to trade and economic integration across Mexican States that has been documented by others and sometimes used as source of identification for the effect of globalization on the Mexican earnings structure. In the last part of the paper we account explicitly in our regressions for trade reforms, and we run a "horse-race" between changes in import tariffs and the real bite of the minimum wage.

The structure of the paper is as follows. Section 2 presents descriptive evidence on the trend in inequality and its correlation with the real value of the minimum wage. Section 3 presents the identification strategy and additional evidence on the correlation between the real minimum wage and inequality across municipalities. Section 4 presents the regression results and Section 5 concludes.

2. Trends in Earnings Inequality and the Minimum Wage in Mexico

In this section we provide basic evidence on the trends in the distribution of earnings in

Mexico and the potential bite of the minimum wage. We present evidence of a broad time series correlation between the rise in inequality between 1989 and 1997 and the fall in the minimum wage. After 1997, the minimum wage follows its declining trend while inequality reverts its trend, with some compression. The minimum wage hence is unable to account for this subsequent fall in inequality.

For our analysis we use micro data from the *Encuesta Nacional de Empleo Urbano* (ENEU) from 1989 to 2001.[3] Our measure of earnings refers to actual monthly earnings. We include all wage workers aged 16-60, with the exception of those respectively below the bottom or above the top percentile in their municipality of residence. The ENEU is a quarterly survey, and households stay for 5 consecutive quarters in the sample. We only use data from the first quarter of each year.

We have combined these data with data on minimum wages. Minimum wages in Mexico are set centrally and cover all workers.[4] First, each municipality is assigned to a group (A, B or C). For each group of municipalities, a different level of the minimum wage is set that is meant to broadly deliver the same relative bite of the minimum wage (with A being the highest wage - and hence the highest minimum wage - area and C being the lowest wage area). The classification of municipalities into each group does not change over time.

We restrict in the rest to the 63 municipalities that are consistently present in the ENEU throughout the period of observation. This comprises 23 zone A municipalities, 13 zone B municipalities and 27 zone C municipalities. Although, over time, more

[3] Although the survey has been available since 1987, we restrict to the data from 1989 since over the first two survey years wages of informal workers change dramatically and we have no clear explanation for this. It is reassuring though that our estimates of the effect of minimum wages are essentially unaffected by the exclusion of these two years (results available upon request).

[4] Minimum wages in Mexico were first introduced in 1917 following the adoption of a new Constitution. At the beginning minimum wages were set at the municipal level, being highly decentralized. Progressively, the system evolved into a regional system of minimum wage determination with central coordination, until finally in 1986 the regional commissions were abolished, with responsibility for the minimum wage set at the central level. For a summary of the institutional features of minimum wage legislation in Mexico see Feliciano (1998).

municipalities were added to the sample, we restrict to the municipalities that are present throughout the period of observation in order to avoid the risk that the estimated trends in inequality are affected by compositional changes. These are also the largest municipalities, so an additional advantage of restricting to this sample is that estimates of the wage distribution by municipality are relatively more precise. The municipalities in the sample account for 70% of the urban population as of 2000. We have approximately 36,000 individual observations per year and the average number of individuals in each year-municipality cell is 565 (with 90% of the cells including more than 50 observations). Table A1 in the appendix reports the list of the municipalities included, the State and the minimum wage area they belong to. One can see that municipalities within the same state can belong to different minimum wage zones.

The labor earnings variable in our analysis refers to usual pay from the primary job and includes overtime premia and other bonuses. Since the minimum wage is given in daily pesos, whereas labor income in the ENEU is monthly, we transform the daily official minimum wage into a monthly minimum wage equivalent multiplying it by a factor of 30.[5]

The top panel of Figure 1 reports the evolution of the wage structure in Mexico as measured by the difference between the first, third, seventh and ninth deciles and the median of the log wage distribution. All series are standardized to their value in 1989. Alongside, we also report a measure of the difference between the minimum wage and the median wage (the Kaitz index).[6] Unless otherwise noted, the data in this and the following figures refer to both men and women and include all employees, irrespective of whether they declare contributing to social security or not.

[5] To obtain this number we have divided monthly earnings by the official daily minimum wage. This results in the highest spike at 30 days in all three regional distributions.

[6] These series are obtained from separate regressions of each different decile of the wage distribution by municipality and year on municipality fixed effects and year dummies. The reported series contain the estimated time effects relative to 1989. A similar procedure is used to estimate the trend in the real bite of the minimum wage. Trends in inequality based on the unconditional (i.e. across all municipalities) distribution of earnings at each point in time deliver remarkably similar results.

A few observations are in order. First, there is a clear fanning out of the wage distribution throughout the period of analysis. Inequality rises markedly from both the top and the bottom until around 1997. The first to fifth decile gap falls by around 20 p.p. between 1989 and 1997. At the top, the ninth to fifth decile gap rises by around 30 p.p. Over the period 1989-1997 the differential between the top and bottom decile grows by around 50 p.p. Similar to others' findings, the data show that inequality drops in the second half of the 1990s. The 10-50 percentile gap increases in the period 1997-2001 by 4 p.p. while the fall at the top is in the order of 12 p.p. Overall between 1989 and 2001 inequality rises. We estimate an annual average fall in the 10-50 percentile gap of 1.6 p.p. and a rise in the 90-10 decile gap of around 1.8 p.p. As already mentioned in the introduction, we are not the first ones to note a reversion in inequality in the second half of the 1990s. While some authors argue that this was the result of the severe macroeconomic crisis and the 1995 devaluation of the Mexican currency (Airloa and Juhn, 2005), others suggest that this was the result of Mexico entry into NAFTA, that led to tariff reduction in more skill intensive industries (Robertson, 2004), while an additional explanation is that the rise in inequality across several Latin American countries - including Mexico - during the 1980s-1990s was just a temporary phenomenon, due to the structural reforms of the 1980s whose effects dissipated in the course of a decade (Behrman et al, 2000; Airloa and Juhn, 2005).[7]

A second feature that emerges from Figure 1 is the almost monotonic deterioration in the real value of the minimum wage. Between 1989 and 1995 the value of minimum wage relative to the median wage falls by approximately 37 p.p. Such fall is due to double digit wage inflation in the face of only modest nominal increases in the minimum wage. After 1995, following the signing of NAFTA, in the middle of a severe recession followed by the

[7] We have also computed inequality series based on alternative measures (the standard deviations of log wages) or for other samples (all municipalities, irrespective of whether these are consistently present in the period of observation). In all cases the trends in inequality are similar, with an initial pronounced rise and a reversion in inequality from around 1997.

currency devaluation, and despite resurgent inflation, a marked increase in the nominal value of the minimum wage generates a temporary rise in its bite (of around 20 p.p. in only two years), after which the minimum wage rejoins its downward trend.

Although the top panel of Figure 1 clearly suggest that the trend in inequality is somewhat correlated with the trend in the minimum wage bite, by concentrating on the changes over time, this figure is unable to show where exactly the minimum wage locates relative to the cross-sectional distribution of wages. In Figure 2 we report kernel density estimates of the distribution of wages at three points in time: 1989, 1995 and 2001 and for the three minimum wage areas (A, B and C). In order to get a visual impression of the time changes in the wage distribution, in each of the figures we report the distribution of log wages over two consecutive points in time (respectively 1989 and 1995, and 1995 and 2001). All series are standardized to the contemporaneous median wage in that area. Alongside, two vertical lines report the real value of the minimum wage in the two consecutive years. First, note the general widening of the wage distribution between 1989 and 1995 and its substantial stability afterwards. The minimum wage appears to create a support for the wage distribution in the early years. One can see a clear spike in the distribution at the minimum wage although compliance appears far from full. Between 1989 and 1995 the minimum wage declines sharply. That is represented in the picture by a substantial shift of the vertical line leftwards. One can clearly see that as the minimum wage declines, the distribution 'fattens up' at the bottom tail while the bunching around the old minimum wage disappears. Interestingly there are no pronounced changes at the top of the distribution. By 1995, the minimum wage is so down the wage distribution that it offers little support to it. Changes in the minimum wage between 1995 and 2001 are rather modest, as already shown above, and, if anything, one can see a moderate decrease in inequality over this period.

In sum, the time series variation in the trends in inequality is roughly consistent with the trend in the real bite of the minimum wage, until at least the mid 1990s. However, this correlation is far from being a proof of any causal effect of the minimum wage on wage inequality. In the next section we present empirical evidence confirming this hypothesis.

3. Empirical Model and Basic Evidence

In order to identify the effect of the minimum wage on the wage distribution, in this section we concentrate on the wage distribution by municipality. Following Lee (1999), who uses this strategy for different US states, we postulate that in the absence of minimum wage, the wage structure would have been (or would have evolved) identical(ly) across municipalities. We attribute any deviation around this common unobserved level (trend) to the effect of minimum wages. In formulas we assume that:

$$\begin{aligned} w_{mt}^{q} - w_{mt}^{p} &= w^{*}_{mt}^{q} - w^{*}_{mt}^{p} \quad \text{if} \quad w^{*}_{mt}^{q} \geq MW_{mt} \\ w_{mt}^{q} - w_{mt}^{p} &= MW_{mt} - w^{*}_{mt}^{p} \quad \text{if} \quad w^{*}_{mt}^{q} < MW_{mt} \end{aligned} \tag{1}$$

where w_{mt}^{q} is the q-the quantile of the observed log wage distribution in municipality m at time t, MW_{mt} is the log of the nominal minimum wage in the same municipality, and a star denotes latent variables, i.e. the ones that would have been observed in the absence of minimum wages.

Equation (1) assumes that the differential between the q-th and the p-th percentile of the actual log wage distribution in municipality m equals the latent differential if the latent level of wages at percentile q is above the minimum wage, and equals the differential between the minimum wage and the p-the percentile otherwise. This is a simple censoring

model, implying - as said - that in the absence of minimum wages, wage dispersion would be the same across municipalities, although the average wage level (denoted by p) could still differ across municipalities.

To achieve identification we make two hypotheses. First, that wages at percentile p and above are unaffected by the minimum wage, so that actual and latent quantile above p are the same ($w_{mt}^{s} = w^*_{mt}^{s}$, $s \geq p$). Second, that the difference between the q-the and the p-the quantile of the latent wage distribution is the same across municipalities ($w^*_{mt}^{q} - w^*_{mt}^{p} = w^*_{m't}^{q} - w^*_{m't}^{p}$). It follows that model (1) can be written as:

$$\begin{aligned} w_{mt}^{q} - w_{mt}^{p} &= D_t^{q} && \text{if} && w^*_{mt}^{q} \geq MW_{mt} \\ w_{mt}^{q} - w_{mt}^{p} &= MW_{mt} - w_{mt}^{p} && \text{if} && w^*_{mt}^{q} < MW_{mt} \end{aligned} \tag{2}$$

where D_t^{q} is the latent differential between the q-the and p-the quantile that we assume being the same across municipalities (and hence not carrying the subscript m).

A useful feature of the model (2) is that for sufficiently high s ($s \geq q$) one would expect differentials across municipalities to be the same. This in turn implies that the model provides an implicit falsification test for the identification assumption. In practice, we should not observe any relationship between inequality at the top of the distribution and the minimum wage.

In order to operationalize equation (2) we again follow Lee (1999) and write equation (2) as

$$w_{mt}^{q} - w_{mt}^{p} = d_{qt} + \beta^{q}[MW_{mt} - w_{mt}^{p}] + u_{mqt}, \tag{3}$$

In practice, we let the dispersion of wages be a function of a measure of real bite of the minimum wage, $MW_{mt} - w_{mt}^{p}$, plus time dummies, d_{qt}, and an error term u_{mqt}. The time dummies pick up the evolution of wages at percentile q conditional on the minimum wage,

i.e. the latent level of inequality at time t ($w^{*}_{mt}{}^{q}$-$w_{mt}{}^{p}$), while β^{q} picks up the effect of minimum wages at percentile q.

Because, if not for the small differences across the three areas, the minimum wage is effectively the same across municipalities (MW_{mt}=MW_{t}), its bite depends effectively on the level of wages at quantile p in each area ($w_{mt}{}^{p}$). One will expect the minimum wage to affect inequality in areas where wages are on average low. Effectively model (2) identifies the effect of the minimum wages based on cross-sectional differences in inequality across municipalities. The counterfactual distribution - i.e. the one that would be observed in the absence of the minimum wage - is identified by municipalities with a high average wage and hence where differentials are unaffected by the minimum wage itself.

Model (3) is fairly restrictive in that it assumes that the latent level of wages is exactly the same in each municipality. A variant of specification (3) is to assume that the trends in (but not the levels of) latent inequality are the same across municipalities. This effectively consists in assuming that:

$$\begin{aligned} w_{mt}{}^{q} - w_{mt}{}^{p} &= D_{t}{}^{q} + D_{m}{}^{q} && \text{if} \quad w^{*}_{mt}{}^{q} \geq MW_{mt} \\ w_{mt}{}^{q} - w_{mt}{}^{p} &= MW_{mt} - w_{mt}{}^{p} && \text{if} \quad w^{*}_{mt}{}^{q} < MW_{mt} \end{aligned} \tag{2'}$$

which delivers the following empirical model:

$$w_{mt}{}^{q} - w_{mt}{}^{p} = d_{qt} + d_{qm} + \beta^{q}[MW_{mt} - w_{mt}{}^{p}] + u'_{mqt}, \tag{3'}$$

where the d_{mq} are municipalities X quantile dummies. The difference between model (3) and model (3') is the latter only exploits the differential variation in the real bite of the minimum wage within municipalities (in essence a simple diff-in diff model) while the former uses the cross-sectional variation for identification. Omission of municipality fixed effects might lead to biased estimates of the effect of interest if the level of average wages in a municipality is systematically correlated with its latent level of inequality. Although a priori this needs not to

be the case, the inclusion of fixed effects should make the identification of the model more credible.

Before presenting the regression results for models (3) and (3'), we present an additional set of figures. Figures 3 plots the difference between the first and the ninth deciles relative to the sixth decile (p=60 in our model) across municipalities (on the vertical axis) on the minimum wage relative again to the sixth decile (on the horizontal axis). We plot these series at the beginning (1990) and at the end (2001) of the period.[8] The reason for using the sixth decile (as opposed to the median, as it would appear natural and consistent with Lee, 1999) is that - as shown below - we find that wages up to the median appear to be affected by the minimum wage. The solid line is a 45 degree line representing the log minimum wage relative to the sixth decile of the wage distribution by municipality.

One can notice that at the beginning of the period the bite of the minimum wage tracks remarkably well differences in the dispersion of wages at the bottom of the distribution across municipalities, consistent with model (3). A large number of municipalities appear to lie on the 45 degree line, suggesting a strong bite of the minimum wage. Also, consistent with this model, one can notice that the dispersion at the top of the distribution is essentially uncorrelated - or perhaps mildly negatively correlated - with the minimum wage.

After around a decade, and a substantial decline in the real value of the minimum wage, the correlation between wage dispersion at the bottom and the minimum wage gets weaker. The mass of the distribution shifts to the south-west, implying lower real minimum wages and higher wage inequality at the bottom. Accordingly, most data points lie above the 45 degree line and essentially on a horizontal line. This is consistent with the minimum wage having lost its bite and not creating any support for the wage distribution. The circumstance that the first to sixth decile gap appears roughly uncorrelated with the minimum wage bite in

[8] The figure for 1989 is similar to the one for 1990 but displays more variability across municipalities.

the later period is consistent with the identification hypothesis, that in the absence of minimum wages, wage differentials are the same across municipalities. After a decade, differentials at the top have increased too, although, consistent with model (2) they still show no correlation with the minimum wage.

Figure 3 exploits the cross-sectional variation across municipalities. As said, one might be worried that in high wage municipalities wage dispersion is different for reasons other than the minimum wage itself. To account for this, Figure 4 reports the correlation between yearly changes in wage differentials and yearly changes in the real bite of the minimum wage over the entire period of observation. To obtain these series we have regressed each differential on unrestricted year and municipality dummies and we have taken residuals from these regression. These are effectively wage differentials net of permanent differences across municipalities and nationwide trends in inequality. The left hand side panel plots residuals for the first to sixth decile gap over the residuals for the differential between the log minimum wage and the sixth decile. Again the solid line is the 45 degree line. One can clearly see a very strong positive correlation between the two, with changes in the real value of the minimum wage tracking well changes at the bottom of the distribution. The same figure for the differential between the top and the sixth decile of the wage distribution in the right hand side panel shows instead no correlation. This evidence is remarkably consistent with model (3').

In sum, both the cross-sectional variation and the differential time series variation across municipalities appear to show strong effects of the minimum wage at the bottom of the distribution and no effects at the top.

4. Regression Results

In this section we report regression results for equations (3) and (3'). As in Figures 1 to 4, we start by pooling men and women and we include both formal and informal workers.

Table 1 presents regressions where each wage differential relative to the sixth decile is regressed on year dummies with no control for the minimum wage. Rather then reporting individual coefficients on each year dummy, we report the average annual change that is computed by regressing the coefficients on the year dummies on a linear trend, with observations weighted by the reciprocal of the square of the standard error of each estimated coefficient. These regressions effectively give an estimate of the actual changes in the wage structure.

The table shows a clear widening of the wage distribution over time. The fist decile for example grows at a lower rate than the sixth decile, with an annual average rise of about 1.9 p.p. over the entire period of observation. The top decile grows relative to the sixth decile by approximately the same amount (0.016). Results with municipality fixed effects at the bottom of the table (effectively those reported in the top panel of Figure 1) lead virtually to the same results, suggesting that most of the changes in inequality take place within municipalities.

Table 2 reports the estimate of equation (3). Standard errors are clustered by state. One can see a clear effect of the minimum wage at the bottom of the distribution, with a 10 p.p. rise in the gap between the minimum wage and the sixth decile being associated to a rise in the gap between the bottom decile and the sixth decile of around 4 p.p. (0.385 X 0.10). Interestingly, the effect of the minimum wage appears positive at the bottom and negative at the top, implying significant but decreasingly weaker effects at higher deciles of the distribution. For example we estimate that a 10 p.p. rise in the gap between the minimum wage and the sixth decile is associated to an annual fall in the gap between the top decile and the sixth decile of around 3 p.p. This result is consistent with the mild negative correlation

between the dispersion at the top of the distribution and the minimum wage that is apparent in Figure 3. These results would imply that the effect of the minimum wage propagates throughout the wage distribution, with pronounced although decreasing effects at higher percentiles.

Estimated latent trends in the same panel suggest that - had the minimum wage remained unchanged - inequality would have risen at the bottom by around 0.7 p.p. a year (column (1)), while inequality at the top would have risen by about 1 p.p. a year (column (8)). Overall, this implies a latent trend in the ninth-to-first decile gap or around 1.7 p.p. a year. This compares with an estimated actual trend in this gap of around 3.5 p.p. (this is 1.6, in column (8), top panel of Table 1, plus 1.9, column (1) of the same table). The decline in the real value of the minimum wage hence would be responsible for around half of the increase in the ninth-to-first log decile gap.

Regressions in Table 2 suggest very pronounced spillover effects of the minimum wage throughout the wage distribution. Although this is not necessarily an unreasonable finding for Mexico, where - as said - it is known that minimum wages act as a nominal anchor for entire earnings distribution (see Castellanos et al., 2004), it is perhaps hard to believe that even very high wage workers gets affected by minimum wages.

An alternative explanation for these results is simply that model (3) is mis-specified. As already mentioned, some spurious correlation between "average" wages and wage inequality across municipalities might lead to estimates of the effect of interest that are biased. In particular, if municipalities with higher average wages also display higher latent inequality, one would find that in these municipalities the real bite of the minimum wage is lower and inequality higher, leading to some spurious negative correlation between the minimum wage bite and inequality.

As a way to check for this, in the bottom panel of Table 2 we report the same regressions as in the top panel where municipality fixed effects are included (equation (3')). A few observations are in order. First, the estimated coefficient on the minimum wage at each percentile increases relative to the specification with no fixed effects. This is consistent with the idea that municipalities with higher average wages (and hence lower bite of the minimum wage) also display higher levels of inequality. The omission of municipality fixed effects tends to underestimate the effect of the minimum wage at each decile. Similar to the specification at the top of the Table, the effect of the minimum wage tends to be stronger at the bottom of the distribution and to decline at higher deciles. For deciles above the fifth we now find small and statistically insignificant effects of the minimum wage. This is precisely consistent with model (3'). Trends in latent inequality suggest no significant changes at the bottom of the wage distribution. For example, we find that the difference between the first and the sixth decile would have actually risen by a 0.1 p.p. a year if the minimum wage had not declined. This is a small and statistically insignificant change. Not surprisingly, latent changes at the top of the distribution appear almost identical to the observed ones, since we see no significant effect of the minimum wage there. Overall, these regressions point to the circumstance that minimum wages are almost exclusively responsible for the rise in inequality from the bottom (i.e. below the sixth decile) over the period of observation. Although relative to the regressions in the top panel, these estimates provide a rather different picture of the effect of the minimum wage at each decile, the basic conclusion on the effect of minimum wages on the trend in the ninth-to-first decile gap remains unaffected. Estimates at the bottom of Table 2 imply that the ninth-to-first decile gap would have risen by around 1.6 p.p. a year had the minimum wage remained unchanged in real terms. This is again just below half of the actual increase (3.5 p.p. a year).

To get a visual impression of the estimated effects from the bottom panel of Table 2, the middle panel of Figure 1 reports the estimated changes in inequality at each decile of the wage distribution that can be attributed to the decline in the minimum wage. This is effectively obtained by multiplying the estimated coefficients on the minimum wage in the bottom panel of Table 2 times the trend in the minimum wage bite. In order to present a more standard picture and one that is directly comparable to the top panel of Figure 1, we report the estimated effects at each decile relative to the median. For example, for the first decile this is computed as the coefficient in column (1), bottom panel of Table 2, minus the coefficient in column (5) of the same table. The difference in these coefficients is then multiplied the change in the Kaitz index (the minimum wage minus the median). One can clearly see a pervasive effect of the minimum wage across the entire wage distribution, even when municipality fixed effects are included. The decline in the real bite of the minimum wage is responsible for a 22 p.p. fall in the differential between the bottom decile and the median over the 13 years of observation. Not surprisingly, the minimum wage appears also to affect inequality at the top relative to the median. This is because, even when municipality fixed effects are introduced, we find spillover effects up to the median. This implies that part of the observed fanning out at the top of the distribution in Figure 1 can be ascribed to the decline in the minimum wage itself. In fact the data show that the decline in the minimum wage is responsible for a rise of around 9 p.p. in the gap between the top decile and the median.

The latent variation in inequality is depicted in the bottom panel of Figure 1. This is obtained based on the estimated year dummies from the regressions in Table 2, bottom panel. The figure shows an overall stability in latent inequality at the bottom. There appears to be some temporary widening up of the wage distribution around 1997. The most plausible explanation is the turbulence in the labor markets following the 1994 devaluation of the Mexican peso and the ensuing recession. Verhoogen (2007) in particular argues that

differential quality upgrading across plants following a currency devaluation could in principle lead to a temporary increase in inequality, and he provides convincing evidence in favor of this hypothesis following the 1994 peso devaluation. At the top, we see a pronounced latent rise in inequality in the first years of observation and a reversion after 1997. For example, the picture shows a rise in the ninth to fifth latent decile gap of 25 p.p. between 1989 and 1997 and a subsequent fall of around 15 p.p. In sum, regressions with municipality fixed effects show pronounced - although declining - effects of the minimum wage up to the median. When municipality fixed effects are accounted for, the data pass the over-identification test implicit in model (3').[9]

In the rest of the analysis we present a battery of additional regressions to check the robustness of our findings and to analyze the responses across different samples. Because of the findings in this chapter, we always include in the model municipality fixed effects.

4.1 Robustness Checks

In Table 3 we report a number of robustness checks for our estimates in Table 2. As a first check we have run the same regressions via GLS where we use the number of observations by municipality as weights. Results are essentially unchanged. If anything, point estimates of the effect of minimum wages fall slightly, suggesting a lower bite in larger municipalities. Estimated trends in latent inequality remain virtually unaffected.

One problem with the regressions in Table 2 is that any measurement error in the "average" level of earnings will lead to a positive mechanical correlation between different measures of inequality and the real bite of the minimum wage, hence leading to an upward

[9] Our results are somewhat different from Lee (1999) who finds that the inclusion of local (i.e. State in his regressions) fixed effects leads to a rejection of the identification assumption. One explanation for his results is that the residual variation in the minimum wage bite is disproportionately due to measurement error when state fixed effects are included, leading to an attenuation bias in the estimates of the minimum wage effects. An alternative explanation is that his model is slightly mis-specified.

biased estimate of the effect of the minimum wage. Lee (1999) also notes this problem, and in an attempt to remedy it, he uses trimmed median wages as a measure of centrality. In our setting, where mean cell sizes are not very large (on average 565 observations), sampling error is potentially a serious source of concern, and this is likely to be exacerbated by the inclusion of municipality fixed effects.

In order to account for this, in the second panel of Table 3 we report regressions where we instrument the real bite of the minimum wage (the log minimum wage minus the sixth decile of the log wage distribution) by the real bite of the minimum wage computed using lagged wages (the log of the contemporary minimum wage minus the sixth decile of the log wage distribution lagged one year). To the extent that sampling error is uncorrelated over time within municipalities, this IV strategy will lead to estimates of the effect of the minimum wage that are free of division bias. A comparison of the results in the second panel of Table 3 - where we revert to unweighted regressions – with those in the bottom panel of Table 2, effectively show that the IV estimates are slightly lower than the OLS estimates. Results though are very similar. For example, the IV estimate at the bottom decile is 0.528, compared to an OLS estimate of 0.604. Similarly the estimated trend in the latent first to sixth decile gap is -0.002, compared to an OLS estimate of 0.001. Like in Table 2, the effect of the minimum wage declines at higher deciles and disappears at deciles above the fifth. Sampling error does not appear to drive our results.

As a third check we additionally control in our regressions for the interaction of year dummies with State dummies. As said, the 63 municipalities in the sample belong to 15 States (out of the 32 Mexican States). These regressions effectively identify the effect of minimum wages based on its differential variation across municipalities in the same State. This appears important because, Mexico, like the US, is a federation of States, each with a certain degree of autonomy, its constitution, governor and congress. Although - as said -

minimum wages are set at the federal level, State specific policies or macro economic factors might induce a spurious correlation between the minimum wage bite in the municipalities that make part of that State and trends in inequality. Effectively, others (see for example Feenstra and Hanson, 1997 and Hanson, 2004, 2005) have exploited regional or State-level variation to identify the effect of US production delocalization, FDI, and migration opportunities on the Mexican wage structure and the distribution of income. Similarly, distance to the US border appears to be an important predictor of changes in the wage structure. By controlling for State X year fixed effects we make sure that our results are not contaminated by unrestricted trends in omitted State factors that others have shown to be important predictors of changes in the wage structure. Results from these regressions are reported in the third panel of Table 3, where we revert to unweighted OLS regressions. For brevity, here we only report the effect of the minimum wage, since the estimated trends in the wage structure will by definition vary by State, and this would imply reporting fifteen additional coefficients. It is remarkable again that the estimated effect of the minimum wage is very similar to the one in Table 2, bottom panel. If anything, estimated coefficients are slightly higher suggesting that that the decline in the real value of the minimum wage is smaller in those States that experience a higher increase in inequality. State specific policies or State specific macroeconomic shocks hence do not appear to explain the results in Table 2.

As a final check, in the bottom panel of Table 3, we present results where we additionally control for municipality linear time trends. By adding these controls we additionally purge our estimates of (linear) trends in inequality across municipalities that might be correlated with the decline in the minimum wage. Identification here is based on the differential growth in the minimum wage bite across municipality, net of municipality specific trends and state specific macroeconomic shocks. Again, even with this extremely saturated specification, we find essentially similar results.

4.2 Differences by Gender

So far we have pooled men and women together. Separate regressions for men and women are reported in Tables 4A and 4B respectively. Table 4A reports the estimated trends in actual and latent inequality alongside the estimated effect of the minimum wage at each decile of the men's wage distribution. Specifications include fixed effects by municipality and time and are unweighted (like in Tables 1 and 2, bottom panel). Notice that because we have standardized all series to the sixth decile of the unconditional wage distribution, we can also report effects for those at the sixth decile of the men's wage distribution (that is not by construction equal to zero as in Tables 1 to 3). Similarly to the regressions that pool men and women together, results for men at the top of the table show a remarkable rise in inequality over the period. The ninth-to-first decile gap grows by around 3.4 p.p. a year with a widening of the wage distribution from both the bottom and the top. Estimates the bottom of the table show again an effect of the minimum wage that is the strongest at the lowest decile and declining at higher deciles, with no effect at deciles above the fifth. It appears that inequality at the bottom of the distribution would have remained constant if the minimum wage had maintained its original bite while all of the rise of the top is due to changes in latent inequality.

Results for women in Table 5B are similar. Inequality among women as measured by the ninth to tenth decile gap rises through the period of observation by around 4.1 p.p. a year, a larger rise than what found for men. Around two thirds of this rise (2.6 p.p., that is 0.027 in column (9) minus 0.001 in column (1)) is due to changes in latent inequality. The residual third is attributable to the effect of minimum wages, that appear to affect women at each decile up to the sixth. This should be no surprise, since women have on average lower

earnings than men. Again, minimum wages explain the entire rise in inequality at the bottom for women and no much of the variation at the top of the distribution. Interestingly, and different from Lee (1999), the results in Tables 4A and 4B show that our model fits remarkably well even when men and women are considered separately.

4.3 Formal and Informal Workers

Several analyses of wage determination and the effect of labor market institutions in Mexico refer to formal workers only (e.g. Castellanos et al., 2004) or they provide separate results for workers based on their formal status (e.g. Maloney and Nunez, 2004). This is sometimes due to data limitations (like in the case of the studies that use social security data or many studies that use data for registered firms) while in other instances this is due to the idea that formal and informal workers are differently affected by labor market institutions.

Because of the circumstance that informal workers have fewer guarantees and are less protected from unjustified firing, one might suspect that these workers are also less likely to be affected by minimum wage legislation. Maloney and Nunez (2004) though find no evidence in support of this hypothesis, and Bell (1997) actually reports that the minimum wage has a stronger effect on informal than on formal workers. This is also apparent in Figure 5 where we report kernel density estimates of log wages separately for formal and informal workers in 1989, alongside the level of the minimum wage. Following most the literature, we define informal workers as those who are not covered by social security payments in their job.[10] We only report the Figure for area B, although figures for the other areas are similar. All series are standardized to the median of the unconditional (i.e. formal

[10] Normally, when available, two criteria are used to assess the informal status of a worker: firm size and contribution to social security. In practice these two criteria overlap substantially. The vast majority of workers without social security coverage in their job work in small firms. A stricter definition of informality that restricts to workers without social security coverage in small firms only leads to similar regression results.

plus informal workers') log wages in that area. Note that informal workers account for around 25% of employment and have on average lower earnings. Consistent with Maloney and Nunez (2004), note that a spike at the minimum wage is apparent for both formal and informal workers. Relatively speaking, a higher proportion of informal workers appear to be in the neighborhood of the minimum wage. However, non-enforcement also appears to be higher among informal workers (12% of informal workers report being below the minimum wage compared to only 1% of formal workers).

The evidence that informal workers also appear to be affected by minimum wages perhaps is not too surprising. As said, the minimum wage in many Latin American countries, including Mexico, has long been used as an inflation index, so it is possible that informal workers are also directly affected by it. Consistent with this view, Freeman (2007) argues that in an economy where wages are very dispersed (as in many developing countries) minimum wages might affect the reservation wage of all workers. This point is also made by Falk et al. (2006) who present laboratory experimental evidence in favor of the minimum wage affecting worker's reservation wages through an "entitlement effect".

In the rest of this section we investigate separately the effect of minimum wages for formal and informal workers. One has to exert some caution in interpreting these results. In the presence of a covered and an uncovered sector, minimum wages might spillover to the uncovered sector through labor demand and supply adjustments. The idea, that dates back to Harris-Todaro (1970), is that higher minimum wages might price some workers out of the covered sector, hence raising the supply of labor to (and hence the wages in) the uncovered sector. However, higher minimum wages might also attract workers from the uncovered sector, who will queue for covered sector jobs, leading to unemployment and lowering the labor supply to the uncovered sector, and hence increasing uncovered workers' wages. If the labor demand elasticity is different in the two sectors, a rise in the minimum wage leads to

ambiguous predictions in terms of the uncovered sector wage and the uncovered-to-covered sector wage differential (Mincer, 1976).[11] In practice, even if informal workers (i.e. those not covered by social security payments) are not directly covered by minimum wages, there are theoretical reasons to believe that their wages respond (albeit indirectly) to minimum wages. In this case though the effect of the minimum wage will also encompass an endogenous compositional response, so analyzing separately formal and informal workers might be inappropriate.[12]

With this caveat in mind, Figure 6 - similar to Figure 3 - reports the correlation between different measures of wage dispersion and the bite of the minimum wage for formal workers while Figure 8 reports the same information for informal workers. In order to obtain these figures we have standardized each decile of the conditional wage distributions and the minimum wage to the sixth decile of the unconditional (i.e. formal plus informal workers') wage distribution.[13] Again here we pool men and women.

Figure 6 shows an extremely clear bite of the minimum wage among formal workers in the early years at the bottom of the distribution that fades away by the end of the period. Compliance among formal workers appears almost perfect. Again, there is no correlation between inequality at the top and the minimum wage. When residuals from a regressions of the relevant series on municipality and year dummies are considered, in Figure 7 (similar to

[11] Additional general equilibrium effects might arise due endogenous movements of capital across the two sectors.

[12] We have investigated this using a methodology similar to Card (1992) by regressing a number of employment outcomes on the minimum wage bite, based on a specification similar to (3') (plus a lagged dependent variable, estimated via GMM). Our results show that higher real minimum wages across municipalities and time are effectively associated to higher informality. We are cautious though in interpreting this as a causal relationship since we find no evidence of these effects being stronger among low paid workers, that is what one would expect for minimum wages to explain informality. An alternative interpretation is that this higher average wages (and hence lower real minimum wages) are associated to lower informality for reasons other than the minimum wage.

[13] The reason for this is that - as already apparent from Figure 5 - informal workers have on average low earnings: median informal wages are around 50% lower than median formal wages and the sixth decile of the unconditional wage distribution corresponds approximately to the eight decile of the informal wage distribution. Were we to standardize each group of worker's wages to the sixth decile of their own wage distribution this would (and indeed does) lead to a clear rejection of the exclusion restriction among informal workers.

Figure 4), we see again an extremely precise correlation between changes in inequality at the bottom and changes in the minimum wage that disappears at the top of the distribution.

Perhaps these results are not very surprising given that formal workers account for around 75% of the sample, so anything that is true for the unconditional wage distribution is likely to hold for the formal wage distribution too. Potentially more interesting is the evidence on informal workers in Figures 8 and 9. Notice that since these workers only account for 25% of the sample, estimates are less precise. Still, the data show very clear patterns. One can see that in the early period the bottom decile of the wage distribution for informal workers lies generally below the minimum wage, implying imperfect compliance. However, there is a clear positive correlation between minimum wages and inequality at the bottom. The minimum wage appears to "pull" wages of low paid informal workers, consistent with the idea that this acts as a nominal anchor for all workers in the economy, without necessarily being a wage floor. By the end of the period, wages of informal workers at the bottom decile essentially correspond to the (by now lower) minimum wage. Perhaps also worth noticing is that the top decile of the informal wage distribution seems to be positively correlated with the minimum wage bite at least in the early period, suggesting potentially pronounced spillover effects of the minimum wages at high deciles of the informal wage distribution. Results based on changes in inequality and the minimum wage in Figure 9 confirm the evidence above that low paid informal workers are affected by the minimum wage.

The evidence in Figures 6 to 9 is confirmed by the regression estimates in Tables 5A and 5B, that have the same structure as Tables 4A and 4B. Inequality among formal workers grows over time, a fact that is also clear from an analysis of the top left-hand side panel of Figure 10, that has the same structure as Figure 1. The ninth-to-first decile of the formal wage distribution grows on average by 3 p.p. a year. This is due to a roughly equal rise in the ninth

to fifth decile and the first to fifth decile gaps. Again the minimum wage seems to affect workers at the bottom of the distribution with pronounced spillover effects up to the median of the formal wage distribution.[14]

Latent inequality grows considerably at the top. We estimate that the ninth to fifth decile of the formal distribution would have risen by around 1.5 p.p. a year over the period of observation had minimum wages not declined (this is 0.29 in column (9) minus 0.14 in column (6)). This is effectively equal to the observed changes (in the order of 1.7 p.p.). Changes at the bottom of the latent distribution by converse are negligible. We estimate that the gap between the first and the fifth decile of the latent distribution remains constant over this period (this is 0.14 in column (5) minus 0.14 in column (1)). Again this is confirmed visually in left-hand side panels of Figure 10. The entire rise in inequality at the top of the distribution for formal workers is due to latent trends, while the minimum wage accounts for almost the entire rise in inequality at the bottom.

Regression results for informal workers also confirm the evidence in Figure 9. First note a substantial increase in inequality among informal workers. Table 5B, top panel, shows an overall increase in the ninth-to-first decile gap of around 1.8 p.p. a year. This is largely due to a rise in inequality at the top of the informal wage distribution, with the actual ninth to fifth decile gap rising by 1.3 p.p. Again this is confirmed visually in Figure 10, top right hand panel. What is potentially more interesting is that that the minimum wage seems to affect up to around the eight decile of the informal wage distribution. This should be no surprise since this roughly corresponds to the sixth decile of the unconditional wage distribution. Latent changes in inequality, that are also plotted in Figure 10, right-hand side panel, are essentially

[14] Note that latent differentials seem to grow at almost each decile of the formal wage distribution. This depends on the circumstance that we have standardized formal workers' wages to the sixth decile of the unconditional (i.e. formal plus informal) wage distribution. The erosion of the real value of the minimum wage is associated to a rise in the average wage gap between formal and informal workers, with an overall rise in the gap between each decile of the formal wage distribution and the sixth decile of the unconditional wage distribution.

flat. The minimum wage appears to explain essentially all of the rise in inequality among informal workers.

In sum, we find wages of both formal and informal workers in Mexico being responsive to minimum wages. Compliance among formal workers is almost perfect and the minimum wage has the potential to explain most if not all of the rise in inequality at the bottom of the formal wage distribution over the thirteen years of observation. Still the data show that latent inequality at the top of the distribution for formal workers first rose and then fell over the period of observation, something that cannot be explained by the minimum wage.

It appears that although the minimum wage does not necessarily act as a wage floor for informal workers, due to widespread non compliance, its effect on the informal wage distribution is substantial. Low wage informal workers appear to respond to minimum wage changes. Effectively, our data show that the erosion in the minimum wage bite over this period can essentially explain all of the rise in inequality among informal workers.

4.4 Explicit Controls for Tariffs

Perhaps one of the major sources of concern for the results in the previous tables is that the correlation between wage inequality and the minimum wage might be contaminated by the opening of the Mexican economy throughout the 1980s and 1990s. As discussed in the introduction, others before us have shown that trade opening contributed substantially to shaping the trends in the earnings distribution in Mexico. If the impact of the trade reforms affected different municipalities differently, so that municipalities with higher growth in average wages - and hence a greater reduction in the real value of the minimum wage - also happened to be relatively more affected by trade liberalization (and assuming that trade

openness increases inequality as generally argued), one might end up overestimating the role played by the deterioration in the real value of the minimum wage on inequality.

In order to assess the influence of trade liberalization *vis à vis* the minimum wage, in the rest of this section we present regressions that explicitly control for import tariffs in addition (or in alternative) to the minimum wage.

Before proceeding to the analysis, it is important to remark on some substantial differences between our analysis and other papers in the area. First, our data come from a household survey for urban areas, while several existing studies (Revenga, 1997; Hanson and Harrison, 1999; Feenstra and Hanson, 1997 and Verhoogen, 2007) used plant or firm level data for the entire country. Although this latter approach has the advantage of allowing the researcher to control for unobserved time invariant plant characteristics, these data only refer to manufacturing and exclude other (tradable and non tradable) industries. By converse, most other studies do not impose any restrictions on the location of firms and workers, while - as said - our data refer to urban areas only. In addition, typically, plant level data refer to large formal enterprises, while our data include all wage employees in all firm sizes, irrespective of their or their firm formal status. These are all margins of potential selection that might affect the results and make our analysis not directly comparable to others. Second, most studies refer to inter-industry wage differentials while we are interested in within municipality inequality. Third, we only have information on tariff barriers but we have no information on non-trade barriers (import licenses and quotas) or FDI, that often are claimed to be important determinants of wage inequality in Mexico.[15] Finally, since the ENEU data are not available until the second half of the 1980s, when the first liberalization episode occurred, we are missing in our analysis the large opening of the Mexican economy that others have suggested

[15] Our attempts to recover information on import licenses over the period of observation have been unsuccessful. Potentially reassuringly, Goldberg and Pavcnik (2007) claim that trade and non trade barrier reforms are generally used as complements as opposed to substitutes, implying that these two variables varied similarly.

led to a massive increase in inequality (Revenga, 1997; Hanson and Harrison 1999; Robertson, 2004).

Figure 11 reports the trend in average import tariffs over the period of observation. These figures are obtained from *ad valorem* tariffs by 4-digit industries as reported in the *Diario Official de la Federacion* (various issues) and used in Aleman-Castilla (2006).[16] These data only refer to tariffs for trade with the US. The figure reports the employment weighted average tariff with weights given by the employment share of each 4-digit industry. We use the time-average of these shares in order to abstract from compositional effects. We report two series. The first is the average tariff across all tradable sectors. The second also includes non tradable sectors, with tariffs set equal to zero for these sectors. In either case, the two series convey the same message: tariffs remained unchanged between 1989 and 1993. In 1994, following the signing of NAFTA, tariffs fell abruptly, after which some further reduction took place. Tariff reduction was not uniform across industries. Aleman-Castilla (2006) reports that the Textiles and Food, Beverages, and Tobacco industries experienced the largest reductions while Machinery and Equipment the lowest. This is potentiality useful for our analysis since municipalities with different industrial structures were potentially differentially exposed to trade liberalization.

In order to ascertain the role played by tariff reduction in shaping the trend in the wage structure over the period of observation, we have computed for each municipality an employment weighted average tariff. Similarly to the series in Figure 11, we use the industrial employment structure (by municipality, in this case) to compute the average tariff by municipality. Again, to avoid potential confounding compositional effects and to enhance

[16] We have compared our import tariffs for trade with the US with data on average import tariffs (irrespective of the origin country) for the period 1988 to 1995. This last series was kindly provided to us by Raymond Robertson. The two series are remarkably similar up to 1993, after which we see a fall in import tariffs from the US but not from other countries. This is the result of Mexico signing NAFTA.

the precision of the estimates, we use the average industrial structure across the thirteen years of observation to weight the tariff data.

Table 6 reports regressions of within municipality inequality on average tariffs by municipality. We use the average level of tariffs including non tradable sectors as a regressor.[17] Similarly to the bottom panel of Table 2, we report regressions with municipality fixed effects in addition to year fixed effects, and again we pool men and women. Notice that because tariffs stayed unchanged between 1989 and 1993, they cannot explain the pronounced rise in inequality observed over the early years. Regressions results reported in the top panel show that municipalities that experienced larger tariffs reductions also happened to experience a smaller increase in inequality. The regression coefficient for the differential between the bottom and sixth decile in column 1 is -0.042, implying that a reduction in tariffs of 8 p.p. - that is the gap between the highest and the lowest change in tariffs across the municipalities in the sample - is responsible for an increase in the tenth to sixth decile gap of about 30 p.p. over the period of observation. This is a sizeable and precisely estimated effect. The estimated effect of tariffs increases monotonically at each decile. For example, the effect of a 1 p.p. reduction in average *ad valorem* tariffs on the differential between the top and the sixth decile in column (8) is estimated to be in the order of 0.031. Overall, and contrary to the widespread evidence that trade liberalization led to a rise in inequality in Mexico as elsewhere in Latin America (see Goldberg and Pavcnik, 2007 for a very careful review of the studies in this area), the regression estimates in this table suggest that the opposite happened in Mexico over the second half of the 1990s. This result is remarkably consistent with Robertson (2004), who finds that - different from the first episode of trade liberalization in the mid 1980s - NAFTA led to a fall in the relative price of skill-intensive goods with an ensuing fall in the skilled to unskilled wage gap. The estimated trend in latent inequality is

[17] Results that include average tariffs by municipality for traded sectors only lead to different conclusions on the effect of trade on inequality. Coefficients are consistently small and statistically insignificant. The estimated effect of the minimum wage though is unaffected.

reported in the top row of the table. It appears that the ninth to first decile gap would have risen by about 5.8 p.p. a year (0.027+0.031) in the absence of trade liberalization. This compares to an actual change, in Table 2, of about 3.5 p.p. a year.

The bottom part of Table 6 reports regressions that control jointly for the minimum wage and tariffs. Results on tariffs are similar to those found at the top of the table (where the minimum wage is not included). It appears that the effect of a 1 p.p. reduction in average *ad valorem* tariffs is responsible for a fall in the ninth to first decile gap of about 0.062 p.p. a year. This compares with an estimate at the top of the table of 0.073 p.p. Perhaps more remarkable is the observation that the coefficient on the minimum wage remains essentially unaltered after the inclusion of explicit controls for tariffs. For example, the coefficient for the bottom decile in column (1) is 0.587. This compares to an estimated effect when tariffs are excluded of 0.604 (Table 2, column 2, bottom panel). Regression estimates in Table 6 overwhelmingly suggest that the estimated impact of the minimum wage cannot be ascribed to the omission of trade variables. When both minimum wages and tariffs are included, the estimated increase in the latent ninth to first decile gap is in the order of 3.9 p.p. a year.

In brief, omission of explicit controls for trade reforms does not appear to affect the main conclusion of the paper, i.e. that the minimum wage is responsible for a significant share of the increase in inequality in Mexico over the 1990s, especially at the bottom of the distribution.

5. Discussion and Conclusions

In this paper we use household micro data to analyze the contribution of the decline in the real value of the minimum wage to the well-documented rise in earnings inequality in Mexico

between the late 1980s and the early 2000s. Consistent with findings elsewhere in the literature, we show that wages of a large proportion of Mexican workers are indexed to the minimum wage: the impact of the minimum wage in Mexico propagates to at least the median of the earnings distribution. This effect is increasingly less important at higher deciles and disappears for deciles above the sixth. Contrary to what we read as a widespread perception that the minimum wage is *de facto* a non important redistributive feature of the labor market in Mexico - as in other less developed economies -, we show that the decline in the real value of the minimum wage is able to explain most - if not all - of the rise in urban inequality at the bottom of the earnings distribution that is observed between the late 1980s and the late 1990s. A temporary increase in the real value of the minimum wage in the mid 1990s - corresponding to the signing of NAFTA - appears to have no effect on the earnings distribution: by then the minimum wage was already too low in real terms to have any effect on the wages of low paid workers.

Our results are extremely robust, and they hold even when we condition on municipality-specific linear time trends and for unrestricted State-specific time effects. IV estimates that attempt to control for potential division bias in the OLS estimates also lead to remarkably similar results. We find a qualitatively similar effect for men and women, although, the effect is stronger for the latter group, consistent with the observation that women earn on average lower salaries. We finally account explicitly for trade-induced changes in the labor market, by computing an index of trade openness by municipality that is an employment weighted average of import tariffs. The signing of NAFTA in 1994 led to a massive reduction in import tariffs from the US. The estimated effect of the minimum wage on the wage distribution is essentially unaltered by explicit controls for tariffs. As an aside finding, our regressions show that NAFTA led to a compression in wage inequality. This is contrary to most of the existing evidence on the effect of trade liberalization on earnings

inequality (see Goldberg and Pavcnik, 2007) but consistent with what was found by others for post NAFTA Mexico (Robertson, 2004; see also Goldberg and Pavcnik, 2007).

Our finding that the minimum wage explains a significant share of the increase in inequality observed in Mexico over the late 1980 to late 1990s is surprisingly consistent with what others argue has happened in the US. Although not undisputed (Autor et al., 2007), a recent body of research (DiNardo and Card, 2002; Lemieux, 2006), building on the work of Lee (1999), emphasizes the role played by the minimum wage in shaping inequality in the US. These papers show a very clear time series correlation between trends in total and within wage inequality and the real bite of the minimum wage. This correlation is particularly evident in the 1980s, when the real value of the minimum wage declined, while inequality rose substantially. After that, no clear time trend is appreciable in either series, so that these authors conclude that the rise in inequality in the 1980s was largely an "episodic phenomenon" potentially linked to the erosion of the real value of the minimum wage (Card and DiNardo, 2002).

Once we account for changes in the minimum wage, we still find evidence that inequality at the top of the distribution would have risen, leaving space for other explanations linked to trade, FDI, outsourcing or even skill-biased technological change. Unfortunately we have no data to test directly the effect of these forces. Others before us though have documented convincingly the contribution of these factors over the late 1980s-mid 1990s. Our results do not necessarily dispute these findings but intend to complement them. Again, our finding is not dissimilar to what others suggest has happened in the US, where other forces – such as falling unionization and the reallocation of labor induced by the 1982 recession, have likely contributed to increasing inequality, especially at the top of the distribution (DiNardo and Card, 2002; Lemieux, 2006).

The monotonic decline in the real value of the minimum wage over the thirteen years of analysis is also obviously unable to account for the reversion in inequality that is observed at the top of the earnings distribution starting in 1997. Again, others before us have noted this, although the interpretations vary as to what might have produced it. In the paper we remain agnostic as to which of these explanations - if any - is relatively more important.

In the paper we report separate analyses for formal and informal wage workers, where the latter are defined as those not contributing to social security in their job. Informal workers account for around one fourth of salaried employment in Mexico. While we report separate results for the two groups primarily for consistency with previous analyses, we are aware that this approach lends its flank to potential criticism. To the extent that minimum wages create an incentive for employers to move workers to the uncovered sector (for which the evidence is admittedly weak), hence creating informality, these estimates are obviously affected by a margin of endogenous selection. In this circumstance - and ignoring general equilibrium effects - one might presumably expect that a minimum wage rise will increase inequality among informal workers. This is because workers whose productivity is below the minimum wage will all be informal and the marginal informal worker will hence be paid more than existing informal workers. Contrary to this prediction, the minimum wage appears to compress earnings of informal workers, and is able to explain the entire rise in earnings inequality among these workers that is observed over the period of observation. Effectively, although we find widespread non compliance among informal workers, with a significant proportion of them earning less than the minimum wage, we also find that workers at the bottom of the informal wage distribution still respond to minimum wage increases. Again, this is consistent with the minimum wage acting as a nominal anchor for wages in Mexico, a fact that is well known to be true in several Latin American countries and presumably the inheritance of the periods of hyperinflation of the 1970s and 1980s. This is consistent with

the notion that minimum wages have the potential to affect the reservation wages of all workers in the economy, whether covered by minimum wages or not (Falk et al., 2006; Freeman, 2007).

Among formal workers, we find very clear compliance with the minimum wage: effectively the minimum wage acts as a floor to the formal earnings distribution not dissimilar to what found in the US.

Whether the estimated effect of the minimum wage on the informal wage distribution is a genuinely direct effect or an effect mediated through labor supply and demand responses, and hence whether one is willing to accept separate estimates for the two groups as being truly "causal", it still remains true that the minimum wage appears to affect the entire unconditional (i.e. formal plus informal workers') distribution of wages in Mexico. Not only does this finding reject a simplistic picture of the labor markets in less developed economies, where widespread informality and poor compliance are often suspected of 'undoing' the redistributive impact of labor market institutions, but it also provides a guidance on how minimum wages might work elsewhere.

A recurrent problem with the finding that the minimum wage tends to compress the wage distribution in more developed economies - where non compliance is certainly less of an issue - is that the evidence that minimum wages create a support to the wage distribution (i.e. wage censoring) cannot be observationally told apart from the circumstance that some workers might lose their job in response to minimum wage rises (i.e. wage truncation). In this literature, truncation is generally ruled out by assumption (see for example DiNardo et al., 1996). Ultimately, with cross-sectional wage data, censoring cannot be separately identified from truncation, since the market wages of those out of work cannot be observed.[18] However, if for many developed countries, there are good theoretical reasons - linked to the existence of

[18] Additionally, it is well known that direct evidence on the dis-employment effect of the minimum wage is at the very least controversial (Card and Kruger, 1994; Neumark and Wascher, 1992).

social insurance systems (e.g. unemployment insurance) - to believe that low productivity workers might afford to remain unemployed as a result of minimum wage increases, this is not the case in many poorer countries, where *de facto* formal welfare is not existent and work - perhaps casual, unprotected and often informal - is the only way to meet ends. In Mexico, for example, unemployment has traditionally been very low: except during the severe financial crisis of the mid 1990s, the unemployment rate has been in the order of 2-2.5 p.p. Unemployment apparently is not a viable option for Mexican workers. From the perspective of a researcher, this means that one can effectively measure market wages of those who are not in formal employment. By showing that wages of all workers (formal plus informal) bunch at the minimum wage, our paper tends to reject a simple model of wage truncation in the face of minimum wages, and adds some additional evidence in favor of modest dis-employment effects of the minimum wage.

Although, admittedly, our paper does not innovate on methodology, largely using a strategy devised by Lee (1999), from a substantive point of view our finding seems to suggest that the emphasis on the role of trade in shaping trends in the wage structure in developing countries might have been exaggerated, and that more research is needed to understand the role of labor market institutions in countries other that the USA.

In closing, at least two caveats that apply to our conclusions are worth mentioning. First, we have treated the real bite of the minimum wage as an exogenous variable. Perhaps, though, the Mexican government let the minimum wage deteriorate - by simply leaving its nominal value unchanged in the face of inflation - for fear that this might impede readjustment in the face of macroeconomic shocks, or because of increasing pressure towards inequality in market wages. As noted by Freeman (2007), the fact that many less developed countries experienced a deterioration in the real bite of the minimum wage in the 1990s is

possibly not a mere accident. The link between labor market institutions and market forces - especially in developing countries - is far from being fully understood.

A second caveat to our conclusions is that our analysis refers only to urban workers hence ignoring the potential general equilibrium effects that arise in a Harris-Todaro model when a rural uncovered sector is present. Understanding the functioning of minimum wages in an economy with a rural sector and mobility of labor, as is the case of Mexico, is next on the agenda.

Table 1
Actual trends in inequality
Males plus females, 1989-2001

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Percentile							
	10	20	30	40	50	70	80	90
	Without municipality fixed effects							
Actual trend	-0.019***	-0.013***	-0.010***	-0.007***	-0.003***	0.006***	0.012***	0.016***
	(0.004)	(0.003)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)
R-squared	0.68	0.71	0.76	0.77	0.64	0.77	0.81	0.72
	With municipality fixed effects							
Actual trend	-0.020***	-0.014***	-0.011***	-0.007***	-0.003***	0.006***	0.013***	0.016***
	(0.004)	(0.003)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)
R-squared	0.71	0.74	0.77	0.79	0.65	0.78	0.85	0.76

Notes: The table reports the estimated trend in each decile relative to the sixth decile of the log wage distribution by municipality and year. The top and bottom panels report results without and with municipality fixed effects respectively. Coefficients on trend are obtained in two steps. First, log differentials are regressed on year dummies. Second, coefficients on year dummies are regressed on a linear trend with weights equal to the reciprocal of the standard error of each coefficient. Standard errors (in brackets) in this second regression are clustered by year. ***: significant at 1%, ** significant at 5%, *: significant at 10%. Number of observations: 819.

Table 2
Latent trends in inequality and the effect of the minimum wage
Males plus females, 1989-2001

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Percentile				
	10	20	30	40	50	70	80	90
				Without municipality fixed effects				
Latent trend	-0.007	-0.001	-0.000	0.000	0.000	0.003**	0.007**	0.010**
	(0.004)	(0.003)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.004)
MW	0.385**	0.350***	0.287***	0.215***	0.109***	-0.088**	-0.182*	-0.288*
	(0.163)	(0.109)	(0.070)	(0.059)	(0.033)	(0.038)	(0.095)	(0.155)
R-squared	0.71	0.74	0.77	0.79	0.65	0.78	0.85	0.76
				With municipality fixed effects				
Latent trend	0.001	0.003	0.003	0.003	0.002*	0.004***	0.011***	0.017***
	(0.004)	(0.003)	(0.003)	(0.002)	(0.001)	(0.001)	(0.002)	(0.003)
MW	0.604***	0.485***	0.388***	0.293***	0.174***	-0.023	-0.029	0.007
	(0.080)	(0.049)	(0.034)	(0.036)	(0.015)	(0.033)	(0.065)	(0.116)
R-squared	0.73	0.71	0.64	0.55	0.35	0.32	0.52	0.62

Notes: The table reports the estimated effect of minimum wages and the estimated residual (i.e. latent) trend in each decile relative to the sixth decile (equations 3 and 3' in the text) of the log wage distribution by municipality and time. Standard errors on the MW variable are clustered by state. Standard errors on linear trend are obtained in two steps and are clustered by year. The top and bottom panels report results without and with municipality fixed effects respectively. See also notes to Table 1.

Table 3
Robustness checks
Males plus females, 1989-2001

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Percentile				
	10	20	30	40	50	70	80	90
				With municipality fixed effects Weighted by number of observations				
Latent trend	0.000	0.003	0.003	0.002	0.001	0.006***	0.014***	0.017***
	(0.004)	(0.003)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.004)
MW	0.509***	0.400***	0.297***	0.213***	0.128***	0.035	0.095	0.061
	(0.083)	(0.060)	(0.053)	(0.039)	(0.033)	(0.035)	(0.068)	(0.093)
R-squared	0.81	0.78	0.69	0.62	0.40	0.44	0.64	0.72
				With municipality fixed effects - IV estimates				
Latent trend	-0.002	0.001	0.001	0.003	0.002	0.007***	0.012***	0.019***
	(0.004)	(0.003)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.003)
MW	0.528***	0.420***	0.319***	0.294***	0.151***	0.048	-0.001	0.065
	(0.085)	(0.063)	(0.041)	(0.028)	(0.022)	(0.056)	(0.119)	(0.174)
R-squared	0.73	0.70	0.63	0.55	0.35	0.31	0.52	0.62
				With municipality fixed effects and state X year dummies				
MW	0.659***	0.531***	0.429***	0.337***	0.198***	-0.020	-0.025	0.018
	(0.086)	(0.049)	(0.031)	(0.057)	(0.030)	(0.037)	(0.070)	(0.133)
R-squared	0.83	0.80	0.75	0.66	0.48	0.45	0.63	0.69
				With municipality fixed effects, state X year dummies and municipality trends				
MW	0.691***	0.571***	0.471***	0.375***	0.231***	-0.004	-0.019	-0.005
	(0.091)	(0.063)	(0.036)	(0.047)	(0.032)	(0.034)	(0.071)	(0.184)
R-squared	0.86	0.84	0.80	0.73	0.55	0.51	0.69	0.72

Notes: The table reports similar regressions to those in the bottom panel of Table 2. Regressions in the top panel are weighted by number of observations. Results in the second panel report unweighted IV regressions where the real bite of the minimum wage (the log minimum wage minus the sixth decile of the log wage distribution) is instrumented by the real bite of the minimum wage computed using lagged wages (the log of the contemporary minimum wage minus the sixth decile of the log wage distribution lagged one year). The regressions in the third panel are again unweighted and include additionally the interaction of year dummies with state dummies. Regressions in the bottom panel further include the interaction of municipality dummies with a linear trend. See also notes to Table 1.

Table 4A
Actual and latent trends in inequality
Males, 1989-2001

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
					Percentile				
	10	20	30	40	50	60	70	80	90
Actual trend	-0.020***	-0.013***	-0.009***	-0.006***	-0.003***	0.000	0.005***	0.012***	0.015***
	(0.004)	(0.002)	(0.002)	(0.001)	(0.001)	(0.000)	(0.001)	(0.002)	(0.003)
R-squared	0.58	0.55	0.46	0.39	0.26	0.32	0.42	0.56	0.62
Latent trend	0.001	0.003	0.004	0.003	0.001	-0.000	0.003**	0.009***	0.014***
	(0.004)	(0.003)	(0.002)	(0.002)	(0.001)	(0.000)	(0.001)	(0.002)	(0.004)
MW	0.586***	0.469***	0.368***	0.262***	0.132***	-0.020	-0.063	-0.072	-0.058
	(0.073)	(0.049)	(0.033)	(0.043)	(0.025)	(0.017)	(0.039)	(0.061)	(0.098)
R-squared	0.70	0.69	0.59	0.51	0.33	0.33	0.43	0.57	0.62

Notes: The table reports similar regressions to those in the bottom panel of Tables 1 and 2 and refer only to men.

Table 4B
Actual and latent trends in inequality
Females, 1989-2001

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
					Percentile				
	10	20	30	40	50	(60)	70	80	90
Actual trend	-0.018***	-0.014***	-0.010***	-0.007***	-0.004***	-0.001*	0.006***	0.015***	0.023***
	(0.003)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.004)
R-squared	0.62	0.57	0.51	0.43	0.31	0.30	0.37	0.53	0.59
Latent trend	0.001	0.004	0.005	0.004*	0.003**	0.001*	0.007***	0.015***	0.027***
	(0.004)	(0.004)	(0.003)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.004)
MW	0.570***	0.525***	0.424***	0.311***	0.197***	0.055**	0.030	0.039	0.160
	(0.075)	(0.060)	(0.041)	(0.035)	(0.015)	(0.024)	(0.035)	(0.071)	(0.123)
R-squared	0.70	0.69	0.62	0.53	0.38	0.31	0.37	0.53	0.60

Notes: The table reports similar regressions to those in the bottom panel of Tables 1 and 2 and refer only to women.

Table 5A
Males plus females, 1989-2001
Formal workers only

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(9)	(9)
					Percentile				
	10	20	30	40	50	60	70	80	90
Actual trend	-0.010***	-0.005*	-0.002	0.001	0.003***	0.008***	0.013***	0.018***	0.020***
	(0.003)	(0.003)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.003)
R-squared	0.60	0.56	0.59	0.59	0.59	0.56	0.52	0.51	0.54
Latent trend	0.014***	0.014***	0.012***	0.014***	0.014***	0.017***	0.021***	0.026***	0.029***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.004)	(0.004)
MW	0.721***	0.559***	0.420***	0.370***	0.298***	0.254**	0.232	0.254	0.256
	(0.081)	(0.071)	(0.059)	(0.082)	(0.096)	(0.114)	(0.156)	(0.176)	(0.157)
R-squared	0.76	0.69	0.69	0.68	0.65	0.60	0.55	0.53	0.55

Notes: The table reports similar regressions to those in the bottom panel of Tables 1 and 2 and refer only to formal workers.

Table 5B
Males plus females, 1989-2001
Informal workers only

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
					Percentile				
	10	20	30	40	50	60	70	80	90
Actual trend	-0.020***	-0.021***	-0.019***	-0.017***	-0.015***	-0.012***	-0.010***	-0.007*	-0.002
	(0.004)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
R-squared	0.54	0.64	0.63	0.65	0.64	0.64	0.66	0.66	0.57
Latent trend	0.003	0.002	0.004	0.003	0.004	0.003	-0.001	-0.001	0.000
	(0.007)	(0.006)	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)
MW	0.739***	0.706***	0.689***	0.601***	0.556***	0.491***	0.328***	0.241***	0.140
	(0.074)	(0.070)	(0.065)	(0.046)	(0.045)	(0.057)	(0.055)	(0.067)	(0.143)
R-squared	0.61	0.74	0.75	0.76	0.74	0.71	0.68	0.67	0.58

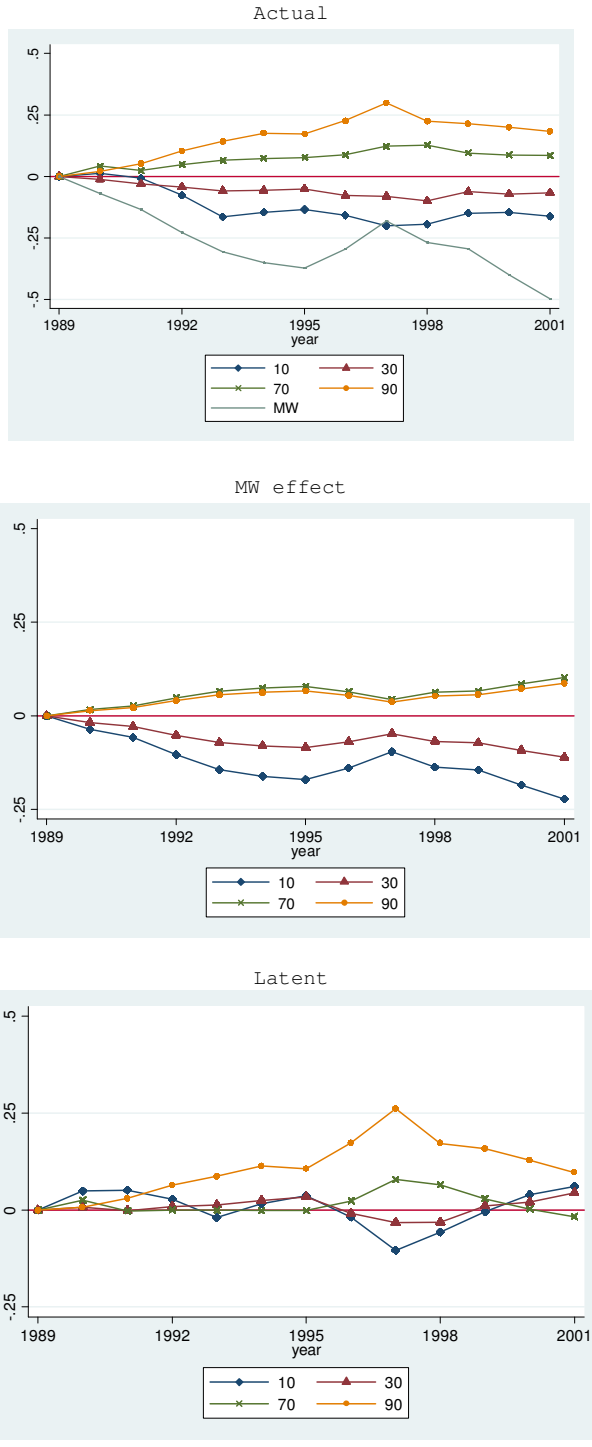
Notes: The table reports similar regressions to those in the bottom panel of Tables 1 and 2 and refer only to informal workers.

Table 6
Actual and latent trends in inequality - controlling for import tariffs
Males plus females, 1989-2001

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Percentile							
	10	20	30	40	50	70	80	90
latent trend	-0.031***	-0.023***	-0.018***	-0.015***	-0.006***	0.010***	0.021***	0.027***
	(0.007)	(0.005)	(0.003)	(0.002)	(0.001)	(0.001)	(0.003)	(0.005)
Tariffs	-0.042***	-0.033***	-0.027**	-0.022***	-0.010***	0.014**	0.027***	0.031*
	(0.013)	(0.011)	(0.009)	(0.006)	(0.002)	(0.005)	(0.009)	(0.014)
R-squared	0.63	0.59	0.52	0.44	0.26	0.34	0.53	0.62
Latent trend	-0.013**	-0.009**	-0.007**	-0.007**	-0.001	0.009***	0.020***	0.026***
	(0.005)	(0.004)	(0.003)	(0.003)	(0.002)	(0.001)	(0.003)	(0.004)
MW	0.587***	0.472***	0.377***	0.284***	0.171***	-0.015	-0.014	0.024
	(0.075)	(0.041)	(0.028)	(0.028)	(0.014)	(0.028)	(0.055)	(0.098)
Tariffs	-0.031***	-0.024***	-0.019***	-0.017***	-0.006	0.014**	0.027***	0.031**
	(0.008)	(0.008)	(0.006)	(0.004)	(0.004)	(0.005)	(0.009)	(0.014)
	819	819	819	819	819	819	819	819
R-squared	0.74	0.71	0.65	0.56	0.35	0.34	0.53	0.62

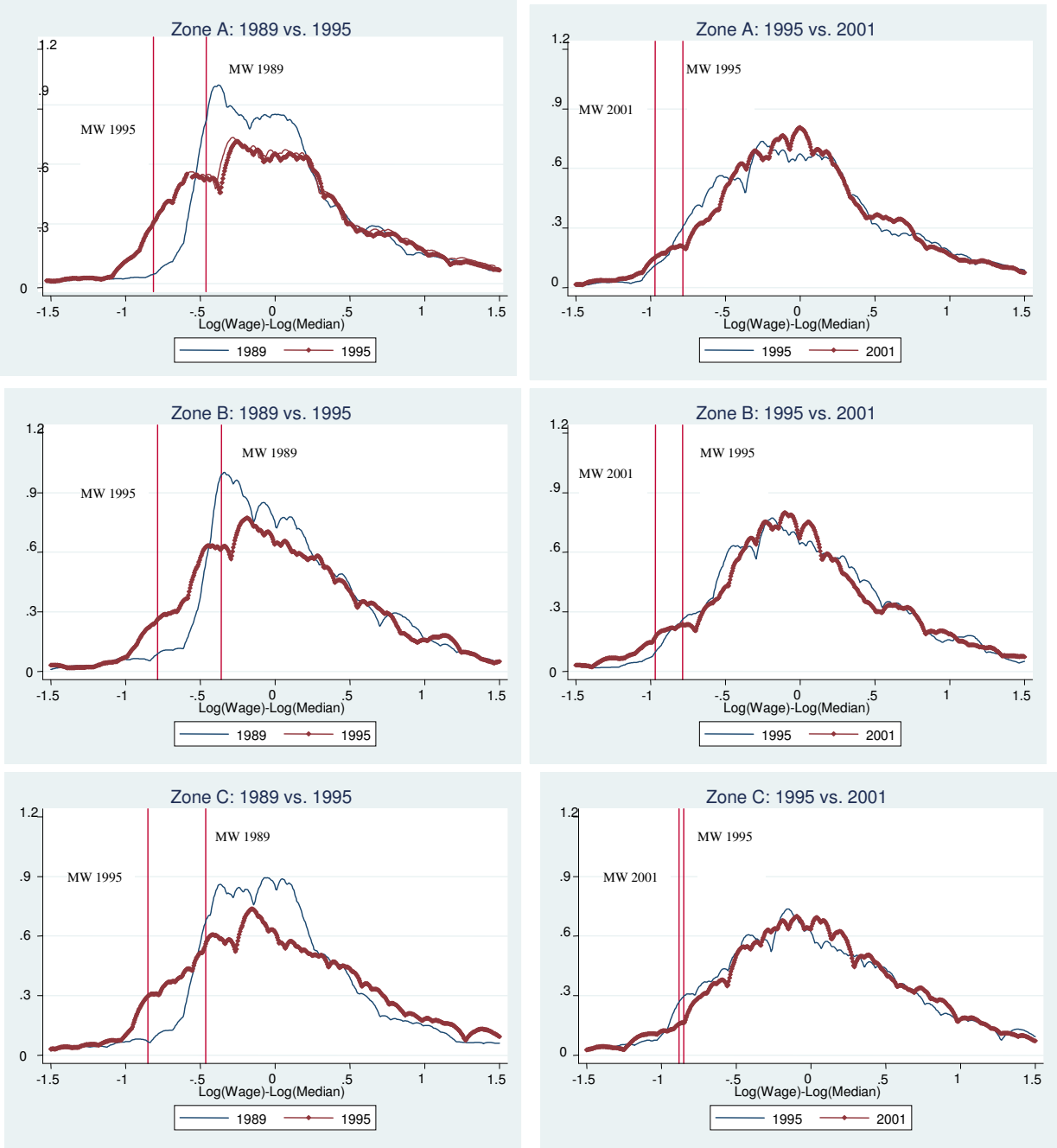
Notes: The top panel reports regressions similar to those in the bottom panel of Table 1 with additional controls for the average level of import tariffs by municipality. The bottom panel reports regressions similar to those in the bottom panel of Table 2 with additional controls for the average level of import tariffs by municipality.

Figure 1. Actual and latent trends in inequality and the effect of Minimum wages



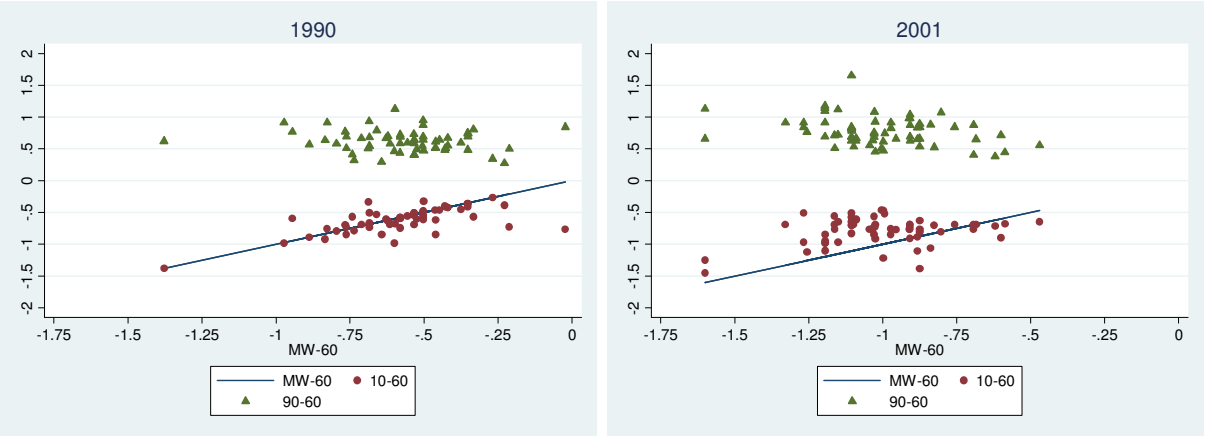
Notes: The top panel depicts the evolution of the gap between different deciles of the log wage distribution and the median. An additional line reports the differential between the log minimum wage and the median. The middle panel figure depicts the estimated effect of the minimum wage and the bottom panel depicts the estimated trend at each decile conditional on the minimum wage. Results refer to regression in Table 2, bottom panel. All series are standardized to their values in 1989. Source: ENEU.

Figure 2: Changes in inequality and the Minimum Wage - Mexico 1989-2001



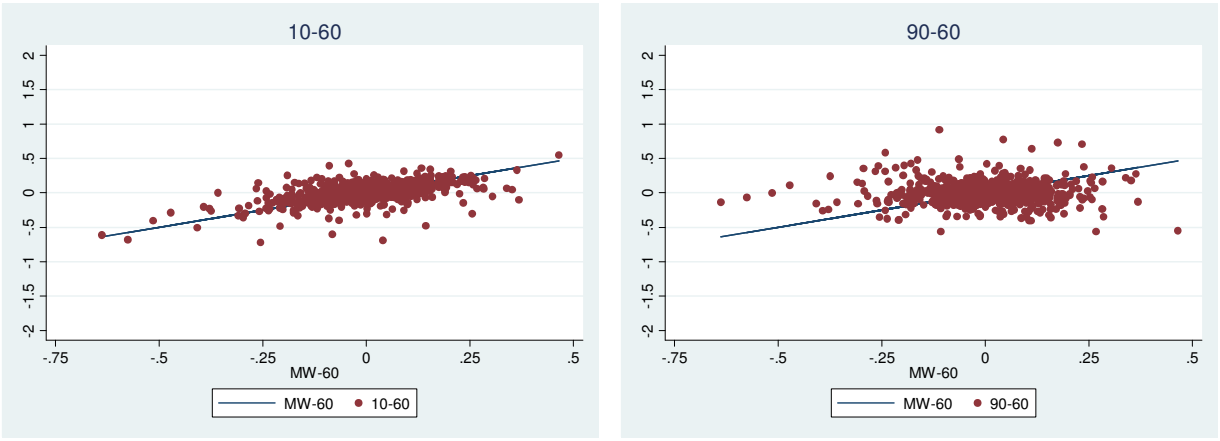
Notes: The figure depicts the distribution of earnings between two years (1989 and 1995 and 1995 and 2001 respectively). A vertical line refers to the level of minimum wages in the two years. Separate graphs refer to different areas, each one corresponding a different level of the minimum wage. Source: ENEU.

Figure 3. Inequality and the minimum wage by municipality



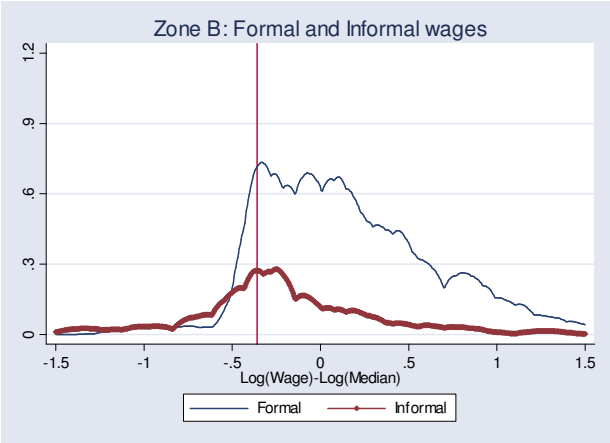
Notes: the figure depicts the 10th and 90th percentile of the log wage distribution by municipality and year over the log minimum wage. All series are standardized to the 60th percentile of the log wage distribution by municipality and year. The solid line is a 45 degree line.

Figure 4. Changes in inequality and the minimum wage by municipality



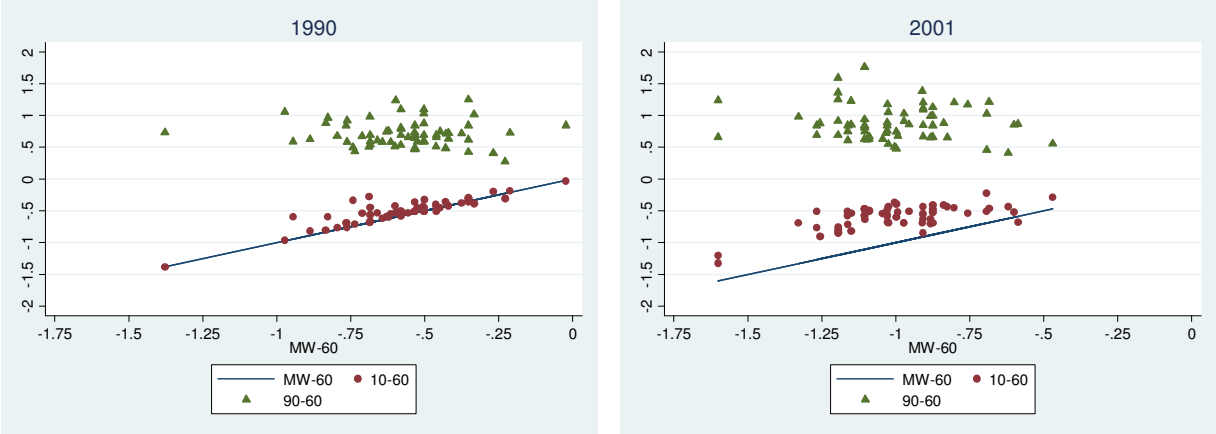
Notes: the left hand side panel plots on the vertical axis the residual from a regression of the 10-60 percentile gap of the log wage distribution by municipality and year on year and municipality dummies. The horizontal axis reports the residual of a similarly specified regression where the dependent variable is the log minimum wage minus the 60th percentile of the log wage distribution. The solid line is a 45 degree line. The right hand panel reports the same picture for the 90-60th percentile gap.

Figure 5. Formal and informal wage distribution: 1989 - Area B



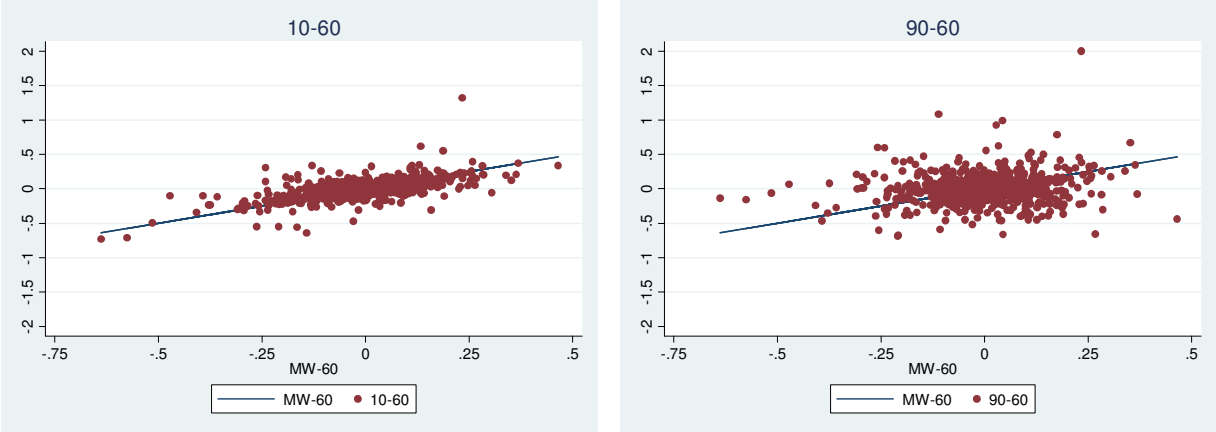
Notes: The Figure reports kernel density estimates of the log wage distribution separately for formal and informal workers in zone B in 1989. The vertical line refers to the minimum wage.

Figure 6. Inequality and the minimum wage by municipality
Formal workers only



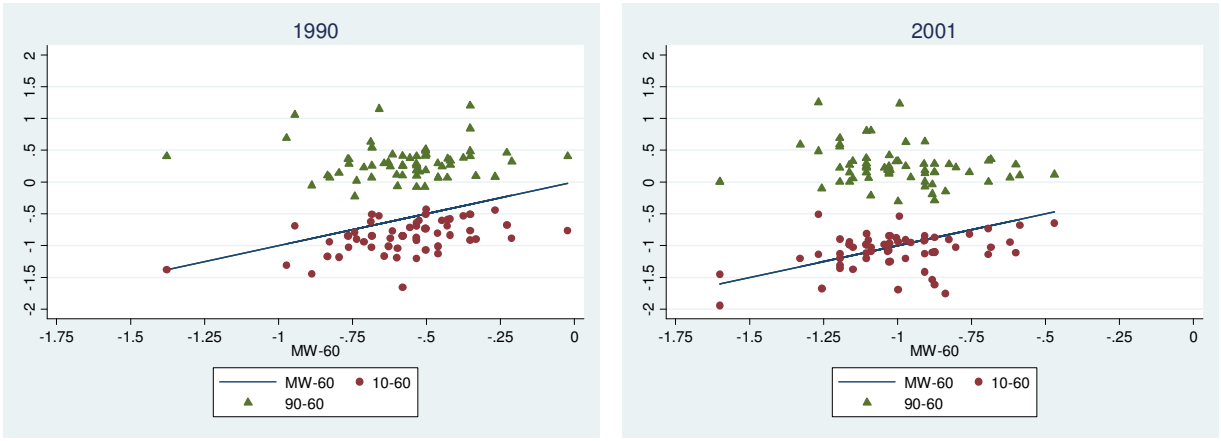
Notes: see notes to Figure 3.

Figure 7. Changes in inequality and the minimum wage by municipality
Formal workers only



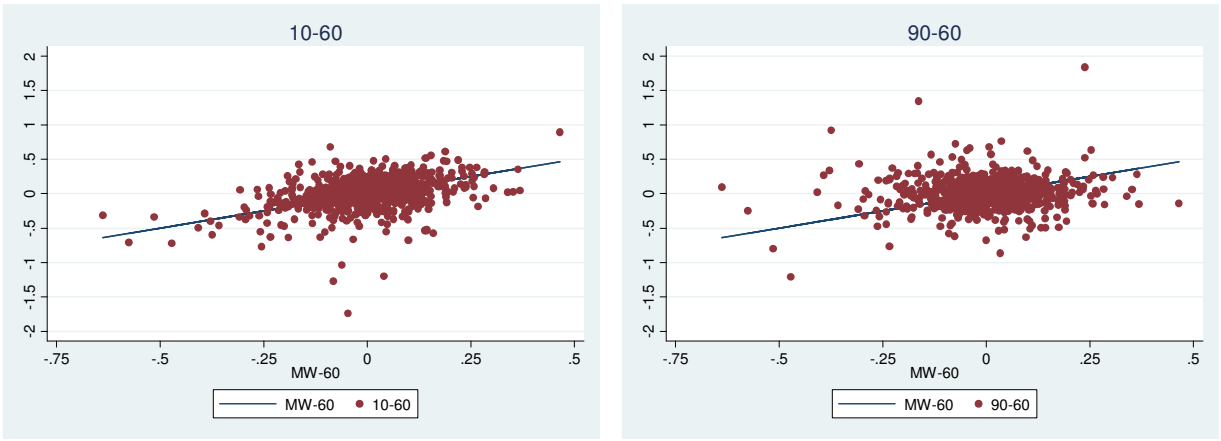
Notes: see notes to Figure 4.

Figure 8. Inequality and the minimum wage by municipality
Informal workers only



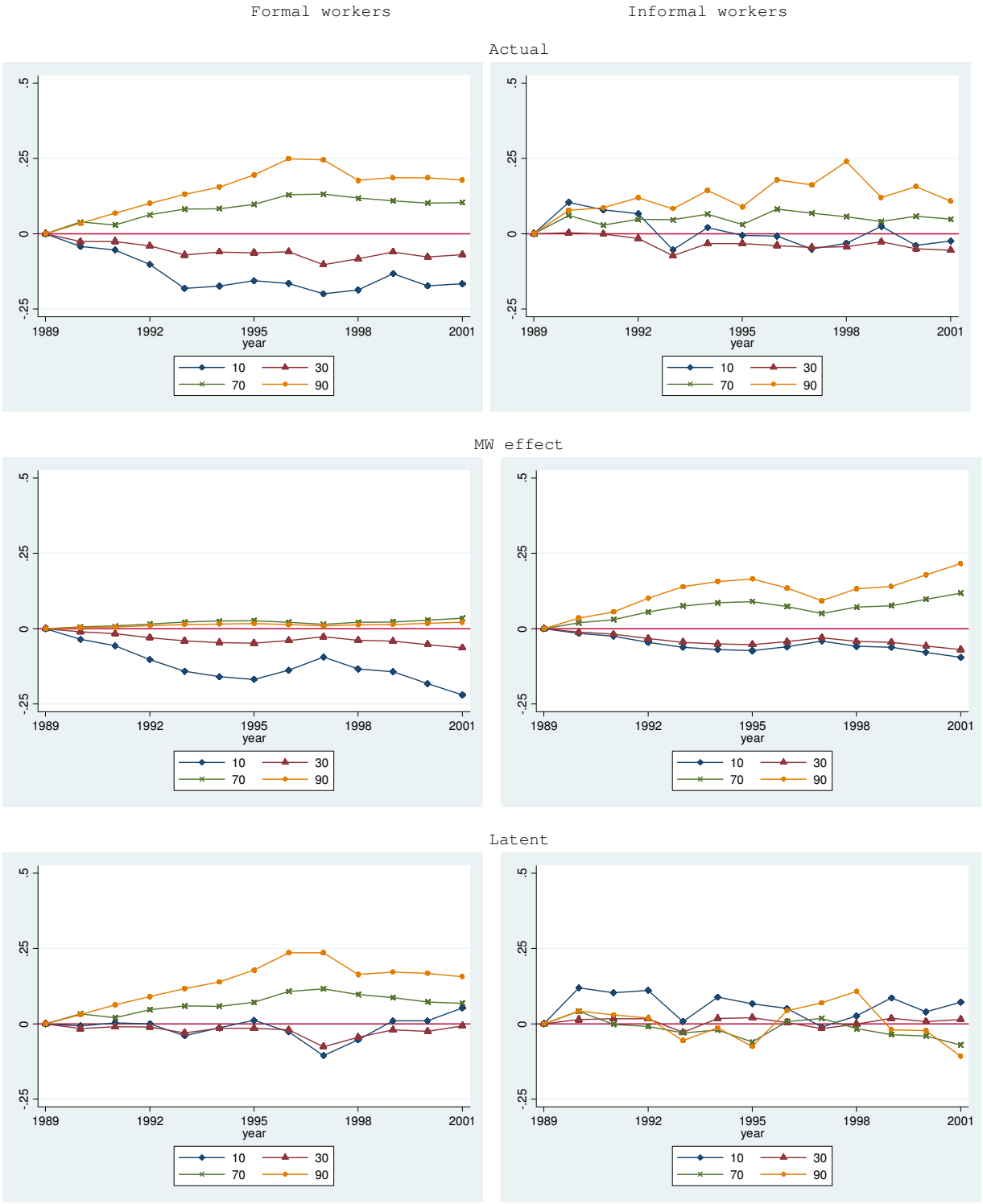
Notes: see notes to Figure 3.

Figure 9. Changes in inequality and the minimum wage by municipality
Informal workers only



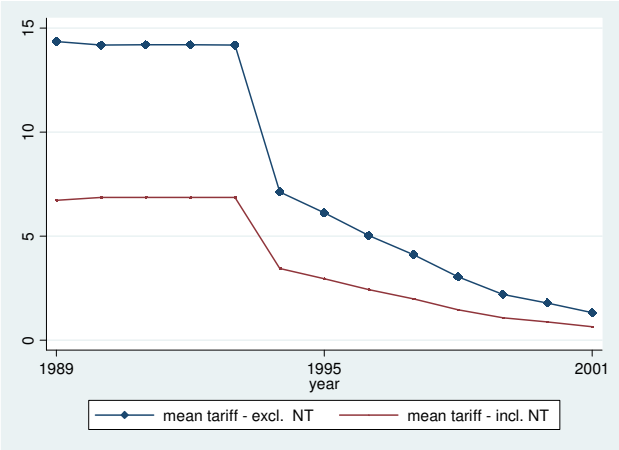
Notes: see notes to Figure 4.

Figure 10. Actual and latent trends in inequality and the effect of Minimum wages separately for formal and informal workers



Notes: see notes to Figure 5.

Figure 11. Trends in import tariffs – Mexico



Notes. The graph reports the employment weighted average of *ad valorem* import tariff from the US. Employment weights are averages across the period of observation. Two series are reported: one that refers only to tradable industries and another that includes non tradable industries with tariffs set to zero. Source: *Diario Official de la Federacion* (various issues).

Table A1
List of municipalities in the sample

Municipality	State	MW zone
Tijuana	Baja California	A
Torreón	Coahuila	C
Chihuahua	Chihuahua	C
Juárez	Chihuahua	A
Azcapotzalco	Distrito Federal	A
Coyoacán	Distrito Federal	A
Gustavo A. Madero	Distrito Federal	A
Iztacalco	Distrito Federal	A
Iztapalapa	Distrito Federal	A
Magdalena Contreras	Distrito Federal	A
Alvaro Obregón	Distrito Federal	A
Tláhuac	Distrito Federal	A
Tlalpan	Distrito Federal	A
Xochimilco	Distrito Federal	A
Benito Juárez	Distrito Federal	A
Cuauhtémoc	Distrito Federal	A
Miguel Hidalgo	Distrito Federal	A
Venustiano Carranza	Distrito Federal	A
Gómez Palacio	Durango	C
Lerdo	Durango	C
León	Guanajuato	C
San Francisco del Rincón	Guanajuato	C
Guadalajara	Jalsico	B
Tlaquepaque	Jalisco	B
Tonalá	Jalisco	B
Zapopan	Jalisco	B
Atizapán de Zaragoza	Estado de Mexico	A
Ecatepec de Morelos	Estado de Mexico	A
Naucalpan de Juárez	Estado de Mexico	A
Nezahualcóyotl	Estado de Mexico	C
Tlalnepantla de Baz	Estado de Mexico	A
Cuautitlán Izcalli	Estado de Mexico	A
Apodaca	Nuevo Leon	B
San Pedro Garza García	Nuevo Leon	B
General Escobedo	Nuevo Leon	B
Guadalupe	Nuevo Leon	B
Monterrey	Nuevo Leon	B
San Nicolás de los Garza	Nuevo Leon	B
Santa Catarina	Nuevo Leon	B
Amozoc	Puebla	C
Cuautlancingo	Puebla	C
Puebla	Puebla	C
San Andrés Cholula	Puebla	C
San Pedro Cholula	Puebla	C
San Luis Potosí	San Luis Potosí	C
Soledad de Graciano Sánchez	San Luis Potosí	C
Ciudad Madero	Tamaulipas	B
Matamoros	Tamaulipas	A
Nuevo Laredo	Tamaulipas	A
Tampico	Tamaulipas	B
San Pablo del Monte	Tlaxcala	C
Boca del Río	Veracruz	C
Camerino Z. Mendoza	Veracruz	C
Córdoba	Veracruz	C
Fortín	Veracruz	C
Ixtaczoquitlán	Veracruz	C
Nogales	Veracruz	C
Orizaba	Veracruz	C
Rafael Delgado	Veracruz	C
Río Blanco	Veracruz	C
Veracruz	Veracruz	C
Mérida	Yucatan	C
Progreso	Yucatan	C

Notes: the table reports the list of municipalities in the sample, with the State and the Minimum wage area (A, B and C, with A being the highest minimum wage area and C being the lowest) they belong to.

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