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Abstract

Instead of merely setting a lower bound on the wages of formal sector workers, minimum wages serve as a norm for wage setting more generally throughout the Mexican economy. Our results suggest that wages are commonly set at multiples of the minimum wage, and that changes in minimum wages influence wage changes across the occupational distribution. Moreover, our findings suggest that these normative features of minimum wages have their greatest impact on the mid-to-lower tail of the wage distribution, including the informal sector of the economy. Thus, the results lend support to the view that declining real minimum wages and stabilization programs that strengthened the link between wage levels, wage changes, and minimum wages, might account for a portion of the growing wage inequality in Mexico over the period of the late 1980s and early 1990s.

JEL classification: J31, J38
Key Words: wage distributions, minimum wages, wage inequality, Mexico

1. Introduction

Research on the impact of minimum wage policies in Mexico has typically concluded that they have little if any effect on the structure of wages. The informal sector of the economy is thought to be mostly immune to government regulations of this sort. Whereas in the formal sector, where mandated wage minimums are expected to have their greatest impact, research suggests that wage levels tend to be well above the minimum, there is no significant spike or clustering in the distribution around the minimum, and the variation in minimum wages over time accounts for none of the inter-temporal variation in either wages or employment (Bell 1997).[1]

Our data confirm many of these empirical regularities regarding labor market outcomes in Mexico. For example, in our data only 5% of formal sector workers earned less than the minimum wage in 1984, and only 2.5% earned less than the minimum in 1992.[2] Moreover, we find little evidence of a sizeable spike or clustering of workers around the minimum wage in the formal sector. However, our empirical results are not supportive of the view that minimum wages have no impact on the wage structure in Mexico. We find strong evidence of clustering around *multiples* of the minimum wage, and some evidence to suggest that wage increases over time for certain occupations follow stipulated increases in the minimum wage. Indeed, there is much anecdotal evidence to suggest that minimum wages play precisely this kind of normative role in overall wage setting in Mexico.

We are unaware of any existing empirical analyses that formally link observed clustering in wage distributions to minimum wage multiples in Mexico. Maloney and Nuñez (2003) offer evidence of clustering in the wage distributions of many Latin American countries, and suggest that this clustering may be explained by the fact that the minimum wage serves as a "numeraire" for wage and price setting more generally throughout the economies of this region. However, they do not establish an empirical relationship between the observed clustering and minimum wage multiples. In an in-depth analysis of the impact of the minimum wage on the wage distribution in Columbia, the authors find that minimum

[1] Bell's analysis utilizes panel data on a select set of formal sector firms. A similar analysis, but with a different, less-privileged set of formal sector firms, finds evidence of a significant employment impact of minimum wages (Feliciano 1998). And, indeed, Bell's own analysis suggests that, although few formal sector firms possess average wages that are less than the minimum wage, there is a significant number of workers in the formal sector who earn less than the minimum. While Bell views this as an indication that minimum wage policies might affect formal sector wages, others see this as evidence that minimum wage regulations are not well enforced even in the formal sector (Bravo and Vial 1997).

[2] By way of comparison, the corresponding figures for the U.S. are 11% for 1984 and 7.7% for 1992 (Source: U.S. Census Bureau, Minimum Wage 2004, Table 10).

wage changes affect a significant range of the lower tail of the wage distribution, which is suggestive of "numeraire" effects and not mere general equilibrium adjustment.[3]

Our results, for Mexico, also suggest that the normative impact of the minimum wage is most significant for the lower tail of the wage distribution. The lower tail of the distribution appears to be directly linked to multiples of the minimum wage, and wage changes for occupations in this tail of the distribution follow more closely changes in minimum wages. This linkage suggests that the declining real value of the minimum wage in Mexico over the past two decades might account for a portion of the growing wage inequality in that country over the same period.[4]

The outline of the paper is as follows. In the next section, we discuss anecdotal evidence suggesting that minimum wages serve a normative role in overall wage setting in Mexico. In section 3, we offer an empirical exploration of this normative feature of minimum wages. There we present evidence to suggest that wages are indeed set as multiples of the minimum wage, especially for workers in the lower tail of the wage distribution. While our data do not allow great insight into the relationship between changes in wages and changes in minimum wages over time, some evidence on this aspect of the normative role of minimum wages in Mexico is offered in section 4 of the paper. In section 5 we offer suggestive evidence of the link between changing wage inequality over the period of the 1980s and early 1990s and the normative role of minimum wages. Section 6 concludes the paper.

2. The Normative Role of Minimum Wages

The minimum wage in Mexico is intended to be the wage that would be sufficient to support a worker and his or her family for a day. Minimum wage levels are currently set once a year by a tripartite commission (the Comisión Nacional de Salarios Mínimos) representing the interests of labor, employers and the state. Due to substantive economic differences across regions in Mexico, minimum wages have been traditionally set at different levels for different regions. Recently, the number of regions has been streamlined

[3] A minimum wage increase may elicit general equilibrium effects on wages both above and below the minimum as workers who are displaced from the covered sector seek work and thereby depress wages in the uncovered sector, or as firms substitute for higher-skilled labor and thereby raise the wages of higher-paid workers in the covered sector.

[4] For a discussion of the extent of wage inequality growth over this period and the factors that might account for this growth, see Alarcón and McKinley (1997), Fairris (2003) and the references cited therein. Cortez (2001) offers evidence that declining minimum wages explain part of the growing wage inequality in Mexico over the period of the 1980s and 1990s, but does not consider the normative aspect of minimum wages, which is the focus of this paper.

significantly. Minimum wages are also established for trades and types of occupations, including construction workers, cashiers, truck drivers, operators of pressure melting machinery, and attendants at gas stations.

There is much institutional evidence to suggest that minimum wages serve as a norm for wage setting at both the micro and macro levels in Mexico. At the micro level, many prices are fixed as multiples or fractions of the minimum wage. Moreover, fines, bails, income brackets for income tax rates, eligibility for certain social services (housing credits, for example), bonuses as part of fringe benefits, and productivity bonuses for teachers and university professors are tied to multiples of the minimum wage. In fact, it is fairly common in Mexico to hear workers and employers report wages in multiples of the local wage minimum. Bair and Gereffi's (2001) study of jean production in Torreon notes that many employers offer pay in multiples of the minimum wage. Base pay in the companies they interviewed ranged between 1.25 and 1.5 multiples of the local minimum wage (p. 1898). Thus, it would not be surprising to see wage levels, both above and perhaps even below the minimum, set at multiples or fractions of the minimum wage.

Tying wages to multiples of the minimum wage probably began as a mechanism for indexing wages to changes in the cost of living. Over time, however, the established levels may have come to be viewed as norms of fairness in relative pay across occupations in the workplace, and thus agreed to by workers because they are perceived as fair, and by employers because they maintain work norms which are premised on workers' perceptions of fairness in pay.[5]

At a macro level, these normative dynamics can be related in part to the role that minimum wages have played in stabilization policies (in 1977, 1983, 1985-86, 1987-89, and 1995-97). Throughout the decades of the 1980s and 1990s the Mexican economy suffered high volatility in inflation and GDP growth rates, and stabilization polices were the government's response. In the wake of the 1982 debt crisis restrictive fiscal and monetary polices were followed, but inflation persisted and GDP growth rates remained low. In December 1987 the government began exchange rate management (the nominal peso-dollar exchange rate was fixed), increased the pace of trade liberalization, and initiated incomes policies taking the form of wage and price controls (Messmacher 2002).

[5] Wages being determined by "norms" is a well established concept in economics. A classic reference is Akerlof (1982). Levin-Waldman (2002) makes a case for minimum wages serving as a reference point for firms' internal wage structures in the U.S.. Living wage advocates have also made reference to 'social norms', 'fairness' and 'ethics' as important determinants in the wage setting process (Robinson, 2004; Prasch and Sheth, 1999; Pollin and Luce, 1998).

Under these incomes policies, changes in minimum wages have been systematically used as signals to indicate acceptable changes in wages more generally (Woodruff 1999). Policy makers were interested in directly controlling wage increases as a way of quelling increases in commodity and service prices and as a tool to avoid increases in government payroll expenses. As part of these stabilization programs, minimum wages were set according to carefully calculated desired changes in prices and subject to budgetary adjustments. The negotiated increases in minimum wage levels were then supposed guide wage negotiations throughout the economy. The objective was to break 'inertial inflation' (Lustig, 1998) – that is, to reduce 'inflation expectations'. These measures are typically part of an overall social agreement involving workers and business representatives along with government officials at the highest rank. The best known of such agreements are the various 'Pactos de Solidaridad' of 1987 to 1994.[6]

Setting wages at minimum wage multiples is arguably more acceptable and meaningful for low-skill workers than for high-skill workers. Enforcement of stabilization policies is also arguably easier for low-skill workers than for high-skill workers. Woodruff (1999) finds, for example, that wage drift away from stabilization targets in Mexico was much greater for white-collar workers than for blue-collar workers during the late 1980s and early 1990s. This suggests that we might expect the influence of the minimum wage as a reference price for labor to diminish in the upper tail of the wage distribution.

3. Empirical Analysis

3.1. Data

The data used for the empirical analysis come from the Comisión Nacional de Salarios Mínimos and from the Encuesta Nacional de Ingresos y Gastos de los Hogares (ENIGH) for the years 1984, 1989, and 1992. We focus specifically on the period of the late 1980s and the early 1990s because this was one of dramatic reductions in real minimum wage levels in Mexico (Feliciano 1998).[7] Stabilization polices were also especially prominent in Mexico during the late 1980s and the early 1990s (Messmacher 2002).[8]

[6] Freeman (1993) cites the need for further research on the impact of stabilization policies on wages in developing countries.

[7] From the mid 1980s to the mid 1990s the real value of the minimum wage in Mexico declined by 54%, but by only about 2% thereafter until 1999 (Source: Table 20, The Mexican Economy 1996 and 1999, Banco de Mexico).

[8] Castellanos *et al.* (2004) in their paper on nominal wage rigidities in Mexico conclude that the wage rigidities and the effects of minimum wage were most prominent in the country during the late 1980s and the early 1990s.

The ENIGH is a national household survey of similar format for the years 1984, 1989, 1992, and every two years thereafter. Each survey is a stratified sample based on city size, with a similar sampling distribution across the survey years, and with weights that render the sample representative of the national experience.

The sample utilized in this analysis is of working individuals who are sixteen years of age or older. The earnings variable is the hourly wage and is computed from reported earnings during the month before the survey and reported hours worked in the last week. No fringe benefits, tips, bonuses or commissions are included in the wage measure. To ensure an accurate measure of the wage, all those who are self-employed or working without pay are excluded from the sample. We also exclude from the analysis all those who hold more than one job.

The data for daily minimum wages come from the Comisión Nacional de Salarios Mínimos. For each year of our survey we pick the minimum wage level corresponding to the timing of the ENIGH survey. For example, the 1984 ENIGH survey was conducted from July to December and so we use the minimum wage level adopted on July 11.

Over the years of our analysis, the country was divided into different economic zones and a minimum wage was set for each economic zone. In 1984 there were eleven economic zones, and by 1992 there were only three. Some states in Mexico possess more than one economic zone. This presents a problem for our analysis because the ENIGH data allow us to locate only the state of residence of respondents. We are thus unable to associate a unique minimum wage to every individual in our sample. The analyzed sample therefore contains only people for whom we can assign a unique minimum wage. Using this selection criterion we have individuals from thirteen states,[9] encompassing three economic zones in 1984. For 1992, we have individuals from twenty-five states (this includes all the thirteen states of 1984),[10] encompassing two economic zones. We have defined the zones consistently over the two years; however two of the economic zones from 1984 were collapsed into one zone in 1992 due to further reductions in the number of minimum wage regions in Mexico.[11]

[9] The thirteen states are: Aguascalientes, Baja California – Norte, Baja California – Sur, Campeche, Colima, Distrito Federal, Morelos, Nayarit, Quintana Roo, Sinaloa, Tabasco, Tlaxcala and Zacatecas.

[10] The additional twelve states are: Coahuila, Chiapas, Durango, Hidalgo, Mexico, Michoacan, Oaxaca, Puebla, Queretaro, San Luis Potosi, and Yucatan.

[11] In 1984, our Zone A includes the states of Campeche and Zacatecas; Zone B includes the states of Aquascalientes, Colima, Morelos, Nayarit, Quintana Roo, Sinaloa, Tabasco, and Tlaxcala; and Zone C includes the states of Baja California Norte, Baja California Sur, and the Distrito Federal. In 1992, the states from our 1984 Zone A and B are combined along with the states of Coahuila, Chiapas, Durango, Guanajuato, Hidalgo, Estado de Mexico, Michoacan, Oaxaca, Puebla, Queretaro, San Luis Potosi, and Yucatan to form one zone, and Zone C remains the same.

Table 1 gives the hourly minimum wage levels (computed as the daily minimum wage divided by eight, the stipulated length of the workday) for the three economic zones in our analysis for 1984 and 1992, along with the mean wage in each zone or region from our sample.

3.2. Minimum Wages and the Wage Structure

To see how minimum wage norms may affect the wage distribution, we begin the analysis by presenting nonparametric kernel density estimates of the cumulative wage distributions for our data. The kernel density estimate $\hat{f}(x)$ of a univariate unknown density *f(x)*, based on a random sample $X_1,....,X_n$ of size *n* is given as: $\hat{f}(x) = \frac{1}{nh}\sum_{i=1}^{n} K\left(\frac{x - X_i}{h}\right)$.

Where *K(.)* is the Gaussian kernel weight function that depends on the distance of X_i from *x* and the sample size through *h*, the window width given by $h = 1.06\sigma_x n^{-1/5}$, σ_x is the standard deviation of the random sample. From the estimated distribution the cumulative can be obtained as: $\hat{F}(x) = \sum_{t \le x} \hat{f}(t)$.[12]

The cumulative wage distributions for 1984 and 1992 are presented in Figures 1 and 2 respectively. The most notable characteristic of these distributions with regard to the subject of this paper is the existence of significant clustering at certain intervals in the distributions.[13] In Figures 3 through 7 we present the cumulative distributions for the separate economic zones in 1984 and 1992, with 0.25 multiples of the zone-specific minimum wages as overlays. Given the various forms of measurement error in our computation of both the hourly wage (which is derived from information on monthly labor income and hours worked in the previous week) and the hourly minimum wage (which is the official daily minimum divided by eight), even if minimum wage policies account for the wage clusters, it is reasonable to expect the wage clusters and minimum wage multiples to be less than perfect matches.

In our view, the matches are surprising for both their extent and accuracy. In 1984, for example, the largest clusters in the wage distributions match up perfectly with minimum wage multiples, except in Figure 5 where the "matches" are close but not exact. The graphs

[12] For details on how the nonparametric kernel density is estimated refer to Pagan and Ullah (1999, chapter 2).
[13] The clustering we observe is not due to rounding in either reported monthly income or hours worked. Within a given hourly wage cluster we observe numerous values for monthly income and hours worked.

reveal some clustering around the minimum wage, but these are far from the most sizeable clusters in the graphs. Moreover, matches exist both above and below the wage minimum. Finally, and somewhat more speculatively, it appears that the extent of matching diminishes as one moves out towards the upper tails of the wage distributions.

The evidence is very similar for the 1992 distributions in Figures 6 and 7, with a couple of important exceptions. First, it appears as though the extent of matching is even greater for this year than for 1984. This may be related to the highly significant and widely publicized stabilization agreements of the late 1980s, which may have served to reinforce minimum wage multiples as wage norms. Second, there are fewer clusters, and virtually no matches between clusters and minimum wage multiples, in the wage distribution below the minimum wage. This is presumably an indication of just how far minimum wages had fallen in the intervening period. The absence of matches among the first few intervals above the wage minimums is another such indication.

Some of the matching we observe between minimum wage multiples and wage clusters may be due to occupational minimum wages, a portion of which are set at exact or near multiples of the general minimum wage. In 1993, for example, 45 of the 88 occupational minimum wages in Zone C fell within a 5% range around multiples of the minimum wage.[14] This is yet another example of how the minimum wage serves as a reference price for wage setting above the minimum.

Our data lack occupational categories at the level of detail for which occupational minimum wages are defined, and so we cannot say to what extent these occupational minimum wages are binding for relevant groups of workers. If the occupational minimum wages were primarily responsible for the matching we observe between multiples of the minimum wage and wage clusters in the figures, our contention that general minimum wages serve as a *norm* for wage setting above the minimum would be undercut. The matches would be explained by occupational minimum wage requirements, not formal or informal wage setting *norms*. It is clear from the figures, however, that this is not the case. None of the occupational minimum wages exceeds two times the minimum wage, and the matches at two times the minimum wage or lower are by no means the dominant matches in these figures. In fact, the most significant matches, in terms of both numbers and the size of the wage cluster, occur in the mid-to-lower range of the distribution – above two and below four times the minimum wage.

[14] Of these 45, 17 were within 5% of 1.25 times the minimum wage, 24 within 5% of 1.5 times the minimum wage, 2 within 5% of 1.75 times the minimum, and 2 within 5% of 2 times the minimum wage.

The graphs give a visual depiction of the amount of clustering in the data and the extent to which multiples of minimum wages match up with these clusters. Table 2 offers a numerical depiction of the extent of matching between multiples of the minimum wage and wages. It does so under three different assumptions regarding errors in measurement. If there were no errors in measuring either hourly minimum wages or hourly wages, the hourly wage would have to be exactly equal to a multiple of the hourly minimum wage in order to be legitimately labeled a match. The numbers in column (1) invoke this assumption. However, given that both hourly minimum wages and hourly wages are measured with some imprecision, we might also label as a match those instances in which the two are equal to one another but within some fixed band of error.

In columns (2) and (3), we allow for fixed bands of error of ± 0.025 and ± 0.05 respectively. In constructing the bands, we have done the following: Let W_i be the wage of individual *i* in any one of the economic zones and *MW* be the minimum wage of that economic zone. We define $D_i = W_i / MW$. If $D_i = 0.25$ then W_i is an exact *0.25* multiple of the *MW*. However because of potential measurement error in the data we consider instances where the matches are not exact, but rather exist within fixed bands of error. For example, the ± 0.05 band means that if $D_i \in (0.2, 0.3)$ then we consider W_i as a *0.25* multiple of the *MW*.

A cluster is defined as a grouping of workers earning the same hourly wage and composing at least 2% of the sample. We chose the 2% threshold by invoking a series of proportions tests. Suppose that at wage W_i there are x_i number of people, or p_i proportion of the sample, where $p_i = x_i / n$ and *n* is the sample size. The first proportions test involves a test of the statistical significance of the *max* p_i against all the other p_i*'s* in the sample. If *max* p_i is statistically significantly different from all other proportions, then we say that there is a statistically significant cluster of people at that particular wage. We do the same for the next largest proportion in the sample, and if that is also significantly different from all the remaining proportions in the sample then we call that a cluster as well. This test is repeated recursively until we arrive at a cluster that is not statistically significantly different from all remaining clusters in the sample. Utilizing this test, the 2% threshold is if anything conservative.[15]

[15] According to the statistical procedure, the 2% threshold is just about right for the 1984 data, but it is far too conservative for the 1992 data, where a much lower threshold for defining a cluster would pass a test of statistical significance.

Using the above definition of a cluster, there are 18 clusters in 1984 and 13 clusters in 1992. The column (1) results show that 17% of these clusters match 0.25 multiples of minimum wages in 1984, but that there are no exact matches in 1992. However, allowing for a fixed band of error in the matching process, the percentage of matches rises to 44% in 1984 and 69% in 1992 using a ± 0.025 band, and to 72% and 77% in respective years using a ± 0.05 band.

In the final three rows of results for each year we give the incidence of matches in the sample, whether part of a cluster or not, and the percentage of the entire sample that is matched (the proportion of the sample earning the minimum wage or some multiple of it). Here, we ignore the issue of clusters and inquire about the extent of matching in the overall sample. Once again, we do this under different assumptions regarding the extent of measurement error in the data. About 3% of the sample in 1984 has a wage that is an exact multiple of the minimum wage, while for 1992 there are no exact matches. Allowing for a fixed band of error of ± 0.025 yields an increase in the percentage of the sample matched to 24% and 30% in respective years. And finally, for the larger fixed band of ± 0.05, almost 44 % of the sample in 1984 and 45% of the sample in 1992 has a wage that is a multiple of the minimum wage.

The visual depictions and descriptive statistics lend support to the view that minimum wages act as a reference price for labor in Mexico in that there appears to be a significant amount of matching between minimum wage multiples and wages. However, it is also important to ask whether these matches are significant in a statistical sense. We indicate with an asterisk in Table 2 those instances in which statistical tests revealed the matches to be significantly different from zero. The proportion of clusters matched and the proportion of samples matched in Table 2 were significantly different from zero in every instance in which we allow for a margin of error in the matching process.

A visual inspection of the graphs reveals not only that hourly wages cluster around multiples of the minimum wage, but that this matching of clusters and minimum wage multiples exists both above and below the stipulated minimum. Because so few formal sector workers receive wages below the minimum wage, this raises an issue of the normative influence of minimum wages on pay in the informal sector, which, in the conventional view, is presumed to be immune to minimum wage policies. We replicated the graphs and

descriptive statistics presented above for the formal and informal sectors separately.[16] They reveal that the normative impact of minimum wages on the wage structure is as significant in the informal sector as it is in the formal sector.

The cumulative wage distributions for the formal and informal sectors suggest just as much clustering and matching of clusters with minimum wage multiples in the informal sector as in the formal sector. This is confirmed in the descriptive statistics shown in Table 3, where, in the informal sector for the year 1984, the number of clusters, the proportion of matched clusters and the proportion of matches in the overall sample generally exceed those in the formal sector. In 1992, while the number of clusters is larger in the informal sector, the proportion of matched clusters and the proportion of matches in the overall sample are generally greater in the formal sector.

A final, and somewhat more speculative, conclusion one might draw from the graphs of cumulative wage distributions in Figures 3-7 is that the matching between wages and minimum wage multiples is more pronounced in the mid-to-lower tails of the distributions. If true, this would indicate that the normative role of minimum wages in the Mexican economy has a greater impact on low-wage workers than on high-wage workers, and, somewhat more speculatively, that changes in minimum wage policies might therefore have a significant impact on wage inequality.

One way to subject this issue to the rigors of statistical testing is by investigating statistical correlation. Suppose we utilize the data on the wages of individuals to create a dichotomous variable that equals 1 if the individual is paid a multiple of the minimum wage and 0 if not.[17] We can then ask whether there is any correlation between this variable and the wages of individuals. A negative and significant correlation would indicate that matches are statistically more likely to be found among low-wage workers. The results of this analysis reveal a negative and statistically significant relationship (at the .05 level, one-tailed test) between wages and being paid a multiple of the minimum wage for both 1984 and 1992. These findings thus suggest that the pay of low-skill workers is more likely to be influenced by minimum wage norms than is the pay of high-skill workers.

[16] We define formal sector workers as those who qualify for certain state-provided social benefits, the costs of which are partially paid for by registered employers.
[17] We use the ± 0.05 band of error in labeling the wage and multiples of the minimum wage a "match."

4. Changing Minimum Wage Levels and Changing Wages

There is a second way in which minimum wages might serve as a norm for wage setting in Mexico – annual changes in minimum wage levels might form the basis for wage changes more generally throughout the economy. Indeed, this was an explicit goal of the various stabilization programs Mexico undertook during the late 1980s to quell inflationary pressures. Obviously, if informal wage norms tie wages to specific multiples of the minimum wage, as we argue above, and *this multiple remains constant over time*, then some wage changes will indeed accord precisely with minimum wage changes. Moreover, given evidence that this normative effect has a greater impact on the lower tail of the wage distribution, the declining real value of the minimum wage in Mexico might be expected to account for some of the growing wage inequality we observe over this period.

However, wages do not seem to be tied to unchanging multiples of the minimum wage during these years. The modal minimum wage multiple in 1984 was 1.25, whereas by 1992 it had risen to 1.75. We believe the reason for this is that the real value of the minimum wage declined so dramatically over these years that, to maintain adequate labor supply and a basic standard of living for low-skill workers, employers had to either adjust upward the multiples of the minimum wage to which they adhered or abandon the norm altogether. The results in Table 2 suggest that employers did not entirely abandon the norm in the later period. The rising modal minimum wage multiple cited above suggests that some merely adjusted upward the normative multiple. Because stabilization policies were also in effect over this period, linking changes in the minimum wage to wage changes more generally throughout the wage distribution, there remains the question of whether minimum wage changes had a greater impact on the lower tail of the wage distribution.

Preliminary evidence on this second normative role of minimum wages can be found in an across-zone comparison of changes over time in minimum wage levels and accompanying changes in the average wages of particular groups of workers. We are able to compute average wage changes for various groups of workers – for union and nonunion workers, formal and informal sector workers, and for certain occupational categories, for instance – with the 1984, 1989, and 1992 survey data. How do changes in average wages for these worker groups accord with changes over time in minimum wages?

An important channel through which minimum wages might influence wages is that the percentage change agreed to in minimum wage agreements becomes the benchmark, if not the rule, for collective bargaining outcomes in the union sector. Labor negotiations in unionized labor markets are subject to approval by government arbitration boards, allowing

for greater enforcement of stabilization policies limiting wage increases to stipulated increases in the wage minimum in this sector as compared, say, to the nonunion sector. Greater enforcement might also be expected in the formal sector of the economy as compared with the informal sector.

When we conduct this exercise for both union and nonunion workers and formal and informal sector workers, nothing very striking emerges. In Table 4A, the economic zones are ranked from 1 to 3 according to the extent of increase in minimum wages (1 being the largest), and these various worker groups are similarly ranked according to the extent of wage increase for each group across zones. If the wages of union and formal sector workers follow more closely changes in minimum wages than do the wages of nonunion and informal sector workers, then the ranking of wage changes for the former groups should more closely approximate the ranking of minimum wage changes. This is not the case.

However, stabilization programs in Mexico during this period date from the late 1980s to the early 1990s. Are our results altered if we limit the analysis to the period 1989 to 1992? The results are shown in Table 4B. Over this more restricted time period, wages do appear to follow more closely changes in minimum wage levels across zones for both union and formal sector workers. However, this is true for nonunion workers as well. Indeed, the only sector whose wage increases are not linked with increases in the minimum wage is the informal sector of the economy. These findings give suggestive evidence to the claim that stabilization programs were successful in restraining wage increases in all but the informal sector during the period of the late 1980s and early 1990s. They also suggest that the second normative role of minimum wages operates through government enforcement of policy measures as well as through informal norms hammered out by firms and workers.

The above exercise makes use of very few observations, thereby limiting our ability to draw strong conclusions. The number of observations can be increased substantially, however, if we focus on occupational categories. In Table 5, we rank on a scale from 1 to 3 the changes in minimum wage levels across the three economic zones (1 being the largest) and the corresponding ranking of changes in average occupational wages across these zones for the eleven 2-digit occupational codes for which we have information from the surveys. Note that if minimum wage changes across economic zones reflected only differences in the increased cost-of-living, we would expect the rankings of all occupational wage changes to be similar to the rankings of minimum wage changes. They are not, which suggests that minimum wage changes may serve as a norm for wage changes across occupational groups, and do so with differential impact across the occupational, and thus wage distribution.

Among the four occupational groups whose ranking of wage changes match perfectly the ranking of minimum wage changes across zones are agricultural workers, personal service workers, and transportation workers. Workers in these three occupational categories fall disproportionately into the mid-to-lower tail of the overall wage distribution. Thus, these results offer suggestive evidence that minimum wage changes have their greatest impact on low-skill and low-paid workers.

In Tables 6A and B, we explore this aspect a bit further. Suppose we rank, within each zone, the occupations from lowest to highest (1 being lowest and 11 being highest) in terms of hourly pay in 1984.[18] And suppose we assign, within each zone, a value from 1 to 11 to each of these occupational categories, reflecting the proximity – furthest equaling 1 and closest equaling 11 – of the wage change for that occupation to the actual percentage change in the minimum wage level for that zone. Finally, suppose we then add these numbers across the zones for each occupational ranking. If minimum wage changes act as a norm for wage changes, and they do so more for the lower tail of the wage distribution than the upper tail, then the sums should be higher for the lowest paid occupational groups.

The pattern we observe in the final columns of Tables 6A and B is reflective of just such an effect. The simple correlation between the rankings in the first column and the sums in the last column is – 0.42 for the period 1984 to 1992, and –0.56 for the stabilization period of the late 1980s and early 1990s (both statistically significant at the 0.10 level, one-tailed test). This suggests that wage changes are more closely aligned to changes in the minimum wage for low-skill workers. Focusing on the specific patterns in the last columns, it appears that the normative impact is most prominent in the mid-to-lower tail of the pay distribution.

5. Minimum Wage Norms and Changing Wage Inequality

Evidence suggests that the declining real value of the U.S. minimum wage during the 1980s accounts for a significant portion of the growing wage inequality in this country (DiNardo *et al.* 1996; Fortin and Lemieux 1997). The argument for the U.S. however is typically one of general equilibrium adjustment (Grossman 1983; Card and Krueger 1995) – the minimum wage is binding for low-wage workers, and changes in the minimum wage primarily affect this group of workers and perhaps a small number of other workers in the lower tail of the wage distribution through labor substitution effects. Our analysis suggests

[18] The rankings of occupations are not exactly the same across zones, although they are roughly similar. For example, the lowest paid occupation is the same across all three zones, as is the highest paid occupation. In between, the ordering follows a general pattern, but is not exactly the same.

that in Mexico, by contrast, while the minimum wage is not especially binding at the level of the minimum, it serves as a powerful norm for wage setting beyond the level of the minimum. Thus, when real minimum wages decline, in the US it is the workers earning around the minimum wage who suffer a wage loss, whereas in Mexico wages decline for a much larger portion of the lower tail of the wage distribution – i.e., that portion for which minimum wages serve as a wage setting norm.[19]

In this section we offer further evidence on the effect of minimum wage norms on changing wage inequality in Mexico over the period of the 1980s and 1990s. Figure 8 shows the trajectory of the real value of the minimum wage and the coefficient of variation (a common measure of wage dispersion)[20] over these years. The results are suggestive: wage dispersion rises significantly when the real value of the minimum wage is falling, but levels off in the mid-1990s, just as the decline in minimum wages is abated. There are alternative explanations for the observed trajectory in wage inequality over this period (see, for example, Fairris 2003 and Behrman *et al.* 2000) but its synchronization with changes in the real value of the minimum wage is telling.

Although the household survey data are not ideally suited for a careful examination of the link between minimum wage norms and changing wage inequality over this period, they do allow a few further insights into the possibility of such a link. We established results earlier in the paper that minimum wage norms have their impact on the mid-to-lower tail of the wage distribution. This suggests a hypothesis about the nature of changing wage inequality over the period. If the link between minimum wage norms and changing wage inequality has validity, wage inequality should evolve in the following manner: (a) there should be relative stasis in wage dispersion for that portion of the wage distribution that is affected by minimum wage norms and rising dispersion among the unaffected portion of the distribution, and (b) there should be declining real wages for that portion of the wage distribution affected by minimum wage norms and perhaps steady or even rising real wages for the unaffected portion. These hypotheses are tested below.

We begin by apportioning workers in each of the two minimum wage zones existing in 1992 into "affected" and "unaffected" groups for the years 1984 and 1992. In each case, the affected group is composed of those workers who earn a wage less than or equal to the

[19] This is not to say that spillover effects are nonexistent in the U.S., but rather that they are generally much smaller (Brown 1999), limited to those at or near the minimum wage with little effect as one moves up the wage distribution (Neumark *et al*. 2004) and are normatively unrelated to minimum wage levels.
[20] The results of this analysis and those that follow in this section are unchanged if, instead, either the Gini coefficient or the standard deviation of the log of wages is used as a measure of dispersion.

highest multiple of the minimum wage for which our earlier analysis established a significant clustering of wage observations and a match between that wage observation and a minimum wage multiple. For both zones in both years, we apportion in this way first the employed labor force as a whole and then the formal sector labor force, and then compare changes in wage dispersion and average wages across affected and unaffected worker groups.[21] The results are shown in Tables 7 and 8.

Table 7 reveals that wage dispersion grew much more significantly among the unaffected portion of the wage distribution than among workers affected by minimum wage norms over this period. Indeed, the results are rather striking: in both zones the percentage change in dispersion in the unaffected group is at least three times that of the affected group. This is precisely what we would expect to find if the wage distribution among affected workers is normatively shaped by minimum wages.

A second prediction is that the average real wage of affected workers should decline, perhaps absolutely as did minimum wages, but certainly relative to the average wage of workers in the unaffected group. The results in Table 8 reveal this to be the case. Affected workers' wages declined in every case, both in real terms and in relation to the wages of unaffected workers. Once again, the results are striking: among formal sector workers, the average real wage of affected workers declined 10-20% across zones, whereas the wages of unaffected workers rose by 20-50%.

While not definitive, the results of this analysis offer suggestive evidence that minimum wage norms do indeed account for some of the rise in wage inequality over the period of the 1980s and early 1990s. Part of the increased inequality is attributable to increased dispersion among workers unaffected by minimum wage norms and part, to the growing separation between the real wages of affected and unaffected workers.

6. Conclusion

This paper presents a different view of the relationship between minimum wages and the wage structure in Mexico than is common in the literature. Instead of merely setting a lower bound on the wages of formal sector workers, minimum wages serve as a norm for wage setting both above and below the level of the minimum. In particular, our empirical evidence suggests that wages are often set at multiples of the minimum wage, and that minimum wage changes affect occupational wages unevenly across the occupational

[21] Unaffected workers make up a very small segment of the informal sector workforce. In the formal sector, the unaffected segment represents roughly 25% of the upper tail of the wage distribution in both zones.

distribution. Indeed, the findings suggest that these two normative roles of minimum wages have their greatest impact on the mid-to-lower tail of the wage distribution. These results lend support to the view that declining real minimum wages and stabilization programs that strengthened the link between wage levels, wage changes, and minimum wages, might account for a portion of the growing wage inequality in Mexico over the period of the late 1980s and early 1990s.

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TABLE 1
Descriptive Statistics

		Whole Sample	Zone A†	Zone B	Zone C
	Observations	1082	122	495	465
1984	Minimum wage*	--	75	82.5	102
	Mean wage*	188.95	165.09	155.01	231.33
	Observations	5675	4060		1615
1992	Minimum wage*	--	1389.38		1666.25
	Mean wage*	4960.97	4028.92		7304.06

* Pesos per hour

† For definition of the different Zones, refer to footnote 11 in the main text. For 1992, Zone A and Zone B were combined into one Zone.

TABLE 2
Clusters and Matches

	Measure	Fixed Band of Error		
		0	± 0.025	± 0.05
1984	Number of Clusters†	18	18	18
	Number of Clusters Matched	3	8	13
	% of Clusters Matched	17	44*	72*
	Sample Size	1082	1082	1082
	Sample Size Matched	31	262	477
	% of Sample Matched	3*	24*	44*
1992	Number of Clusters	13	13	13
	Number of Clusters Matched	0	9	10
	% of Clusters Matched	0	69*	77*
	Sample Size	5675	5675	5675
	Sample Size Matched	0	1712	2550
	% of Sample Matched	0	30*	45*

† A cluster is a group of workers having the same wage and composing at least 2% of the sample.

* Significant at 5% level.

TABLE 3
Clusters and Matches: Formal and Informal Sector

	Measure	Fixed Band of Error		
		0	± 0.025	± 0.05
1984 Formal	Number of Clusters	19	19	19
	Number of Clusters Matched	5	7	11
	% of Clusters Matched	26.32*	36.84*	57.89*
	Sample Size	647	647	647
	Sample Size Matched	19	145	283
	% of Sample Matched	2.94*	22.41*	43.74*
1984 Informal	Number of Clusters	20	20	20
	Number of Clusters Matched	5	11	14
	% of Clusters Matched	25*	55*	70*
	Sample Size	435	435	435
	Sample Size Matched	12	117	194
	% of Sample Matched	2.76*	27*	44.6*
1992 Formal	Number of Clusters	12	12	12
	Number of Clusters Matched	0	9	10
	% of Clusters Matched	0	75*	83.33*
	Sample Size	3068	3068	3068
	Sample Size Matched	0	986	1349
	% of Sample Matched	0	32.14*	43.97*
1992 Informal	Number of Clusters	18	18	18
	Number of Clusters Matched	0	9	10
	% of Clusters Matched	0	55.55*	72.22*
	Sample Size	2607	2607	2607
	Sample Size Matched	0	726	1201
	% of Sample Matched	0	27.85*	46.07*

* Significant at 5% level.

TABLE 4A
Rankings Across Minimum Wage Zones – Union/Nonunion and Formal/Informal (1984 and 1992)

	Rankings		
	Zone A†	Zone B	Zone C
Change in the minimum wage	1	2	3
Change in the avg. wage of union workers	2	3	1
Change in the avg. wage of nonunion workers	3	2	1
Change in the avg. wage of formal sector workers	3	2	1
Change in the avg. wage of informal sector workers	2	3	1

1 equals largest and 3 equals smallest.

† For definition of the different Zones, refer to footnote 11 in the main text.

TABLE 4B
Rankings Across Minimum Wage Zones – Union/Nonunion and Formal/Informal (1989 and 1992)

	Rankings	
	Zone A†	Zone B
Change in the minimum wage	2	1
Change in the avg. wage of union workers	2	1
Change in the avg. wage of nonunion workers	2	1
Change in the avg. wage of formal sector workers	2	1
Change in the avg. wage of informal sector workers	1	2

1 equals largest and 3 equals smallest.

† For definition of the different Zones, refer to footnote 11 in the main text.

TABLE 5
Rankings Across Minimum Wage Zones – Occupations

Occupations	Rankings		
	Zone A†	Zone B	Zone C
Change in the minimum wage	1	2	3
Technicians	3	2	1
Educational Workers	1	2	3
Workers in Arts, Entertainment, and Sports	2	1	3
Agricultural Workers	1	2	3
Craft and Maintenance Workers in Manufacturing	3	2	1
Laborers, Assistants, and Other Less-skilled Workers	3	2	1
Supervisors and Administrative Workers	2	3	1
Salespeople	2	3	1
Personal Service Workers in Establishments	1	2	3
Transportation Workers	1	2	3
Police and Armed Forces	1	3	2

1 equals largest and 3 equals smallest.

† For definition of the different Zones, refer to footnote 11 in the main text.

TABLE 6A
Occupational Pay Rank and Proximity* to Minimum Wage Increase
(1984 and 1992)

Occupational Pay Rank	Zone A† Proximity	Zone B Proximity	Zone C Proximity	Overall Proximity
Lowest paid=1	4	6	10	20
2	1	10	4	15
3	8	4	6	18
4	5	9	9	23
5	3	11	11	25
6	7	7	5	19
7	9	3	8	20
8	6	5	1	12
9	10	8	2	20
10	11	1	7	19
Highest paid=11	2	2	3	7

* The proximity measure varies from 1 (farthest from) to 11 (closest to) within zones, and captures the extent to which the change in the average pay of occupations matches the change in the minimum

† For definition of the different Zones, refer to footnote 10 in the main text.

TABLE 6B
Occupational Pay Rank and Proximity* to Minimum Wage Increase
(1989 and 1992)

Occupational Pay Rank	Zone A† Proximity	Zone B Proximity	Overall Proximity
Lowest paid=1	11	9	20
2	9	8	17
3	12	12	24
4	10	10	20
5	6	11	17
6	3	1	4
7	13	13	26
8	4	6	10
9	8	5	13
10	7	7	14
Highest paid=11	2	2	4

* The proximity measure varies from 1 (farthest from) to 11 (closest to) within zones, and captures the extent to which the change in the average pay of occupations matches the change in the minimum.

† For definition of the different Zones, refer to footnote 11 in the main text.

TABLE 7
Changing Wage Inequality

Wage Inequality – Coefficient of Variation					
		Zone A/B		Zone C	
		Affected*	Unaffected	Affected	Unaffected
1984	All Workers	0.48	0.25	0.32	0.48
	Formal Sector Workers	0.39	0.23	0.27	0.48
1992	All Workers	0.43	0.56	0.39	1.12
	Formal Sector Workers	0.4	0.47	0.36	0.99
Percentage Change Over Time					
	All Workers	-10.42	124.00	21.88	133.33
	Formal Sector Workers	2.56	104.35	33.33	106.25

* Affected workers are those whose wages are less than or equal to the wage corresponding to the highest multiple of the minimum wage at which there exists a match with a cluster of workers.

TABLE 8
Changing Real Wages

Average real* wages (in old Pesos)					
		Zone A/B		Zone C	
		Affected**	Unaffected	Affected	Unaffected
1984	All Workers	37.30	105.13	48.99	134.99
	Formal Sector Workers	46.99	108.67	53.83	133.82
1992	All Workers	28.91	104.80	45.94	198.31
	Formal Sector Workers	37.95	129.09	48.53	198.94
Percentage Change Over Time					
	All Workers	-22.49	-0.31	-6.23	46.91
	Formal Sector Workers	-19.24	18.79	-9.85	48.66

* To obtain real wages, nominal wages are deflated by the National Consumer Price Index (NCPI), which is reported in the Annual report published by the Banco de Mexico.
** Affected workers are those whose wages are less than or equal to the wage corresponding to the highest multiple of the minimum wage at which there exists a match with a cluster of workers.

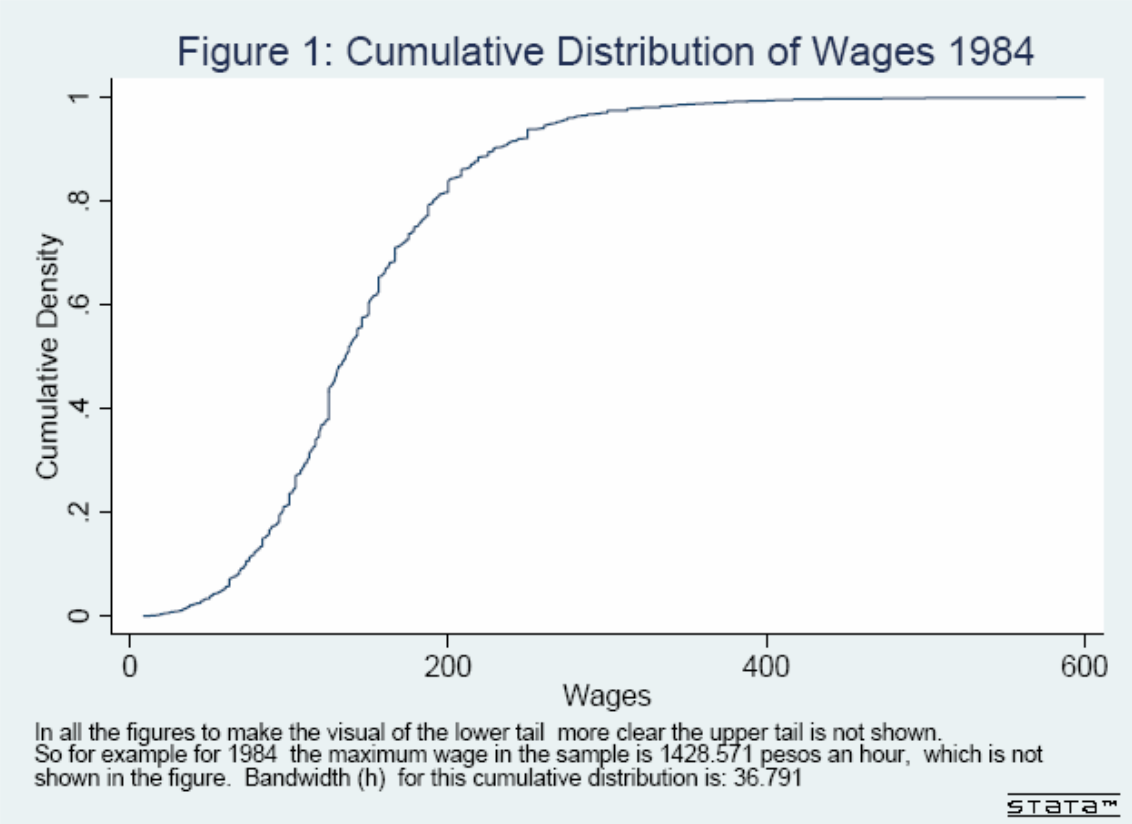


Figure 1: Cumulative Distribution of Wages 1984
Cumulative Density
0
.2
.4
.6
.8
1
0
200
400
600
Wages
In all the figures to make the visual of the lower tail more clear the upper tail is not shown.
So for example for 1984 the maximum wage in the sample is 1428.571 pesos an hour, which is not shown in the figure. Bandwidth (h) for this cumulative distribution is: 36.791
STATA™

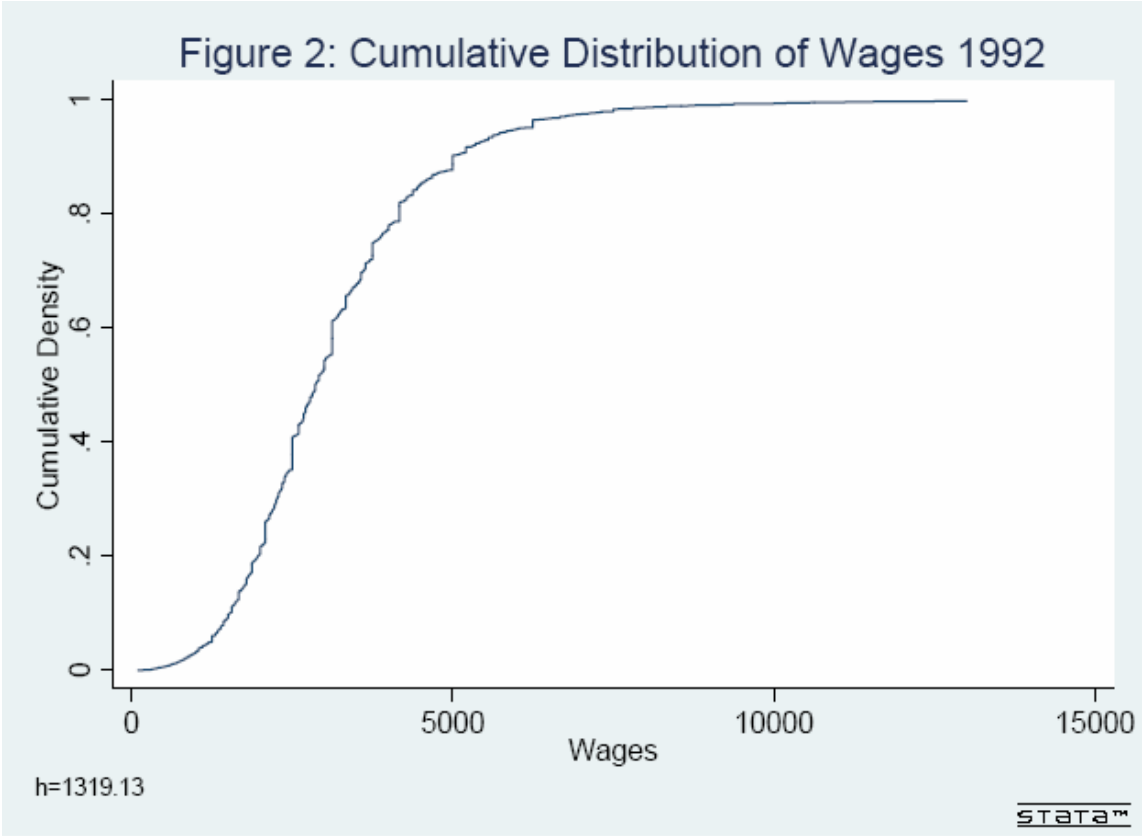


Figure 2: Cumulative Distribution of Wages 1992
Cumulative Density
0
.2
.4
.6
.8
1
0
5000
10000
15000
Wages
h=1319.13
STATA™

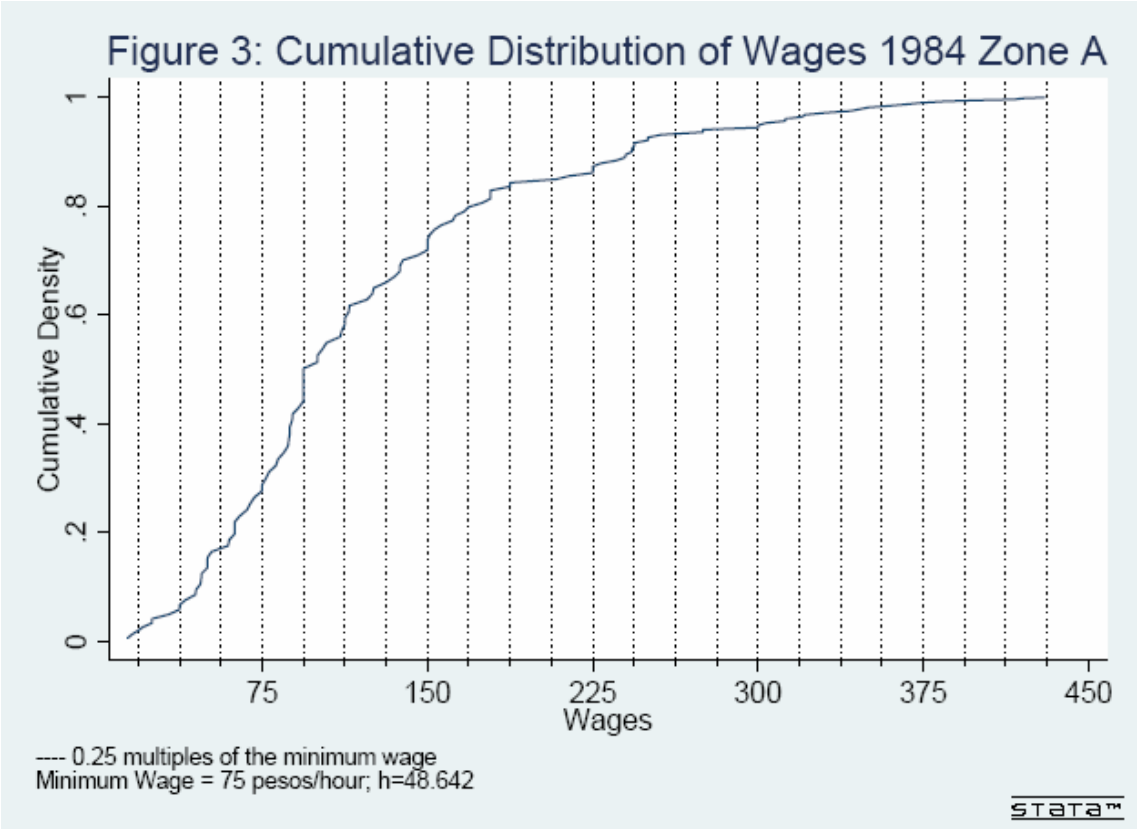


Figure 3: Cumulative Distribution of Wages 1984 Zone A
Cumulative Density
0
.2
.4
.6
.8
1
75
150
225
300
375
450
Wages
---- 0.25 multiples of the minimum wage
Minimum Wage = 75 pesos/hour; h=48.642
stata™

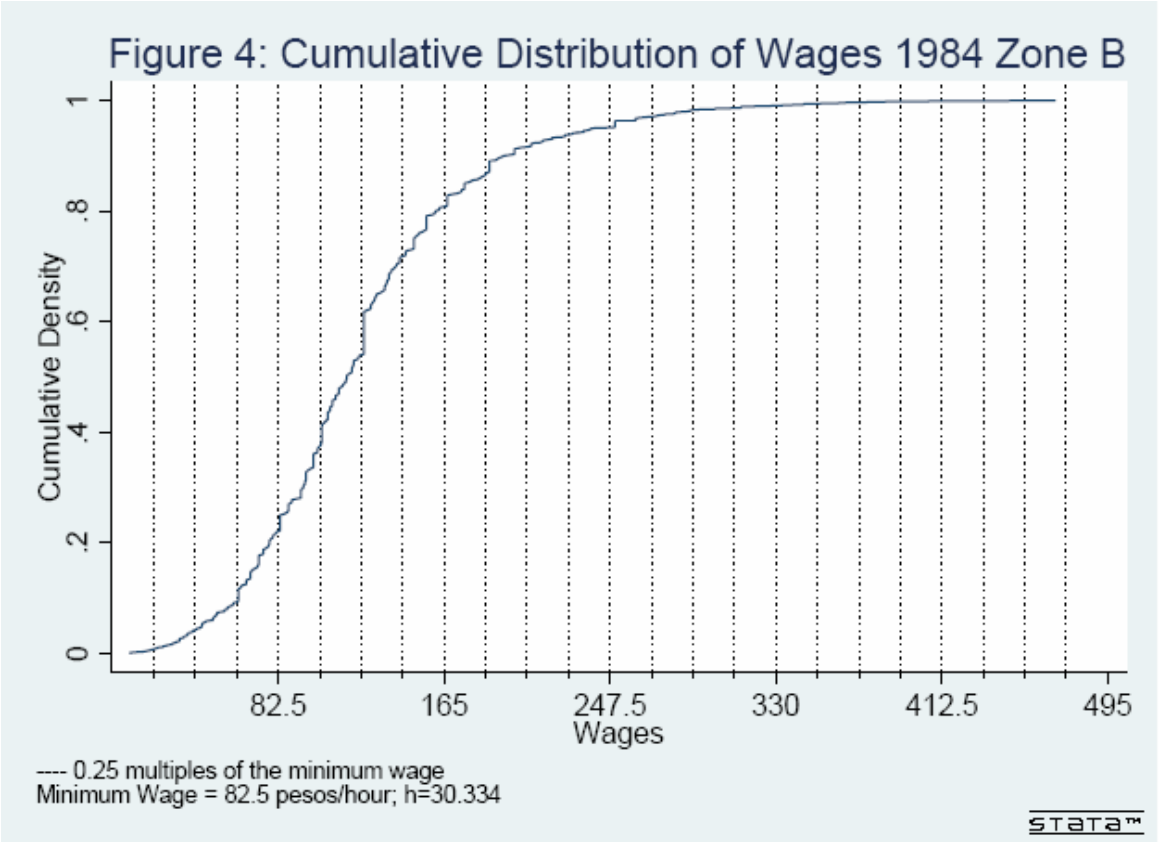


Figure 4: Cumulative Distribution of Wages 1984 Zone B
Cumulative Density
0
.2
.4
.6
.8
1
82.5
165
247.5
330
412.5
495
Wages
---- 0.25 multiples of the minimum wage
Minimum Wage = 82.5 pesos/hour; h=30.334
stata™

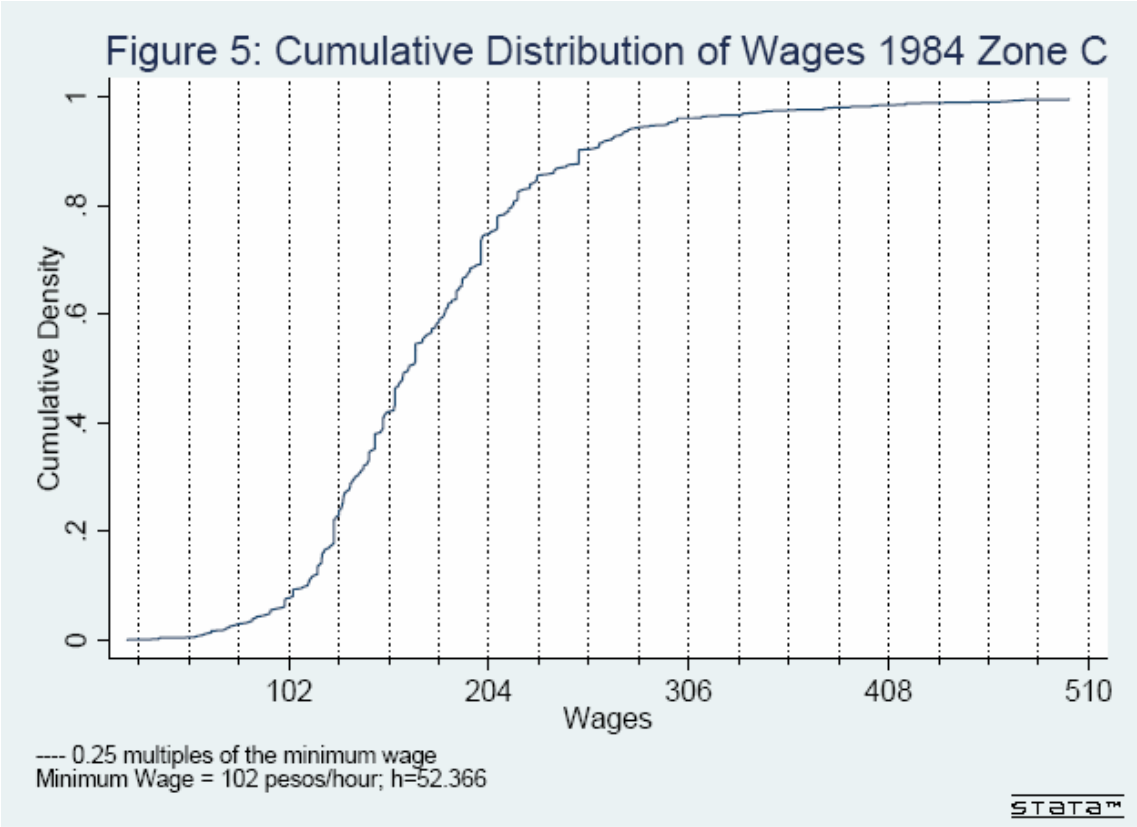


Figure 5: Cumulative Distribution of Wages 1984 Zone C
Cumulative Density
0
.2
.4
.6
.8
1
102
204
306
408
510
Wages
---- 0.25 multiples of the minimum wage
Minimum Wage = 102 pesos/hour; h=52.366

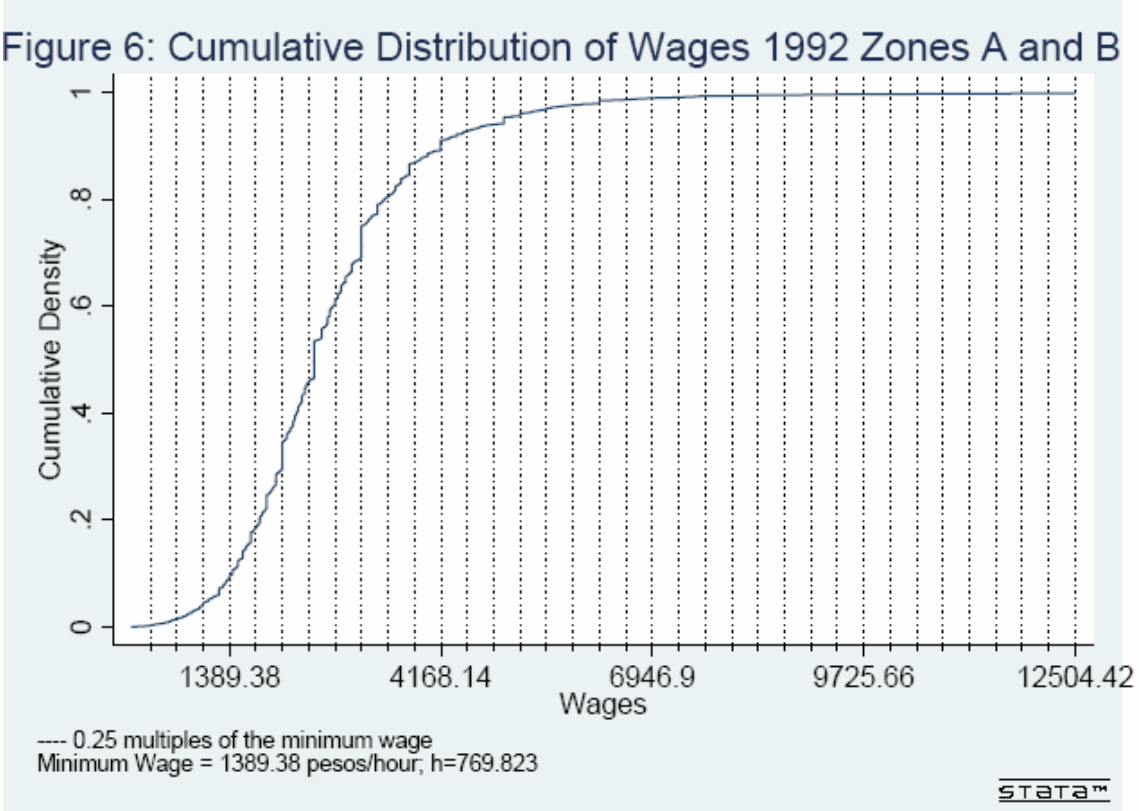


Figure 6: Cumulative Distribution of Wages 1992 Zones A and B
Cumulative Density
0
.2
.4
.6
.8
1
1389.38
4168.14
6946.9
9725.66
12504.42
Wages
---- 0.25 multiples of the minimum wage
Minimum Wage = 1389.38 pesos/hour; h=769.823

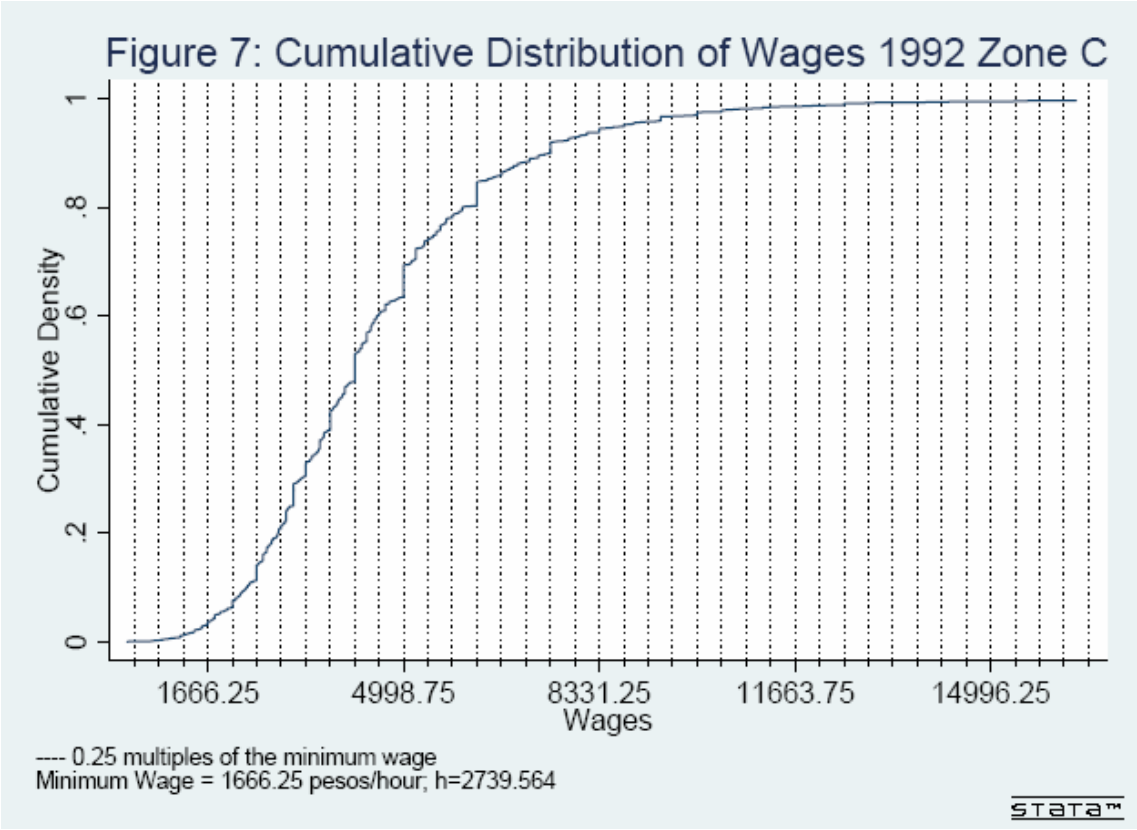
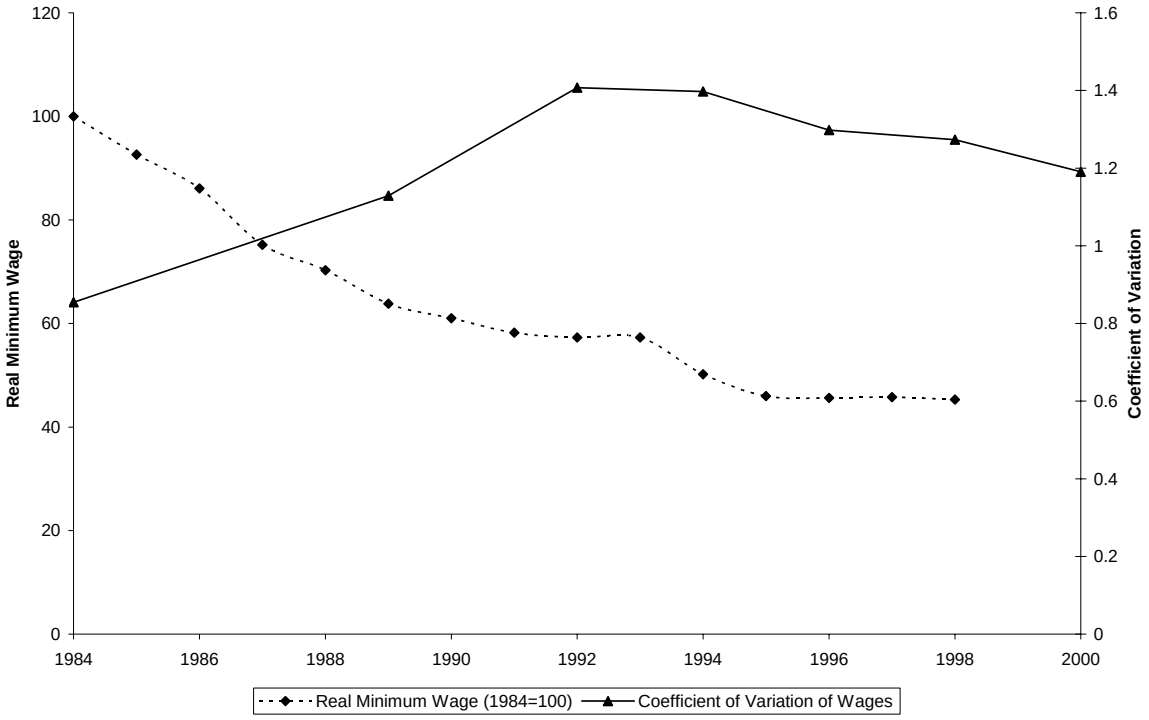


Figure 7: Cumulative Distribution of Wages 1992 Zone C
Cumulative Density
0
.2
.4
.6
.8
1
1666.25
4998.75
8331.25
11663.75
14996.25
Wages
---- 0.25 multiples of the minimum wage
Minimum Wage = 1666.25 pesos/hour; h=2739.564
Stata

Figure (8) Real Minimum Wage and Wage Inequality



Source: The minimum wage data is from the Annual Reports of Banco de Mexico. Coefficient of variation for wages is calculated by the authors from the ENIGH data sets.