DOES THE MINIMUM WAGE AFFECT EMPLOYMENT IN MEXICO?

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INTRODUCTION

Starting in the 1970s Latin American countries have reduced widespread, government-imposed minimum wages [World Bank, 1995]. Although empirical evidence on the effect of minimum wages in these developing countries is needed to evaluate past and guide future policies, few studies have pursued the topic. Such a study is important to understanding the effects of the minimum wage on employment in Latin America where minimum wages are relatively high, but also in the United States where the minimum wage is relatively low. (In contrast to the U.S. where only a small fraction of workers earn wages at or below the minimum, in 1986, 17 percent of Mexican workers earned wages at or below the minimum.)

This paper analyzes the employment effects of policies that reduced minimum wages in Mexico from 1970 to 1990. Not only were the number of minimum wages reduced dramatically but the real minimum wage decreased and became ineffective for most workers. In Mexico minimum wages were set by state boards with representatives from unions, employers and government officials. Minimum wages varied by municipalities within the 31 Mexican states and the federal district. In 1970 Mexico had 111 general minimum wages; by 1986 control over minimum wage setting shifted to a national commission and the number fell to just 3. During the same period, the minimum wage to average wage ratio decreased by approximately 50 percent.

In this study, I look at how the decline in the minimum wage affected employment levels by gender and age groups using panel data of average minimum wages and employment-to-population ratios of males and females ages 15 to 64 for all Mexican states for the years 1970, 1980 and 1990.[1] Analysis of the constructed panel data show that government policies reducing minimum to average wage ratios did not affect male employment but increased female employment. The elasticity of female employment with respect to the minimum wage is -0.58 in the OLS regression and -1.25 in the instrumental variables regression. The results suggest that male employment is not affected by minimum wages because their earnings are large relative to the minimum while female employment is affected by minimum wages since their earnings are closer to the minimum.

Separate age group regressions show that minimum wage elasticities are smaller for females ages 15 to 34 than for those ages 35 to 64. Reductions in minimum wages

Eastern Economic Journal, Vol. 24, No. 2, Spring 1998

had no effect on employment of young males, ages 15 to 24 but were found to decrease employment of older males, ages 55 to 64. For this group, the estimated elasticity of employment with respect to the minimum wage is 0.04 in the OLS regression and 0.17 in the instrumental variables regression. The evidence suggests that reductions in minimum wages shifted demand away from more-skilled workers, males 55 to 64, towards relatively less skilled workers, females. Surprisingly, less-skilled males aged 15 to 24 were not found to be affected by the decline in the minimum.

Since there is a small number of states some of the results can be affected by a few observations. If four states are excluded from the analysis, minimum wages are found to have no effects on employment of males or females ages 15 to 64. Excluding these states reduces the variation in female employment which may in part reduce the significance of the results. Since there is no evidence that these states are outliers and therefore should be excluded from the analysis, the sensitivity of the results to the exclusion of the four states does not weaken the findings of the paper.

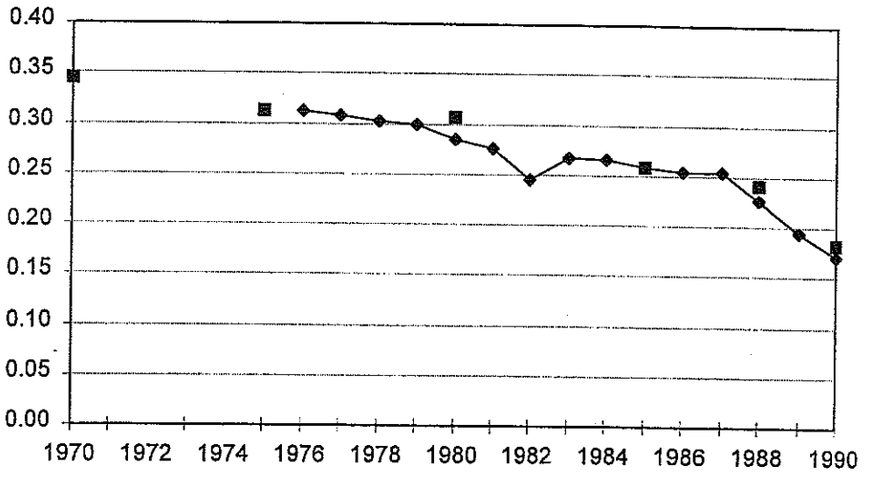
THE MINIMUM WAGE IN MEXICO

Mexico is composed of 31 states each with its own separate local government, but all under one federal district. Federal power is concentrated in the executive branch, mostly in the president himself who has almost unrestrained authority over the legislative and judicial branches. Federal funds are allocated to municipalities through the state government, which allows the governor and other state authorities to decide which municipalities will receive funding. This process gives state governments considerable power [Rodriguez, 1997].

The Mexican Federal Labor Law defines the minimum wage, applied to all workers, as "the least amount that a worker may receive in cash for services rendered during one day" [Dávalos, 1990]. The law does not establish the number of working hours required in order to earn the daily minimum but it sets a maximum number of 8 hours per day for those working during the day shift, 7 hours for those working the night shift, and 7 ½ hours for those working a mixed shift.[2] Hours above the legal maximum per day are considered overtime and must be paid at a higher rate. The law also specifies that if a worker earns the minimum wage, the employer has to pay the employee portion of payroll taxes such as social security. Thus the minimum wage refers to the after payroll tax wage.

The most recent minimum wage structure, dated back to 1962, has been the subject of continuous reform since 1976. The 1962 minimum wage law establishes minimum wages for three categories of workers: general, agricultural, and professional. The professional workers minimum is composed of 86 different minimums and applies to workers in specific occupations. The agricultural workers minimum applies to agricultural workers and the general minimum applies to all other workers. Each of the categories vary by region. In 1962 there were a total of 111 minimum wage regions (economic zones), each with its own committee composed of representatives from trade unions, employers and government. The Regional Committees submitted

FIGURE 1
Minimum Wage Relative to Manufacturing Wage



a recommendation for a minimum wage rate to the National Minimum Wage Commission, a national body with authority over all proposed minimum wage levels.

In 1976, the National Minimum Wage Commission began to simplify the minimum wage structure, gradually eliminating the distinction between the general minimum and agricultural worker minimum and equalizing general minimums across regions. In 1982 the agricultural worker minimum was completely abolished. The number of different minimum wage rates fell from 111 in 1976 to 18 in 1981 to just 3 in 1986. In addition, in 1986, Regional Committees were abolished and replaced by the National Minimum Wage Commission.

The restructuring of minimum wages was accompanied by a policy of reducing minimum wages relative to average wages. Figure 1 shows trends in the ratio of the average minimum to average manufacturing wage using two different data sets, the Industrial Census and the Monthly Industrial Survey.[3] Both data sets show similar declines in the average minimum to average wage ratio between 1970 and 1990. Based on the Industrial Census, the ratio declined from 0.34 in 1970 to 0.30 in 1980 and 0.18 in 1990.

EVIDENCE OF THE IMPACT OF MINIMUM WAGES ON EMPLOYMENT

The empirical literature on minimum wages, particularly those that pertain to the United Sates, is extensive. Time series studies using data from the early 1950s to the late 1970s find that a 10 percent increase in the minimum wage reduces teenage

employment-to-population ratios by 1 to 3 percent [Brown, Gilroy and Kohen, 1982]. More recent time series studies have found smaller and often insignificant effects on employment [Solon, 1985; Wellington, 1991; Klerman, 1992; and Card and Krueger, 1995]. Cross section studies find that increasing the minimum wage reduces teenage employment, but the magnitudes of the estimates vary widely. Both time series and cross section studies are problematic. Time series may simply reflect spurious correlations. Cross section estimates might reflect state-specific effects since states with a low federal minimum to average wage ratio are those with higher wages.

Recent minimum wage studies examine the impact of changes in the minimum wage on employment using firm-level data [Katz and Krueger, 1992; Card and Krueger, 1994], individual level data [Card 1992a; 1992b], and state or industry minimum wage panel data [Castillo-Freeman and Freeman, 1992; Neumark and Wascher, 1992]. With the exception of Castillo-Freeman and Freeman [1992], and Neumark and Wascher [1992], these studies find that minimum wage increases have no impact on employment. The issue is yet to be resolved.[4]

There are very few studies of the effects of minimum wages on employment in Mexico. Using data from 1965 to 1979 de Villarreal and Samaniego Breach [1988] estimate the elasticity of demand for manual workers with respect to the minimum wage in various industries to be between −0.02 and −1.03. The findings of this study depend heavily on the assumptions of the model, one of which is that the elasticity of the minimum wage with respect to the mean wage is equal to one.

Bell [1997] analyzes the impact of reductions in the minimum wage on employment in Mexico between 1984 and 1992 using data from a panel of large manufacturing firms. She finds that minimum wages do not affect employment of skilled or unskilled workers. Using time series data from 1972 to 1990, she also finds no effect of minimum wages on manufacturing employment.

This study evaluates the effect of minimum wages on employment-to-population ratios in Mexico from 1970 to 1990. Unlike other studies, it estimates the impact of minimum wages on employment using regional minimum wages. The large variation in minimum wages between and within regions facilitates identification of the effect of minimum wages on employment. The analysis extends beyond the relatively high paying jobs in large manufacturing firms examined by Bell to all sectors of the economy.

STATE PANEL DATA ON MINIMUM WAGES

To analyze the impact of minimum wages in the Mexican labor market I used four data sources: the Mexican Census of Population, the Mexican Industrial Census, National Minimum Wage Commission Statistical Reports and the Encuesta Nacional de Empleo Urbano (ENEU). The Mexican Census of Population data corresponds to the years 1970, 1980 and 1990. With these data I estimate the ratio of employment-to-population for men and women age 15 to 64 for each state in Mexico. The Industrial Census is a census of establishments in the mining and manufacturing sectors of the economy.[5] The Industrial Census compiles data on total annual employee compensation, average number of employees during the year and number of days the establishment was working during the year. From these data I estimate mean compensation per worker per day by state for 1970, 1980 and 1990.[6] Mean compensation is equivalent to total labor cost per worker since it includes all payments made by employers on behalf of employees.[7] Ideally one would use data on wages of all workers instead of wages for those in manufacturing and mining. However, such data are not available.

State minimum wages in 1970, 1980, and 1990 are constructed by estimating a weighted average of regional minimum wages, of which there were 111 in 1970 and 2 in 1990. Weights are based on the population aged 12-64 in 1980.[8]

Finally, the ENEU is a stratified sample of families in the sixteen largest urban areas of Mexico and was used to estimate the Mexican wage distribution. The selected sample is from the second quarter of 1986, 1988 and 1990 and includes all workers with positive earnings ages 12 to 64.[9] Hourly wages are calculated using two variables available in the survey; monthly earnings in most important employment activity and hours worked last week in most important employment activity. With this information I constructed hourly wages using the following formula: hourly wages = monthly earnings/(4.3 × hours worked per week). Unlike the Industrial Census, the ENEU wages correspond to payments after payroll deductions.

The Mexican Census of Population data, the Industrial Census data and the minimum wage data were used in order to construct a panel of minimum wages and economic conditions in the 31 Mexican states and the Federal District. Summary statistics of these data are presented in Table 1. The table shows a small increase in the average real minimum wage between 1970 and 1980 and a large decline between 1980 and 1990. The ratio of the average minimum wage to the average wage shows a continued decline from 1970 to 1990: 0.39 in 1970, 0.30 in 1980 and 0.19 in 1990. Employment-to-population ratios increased from 1970 to 1980 but declined between 1980 and 1990. Overall, between 1970 and 1990 the employment-to-population ratio did not change for males and increased 27.8 percent for females, from 0.18 in 1970 to 0.23 in 1990.

THE MINIMUM WAGE WORKER

Table 2 shows characteristics of workers earning wages below the minimum wage, around the minimum and above the minimum, using 1986 data from the ENEU. The daily minimum wage was converted to an hourly minimum by dividing the daily rate by 8, the maximum number of regular working hours in a day for those working the day shift.[10]

In 1986, 10.7 percent of workers earned less than the minimum, 7.4 percent earned wages around the minimum and 81.9 percent earned wages above the minimum (see Table 2).[11] Minimum wage workers are younger and less educated compared to the entire Mexican labor force. Approximately 40 percent of those earning less than the minimum and around the minimum are between 15 and 24 years old compared to 27 percent of those earning above the minimum fall within that age group. More than 60 percent of workers earning below and around the minimum have 6 or fewer years of education compared to 42 percent of those earning wages above the minimum. Moreover, workers earning less-than-the-minimum are disproportionately female.

TABLE 1
Minimum Wages and Participation in Mexico, 1970-1990

Variable	1970	1980	1990	1970-90	1970-80	1980-90
Minimum Wage (1978 Pesos)	84.13	89.82	39.86	-44.28	5.68	-49.96
	(14.40)	(12.33)	(2.70)	(12.50)	(5.00)	(10.05)
Minimum/Average Wage	0.39	0.30	0.19	-0.20	-0.09	-0.11
	(0.10)	(0.07)	(0.04)	(0.08)	(0.08)	(0.05)
Avg. Wage per Day	226.18	309.71	222.52	-3.66	83.53	-87.19
(1978 Pesos)	(61.07)	(71.13)	(47.65)	(49.90)	(61.40)	(37.55)
Employment/Population	0.76	0.82	0.76	0.00	0.06	-0.05
Males: age 15 to 64	(0.04)	(0.02)	(0.02)	(0.05)	(0.04)	(0.03)
Employment/Population	0.18	0.30	0.23	0.05	0.12	-0.08
Females: age 15 to 64	(0.06)	(0.05)	(0.06)	(0.08)	(0.08)	(0.08)

Standard deviations are in parentheses.

Fifty one percent of the less-than-minimum-wage workers were female compared to approximately 30 percent of the minimum and above-minimum-wage workers.

It has been argued that if the minimum wage is effective, it should produce a spike in the distribution of earnings in the area of the minimum [Castillo-Freeman and Freeman, 1992]. This argument is based not on theoretical grounds, but rather on the observation of such a spike in the U.S. wage distribution [Brown, 1988]. Analysis of the Mexican wage distribution shows little indication of a spike around the minimum wage in 1986. This might be due to the fact that hourly data from the ENEU are estimated from monthly earnings in most important employment activity and hours worked last week in most important employment activity which introduces measurement errors.

ESTIMATING THE IMPACT OF THE MINIMUM WAGE

Methodology

To analyze the impact of minimum wages on employment, I use panel data on minimum wages and employment conditions in Mexican states for 1970, 1980 and 1990. The data show substantial variation in minimum wages for two reasons: minimum wages vary by municipality and minimum wages have declined relative to average wages since the early 1970s. Since local control over the minimum wage has fallen since 1976, the setting of the minimum wages has become more exogenous, making identification of the employment effects of minimum wages easier.

The estimated employment equation is the following:

$$(1) \qquad (EMP_{it}/POP_{it}) = \alpha + \beta_1(MIN_{it}/WAGE_{it}) + \beta_2 X_{it} + \gamma_i + \mathbf{Y}_t + \varepsilon_{it}$$

TABLE 2
Characteristics of Workers Earning the Minimum Wage in 1986

Variables	All	Less than Minimum	Minimum	More than minimum
Wage per Hour				
1978 pesos	18.02	4.63	7.68	20.71
	(.34)	(.16)	(.96)	(.38)
1986 dollars	0.83	0.21	0.35	0.95
Minimum / Average Wage	0.71	2.01	1.00	0.51
Percent Female	32.00%	51.08%	32.84%	29.42%
Age	32.95	32.18	30.77	33.25
	(.11)	(.14)	(.12)	(.11)
Age 15 to 19	11.82%	26.08%	22.12%	9.02%
Age 20 to 24	17.78%	14.96%	20.24%	17.93%
Age 25 to 34	30.64%	19.31%	23.57%	32.77%
Age 35 to 44	20.66%	16.55%	16.47%	21.58%
Age 45 to 54	12.72%	12.76%	11.22%	12.85%
Age 55 to 64	6.37%	10.34%	6.38%	5.85%
Education	7.79	5.39	6.19	8.25
	(.43)	(.35)	(.33)	(.43)
Education: 0 to 6 years	46.41%	69.76%	61.06%	42.03%
7 to 9 years	22.44%	19.44%	24.42%	22.65%
10 to 12 years	17.56%	7.99%	10.84%	19.42%
13 to 16 years	7.13%	1.52%	2.77%	8.26%
17 or more	6.34%	1.20%	0.72%	7.53%
Sector of Employment				
Agriculture and Mining	2.88%	4.99%	2.14%	2.67%
Manufacturing	27.38%	15.83%	26.65%	28.96%
Construction	6.57%	4.07%	7.98%	6.77%
Services	57.96%	72.98%	59.08%	55.89%
Government	5.21%	2.13%	4.15%	5.70%
Observations	42869	4593	3182	35094
Percent of Total		10.71%	7.42%	81.86%

Standard deviations are in parentheses. Tabulations from Encuesta de Empleo Urbano 1986.

where EMP_{it} is employment in state i at time t, POP_{it} the population in state i at time t,
MIN_{it} is the minimum wage in state i at time t, $WAGE_{it}$ is the average wage in state i at time t,
X_{it} is a set of variables that capture state business-cycle effects, γ_i is a vector of state fixed effects,
$\mathbf{Y}_t$ is a vector of year effects and ε_{it} is a random variable with mean 0 and variance σ^2.

Equation (1) is similar to those used in past studies of the employment effects of minimum wages [Neumark and Wascher, 1992]. Changes in the minimum wage are interpreted as movements along the demand curve. The state fixed effects serve as controls for unmeasured conditions in state economies that are responsible for differences in employment and average wage rates. The year effects serve as a control for fluctuations in the aggregate business cycle. The cross-section and time fixed effects allow for a more precise estimation of the effect of the minimum wage on employment when compared to the purely cross-section and the time series studies.[12]

An alternative estimation method is to add a control group in the employment equation to control for changes in state economic conditions. This control group measures state changes in employment-to-population ratios between 1970 and 1990 that occurred as a result of changes in economic conditions other than changes in the minimum wage. The estimated equation is:

$$(2) \quad (EMP_{it}/POP_{it}) = \alpha + \beta_1(MIN_{it}/WAGE_{it}) + \beta_2 X_{it} + (CEMP_{it}/CPOP_{it}) + \gamma_i + \mathbf{Y}_t + \varepsilon_{it}$$

where $(CEMP_{it}/CPOP_{it})$ is the employment-to-population ratio of the control group in state i at time t and other variables in the equation are the same as in equation (1).

The estimation requires that those in the control group are not affected by changes in the minimum wage. Analysis of the Mexican wage earnings profile shows that males ages 35 to 44 and 45 to 54 earn wages higher than any other age-gender group. Since employment changes for these workers are likely to be unaffected by changes in the minimum wage, their ratio of employment-to-population can be used as a control for within state changes in economic conditions. This alternative estimation method has the advantage of more accurately controlling for in-state economic conditions. The disadvantage is that if minimum wages affect workers in the control group, the control group adds endogeneity bias to the equation. For this reason, estimates from equation (2) should be viewed in relation to results from equation (1).

In equations (1) and (2) minimum wages are measured relative to average wages. The index is a measure of the strength of the minimum wage. If the minimum wage is high relative to the average wage, we expect the minimum to have a greater impact on employment than if the minimum is low relative to the average wage. It has been argued that the minimum wage index may introduce biases in the estimation because the factors that cause wages to rise in a state may also cause employment to grow [Card, Katz and Krueger, 1994]. According to this argument, the estimated minimum wage effect may simply reflect the relationship between average wages and employment. An alternative method of estimation is to use the real minimum wage as an instrument. The real minimum wage is correlated with the minimum to average wage ratio because the real minimum is the nominal minimum indexed with a consumer price basket instead of the average nominal wage. Unlike the minimum to average wage ratio, the real minimum is not likely to be correlated with unmeasured factors that cause employment to change in a state.

Results

Estimates of the effects of minimum wages on employment are shown in Table 3.[13] Separate employment equations were estimated for males and females. The first two columns of the table show ordinary least squares (OLS) regressions of employment-to-population ratios on minimum wages as measured by the log of the minimum wage index, (daily minimum wage in state/average daily wage in state). Columns three and four use real minimum wages as an instrument for the minimum wage index.

Male regressions show no impact of minimum wages on employment. In OLS regressions the estimated coefficient is positive but close to zero and insignificant. In instrumental variables regressions, the coefficient is negative and insignificant. In contrast to male regressions, all female regressions show a significant effect of minimum wages on employment. In OLS regressions, the elasticities are −.43 when the log of manufacturing and mining output are not included and −.58 when they are included.[14] The estimated elasticities from instrumental variables regressions are −1.70 when output variables are not included and -1.25 when output variables are included.

Tables 4 and 5 show estimates of the impact of minimum wages on employment using employment-to-population ratios of males ages 35 to 44 as controls.[15] Table 4 shows separate regressions for males ages 15 to 19, 20 to 24, and 55 to 64.[16] Results show that employment of young males is not affected by minimum wages. Coefficients on the minimum wage index are for the most part small, negative, and insignificant in regressions for males ages 15 to 19 and 20 to 24. This is surprising since young males are relatively unskilled. Results also show that reductions in minimum wages decreased employment of older males. Coefficients in regressions for males ages 55 to 64 are small but positive and significant. The estimated elasticities are 0.04 in the OLS regression and 0.17 in the instrumental variables regressions.

Table 5 shows results for females. I present separate regressions for females ages 15 to 19, 20 to 24, 25 to 34, 35 to 44, 45 to 54 and 55 to 64. I also present separate regression results for all females. Most regressions show a large positive effect of reductions in minimum wages on employment. In the all-female regressions, elasticities of minimum wages on employment are -.52 in the OLS regression and -1.11 in the instrumental variables regression. Including employment-to-population ratio of males ages 35 to 44 as a control does not change the significance of the results but the coefficients are slightly smaller. Variation in the estimated elasticities is mostly due

TABLE 3
Regressions of Employment to Population Ratios on Minimum Wages

Dependent Variable: Log(Employment / Population)

Independent Variables:	Males OLS	Males OLS	Males IV	Males IV
Log (minimum/avg. wage)	0.014	0.005	-0.097	-0.074
	(0.029)	(0.035)	(0.120)	(0.081)
Log(manufacturing output)		0.005		-0.002
		(0.013)		(0.015)
log(mining output)		-0.002		-0.005
		(0.003)		(0.004)
R-Squared	0.75	0.76	—	—
Adj. R-Squared	0.61	0.61	—	—
Observations	96	96	96	96
independent variables:	**Females OLS**	**Females OLS**	**Females IV**	**Females IV**
log (minimum/avg. wage)	-0.426 [a]	-0.575 [a]	-1.702 [a]	-1.245 [a]
	(0.126)	(0.146)	(0.760)	(0.379)
log(manufacturing output)		-0.063		-0.119 [b]
		(0.056)		(0.071)
log(mining output)		-0.015		-0.038 [a]
		(0.012)		(0.018)
R-Squared	0.90	0.90	—	—
adj R-Squared	0.84	0.84	—	—
observations	96	96	96	96

a. Significant at the 5 percent level.
b . Significant at the 10 percent level.
Regressions are weightedby population in the state. All regressions include state and year dummies. Standard errors are in parentheses.

to differences in regression techniques; OLS results are smaller than instrumental variables results. Moreover, elasticities are larger for older females. To make a comparison, OLS estimates are approximately -.40 for females ages 15 to 34, −0.62 for females ages 35 to 44 and approximately -.75 for females ages 45 to 64.

To make my results more comparable to Bell's [Bell, 1997], I estimated the effect of minimum wages on employment-to-population ratios separately for the years 1970 to 1980, and 1980 to 1990. I find no statistical difference in the effect of minimum wages on employment in these two time periods.

TABLE 4
Regressions of Male Employment to Population Ratios on Minimum Wages by Age

Dependent Variable: Log (Employed Males/Male Population)

	OLS	IV
Males age 15 to 19		
Minimum/average wage	0.036	-0.154
	(0.094)	(0.231)
Log(emp/pop) males 35-44	0.671	0.461
	(0.769)	(0.829)
Log(manufacturing output)	0.042	0.024
	(0.036)	(0.042)
Log(mining output)	0.008	0.000
	(0.008)	(0.011)
Adj R-squared	0.78	—
Males age 20 to 24		
Minimum/average wage	-0.002	-0.061
	(0.032)	(0.077)
Log(emp/pop) males 35-44	1.005 [a]	0.935 [a]
	(0.267)	(0.287)
Log(manufacturing output)	0.033 [a]	0.028 [b]
	(0.012)	(0.014)
Log(mining output)	0.002	-0.000
	(0.003)	(0.004)
Adj R-squared	0.77	—
Males age 55 to 64		
Minimum/average wage	0.037[b]	0.167[a]
	(0.021)	(0.063)
Log(emp/pop) males 35-44	0.832[a]	0.988[a]
	(0.173)	(0.235)
Log(manufacturing output)	0.026[a]	0.038[a]
	(0.008)	(0.011)
Log(mining output)	0.002	0.006[a]
	(0.002)	(0.003)
Adj R-squared	0.95	—

a. Significant at the 5 percent level.
b. Significant at the 10 percent level.
Regressions are weighted by population in the state. All regressions include state and year dummies. Standard errors are in parentheses.

TABLE 5
Regressions of Female Employment to Population Ratios on Minimum Wages by Age

Dependent Variable: Log(Employed Females/Female Population)

	OLS	IV	OLS	IV
	Females all ages		**Females age 35 to 44**	
Minimum/average wage	-0.522	-1.107 [a]	-0.617[a]	-1.351[b]
	(0.141)	(0.371)	(0.150)	(0.408)
Log(emp/pop) males 35-44	3.070	2.370 [b]	3.408[a]	2.564[b]
	(1.170)	(1.393)	(1.248)	(1.543)
Log(manufacturing output)	-0.041	-0.094	-0.089	-0.154[b]
	(0.054)	(0.068)	(0.057)	(0.075)
Log(mining output)	-0.008	-0.029	-0.015	-0.041[b]
	(0.012)	(0.018)	(0.013)	(0.020)
Adj R-squared	0.86	—	0.88	—
	Females age 15 to 19		**Females age 45 to 54**	
Minimum/average wage	-0.406[a]	-1.130[a]	-0.764[a]	-1.564[b]
	(0.201)	(0.527)	(0.154)	(0.435)
Log(emp/pop) males 35-44	2.742 [b]	1.916	3.633[a]	2.556
	(1.646)	(1.901)	(1.305)	(1.665)
Log(manufacturing output)	0.012	-0.057	-0.133[a]	-0.200[b]
	(0.076)	(0.096)	(0.059)	(0.079)
Log(mining output)	0.007	-0.020	-0.029[a]	-0.057[b]
	(0.017)	(0.026)	(0.014)	(0.022)
Adj R-squared	0.71	—	0.88	—
	Females age 20 to 24		**Females age 55 to 64**	
Minimum/average wage	-0.406[a]	-0.787[a]	-0.718[a]	-1.358[b]
	(0.136)	(0.338)	(0.142)	(0.380)
Log(emp/pop) males 35-44	3.082[a]	2.628[a]	3.020[a]	2.160
	(1.125)	(1.253)	(1.201)	(1.470)
Log(manufacturing output)	0.019	-0.017	-0.116[a]	-0.170[b]
	(0.052)	(0.062)	(0.054)	(0.070)
Log(mining output)	0.002	-0.012	-0.034[a]	-0.056[b]
	(0.012)	(0.017)	(0.013)	(0.019)
Adj R-squared	0.87	—	0.92	—
	Females age 25 to 34			
Minimum/average wage	-0.436[a]	-0.847[a]		
	(0.127)	(0.316)		
Log(emp/pop) males 35-44	2.794[a]	2.317[b]		
	(1.065)	(1.203)		
Log(manufacturing output)	-0.023	-0.060		
	(0.049)	(0.059)		
Log(mining output)	-0.004	-0.019		
	(0.011)	(0.016)		
Adj R-Squared	.91			

a. Significant at the 5 percent level.
b. Significant at the 10 percent level.
Regressions are weighted by population in the state. All regressions include state and year dummies. Standard errors are in parentheses.

ESTIMATION ISSUES

Endogeneity

This paper initially assumed that minimum wage changes were independent of state employment trends and state characteristics that make states more sensitive to the minimum wage. In other words, minimum wage changes are assumed to be exogenous. But this assumption may not hold. I regressed changes in real minimum wages between 1970 and 1990 on state characteristics and found that states experiencing a large reduction in the real minimum between 1970 and 1990 had larger employment growth between 1960 and 1970. These states were also more likely to be located on the U.S.- Mexico border.

This suggests that reliable estimates of the effect of minimum wages on state employment are derived from regressions that successfully control for statewide economic conditions responsible for employment growth. I replicated all regressions in Tables 3 to 5 including controls for growth in employment-to-population ratios between 1960 and 1970, a U.S.-Mexico border state dummy, and a Baja California dummy. The results of these regressions are similar to those in Tables 3 to 5.

Sensitivity of Results to the Exclusion of Some States

Estimates of the impact of minimum wages on employment were derived from a 3-year panel of 32 Mexican states. Since this is a small sample, a few observations may be responsible for the results. Re-estimation of regressions in Tables 4 and 5 show that results are weakened by the exclusion of Chiapas, Oaxaca, Quintana Roo and Zacatecas. Regressions that exclude the four states show no employment effects of minimum wages on males ages 55 to 64. The all-female regressions show that minimum wages have no significant employment effects. In terms of age groups, the results still show that females ages 45 to 54 and 55 to 64 are significantly affected by reductions in the minimum wage.

The excluded states have a few characteristics in common. Three, Chiapas, Oaxaca and Quintana Roo, are located in southern Mexico. Three, Chiapas, Oaxaca and Zacatecas, are characterized by having little or no increase in female employment-to-population ratios and having medium to low reductions in the minimum relative to the average wage. Excluding states with small increases in female participation reduces variation in female employment and this may partly contribute to making many of the results insignificant. While results are sensitive to the exclusion of the four states, this is not strong evidence against the main findings of the study since there is no justification to exclude these states from the analysis.

CONCLUSION

Large reductions in the Mexican minimum wage between 1970 and 1990 were found to increase employment of females ages 15 to 64 and reduce employment of males ages 55 to 64. Minimum wages were not found to affect employment of young

males ages 15 to 24. While the empirical finding that young males are not affected by the minimum is surprising, most of the findings are consistent with standard minimum wage models that allow for skill differences among workers. When the minimum wage decreases, the price of unskilled labor decreases. If skilled and unskilled workers are substitutes, employers have an incentive to hire more unskilled labor, leading to a reduction in the employment of skilled workers and an increase in the employment of unskilled workers [Brown, 1988].

The findings contrast with Bell's results that reductions in the Mexican minimum wage between 1984 and 1990 did not increase employment in manufacturing firms. Differences in results may be due to differences in the dependent variable. While Bell studies the impact of minimum wages on employment in large manufacturing firms where workers are paid relatively high wages, this study evaluates the effect of minimum wages on overall employment.

Other studies have not found differences in the skill levels of those benefitting and those losing from reduction in minimum wages. Further research on the effect of minimum wages in the employment of workers with different skill levels may help us better understand the impact of minimum wages in labor markets.

NOTES

Special thanks to Richard Freeman, Claudia Goldin, Guido Imbens and Lawrence Katz for their suggestions and support. I am also grateful to Linda Edwards, Robert Kaestner, Robert Lipsey, Joan Nix, Stephen Machin, members of the Harvard University Labor/Public Finance Workshop, members of City University Graduate Center Applied Economics Seminar and an anonymous referee for their comments. Thanks to Isaac Katz and the Staff of ITAM for allowing me to use their facilities during my visit to Mexico, and to Mario Rodarte and the staff of INEGI for providing some of the data. Financial support was provided by the National Science Foundation, the Tinker Foundation and the Fundacion Mexico of Harvard.

1. The average minimum wage for a given state is the weighted average of minimum wages in different municipalities of the state. Weights are based on the population of each municipality. In 1970 each state had a different minimum to average wage ratio since both the average minimum wage and the average wage was different in each state. By 1990 most states had the same average minimum wage and differences in the minimum to average wage ratio were due to differences in average wages.
2. The day shift is from 6:00 a.m. to 8:00 p.m., the night shift is from 8:00 p.m. to 6:00 a.m., and the mixed shift has day and night shift hours.
3. Mean wages here are equivalent to total labor cost per worker. The Industrial Census wages are based on workers in mining and manufacturing. The Monthly Industrial Survey wages are based only on manufacturing workers.
4. The Card, Katz, and Krueger [1994] comments on the robustness of Neumark and Wascher [1992] results is rebutted by Neumark and Wascher [1994]. Krueger [1994] also comments on the robustness of Castillo-Freeman and Freeman's [1992] results. In addition Neumark and Wascher [1994] re-estimates the results of Card and Krueger [1994] using payroll data.
5. In more recent versions of the Census, data was also gathered from establishments in the construction industry.
6. The Industrial Census was compiled in 1970, 1980 and 1988. I estimate 1990 wages by increasing the 1988 values by the growth in manufacturing wages between 1988 and 1990 based on data from the Mexican Monthly Industrial Survey.
7. This includes salary, bonuses, mandated employee profit sharing payments, the value of in-kind benefits and employer payroll taxes such as social security.

8. The use of fixed weights assures that changes in average state minimum wages are not due to changes in the population living in different minimum wage zones within the state but rather due to changes in minimum wage rates.
9. The ENEU is designed and compiled by the Instituto Nacional de Estadística, Geografía e Informática (INEGI).Sample weights are not used in the analysis because the 1986 weights appeared to be inconsistent with 1988 and 1990 weights.
10. The ENEU does not have information on work shift (day, night, or mixed). Since most individuals work the day shift, I used the number of hours for this shift to calculate the minimum wage per hour. Very few workers earn wages equal to the minimum. This might be due to the fact that hourly wage data in the ENEU is estimated from recorded hours worked last week in main occupation and earnings per month in main occupation. If workers misreport hours worked or if there is a lot of variation in hours from week to week, estimated wages per hour will not be precise. In Table 2, the minimum to average wage ratio is 0.71. This ratio is much greater than the 1985 ratio based on Industrial Census data, 0.26. The difference is partly due to the fact that ENEU wages are based on take-home salary while Industrial Census wages include all payments on behalf of employees. Moreover, wages are based only on workers in manufacturing and mining in the Industrial Census but on all workers in the ENEU.
11. In the table, those classified as earning less than the minimum are workers earning wages at or below 90 percent of the minimum wage. Minimum wage workers earn wages above 90 percent and up to 110 percent of the minimum wage. Above minimum wage workers earn wages above 110 percent of the minimum wage.
12. Equation (1) assumes that the coefficient on the minimum wage index reflects the impact of minimum wages on employment. However, changes in the minimum wage index might be correlated with changes in unmeasured economic conditions that are responsible for employment growth in a state. Variables measuring state business cycle conditions are used to control for the effect of changes in state economic conditions on employment. To the extent that these are imperfect controls the results may be biased.
13. All regressions are weighted by state population. Weights are needed to estimate the average effect of the minimum wage on the Mexican economy. Moreover, weighted regressions are more efficient than those without weights because observations from more populated states have smaller sampling errors [Card, Katz and Krueger, 1993].
14. The control variables manufacturing output and mining output are positive in male regressions and negative in female regressions. Since most of manufacturing employment is male, these variables are good measures of state aggregate demand for male workers but are not as good measures of state aggregate demand for female workers.
15. I have chosen males ages 35 to 44 as controls because they are likely to be high wage earners in most occupations and industries. Their wages are either at their peak or still increasing. In contrast, earnings of some workers within the 45 to 54 year old group might have already started to decline.
16. I do not provide regression results for males ages 25 to 34 and 45 to 54 because their wages are too similar to those ages 35 to 44 and, therefore, including the ratio of employment-to-population of males 35 to 44 years old as a control may introduce endogeneity bias in the regression.

REFERENCES

Bell, L. The Impact of Minimum Wages in Mexico and Colombia. *Journal of Labor Economics*, July 1997, s102 -s135.

Brown, C. Minimum Wage Laws: Are They Overrated? *Journal of Economic Perspectives*, Summer 1988, 133-145.

Brown, C., Gilroy, C., and Kohen. A. The Effect of the Minimum Wage on Employment and Unemployment. *Journal of Economic Literature*, June 1982, 487-528.

Card, D. Do Minimum Wages Reduce Employment? A Case Study of California, 1987-89, *Industrial and Labor Relations Review*, October 1992, 38-56.

_____. Using Regional Variation in Wages to Measure the Effects of the Federal Minimum Wage, *Industrial and Labor Relations Review*, October 1992, 22-36.

Card, D. and Krueger, A. *Myth and Measurement.* Princeton: Princeton University Press, 1995.

_____. Minimum Wages and Employment: A Case Study of the Fast Food Industry in New Jersey and Pennsylvania. *American Economic Review*, September 1994, 772-793.

Card, D., Katz, L., and Krueger, A. Comment on David Neumark and William Wascher, "Employment Effects of Minimum and Submininum Wages: Panel Data on State Minimum Wage Laws". *Industrial and Labor Relations Review*, April 1994.

Castillo-Freeman, A. and Freeman. R. When the Minimum Wage Really Bites: The Effect of the United States-Level Minimum on Puerto Rico, in *Immigration and the Work Force*, edited by G. Borjas and R. Freeman. Chicago: The University of Chicago Press, 1992, 213-244.

Dávalos, J. *Derecho del Trabajo I*, Mexico D. F: Editorial Porrúa, 1990.

Katz, L. and Krueger, A. The Effect of the Minimum Wage on the Fast-Food Industry. *Industrial and Labor Relations Review*, October 1992, 6-21.

Klerman, J. Employment Effect of Mandated Health Benefits, in *Health Benefits and the Workforce.* U.S. Department of Labor, Washington, D.C.: Government Printing Office, 1992

Krueger, A. The Effect of the Minimum Wage When it Really Bites: A Reexamination of the Evidence from Puerto Rico. Working Paper no. 330, Industrial Relations Section, Princeton University, May 1994.

Neumark, D. and Washer W. Employment Effects of Minimum and Subminimum Wages: Panel Data on State Minimum Wage Laws. *Industrial and Labor Relations Review*, October 1992, 55-80.

_____.Employment Effects of Minimum and Subminimum Wages: Reply to Card, Katz, and Krueger. *Industrial and Labor Relations Review*, April 1994.

_____. The effect of New Jersey's Minimum Wage Increase on Fast-Food Employment: A Re-evaluation Using Payroll Records. *NBER Working Paper*, No. 5224, August 1995.

Rodriguez, V. *Decentralization in Mexico.* Boulder: Westview Press, 1997.

Solon, G. The Minimum Wage and Teenage Employment: A Re-analysis with Attention to Serial Correlation and Seasonality, *Journal of Human Resources*, Spring 1985, 292-97.

de Villarreal, N. and Samaniego Breach, R. Evaluation of the Impact of Minimum Wages on the Mexican Economy, in *Assessing the Impact of Statutory Minimum Wages in Developing Countries.* Geneva: International Labour Office, 1988, 81-110.

Wellington, A. Effects of the Minimum Wage on the Employment Status of Youths: An Update. *Journal of Human Resources*, Winter 1991, 27-46.

The World Bank. *Labor and Economic Reforms in Latin America and the Caribbean.* Washington D.C., 1995.