Measuring the Impact of Minimum Wage Policies on the Economy

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Traditional statistical techniques probably underestimate the
negative effects of protective wage regulations on young and
unskilled workers -- who should be getting training, not mini-
mum wages.

Our knowledge about the harmful effects of minimum wage regulations has been strongly influenced by statistical evidence from the industrial countries — which is often based on indirect estimates that do not take into account the many "discouraged job seekers" who withdraw from the labor force (and statistical samples) because of minimum wage regulations. Minimum wage regulations are probably more harmful than economists have assumed them to be.

Government regulation of the minimum wage is most likely to limit the job prospects of young and uneducated or unskilled workers.

Proportionately fewer women than men are affected by the minimum wage because women withdraw from the labor force and remain unemployed — or work in the informal sector and productive activities not accounted for in labor statistics.

Minimum wage regulations should probably not apply to young or unskilled workers or apprentices. It is less important to guarantee unskilled workers a minimum wage and more important to provide them with training that will increase their chances of rising above the need for wage protection.

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Table of Contents

I. Introduction

Recently, notable attention has been lent to the role played by minimum wage (MW) in the process of macroeconomic adjustment. The current professional wisdom highlights the important effect of MWs in raising total labor costs and in contributing to open unemployment. Moreover, in a dynamic context, it is believed that MWs introduce rigidities in the wages structure across industries, thereby hindering smoother intersectoral labor reallocation. The policy implication has been rather straightforward: maintain a low real MW.

Although a great deal is known about the macroeconomic effects of the MW, our understanding of how they work in terms of microeconomic foundations is rather limited. In particular, the effect of MWs on the unemployment and on the employment probabilities of specific labor force groups has not been clearly assessed in the case of developing countries. Our empirical knowledge on this issue has been strongly influenced by the statistical evidence obtained from industrial countries which, in turn, has notably relied on indirect estimating techniques.

In this paper, we undertake a statistical analysis of the effect of MWs on different population groups. The underlying question for this analysis relates to the probable bias exerted by certain protective government regulation in terms of the unemployment prospects of specific groups. We use several cross-sectional data and a standard human capital model corrected for selectivity bias to analyze the case of Chile, where high structural unemployment has been a remarkable feature of the 1970s and 1980s. Our main conclusions show that the coverage of the MW is more significant for the young and the less educated, and there exists a negative relationship between human capital stock and actual coverage of MWs. We also show that previous

statistical analysis of this issue, both in the case of Chile and in industrial countries may have underestimated the negative impact of MWs because they do not correct for selectivity bias.

II. **The Issue**

Two distinct methodologies have prevailed in analyzing the impact of MWs in the economy.[1] In cross-sectional studies different MW levels prevailing across regions (states) are correlated with other observed labor market outcomes, thus providing some policy implications on the basis of specific labor force groups being affected. Studies by Osterman (1979), Cunningham (. and Lang (1982) are very much in this vein; also those by Freeman (1979) and Meyer and Wise (1981) for the specific case of the young. A variant in the application of this methodology is offered by Linneman (1982) who uses cross-sectional regressions to assess the adult wage structure prevailing prior to the establishment of MWs, identifying the subminimum wage population. A second type of methodology is based upon time series analyses that, in principle, would produce more robust results, for they allow a more direct observation of the effect of MWs on certain market outcomes. Cotterman (1981) discusses the issues involved in the specification of a system of econometric relationships; Fels and Van Hoa (1981), and Paldam and Riveros (1987) apply full and partial causality tests between MWs, average wages and other macroeconomic outcomes.

Surprisingly, econometric research on the role played by MWs in LDCs is all but abundant.[2] At the same time, most of the available studies on the role of MWs in industrial economies have been based on the observation of aggregate relationships, usually estimated on the basis of some reduced-form model. These results surround much of the current empirical wisdom, which in turn support many policy recommendations (see, for instance, Drabick and Takayama (1982)).

Although the analytical work has not been done with precision for developing countries, much of the policy insights stemming from research in industrial economies have been enormously influential.

The role actually played by the MW in developing countries is influenced most likely by other labor market characteristics that determine not only its potential coverage, but also their connection to other observed economic outcomes. In particular, segmentation is an outstanding feature of Latin America's labor market (PREALC, 1987) which, in turn, constitutes a major issue in the context of macroeconc·ic adjustment. In several models of segmented labor markets the role played by the MW is considered vital, particularly in connection with the presence of a large and competitive informal market dominated by the presence of quasi-voluntary unemployment. This view of the labor market makes the MW a crucial variable in the context of macroeconomic adjustment [Lopez and Riveros (1987)]. However, in apparent contradiction with the idea that the structure of the labor market is more complex than usually assumed, analyses of the role played by the MW in macroeconomic models has not relied on microeconomic evidence. This evidence includes some relevant factors such as partial coverage, and the direct and indirect effects of the MW on different types of workers.[3]

The impact of MW regulations on specific population groups, as studied in industrial economies [Ragan (1982), Cunningham (1982), and Linneman (1982)], is particularly relevant for developing countries. In fact, the concentration of unemployment among certain groups of the labor force, for instance the young, the unskilled and women, may be an observed result of the bias contained in certain protective government regulations, which are enforced in varying degrees across countries.[4] The possible bias of MW laws against more disadvantaged groups of the labor force is consistent with the observed importance of

structural unemployment in many developing countires. This has lead to recommendations for the deregulation of the labor market to attain equilibrium.

Cross-sectional studies aimed at identifying the actual and potential coverage of MWs in terms of labor force groups face the statistical problem of selectivity bias. In fact, cross-sectional studies on wage setting are based in sample results that exclude the unemployed, thus creating a specification error which implies that the statistical estimates will be influenced by the relative size of the unobserved population in the sample.[5] As a consequence, given the unavailability of data on actual wages below the legal MW level, statistical estimates of the coverage of MWs and of the "damage" caused to specific groups of the labor force, will be underestimated. We attempt to apply a corrective statistical technique to a cross-sectional analysis performed with Chilean data.

III. The Case

The performance of the labor market has been central to the process of macroeconomic adjustment in the 1970s and 1980s in Chile, as indicated by prevailing unemployment levels and enormous wage fluctuations. Given that the role of the MW has been acknowledged as important, the economic policy has put strong emphasis in keeping them down in real terms. However, the evidence reported by available empirical studies does not support the negative effects of MWs on employment. For instance, on the basis of aggregate labor demand estimates, Solimano (1983) has indicated the existence of a low potential negative impact of the MW on the economy. On the other hand, Corbo (1981), based on the parameter estimates for a production function, has calculated an important negative impact of the MW on manufacturing employment. With a more aggregate model, Paldam and Riveros (1987) found that, even though the causality between increases in the MW and the average wages is significant, the causality

between the MW and employment is not as important. However, none of these studies have applied a direct test on the impact of the MW across population groups, which is likely to be more relev in relation to employment effects and coverage of specific groups of indivir als.

The methodology developed by Linneman (1982) was applied to the Chilean case by Castaneda (1983). Linneman examined the impact of MWs on employment and earnings by estimating the adult wage structure which prevailed prior to the change in the federal MW and by identifying the sub-MW wage population that existed at that particular point in time. Likewise, Castaneda estimated a log-earnings function for two different years (1978 and 1981), the first one of which would be characterized by a "low" MW, (i.e., not being "binding" for all practical purposes). He then used these estimates to forecast potential (econometrically-fitted) wages for certain groups in a subsequent year, when the MW was in fact considered "binding". Hence, the fitted money wage computed for the first year was compared with those actually perceived by certain prototype human capital groups during the second year. Castaneda concluded that a significant incidence of MWs existed for young groups, thus being a major reason underlying the concentration of unemployment among these groups.

A major problem with Castaneda's methodology is the specific definition of the years being subjected to a "binding" versus a "not binding" MW regime. This choice requires use of certain value judgements based on the comparison of the current real MW level with some of its past values. The practical implementation of this involves some conceptual problems, such as the selection of the more appropriate price deflator[6] and the choice of the reference period for the comparisons. As it appears clearly in figure 1, the choice would be strongly influenced by inflationary episodes, while the specific reference

Figure 1

CHILE: MINIMUM WAGE INDICES
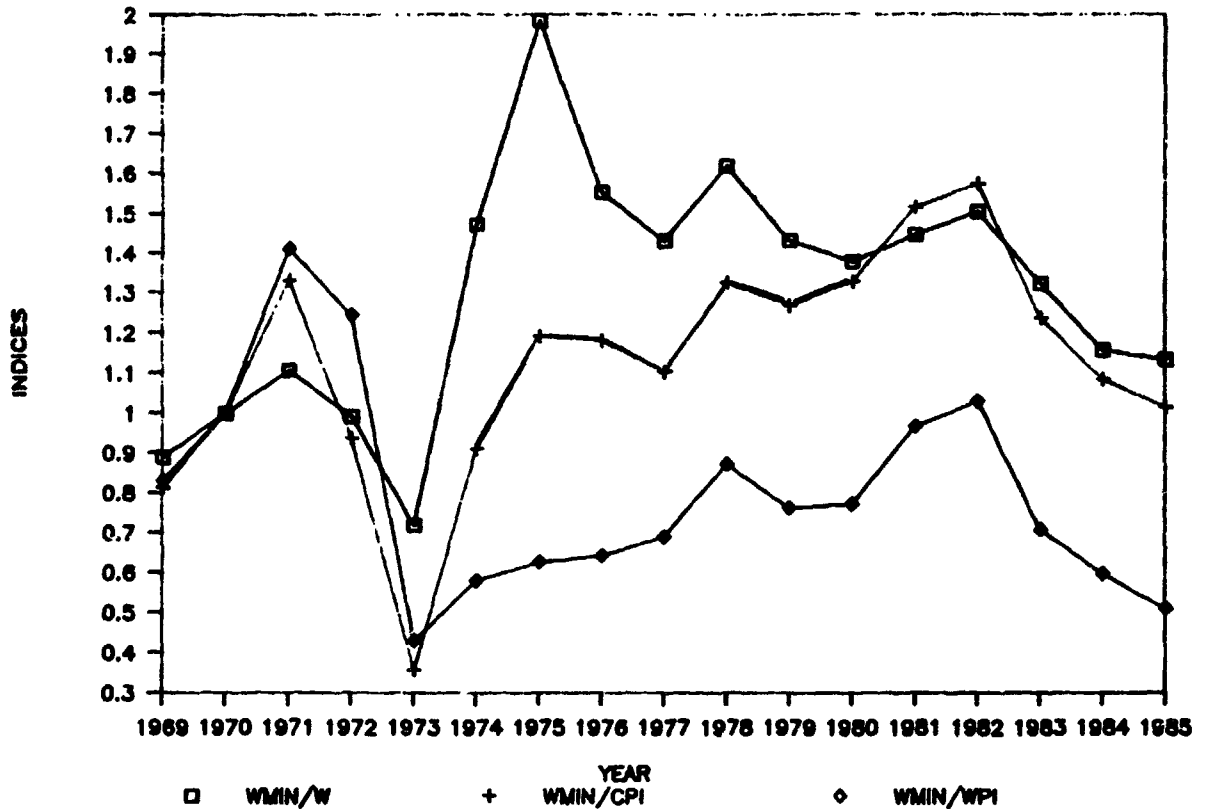
period will very much depend upon other (unrevealed) macroeconomic aspects determining the effectiveness of a certain MW level. Moreover, selectivity bias affecting OLS estimates could make the comparisons between fitted and actual wages very unreliable, particularly if the bias does not remain constant throughout time.

IV. The Model and the Hypotheses

In this paper we apply a correction for selectivity bias to estimate an earnings function for several different years. The basic idea is the same underlying the Linneman-Castaneda approach, but our test does not rely upon any specific judgment about an initial year serving as a reference for comparisons.

We also applied an appropriate estimating technique to account for the bias caused by unobserved units in the sample. Our basic hypothesis is that Castaneda's conclusion underestimates the unemployment impact of the MW because his methodology disregards the fact that the population covered by the MW is not actually observed in wage data as unemployed and seeking inactives are not included when estimating an earnings' function. We would also expect that MWs are more binding for the less educated and the young.

For the purposes of this analysis, the MW is considered binding if the marginal productivity of a worker is less than the actual prevailing MW. We assume that the productivity of an individual is related to a matrix X of human capital characteristics. In following Mincer (1974), and assuming that the marginal productivity of labor is reflected in wages, we postulate a semi-log relationship between wages and the matrix X of human capital characteristics, so that

$$w_i = X_i \beta + \mu_i \qquad [1]$$

where β is a k-dimensional vector of parameters, μ_i is a random term, $i=1...T$ is the number of individuals in the sample, k is the dimension of X (the number of independent variables).

The problem we face is that the variable w_i is not observed in all its range. In particular, we will not observe values under MW, i.e., the distribution is truncated at $w = MW$, implying that we will have observed wages only if

$$MW \leq w_i = X_i \beta + \mu_i \qquad [2]$$

The density function of the truncated normal distribution from which the samples are drawn can be described as

$$h(w/w \geq MW) = \frac{1}{\sigma} f_1\left(\frac{w_i - X_i\beta}{\sigma}\right) / f_2\left(\frac{MW - X_i\beta}{\sigma}\right) \qquad [3]$$

$$h(w/w < MW) = 0 \qquad\qquad MW \leq w < +\infty$$

where $f_1(\ )$ and $f_2(\ )$ are, respectively, the density function and the distribution function of the standard normal. Estimation of [1] by OLS will lead to negatively biased estimates because of the "unobserved" portion of the distribution.

The log likelihood function for the model is

$$\log L = -T \log\left((2\pi)^{1/2}\sigma\right) - \frac{1}{2} \Sigma\left[\frac{w_i - X_i\beta}{\sigma}\right]^2 - \Sigma \log f_2\left(\frac{MW - X_i\beta}{\sigma}\right) \qquad [4]$$

It is possible to show [Maddala (1983)] that the likelihood function is concave and that its maximization according to standard procedures leads to:

$$E(w_i/X_i) = X_i\beta - \sigma\frac{f_1(\ )}{f_2(\ )} \qquad [5]$$

$$VAR\ (w_i/X_i) = \sigma^2 - \sigma^2\left[\frac{w_i - X_i\beta}{f_{2i}} + \frac{f_1^2(\ )}{f_2^2(\ )}\right] \qquad [6]$$

The downward biases of OLS and the maximum likelihood (ML) estimates are evident in the expressions [5] and [6]. Given that no observations are available for $w_i \leq MW$, two-stages methods available for Tobit models are not applicable either (Amemiya (1973)].

The bias involved in the expression [5] corresponds to the usual one associated to the "absence-of-a-relevant-variable" problem. Another form to express (5) is the following:

$$E\left(w_i / I \leq \frac{\mu}{\sigma}\right) = X_i\beta + E\left(\mu / I \quad \frac{\mu}{\sigma}\right) \tag{7}$$

where "I" is the "observability" index $w_i - X_i\beta$ standardized by the variance of μ (σ). The ratio $\frac{f_2(\ )}{f_1(\ )} = \frac{1}{\lambda_i}$ is known as the Mill's ratio and it can be taken as a measurement of the bias of the OLS or ML estimates.

Heckman (1979) proposed to estimate the model by including the "missing" variable λ_i in [1] based on the fact that the inverse of Mill's ratio is a monotone decreasing function of the probability that an observation is selected into the sample. The proposition is to estimate the parameters of the probability that $w \leq MW$. For this purpose we will use a probit regression for the full sample. From these estimators one can compute $\left(\frac{MW-X\beta}{\sigma}\right)$ and hence λ_i. Subsequently, the value λ_i may be used as an extra regressor in [1] thus eliminating the selectivity bias contained in the original estimate of β.[7]

In what follows this technique will be applied to the analysis of the significance of the MW play in terms of different labor force groups in Chile.

The empirical model we will apply is

$$w = X_i\beta + \lambda_i\gamma + E_i \tag{8}$$

where the specification of X_i includes years of schooling, market experience, market experience squared[8] and an interactive variable (schooling)x(experience).

The basic idea is to divide our sample into a group for which MWs are binding and a group for which they are not. The fitted value of [8] will be used to associate human capital characteristics with the prevailing MW level,

Figure 2
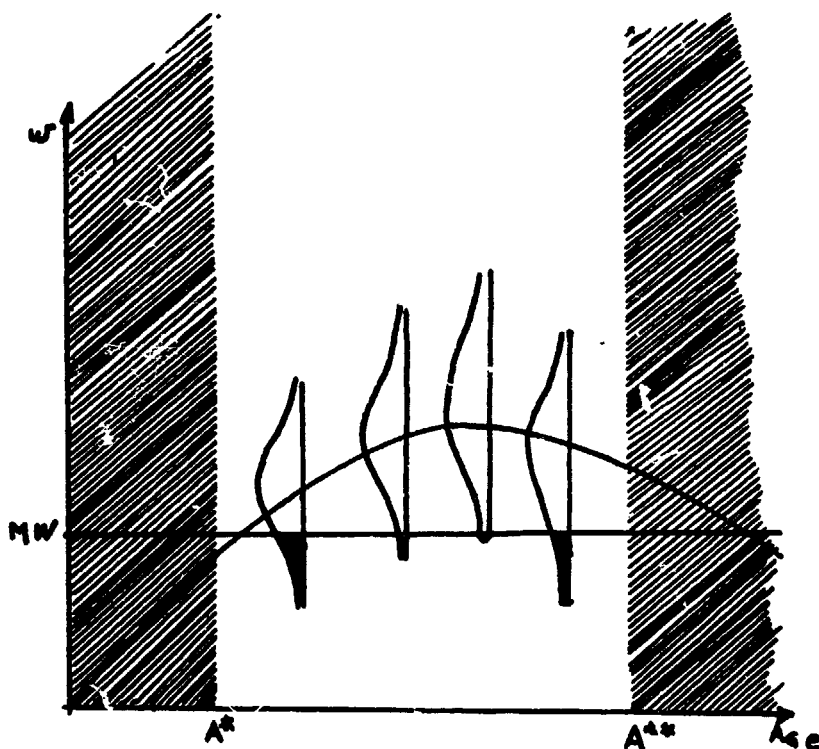
thus allowing us to determine its impact on unemployment probabilities.[9] Hence,

we will calculate, for a given level of human capital (expressed, for instance,

in terms of age) what proportion of the distribution is subject to a binding MW.

According to this methodology, the MW will be binding with different

intensities for different age groups. Therefore, this approach is more in line

with the more recent research on this subject (Plant, et al., 1985) and the

logic implicit in the operation of the MW in the economy. In Figure 2, where

age is presented on the x axis, the "tails" of the distributions for each age

group, remaining under the MW level, correspond to the "coverage" of the MW for

that specific group. The sum of all these 'tails" for alternative values of the

independent variable, corresponds to the total coverage of the MW. The

Linneman-Castaneda approach, on the contrary, assumes that the MW is completely

binding for some (extreme) age groups. In Figure 2, the shaded area below and above the critical age levels (A*, A**) represents the total coverage if one follows their methodology. Of course this area and the one resulting from the method used in this study do not necessarily coincide.

V. The Data

We will use the data provided by the Labor Force Survey conducted annually by the University of Chile in the Greater Santiago area. The survey questionnaire has been fairly similar throughout time, while the sample size and its distribution has been reviewed periodically to account for the city's expansion. The quality of the survey and its representativity is supported by the consistency of its main reported results regarding labor force categories and incomes. Corbo and Stelcner (1980), Uthoff (1983) and Riveros (1986) have used this information to examine wage setting and earnings across several labor force groups, and their conclusions support the accuracy of this sample's information for statistical analysis. The above mentioned study by Castaneda (1983) used this same data source, thus allowing a direct comparison with our empirical results.

In this study we will use a sample of males for the years 1968, 1977, 1980 and 1985, thus spanning a wide range of economic experiences and MW regimes. The sample included employed, unemployed and discouraged job seekers (seeking inactives). Inclusion of seeking inactives reflects our expectations that, under a binding MW regime there will be a decline in participation rates, the effect of which we would like to account for.[10] The distribution of the sample and the average values for the variables are presented in Appendix 1.

VI. The Results

A. Aggregate Estimates

We first estimated the value of λ, through estimation of the probability of belonging to group 1 (employed) or to group 0 (seeking inactives and unemployed). We used a probit model, the results of which are presented in Table 1. In general, the estimates are statistically acceptable, and the parameters are very stable for 1977, 1980 and 1985. However, the observed change between 1968 and 1977 appears very significant, which may reflect change in other labor market conditions, such as total unemployment levels, government intervention and industrial composition of employment.

Table 1

Probit Participation Functions

	1968	1977	1980	1985
Schooling	.0766	.1169	.1314	.1273
	(8.04) *	(11.03) *	(10.73) *	(11.18) *
Experience	.0694	.0952	.1023	.1096
	(9.41) *	(11.30) *	(10.68) *	(12.09) *
Experience Squared	-.0011	-.0013	-.0014	-.0014
	(-10.59) *	(-11.44) *	(-10.62) *	(-11.78) *
(School)x(Experience)	-.0013	-.0015	-.0025	-.0031
	(-3.36) *	(-3.43) *	(-4.81, *	(-6.75) *
Constant	-.4926	-1.2402	-1.33C3	-1.591
	(-4.26) *	(-8.91) *	(-8.44) *	(-10.38) *

Notes:

-2 Log likelihood ratio   207.96   336.13   254.79   257.71
 t ratios appear in parentheses
 * Significant with a 95% confidence interval.

As a second step we computed the value of the inverse of Mill's ratio on the basis of the estimated vector parameters and we proceeded to use standard OLS to estimate the wage equation [8]. The results presented in Table 2 for the four years analyzed show that consideration of the selectivity bias is important in estimating a wage function. This is indicated by the statistical significance of the parameter associated to λ_i and by the important change observed in the rest of the parameters when this variable is included in the model.[11]

Table 2

Estimated Earning Functions Corrected by Selectivity Bias

	Educ	Exp	Exp^2	EducExp	λ	Const.	R^2
1968	.144	.068	-.00086	-.0011	-	-3.28	.465
	(30.3)*	(15.6)*	(-13.1)*	(-4.96)*	-	(-50.8)*	
	.18	.11	-.001	-.0018	1.10	-4.35	.466
	(8.19)*	(4.08)*	(-4.08)*	(-3.84)*	1.74)	(-7.01)*	
1977	.154	.067	-.00081	-.0011	-	-2.01	.431
	(27.6)*	(13.5)*	(-11.5)*	(-4.79)*	-	(-24.6)*	
	.223	.126	-.0017	-.0022	1.30	-3.73	.44
	(6.07)*	(6.42)*	(-5.92)*	(-5.26)*	(3.12)*	(-6.70)*	
1980	.176	.080	-.0009	-.0020	-	-3.42	.426
	(28.0)*	(14.3)*	(-11.6)*	(-7.17)*	-	(-38.3)*	
	.289	.174	-.0022	-.0044	1.95	-6.04	.43
	(9.88)*	(7.18)*	(-6.60)*	(-6.61)*	(3.98)*	(-9.09)*	
1985	.181	.087	-.0010	-.0017	-	-2.96	.441
	(26.5)*	(14.5)*	(-12.9)*	(-5.86)*	-	(-29.9)*	
	.52	.390	-.0050	-.0107)	5.13	-11.26	.45
	(11.3)*	(9.47)*	(-9.27)*	(-8.61)*	(7.43)*	(-10.1)*	

Notes: t - ratios appear in parentheses.
* indicates the estimate is significant with a 95% confidence interval.

The observed change in the rates of return of schooling and experience when the correction for selectivity bias is performed, is certainly striking. For instance, in 1980 the average return of schooling without correction was 14 percent, while after the correction this value increased to 21 percent[12] In 1985 this value rose from 15 percent before correction to 33 percent after correction.

One important factor in overstating the magnitude of the bias for sample selectivit, is the presence of seeking inactives in our sample. As explained above, this group was included because in a developing country this group is fundamentally formed by discouraged job seekers. However, these individuals are also characterized by lower human capital than those actually included in the labor force. As a result, the estimated returns[13] increase substantially when this group is included in a wage equation. As presented in Appendix 2, the results of an exercise using 1987 data show that the inclusion (or exclusion) of seeking inactives from our sample does make a clear difference in terms of the final estimates.[14]

Although the inclusion of seeking inactives introduces an important difference in terms of observed changes in the parameters, it is important to keep them in the sample in order to consider the potential impact of the MW on them. In fact, we believe that a large proportion of seeking inactives withdraw themselves from the labor force because of MWs. Consequently, their elimination from the sample will lead to underestimate the total impact of the MW, which is the central focus in this study.

In order to calculate the total coverage of the MW in the economy, we used two alternatives: the Linneman-Castaneda (L-C) approach and the approach advanced in this paper. Using the L-C method, we computed the percentage of individuals for which the predicted values of wages[15] was less than the

prevailing legal minimum in each year. The results appear in the first row of Table 3. We also applied the "tails" method explained above, the results of which appear in the second row of Table 3, allowing a comparison with the L-C method. In general, our estimates show larger proportions of persons affected by MWs than those associated with the L-C method.[16] These results clearly indicate that the L-C method introduces an important underestimation of the actual coverage of the MW. Our methodological approach can be also used for calculating the expected increase in the population affected associated with a certain given increase in MWs.[17]

B. Effect of MWs upon Specific Groups

Table 4 presents the percentage of different population groups that would have been affected by MWs (i.e., potential "covered" population)

Table 3
Proportion of Persons Affected by the MW

Method	1968	1977	1980	1985
Linneman-Castaneda	0.69	0.00	10.36	12.34
Tails	10.44	0.01	24.44	25.57

Source: Table 2

during the years 1980 and 1985. In general, the groups most affected by MW laws are the young and the less educated. This information also shows that the impact of MWs on unemployment (and probably also disguised unemployment), is important despite of the fact that MWs declined substantially in real terms in

Chile during the 1980s. Finally, an interesting observation derived from our estimates is that the proportion of women affected by the MW is lower than that of men. One interpretation for this is that women affected by the MW withdraw themselves from the labor force and work in the informal sector and in other productive activities which are not totally taken into account by labor force surveys. Moreover, it has been observed that the average women participating in the labor force has an above-the-average human capital, and it is likely that on the average the pi portion of women covered by the MW is in fact less than that for men.

The estimates presented in Table 4 have been based on the total predicted wage computed with the OLS estimates of [8]. As discussed above, this method underestimates the actual coverage of the MW. In order to analyze a more accurate computation, we should compute the change in the cumulative wage function with regard to changes in the MW for a given human capital level. The computed density function (DF), which corresponds to the change in coverage with increases in the MW, are presented in Table 5 for the years 1980 and 1985, and for some specific experience and schooling years.

As shown in Table 5, the proportion of young individuals affected by an increase in the MW appears extremely high (between 40 percent and 50 percent). In the case of the older, more experienced group, the potential coverage decreases substantially between 1980 and 1985, suggesting this group is more affected by elements related to a contractionary global economic situation. In general, however, one may conclude that, in considering the potential coverage seen for both 1980 and 1985, the relative change in MWs is more binding for the young than for the older group. This is consistent with the relatively larger expansion of unemployment among the young between those years, at the same time that the prevailing MW is more binding in terms of real levels (Figure 1).[18]

Table 4

Proportion of Pérsons Affected by the MW Classification
by Personal Characteristics
(percentages)

	1980	1985
Experience (years):		
4 - 10	45.6	47.0
10 - 20	11.3	13.4
21 - 50	2.2	4.7
51 - and more	8.5	19.5
Education (years):		
less than 8	26.5	39.5
less than 12	8.3	12.3
12	0.0	0.0
12 and more	0.0	0.0
Males	12.0	14.0
Females	7.4	9.6
Employed	8.4	9.6
Unemployed	17.5	16.1
Inactive	14.7	19.9

Table 5

Computed Density Functions

	E(w)	DF(1980)	E(w)	DF(1985)
Years of experience:				
4 - 10	-1.54	0.50	-1.29	0.39
11 - 20	-0.89	0.27	0.04	0.18
21 - 50	-0.48	0.10	0.58	0.04
51 and more	-1.82	0.47	-2.88	0.03
Schooling years:				
less than 8	-2.18	0.32	-2.16	0.06
8	-1.13	0.38	-0.51	0.43
12	-0.28	0.06	-0.82	0.01
12 and more	0.35	0.004	1.81	0.00
log $\bar{w}$	-1.59		-0.86	
σ	0.62		0.63	

DF = Density Function, estimated as $f\left(\frac{MW-E(w)}{\sigma}\right)$.

C. MW Coverage and Human Capital

In addition to the above exercise, we also estimated the relationship between human capital characteristics and the probability of being affected by MWs. With this in mind, we defined Vi as the difference between E(W) and MW. For all Vi < 0, the MW was considered binding. Subsequently, we generated a dummy variable (PA) with value 1; if Vi $\geq$ 0 (and 0 otherwise), and we regressed PA against certain human capital characteristics. The results appear in Appendix 3. They indicate that, in general, there is a significant positive correlation between the MW and human capital variables,[19] thus suggesting that the young and the less educated are most likely affected by increases in the MW.

Similarly, and with the purpose of examining the effect of marginal changes in the degree of "bindingness" of MWs, we regressed a dummy variable (EM) with value 1 if the ith individual was unemployed or inactive (and 0, otherwise) against the numerical value of Vi.[20] As the results in Appendix 3 show, the degree of bindingness of MWs, as measured by the numerical value of Vi, significantly explains the probability of being unemployed for all groups. The quadratic term was, however, not significant, suggesting that the percentage change in unemployment probabilities was approximately the same across groups for a given change in Vi.

VII. Concluding Remarks

The effect of MW policies on the employment prospect of specific groups of the labor force has remained largely ignored in the empirical research done on developing countries. Despite its importance in connection with policies seeking to minimize the negative effect of labor protective regulations, this issue had only been approached on the basis of the evidence offered by studies

prepared for industrial countries. However, these studies have been chiefly
based on comparisons of several cross-sections, with no correction for sample
selectivity biases in estimating the coverage of the MW had been done.
Nonetheless, this can be an extremely important factor in developing countries,
where the absence of affected population in the sample is likely relatively more
important than in industrial economies.

In this paper we have applied a statistical technique which is
basically different from the traditional one used to analyze the effect of MWs
across population groups. The statistical analysis presented in this paper
reveals a significant underestimation when the sample selectivity bias is not
considered in estimating a wage equation. In particular, we have shown the
serious underestimation of the rate of return to human capital, which in turn
may lead to originate misjudgments about investment prospects. We have used a
sample in which we included both the total labor force and the seeking
inactives. Even if the latter are excluded from the sample, a substantial
selectivity bias is still apparent.

Our results also show that MWs are more binding for young workers and
for the less educated, groups for which the employment probabilities are
substantially notably affected. We have estimated that an increase in the MW
level will more significantly affect both these groups than other groups, thus
implying the existence of unequitable effects in terms of unemployment. More
specifically, we have indicated that the probability of being affected by the
MW, and thus of being affected by its employment consequences, is highly and
negatively correlated with the human capital stock.

The analysis performed indicates that the MW is a powerful tool having
the impact of creating structural unemployment. The results do not imply that
the MW is necessarily "bad". However, while more applied research is necessary

to determine specifically the groups most affected, a general policy implication is that MWs should not apply to young workers, or possibly apprentices. In addition, the results suggest the importance of training to increase the human capital stock in the labor force, in order to reduce the population potentially covered by MW laws.

F O O T N O T E S

1   For reviews, see Brown, et al (1982), West & MacKee (1980), Cox & Oaxaca
     (1982).

2   For reviews, see Fallon and Riveros (1986) and Paldam and Riveros (1987).

3   An exception to this is Edwards (1986).

4   International comparisons of the degree of "aggressiveness" of MW policies
     indicate varying results. See Fallon and Riveros (1986) and Starr (1981).
     For the case of Latin America, see Paldam and Riveros (1987)

5   The basics are found in Heckman (1979) and Blooms and Killingsworth (1982).
     The fundamental problem is associated to the correlation between the
     conditional error of the distribution under selection in the sample and the
     independent variable (for instance human capital characteristics).

6   For instance, as suggested by Graph 1, there are significant differences in
     the evaluation of the MW when deflated by the CPI, the WPI, the GDP
     deflator or if they are simply expressed as a ratio of average normal
     sector wages in the economy.

7   According to Heckman (1979), the estimated β's and the estimated parameters
     associated to λ_i are consistent.

8   This variable is defined as Age minus Schooling Years minus 6. The squared
     variable aims at controlling for the existence of increasing returns at
     decreasing rates. See Mincer (1974).

9   A problem with this methodology is that it does not allow one to know
     exactly the proportion of persons in the labor force affected by the MW
     given that, for a given set of observable human capital characteristics,
     there prevails a distribution of unobservable characteristics also valued
     in the market.

10   In our empirical exercise below, we study the sensitivity of our estimates
     to this particular definition.

11   As implicit in our discussion above, the absence of correction for
     selectivity in the sample, introduces a downward bias in the estimates of
     the other parameters in the model. The intuition is that, the larger the
     human capital, the larger the probability of observing the right wages in
     the sample (i.e., the lower the omission), thus underestimating the use of
     return to human capital.

12   The return to schooling is $\delta w/\delta S_i = \delta \ln w^*/\delta S_i = \hat{\alpha}_1 + \hat{\alpha}_4 \overline{EXP}$. The return to
     experience is $\hat{\alpha}_2 + 2\hat{\alpha}_3 \overline{EXP} + \hat{\alpha}_4 \overline{S}$.

13   It is also important to consider that the number of seeking inactives in
      Chile has been increasing through time relative to the labor force, while
      its behavioral pattern has been notably procyclical [see Cortes (1983) and
      Riveros (1986)].

14   In fact, according to the results in Appendix 2, the rate of return to
      schooling with inactives changed from 21 percent to almost 39 percent when
      correction for selectivity bias was made. However, when the seeking
      inactives are excluded from the sample, the observed change goes just from
      21 percent to 30 percent.

15   This value is estimated on the basis of the OLS regression based on
      equation [8].

16   Partly those results are associated to low R squared which are crucial
      factors in the L-C methodology. In addition, those differences also
      account for the fact that the L-C approach does not correct for selectivity
      bias.

17   In fact, our method allows us to calculate the probability of coverage,
      expressed as the change in proportion of persons affected with respect to
      an increase in MWs. The percentage change in this probability is $g[MW -
      E(Wi)]/\sigma^2$, evaluated at the difference between the actual MW and the
      predicted value E(W). For instance, in 1985, an increase of 10% in the MW
      would have produced an increase of 5.6 percent in the number of persons
      affected.

18   The unemployment rate for the young (15 to 19 years old) in 1980 and 1985
      was 26.3 percent and 36.7 percent respectively. For the older (60 to 69
      years old) group unemployment was 9.3 percent and 11 percent in the same
      years.

19   The model included the probability of not belonging to the affected
      population (Vi>0) in the left hand side. The regressors were the same ones
      considered for the case of the wage equation, plus a dummy variable for
      sex. The dummy variable did not appear significant in explaining the
      probability of being covered by MW laws.

20   This equation included V_i, V_i^2 and a dummy for sex.

APPENDIX 1
Sample

Year		Total	Males	Females
1968	0	1036	341	695
	1	3010	2216	794
	Total	4046	2557	1489
1977	0	1018	490	528
	1	2885	2068	817
	Total	3903	2558	1345
1980	0	884	402	482
	1	2609	1849	760
	Total	3493	2251	1242
1985	0	1259	584	675
	1	2573	1804	769
	Total	3832	2388	1444

1 = Employed
0 = Unemployed and seeking inactives

Averages
(years)

	1968	1977	1980	1985
Schooling	8.536	9.533	9.882	10.562
Experience	19.503	18.475	17.673	17.639

APPENDIX 2

OLS Wage Equations for 1987: With and Without Seeking Inactives

	Constant	Schooling	Exper.	Exper^2	SchExp.	λ	R^2
With	-2.85u8	0.205	0.0799	-0.0008	-0.0019	-	.47
	(-28.63)	(30.32)	(13.02)	(-9.48)	(-6.917)	-	
	-10.97	0.5534	0.3446	-0.0042	-0.0095	5.36	0.49
	(12.34)	(14.37)	(11.71)	(-11.1)	(10.97)	(9.19)	
Without	-8.554	0.4441	0.2865	-0.0033	-0.0076	5.538	0.49`
	(-11.21)	(13.70)	(10.21)	(-9.71)	-9.51	(7.54)	

t-ratios in parentheses

APPENDIX 3

A. Probit Estimates of Being Unaffected by MWs

	1980	1985
Constant	-62.62	27.3
	(-11.85)	(-13.9)
Schooling	6.16	2.55
	(11.8)	(13.8)
Exp	2.42	0.97
	(11.85)	(13.65)
Exp^2	-.0245	-.010
	(-11.8)	(-13.99)
SchoExp	-.336	-.015
	(-5.91)	(-4.38)
DSex	.32	-.023
	(1.19)	(-.15)

	1980	1985
PA = 0 (affected by MWs; Vi < 0)	362	473
PA = 1 (unaffected by MWs; Vi ≥ 0)	3131	3359
-2 log likelihood ratio	2224.1	2496.2

B. Probit Estimates of Being Unemployed or Inactive

	1980	1985
Constant	1.31	1.13
	(16.26)	(15.5)
V_i	-.68	-.82
	(-5.5)	(-1.2)
V_i	0.11	-.078
	(1.41)	(-1.24)
DSex	-.71	-.70
	(-14.26)	(-15.47)

	1980	1985
-2 log likelihood ratio	425.5	427.3

Note: $V_i = \left(\dfrac{MW - E(W)}{\sigma}\right)$

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