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THE CAUSAL ROLE OF MINIMUM WAGES IN SIX LATIN AMERICAN LABOR MARKETS

by

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A B S T R A C T

Minimum Wage (MW) regulations are an old tradition in Latin America. Controversy about their effects on inflation, unemployment, wage flexibility and international competitiveness has became central in the context of macroeconomic adjustment. The strategic question analyzed in this paper refers to the role of MWs in moving the entire wage structure up; subsequently, their effects on inflation and employment are also analyzed. The countries studied are Argentina, Brazil, Chile, Colombia, Mexico and Peru; the methodology is based on application of causality tests. Results indicate that there prevails a weak causality link from MWs to average wages in Argentina and Peru, but that this connection is very strong in Chile, Colombia and Mexico As with regard to distributive impact, the tests reveal that MWs do not exert a significant role in shrinking the wage structure, although our results are for some of the countries only. The causality from inflation to MWs proved important in all our countries, but Argentina; the causality the other way around resulted significant in Chile, Colombia, Mexico and Peru. The main implication of the study is that existence of MWs cause aggregate effects only when they are used aggressively as a policy tool, while their actual impact would depend upon the particular targets been sought and the specific institutional role assigned to MW policies.

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1. INTRODUCTION.

Most countries have (Minimum Wage) MW-regulations, either in the form of laws, or as a result of central wage agreements MW- policies are often controversial both with the general public and with the economic profession; but they are not easy to analyze empirically as MWs are used very differently: sometimes they are used actively to improve the income distribution, but mostly they are used passively, so that MWs are periodically adjusted to CPI inflation. Main controversies can be summarized by considering the economic arguments in the extreme cases for and against (the active use of) MWs:

The case FOR MWs rests on the belief that the economy is quite far from the GE-optimum (or that this whole concept is irrelevant) also as regards the job-allocation in the labor market Monopoly power of firms and certain unions has reduced wage shares, and, at the same time, made certain skilled wages too high relative to low wage groups. Therefore it would be easy to narrow the differential, and this would lead to the society (especially the low income groups) being better off[1/]. In this view MWs will not lead to [much] more inflation, and, consequently, they cannot cause a fall in expected incomes of the low wage group.

The case AGAINST MWs starts from the claim (dear to the economist) that the structure of wages is due to supply and demand. In order to change relative wages one has to change the factors of supply and demand, i.e the skill composition of the labor force, the industrial structure and so on. Just

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1/ In short, MW-policies are seen as a means to decrease structural wage differentials in the labor market. In the structuralist analysis such differences are taken to be a central fact of the labor markets performance in Latin America.

increasing the MW will, therefore, at best increase inflation by the same percent and at worst (or in some mixture) will lead to unemployment concentrated in the low wage group, i.e the ones the MW is supposed to help. In any case the society will end up being worse off since, as a matter of fact, the drop in employment will correspond to a drop in real production.

It is easy to strengthen BOTH the cases for and against MWs by taking the longer run dynamic into consideration. At the same time, one could also formulate a great deal of "reasonable" intermediate positions. Nonetheless, it is striking that the empirical results found to date in this field have not been strong enough for professional economists to be able to reach some agreement as to the most likely outcome of MW-policies.

Hence, there are three essential issues to analyze: the effects of MWs on inflation, on employment and on income distribution. The last issue is, as usual, difficult as a full analysis requires very rich data; but the reader will see that we have found some wage relations to analyze. The relation between MWs and inflation is straightforward to analyze using CPI-data Em- ployment/unemployment data of a sufficiently good quality are hard to obtain for all the countries so our results are here for some countries only. However, we think the strategic tests - in the analysis of all three issues - are the ones analyzing the relation between MWs and average wages. If there is a strong causal relation from MWs to average wages then MWs generate inflation and (if the inflation is accommodated) small changes in employment and the income distribution.

We concentrate on six Latin American countries: Argentina, Chile, Brazil, Colombia, Mexico and Peru As the subject is so controversial, and as the main questions to be analyzed are straightforward, we have chosen to use

the technique of causal testing where results are reached without having to rely on structural assumptions[2/].

In Section II we give a brief economic history and a sketch of the institutional background as regards the labor markets in our six countries ..Section III gives a short survey of the main findings in the literature, concentrating on the Latin American discussion. Section IV discusses the technique, while Section V presents the causality tests between the MW-series and various aggregate wage-series for the countries. Finally, Section V makes an attempt to draw some conclusions from our findings. It is worth already to stress that we find quite different results as to the causal connection between MWs and other wages in the six countries. This we ascribe to the very different ways MWS can be used policy-wise. Also the different results can help explaining some of the differences in opinions as regards the usefulness of the MW-policy tool.

2. THE LABOR MARKETS

Inter-country studies provide greater variation with regard to empirical data and allow a perspective unavailable in the information from any one country. In comparative studies it is however, important to keep the comparisons within bounds: if the countries are too different it is hard to attribute differences in the country results to any of the many differences

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2/ Causal testing has not been applied to Latin American minimum wages before; but Fels & Hoa (1981) analyze the case of Australia, with the same techniques. Their results are similar to ours, but they reach a more complex causal structure than we have managed to find, mainly because of better data availability in Australia.

among the countries. Our six countries have similar historical and cultural backgrounds. In addition they share common economic characteristics, as regards per-capita income levels and development strategies. However, marked differences also appear at closer inspection, particularly their wide range of experien- ces with regard to unemployment, wages and inflationary records. This section is aimed at examining those differences, so to obtain a framework suitable to evaluate our statistical results.

Some main data are presented in Table 1. Figures in column "u" for each of the six countries' unemployment rates[3/]. From those figures it is evident that the countries can be placed in three groups: the first one, characterized by low (and stable) unemployment rates, consists of Argentina and Peru during the early 1970s; the second one, with a medium level of unemployment consists of Mexico, Brazil (at least from 1980) and Peru; the third group, with high unemployment rates, is Chile and Colombia (and probably Peru during 1984-1985).

Both in Chile and Colombia explanations of heavy unemployment have run along similar lines, the cause being attributed to sectoral disruptions and low labor mobility that, in turn, produced significant inter-sectoral wage differentials among industries [see Lopez (1987) and Riveros (1986)]. Besides this, increasing labor supply pressures combined with wage rigidities has also created some unemployment [Reyes (1986) and Riveros (1986)]. By contrast, as argued by Sanchez (1987), decreasing participation rates are key to understand

3/ There are, of course, some differences in statistical definitionsand geographical coverage, and well known problems as regards the concept of unemployment, in countries with large informal/traditional sectors. Our data, however, are broadly comparable insofar as different methodologies do not fundamentally explain observed differences across countries.

low urban unemployment in Argentina, while in Mexico, as well as in Peru, unemployment seems to follow closely the ups and downs of the aggregate activity [Reyes-Heroles (1985) and Suarez (1987)].

Even when the six labor markets have all been subject to severe macroeconomic strains in the period covered, these strains have been differently distributed over time till recently, when the financial crisis of the 1980s has exerted severe internal impact in all our countries. However, even here reactions in in terms of labor market variables have been different because of the mix of policy tools used in each country, in accordance with different targets as regards the social cost of the adjustment.

Among the six countries, Argentina is the one showing the "wildest" inflationary peaks combined with the strongest fluctuations in real wages. Strikingly, this combination and the existence of low real growth rates, has not significantly raised open unemployment. Dramatic wage fluctuations within the period are strongly connected with unusual political instability and changing importance of unions and other institutions in the wage setting process [di Tella (1983)].

The two countries with the strongest growth record are Brazil and Mexico. Both have experienced steady economic deterioration since the peak in the early 1970s -- not only did the rate of inflation go up, but the real growth rate dropped from the high growth period. The development is most dramatic in Brazil, both as regards the growth wave in 1967-74 [see Macedo (1986)] and the ensuing inflation. In both cases, real wages have suffered due to the general macroeconomic problems, particularly the high inflations of the 1980s. Finally, the case of Peru is similar with regard to inflation and real wages behavior, but deterioration started from a much less favorable starting point.

Table 1 The Main Characteristics of the Six Labor Markets.

	ARGENTINA				BRAZIL				CHILE			
	u[a]	p[b]	w[c]	MW[d]	u[e]	p[b]	w[c]	MW[d]	u[f]	p[b]	w[c]	MW[d]
1970	5.0	13.6	100	100		22.4	100	100	5.7	33.0	100	100
1971	5.9	34.8	105	107		20.1	110	101	3.8	19.2	119	118
1972	5.8	58.4	99	95		16.6	114	103	3.1	77.3	96	110
1973	4.7	61.2	107	110		12.7	119	107	4.8	353.6	50	76
1974	4.2	23.5	126	136		27.6	119	100	9.2	504.7	63	79
1975	3.6	182.3	124	115		29.0	127	105	15.5	274.7	61	79
1976	4.8	443.2	80	51		42.0	129	106	20.6	211.8	77	78
1977	2.3	176.0	76	50		43.7	134	105	19.2	91.9	76	80
1978	3.3	175.5	77	42		38.7	142	108	18.0	40.1	83	94
1979	2.5	159.5	86	47		52.7	134	108	17.2	33.4	91	93
1980	2.5	100.8	100	55	7.5	82.8	130	110	16.7	35.1	98	93
1981	4.8	104.5	91	53	8.6	105.6	118	109	16.3	19.7	107	96
1982	5.3	164.8	79	58	5.8	98.0	115	110	28.6	9.9	108	95
1983	4.7	343.8	96	81	6.7	142.0	97	99	27.8	27.3	101	77
1984	4.6	627.0	112	74	7.7	197.0	84	89	25.2	20.0	101	72
1985	4.7	672.2	98	71	na	226.8	na	na	22.1	26.4	98	70

	COLOMBIA				MEXICO				PERU			
	u[g]	p[b]	w[c]	MW[d]	u[h]	p[b]	w[c]	MW[d]	u[i]	p[b]	w[c]	MW[d]
1970	9.9	6.5	100	100	7.1		100	100	4.7	5.0	100	
1971	10.2	9.5	105	90	na	5.2	103	95	4.4	6.8	94	107
1972	9.4	13.0	100	96	na	5.0	104	106	4.2	7.2	114	106
1973	11.8	20.9	97	85	7.6	12.1	104	102	4.2	9.5	134	97
1974	11.6	24.5	94	103	7.4	23.8	107	108	4.0	16.9	132	103
1975	11.2	22.6	92	105	7.2	15.1	114	109	4.9	23.6	111	99
1976	10.4	20.2	83	95	6.7	15.8	123	122	5.2	33.5	116	94
1977	9.6	33.2	81	102	8.0	29.0	125	121	5.8	38.1	97	82
1978	8.1	17.8	93	115	6.9	17.5	122	117	6.5	57.8	88	66
1979	9.1	24.6	97	128	5.7	18.2	121	116	7.1	66.7	86	69
1980	10.0	26.6	101	134	4.5	26.4	116	108	7.0	59.2	93	79
1981	8.7	27.5	108	139	4.2	27.9	119	113	6.8	75.4	90	66
1982	9.3	24.5	112	144	4.2	58.9	117	101	7.0	64.4	92	62
1983	11.0	19.8	114	151	6.7	101.8	86	83	9.2	111.2	75	64
1984	13.2	16.1	117	157	6.0	65.5	83	77	10.9	110.2	65	60
1985	14.0	24.0	119	161	4.8	57.7	84	na	12.0	163.4	53	43

DEFINITIONS AND SOURCES:

a = National Average Unemployment Rate (INDEC:Encuestas Permanentes de Hogares).
b = Average Yearly Inflation Rate (IFS).

c = Real Wage Index Base 1970=100--Deflator:CPI (ARGENTINA:Sanchez (1987); BRAZIL:Average Wages for Skilled Workers in Construction --Central Bank; CHILE: Riveros(1986); COLOMBIA: Reyes (1986); (notes to Table 1 continued) -7- MEXICO: ILO(Yearbook) and Banco de Mexico(1986); PERU: Ministerio del Trabajo and ECLA(1986).
d = Real Minimum Wage Index Base 1970=100 --Deflator:CPI (ARGENTINA: ECLA(1984) and Sanchez (1987); BRAZIL :Central Bank; CHILE: Riveros (1986) and Central Bank; COLOMBIA: Reyes (1986); MEXICO: Comision Nacional de Salarios Minimos; PERU:Ministerio del Trabajo).
e = Unemployment Rate in Rio de Janeiro; since 1982 it corresponds to a national average [Macedo (1986)].
f = Unemployment Rate for Greater Santiago; since 1975 it includes unemployed participating in Public Employment Programs [Riveros (1986)].
g = Urban Unemployment Rate [Reyes(1986)].
h = 1970-1974:Federal District. Since 1975:National Urban Unemployment Rate [ILO (Yearbook) and Direccion General de Presupuesto].
i = Metropolitan Lima (ILO(Yearbook) and Suarez(1987)).

Colombia is the country with the lowest and most stable inflation in the period, having also the smallest fluctuations in real wages when inflation was peaking. Consequently, real wages have been very stable, with significant growth after 1981. Chile, on the contrary, stands out as the country where inflation is most extreme early in the period, conveying dramatic fluctuations in real wages[5/]. Also, the uneven Chilean growth record stands out, with high growth in the middle of the period and recessions at both ends. The heavy unemployment rates of the 1970s further increased with the recession, while real wages never recovered the previous 1971 level; in part, this was due to elimination of unions after 1973, which is especially important because of the former tradition of strong union activism (Falabella, 1980).

5/ The exact course of real wages from 1971 to 1978 in Chile ishighly debatable thanks to great measurement problems: the CPI controversy, the attempts to suppress inflation creating large scarcities, etc. However, there is no doubt that there were large real wage fluctuaicns.

MWs have traditionally been a central labor market feature in the six countries. Colombia is the economy where MWs have been used more aggressively during the period, as indicated by their real growth. By contrast, in Peru and Chile MWs have been steadily falling altogether with average wages. Mexico and Argentina practiced expansionary MW policies until the middle 1970s, but from then on governments let real wages fall; in the case of Mexico this restrictive MW policy - although constrained by political negotiation - explains very well long term employment trends (Casar & Marquez, 1983). Brazil attempted a mild expansionary policy in 1970-82, though letting real MWs fluctuate a bit; however, in the middle of the recession, the government did not insist in its distributionist aims anymore.

In all our countries there seems to be significant segmentation between formal and informal urban labor markets as well as between rural and urban markets. Consequently, one has to be careful in aggregate studies: there are likely to be not only adjustments in terms of unemployment and wages, but also through changes in the composition of the labor force across segments[6/], not shown in available statistics. However, MW enforcement is largely restricted to the formal sector, and, at the same time, average wages represent formal sector wages. Therefore, lack of informal sector data is not a serious problem for our study.

To summarize, MW dynamics is different in our countries, particularly whit regard to its interaction with average wage and unemployment trends. Only in Colombia there has prevailed a similar and marked increasing trend in

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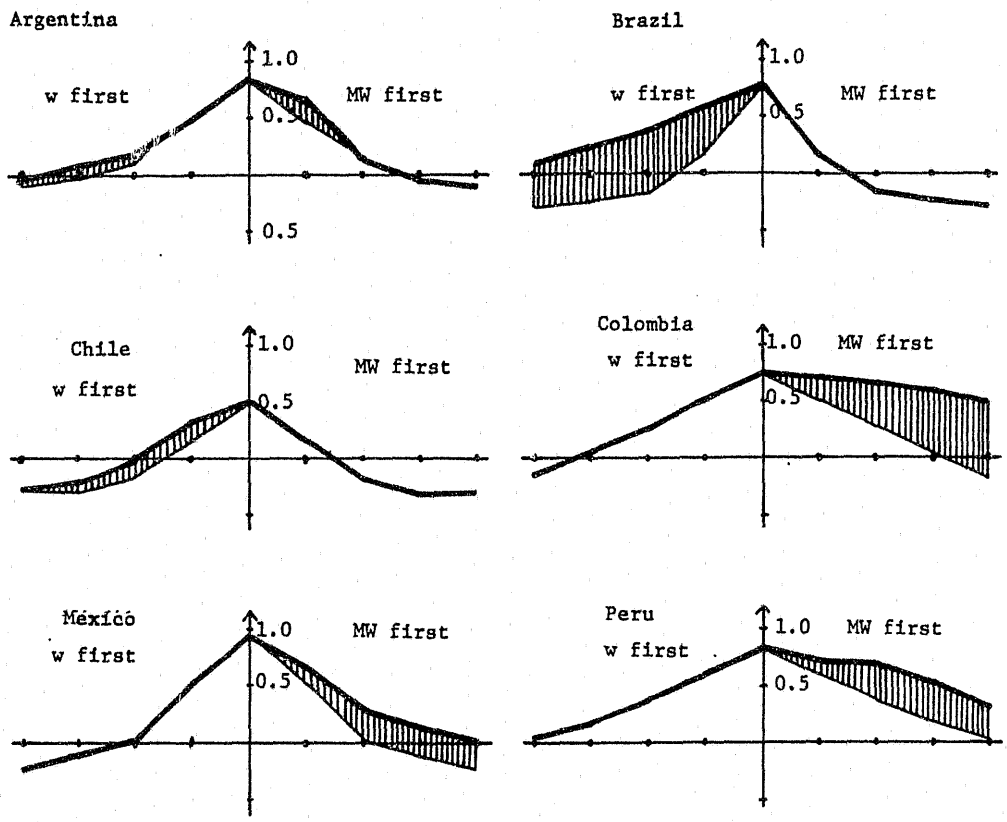
6/ I.e., through the employment and earning opportunities existing in informal activities. See, for instance, the analysis by Tokman (1984) with regard to adjustment of Latin American labor markets in process of macroeconomic stabilization.

both MWs and unemployment; in the case of Mexico, this relationship is also seen, but it is clearly weaker. With regard to the connection between MW and average wages, the aggregate data in Table 1 appear to indicate strong correlation in Colombia, Chile, Mexico and Peru; in Brazil this has happen only until 1978. In Argentina, by contrast, this connection is rather mild. The question is whether the presence of such a connection can be attributed to the existence of a causal relationship from MWs to average wages. This question will be analyzed in Section IV.

Fig.1 Correlation Between Real Wages and MWs with Assorted Lags.



Note: The correlations are calculated on the real indexes of Table 1 using 9 lags., i.e. the extreme left hand observation show the correlation between W and MW four years later; then follows W and MW three years later, etc. Shaded areas show the asymmetries.

3. MWs IN LATIN AMERICA - NOTES ON THE LITERATURE.

MWs are an old tradition in Latin America, as they were introduced as components of populist/socialist policies aimed at improving income distribution around half a century ago. They have remained as a policy tool ever since -- albeit a tool used with variable vigour by the various governments in accordance with other targets, such as controlling inflation and creating politico/social stability[7/].

3.1 Historical Trends and Purposes of MWs.

In all our countries use of MW regulations started in the 1930s. Both in Mexico and Peru, however, the principle had been formulated still earlier[8/], but the general implementation first occurred in 1931 and 1933, respectively, when specific legal norms were enacted. Similarly, the principle was stated in the Chilean labor Code of 1931 and a MW system was set up for nitrate workers in 1934; from then on, the system was made nationally binding to cover industrial and agricultural workers. In Brazil, the legal framework was established in 1938, the first MW-level being scheduled in 1940. In Argentina, MW origins are found in local initiatives in the 1930s, but they became national law in 1946. Finally, in Colombia though provisions concerning MW fixing had existed before, steps were taken in 1945 to organize

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7/ A good description of the origins of MWs and the institutional background is found in ILO (1954), while Webb (1977) is a newer summary of the main issues discussed.

8/ In Mexico, the 1917 Constitution had already introduced the principle. In Peru, MW regulations date back to 1916, when the government fixed minimum pay for unskilled workers in Lima.

a formal administrative machinery.

The tendency of MW-laws in Latin America has been to include all workers regardless of sex, age, geographical context, skills and occupations. Nonetheless, few exceptions have been allowed, as for instance workers under 16 years old in Colombia, domestic servants in Argentina, apprentices in Colombia, Mexico and Peru. Although laws stress "need" as the criterion for MWs[9/], it has been rare to impose uniform rates based on empirical studies of "needs" so that, by and large the fixing criteria has been dominated by political assessment and expediency.

The fixing machinery shows remarkable variation across countries, and in some cases it has reached high complexity, with labor/management participation as well as central deciding authorities[10/]. Different groups of workers are usually identified in the wage setting process, which builds up into a rather complex negotiation and information structure. The case of Mexico is classical to this respect, where 111 geographical regional and 86 job categories are considered for MW fixing. However, the actual fixing of the MW-structure is done at the central level, as a deliberate policy act.

9/ In Argentina, the law states that NW is "the remuneration for work that () will ensure an employee or worker and his family adequate food, healthy living quarters, clothing, education of his children, medical care, transport, pension, holidays and recreation. Similarly, the notion of "normal needs" is stressed in the Brazilian law, while in Mexico and Chile "adequate living standards" and "daily minimum consumption standards" are explicitly mentioned. Finally, in Colombia, MW is designed to cover a worker's "normal requirements and those of his family both in the material and in the moral and cultural spheres".

10/ In the case of Brazil, for instance, committees formed by workers and employers approve certain MW schedules that must befurther confirmed by a presidential decree. In Mexico MW boards function at parish levels with representation of workers, employers and government, their recommendations going to a national committee. This type regional organization alsoworks in Argentina, but in Chile and Peru the system is centralized with indirect participation of workers.

As argued by Webb (1977), after about 50 years the issue of MWs has become less their existence than their level. While the basic purpose of the principle was to improve unsatisfactory living standards of working population, this goal has often been broken up in more specific objectives, such as growth promotion by means of increased effective demand in periods of low inflation, or (when MWs have been raised relatively little) as a brake on wages to generate export growth. Critics claim that MWs discriminate in favor of labor in the modern sector and against the unemployed, the informal sector and the fairly large group of self-employed workers[11/] Besides the claimed failure of MWs to exert a positive distributional impact, it is also argued that they contribute to generate inflation and to the loss of international competitiveness.

3.2 Previous Studies for the Six Countries.

In spite of their long history, an extensive theoretical discussion[12/], and many political claims as regards the effects of MWs, there only are few empirical studies of MWs in Latin America. For instance, there is lack of studies concerning the effect of MWs on employment, probably due to the uncertainty about actual enforcement (and even enforceability) of MWs as well as from absence of suitable employment data and existence of analytical difficulties that make necessary to choose econometric techniques with some

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11/ With regard to this distributional issue, Webb (1977) suggests that a large proportion of wage earners do actually receive less than the MW in Mexico. Suarez (1987) for the case of Peru and Castaneda (1983) for Chile, arrive to similar conclusion; but it appears that no reliable figures exist on enforcement.

12/ For a review of main theoretical issues involved in MW regulations, see Rottemberg (1981).

care. By the same token, little attention has been paid in Latin America to the macro-economic effects of MWs, particularly to their inflationary consequences, as well as to their impact on microeconomic wage setting. Finally, with the exception of a previous work by Paldam & Riveros (1986), no previous study has analyzed the MW issue in an across country comparative framework.

Analyzing Argentina, Marshall (1980) reported that MWs have increased agriculture's relative wages as well as wages in both a number of industries and across the board. In a more recent study, however, Sanchez (1987) showed that effective MWs have been well below the legal boundary because the enforcement machinery is apparently weak. Since MWs have been used in Argentina to index severance payments[13/] and public sector pensions, the most important effect is not the distributional one, but the increase in the cost for firms to sack workers, and heavier pressures on the public budget.

With regard to Brazil, considerable analytical effort was made in the 1980 IBRD Country Economic Memorandum, but no firm conclusion was reached in connection with the impact of MWs on employment. In this country, MW controversy has centered around their possible distributional impact. Macedo (1977,1986) has argued that wages for unskilled workers in the urban sector are determined by demand and supply and that, consequently, MWs cannot play an important role. Similarly, Taylor et al (1980) found that MWs are widely evaded (even) in the formal sector, giving an elasticity of MWs on average

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13/ Whenever a worker is discharged, severance payments are determined on the basis of the number ofyears worked with the employer and the highest wage ever earned. The law set an upper limit to the annual payment, which is made equivalent to three times the prevailing MW at the moment of the discharge.

wages of only 0.5. On the other hand, Souza and Baltar (1979) have argued that, even when MWs do not influence wages of unskilled workers outside the formal sector, they do exert important impact within this sector. Likewise, Drobny & Wells (1983) suggest that MWs play an important signalling role in the wage setting for unskilled workers in the construction industry and that MWs exert important impact on the size distribution of earned income.

With regard to the effects of MWs on the Chilean labor market there has been more agreement. Gregory (1979) stated that, although little could be said in connection with the distributional impact of MWs on the basis of available data, MWs do indeed caused slower employment growth. Along these same lines, Corbo (1981) concluded that manufacturing employment losses from MWs were not negligible, even when he assumed no substitution between high-wage and low-wage workers. Similarly, Riveros (1984) showed that the negative impact of MWs in employment generation in manufacturing was important in a short run context. Finally, Castaneda (1984) by means of econometric analysis based on labor force surveys, showed that the potential coverage of MWs was as high as a 20 percent of the labor force.

Aggregate effects of MWs has concentrated the attention of Colombian researchers. Thus, in analyzing mechanisms to affect income distribution, Bourguignon (1986) did not consider the role of MWs. At the same time, Lopez (1987) has found strong impact of MW levels on Colombian unemployment rates, as well as on aggregate investment. In Mexico, by contrast, the evidence is more mixed; Ibister (1971) concluded that MWs have not been important in terms of employment effects and increase in manufacturing wages but Marquez (1982) and Casar & Marquez (1983), who have analyzed the subject extensively, concluded that the actual impact of MWs in the labor market is substantial.

Finally, in the Peruvian case, Suarez (1987) has shown that MWs have played a small role in shifting the wage structure of the economy that, in turn, would essentially respond to the path of economic growth.

To summarize, previous literature from Latin America suggest that MWs do not play an important role in shifting the wage structure up in the cases of Argentina and Peru. Their redistributive impact has been said important in the case of Brazil but their effects on employment (and wages) are seen as central in the cases of Colombia, Chile and Mexico. With regard to the inflationary impact of MWs, references are more general, but there exist certain concensus around causality running from inflation to MWs.

4. THE TECHNIQUE OF CAUSALITY TEST[14/]

The literature surveyed has clearly put forward some important questions: Do MW-rises cause the entire wage structure to rise? Do they change the structure of wages? What are the unemployment consequences of raising the MW? etc. While Latin American data appear to be highly relevant to answer these questions, further analysis need a statistical technique that does not require controversial assumptions to be imposed upon the problem.

Following Granger's idea [see Granger (1969) and Granger & Newbold (1977)], we simply equalize causality with the ability to predict better, by saying that A is causing B if we can predict B significantly better using A than without A. One immediate consequence of this definition is that to speak of causality one has to look at the "new" things happening in a series - the

14/ The reader familiar with the technique of causal testing may go directly to the next section.

developments Sims has termed "innovations". One has to compare the innovations. A is causing B if a significant number of the innovations in A precede the innovations in B. It follows that it is perfectly possible to have causality both ways. From the basic idea a number of tests have been developed. Let us introduce the necessary minimum of formalization and discuss whether A is causing B:

Three main tests have been proposed: Granger's direct test, Sims' test and Geweke's test. All three tests compare two regressions (R1) and (R2), with the same dependent variable. Furthermore, (R2) contains the same regressors as (R1) plus some additional ones. The basic idea is clearest in Granger's test where (R1) predicts B as well as possible from lagged values of B, and then lagged values of A are added in (R2). It is then tested if (R2) has significantly smaller residuals than (R1). This is done using a simple F-test (or LM test) on the SSR (squared sum of residuals). Note that the regressions disregard many of the usual problems with the two regressions - i.e. it is irrelevant whether there is multicollinearity in (R1) or (R2). Also we do not need to assume a constant lag structure. Thus, the three tests are:

<u>Granger's test</u> (or direct test):

(R1) explain B(t) by B(t-1), B(t-2), ...

(R2) add A(t-1), A(t-2), ... , as extra regressors.

<u>Sims' test</u>:

(R1) explain A(t) by B(t), B(t-1), B(t-2), ...

(R2) add B(t+1), B(t+2), ... , as extra regressors.

Geweke's test:

(R1) explain A(t) by B(t), B(t-1), ...& A(t-1), A(t-2), ...

(R2) add B(t+1), B(t+2), ... , as extra regressors.

The direct test follows immediately from what has already been said; but it is clearly an interesting twist to the basic idea to reverse the explained variable - as proposed by Sims - and then use leads in (R2). What Sims analyses is whether A(t) can explain the future Bs in a way that is not already contained in the past values of B. Philosophically that is obviously almost the same idea as the one of the direct test. Geweke's test is a simple expansion of Sims' test, made to remedy a weakness discovered with the test[17/].

One general problem is how many lags to include in (R1) and (R2). The problem is not big in (R2) - here one simply includes as many lags as gives the highest F-score; but it is difficult to choose the right number of lags in (R1). The principle here is to include lags until the residuals are white noise; but the rele- vant tests are weak and each lag uses degrees of freedom. So, it is - on the margin - a difficult assessment, whether an extra lag more or less should be included. Clearly we want our causality tests to be robust regarding these difficult choices of specification, and furthermore the results should be robust to the choice of test. Unfortunately neither of these "robustness" applies. Therefore, it is better to use a few extra lags, to be on the safe side. Furthermore, we recommend caution, so that causality

17/ Sims' test becomes unreliable if B contains a MA-process; but the Geweke test does use a lot of degees of freedom.

is only accepted to the extent that tests do not disagree among themselves.

MWs are changed in jumps, by an administrative procedure. In the context of causality testing the MW-series therefore have the advantage that there is no doubt where the innovations are. When divided by the CPI, the resulting real MWs obtain a characteristic "saw-blade" structure for a "stylized" high inflation economy. The schedule of the changes is often fixed to the year - one or two changes per year at the same time of the year, as is actually the case in most of our countries. The series fall steadily except at the change dates where they jump up. Therefore, these series tend to suffer from two problems: (i) They have a very marked seasonality; (ii) they contain relatively little information. In fact, for all the quarters where the MW is (nominally) constant, there is no information to use in the tests. Therefore, the seasonality necessitates the use of a considerable number of lags, and furthermore, we have less information per quarter than we would like. So even when the 70-80 observations we have collected from each country seem a lot they are on the low side for the tests made - however, by looking at general patterns in the results from all the six countries we do build upon more that 400 observations altogether.

It is always a problem when using a two series approach that the relation may depend upon a <u>third series</u>. However, as long as we are still within observed series we can, in principle, expand the tests to examine more complex causal structures. One particular possibility should be mentioned in this connection: the most dramatic changes in the MWs have normally been made together with other policy changes, i.e. there has been a political regime change and the new regime begins with a lot of policy reversals including a spectacular change in the MW. A regime may e.g., have made a large

devaluation and changed the MW at the same time, thereby producing a large inflationary impact which we in our analysis come to ascribe exclusively to the MW-change. Also MWs are often tied to public pensions, and public expenditures so there is an automatic relation between the MW and the public sector deficit.

As has already been suggested, quite frequently the causality tests give no results - or results so conflicting that one does not know what to believe. One simple explanation is simultaneity - if things occur at the same time in the two series there is no way to determine the causal direction, by statistical methods. However, it is frequently possible to dissolve the simultaneity by considering a shorter time period. Also, it is obvious that if the series contain no innovations one has no possibilities to reveal whether or not there is a causal relation - so it is easy to fail to discover causality by the tests even when, in fact, there is a causal direction. The fact that it is diffi- cult to find cases where the causality tests tell a clear story is - in our opinion - a great advantage. For it also means that if the tests do tell a story, then it is a story worth considering and keeping in mind.

To see how the test result look like we present the detailed results for two of the causality tests for Argentina and Chile. Similar Tables are available from the authors for all tests run. The reader will see that the results are rather bulky so, in the following Section where we discuss the results, we summarize Table 2 as indicating that the results (MW -> w) from MW-changes to average wage changes are "yes-" - not strongly so, but in the other cases causality is accepted at the 5 % level ("yes" or "yes+") However, the for the test the other way around (w -> MW) the result is clearly "no".

Table 2. The causality tests for MW & w (average wages) in Argentina.

Causal direction	Test	Re-sult	No.of Lags	F-score	P(F) %	adj. R2	X2-test 6 lg	X2-test 12 lg
Argentina - MWs and average wages - 1970:1 to 1984:1								
MW -> w	Granger	B	8	2.31	4.4&	0.16	1.00	1.00
		B*	6	2.55	3.6&	0.16	1.00	0.63*
	Sims	*	8	0.76	63.9	-0.12#	0.02	0.07#
		*	6	1.28	29.6	0.01#	0.01	0.05#
	Geweke	*	8	0.84	58.1	-0.01#	0.95	1.00
			6	1.84	13.0&	0.22	0.90	0.90
w -> MW	Granger	F	8	0.83	55.9	0.26	0.95	0.97
		F	6	1.09	38.6	0.29	0.93	0.63*
	Sims	F*	8	0.51	84.0	-0.28#	0.79	0.54*
		F*	6	0.69	66.2	-0.07#	0.84	0.75
	Geweke	F*	8	0.21	98.2	-0.53#	1.00	1.00
		F*	6	0.48	81.7	-0.19#	1.00	0.98

Notes: The tests are provided with the following "marks":

& is used to indicate that the F-test is showing causality at the 5% level.

&& is used to show causality at the 0.5% level.

is used to show that the R2 - adjusted for degrees of freedom - is below significant. It is also used to point out that at least one of the X2-tests show that the autocorrelation in the residuals are significant at the 15% level.

* Shows autocorrelation in the residuals at levels between 15% and 75%. It appears that autocorrelation in that interval is unproblematic for the resultss of the causality tests.

The column "result" uses the following notation:

A (B) the test shows causality on the 0.5% (5%) level and there are no problems with the regressions.

A* and B* are like A and B except that autocorrelation in the residuals are between 15% and 75%. These results are accepted in the summary Tab.4.

* the causality tests are significant; but there exists serial correlation.

F causality is rejected - p(F) > 15% - and there are no problems with the regressions.

F* Causality is rejected; but the there exist serial correlation. Finally some places in the column are left blank, indicating that there are some signs of causality; so perhaps with better or longer series there it would be possible to find something.

To show how really strong positive results look the reader should look at Table 3. All the test results are highly significant from WM to p and nearly all the other way; but there are in many cases some autocorrelation left in the residuals. In most of the cases for w -> MW the autocorrelation is not so strong as to invalidate the test results. However, some of the results fulfill all criteria, so we are able to write "yes+" as our summary for MW -> p, while the result the other way is only "yes".

Table 3 Causality tests for WM & w (average wages) for Chile.

Chile - MWs and prices (the CPI) - 1973:3 to 1985:2

MW -> w	**Granger**	A*	8	37.46	0.0&&	0.90	0.94	0.61*
		A	6	37.83	0.0&&	0.87	0.93	0.87
	Sims	*	8	60.83	0.0&&	0.94	0.07	0.17#
		*	6	69.49	0.0&&	0.93	0.10	0.36#
	Geweke	*	8	32.94	0.0&&	0.95	0.00	0.00#
		*	6	33.35	0.0&&	0.93	0.02	0.11#
w -> MW	**Granger**	A*	8	5.27	0.0&&	0.54	0.50	0.71*
		A*	6	6.42	0.0&&	0.53	0.51	0.17*
	Sims	*	8	14.31	0.0&&	0.96	0.07	0.36#
		A*	6	14.46	0.0&&	0.94	0.25	0.51*
	Geweke	A*	8	8.00	0.0&&	0.99	0.37	0.39*
		*	6	19.80	0.0&&	0.97	0.06	0.20#

Notes: see Table 2.

5. EXAMINING THE RESULTS.

The results are summarized in Table 4. Nearly all the results analyzing the MW -> w and w -> MW causalities are significant and so are the two causal links between MWs and inflation - so it is clear that MW-rises are due to price-wage inflation and that, in turn, they generate rises in wages and prices. The other results are more mixed, and there are a few exceptions to the general result. In what follows we will briefly examine the tests from each of the individual countries:

Argentina: Here we first used the series for wage agreements ("salario de convenio"). This series turned out to have no causal relation to the MW series in the sense that they produced no significant tests. Hence, results reported in Table 4 use a series based on an actual sample of wages for the manufacturing sector. If we take wage rises to have two components - (i) an agreement and (ii) a drift component - then obviously it is the drift component which is affected by the MW-rises. In short, if one tries to change the wage structure by rising MWs independently of agreed wage rises then the MWs cause wage drift.

In Argentina there is the special problem that MWs are de facto tied to public pensions in the sense that 80 % of the retirees get the MW. As, furthermore, pensions constitutes 30 % of the public budget there is a rather strong direct link between changes in the MW and the budget deficit. Also, given that MWs are used as a basis for the severance pay system, the higher the MW level, the more expensive it is for firms to sack workers. Whether this effect of the MW is enough to offset the more normal negative effect of

Table 4. Summary of the Causality Tests.

	From MW	To MW
Argentina: 1970:1 - 1984:1		
Average wage rises in manufacturing	Yes-	No
Consumer price rises	No	No
Brazil: 1971:1 - 1984:2		
Wage rises in construction:		
Average for unskilled workers	Yes *	Yes-
Average for skilled workers	Yes	No
Consumer price rises	Yes	Yes+
Chile: 1973:4 - 1985:1		
Average wage rises in manufacturing	Yes	Yes+
Consumer price rises	Yes	Yes
Employment in manufacturing		
total	No	No
tradables sector	No	No
non-tradables sector	Yes	Yes
Colombia: annual 1958 - 1982		
Average wage rises in manufacturing	No	Yes
Consumer price rises	Yes	Yes
Mexico: 1953:1 - 1984:4		
Average wage rises in manufacturing	Yes	Yes *
Consumer price rises	Yes	Yes *
Perul: 1962:1 - 1984:1		
Average wage rises in manufacturing	Yes	Yes
Consumer price rises	Yes	Yes *

Note: The "+" is used where the test results are very strong. On the other hand, the "-" is used where the test results are not so strong: tests are not rejected at 5% level but there exist some autocorrelation. The rules used to summarize the results are explained with presentation of Tables 2 & 3. "*" is used when there are too much autocorrelation left in the residuals; but the R2-score is very high.

1) In Peru 14 quarters of the average wage data are missing, in the tests they have been replaced by trends. This does not affect the causality tests but increase multicollinearity in the regressions.

increasing MWs on employment (as found in the non-tradable sector in Chile, as explained below) ought to be analyzed. When our results are seen in connection with previous research (as reported in Section 2) and our overview of labor market trends in Argentina (in Section 3) they seem to fit well. MW policies do not appear to have been used very actively and, when they have been used, they caused wage drift to the same extent.

Brazil: Here we have used two wage series for the construction industry which are reported to be the most consistent and reliable series of wage data available. The detailed results are rather similar and it is interesting to note that causality is even stronger from MWs to the skilled wages than to the unskilled. The difference is not strong, but it surely stress the importance of the counteracting character of the wage drift when attempts are made to change the wage structure. We also tested the hypothesis of a causal relation between the wage structure (i.e. the difference between skilled and unskilled wages) and the MW, but all results were negative: MW-rises do not appear to change relative wages in the Brazilian construction sector. However, the reader should not draw unduly strong conclusions from this limited result.

Chile: Here the results are very strong and all causal links are significant between nominal quantities and MWs. Clearly we are dealing with a dynamic interaction: MWs push up all wages and prices, and then they push up the MW[18/]. So it seems obvious that the MW has played an important role in

18/ The same result was found when we tried other series including salaries.

the dynamics of inflation in Chile. This corresponds well to both the high coverage of MWs in the Chilean labor force and the depressed situation in terms of average wages that has been singled out in previous research.

In addition to the price/wage series we also had long quarterly employment series for Chile. For this series our results are more mixed and they are somewhat at variance with previous results: while we did find a significant effect from MWs to employment in the non-tradables sector and the other way round there is no connection between MWs and employment in the tradables sector and nothing in the aggregate series either. These findings are not as clear as one could have hoped, the most interesting finding being that there is no effect on aggregate employment. Also it is worth mentioning, when a test was performed to establish the causal link between employment and wages, the results were negative. It seems, therefore, that even when MWs push up average wages, this process does have a small effect on employment[19/].

Colombia: quarterly MW-series appears not to be available so we had to use annual data. Here the simultaneity between MWs and w's is too strong to show a causal direction; but there is a significant causal link from MWs to inflation, and as we are likely to deal with a wage cost effect here it is very likely that there would have been a significant effect from the MW to the average wage if we have had quarterly data.

The last two countries Mexico and Peru give almost the same results. Note that we use longer series here. For Mexico MWs were only changed every second year until recently, so to get sufficient information in

19/ This result corroborates other studies (see Riveros, 1986) which have found small price elasticities for the demand for labor in Chile. For the employment data used in our analysis, the reader is referred to Budnevich etal(1986).

the series we have used a much longer series than for the other countries. For Peru there are some gaps in the series for average wages. In both countries the tests show significant results with regard to the existence of both ways causality between MWs, w, and inflation, but there are serious problems of residual autocorrelation; making some of the results - especially the ones from the price/wage-series to MWs less reliable than desirable.

6. CONCLUSIONS - INTERPRETING THE RESULTS

The technique used has both strong and weak sides, in the sense that it does give very reliable answers, but these answers are to limited questions only. However, we have made no attempts to provide a structural model at the present.

The clearest result we have found is that MW-increases do normally push up other wages and prices . From the limited evidence it appears that the push effect occurs through the wage drift, and we have no indication that MWs does change the wage structure. We have only found adequate quarterly employment data for one country and here the results are a little unclear, but the main result is the lack of causal connections between MW- changes and aggregate employment.

Since MW-changes require deliberate policy decisions one has to interpret the results at the causality tests from price/wage-rises to MWs as a study of the endogeneity of the policy decisions, i.e., we are studying the political MW-reaction function. The tests are significant in 2/3 of the cases - so quite clearly the MW is used differently in the different

countries.

When causality is significant both ways the MW has been shown to have played a dynamic role in the process of inflation, and it becomes an interesting question how strong the total inflationary multiplier of an initial MW-increase is. Our study is not designed to find this number, and here other variables clearly come into play - for the dynamic process to run its full course the inflation generated has to be accommodated in the money stock and the exchange rate. However, it appears logical that if a government does pursue a policy of pushing up the MW then it will also accommodate. If this is the case then our results do suggest that MWs have large inflationary multipliers. We are clearly dealing with an instrument that is potentially quite powerful when it comes to change the rate of inflation[20/].

20/ Our results are not strong enough to allow us to say whether the effect on the inflation rate issymmetrical; but it from looking at the data one can find some support for the (intuitively likely) idea that it is easier to raise the inflation rate by increasing the MW than to decrease inflation by decreasing the MW. However, a stabilization of the MW in real terms as has happened in some of the countries has clearly contributed to curbing inflation.

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MWs: Salario-minimo mensal estabelecido para os Municipios das Capitais. Data for Rio de Janeiro were used and quarterly averages were calculated.
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Wages: Indice de Sueldos y Salarios para Obreros en el sector Manufacturero.

MWs: From 1970-74: Salario Minimo Industrial para Obreros Y Sueldo Vital para Empleados. An average was constructed by weighing both series through the participation of Blue and White Collars in total employment. From 1974 onwards data correspond with the Ingreso Minimo.
Employment: Series taken from Budnevich etal (1986).
Sources: Boletin Mensual (several issues), Banco Central.

Colombia:

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MWs : Average legal MWs.
Source : Reyes (1986).

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