♦ A INTERNATIONALIZAÇÃO DO SISTEMA FINANCEIRO: 1990-1992
Lauro Lobo Burle

♦ GOVERNMENT INTERVENTION, INSTITUTIONAL FACTORS AND MARKET: AN ANALYSIS OF THE WAGE BARGAINING IN BRAZIL
Francisco Galrão Carneiro

♦ A INSTITUCIONALIZAÇÃO DA PREFERÊNCIA PELA LIQUIDEZ
Albério Neves Filho

♦ PADRÕES MONETÁRIOS ALTERNATIVOS
Fernando Carlos G. de Cerqueira Lima

♦ AS CONTAS NACIONAIS E OS CUSTOS AMBIENTAIS DA ATIVIDADE ECONÔMICA
Charles C. Mueller

♦ LIVROS RECEBIDOS

ano 13 | março e setembro, 1995 | n°s 23 e 24
Os materiais publicados na revista *Análise Econômica* são da exclusiva responsabilidade dos autores. É permitida a reprodução total ou parcial dos trabalhos, desde que seja citada a fonte.

Aceita-se permuta com revistas congêneres. Aceitam-se, também, livros para divulgação, elaboração de resenhas e recensões.

Toda correspondência, material para publicação (vide normas na terceira capa), assinaturas e permutas devem ser dirigidos ao seguinte destinatário:

**PROF. NALI DE JESUS DE SOUZA**

**Revista Análise Econômica**

Av. João Pessoa, 52

CEP 90040-000 PORTO ALEGRE - RS, BRASIL

Telefones: (051) 316-3348 e 316-3440

Fax: (051) 225-1067
ABSTRACT

The paper analyzes the process of nominal wage determination in Brazil. A wage equation is specified to capture the government's participation and the role of institutional and market factors in the wage bargaining of the organized and competitive sectors of the Brazilian economy. The Chow Test is applied to the preliminary results and then the wage equation is re-estimated using the Kalman's Filter Algorithm. The article's main conclusions are as follows: (a) government's wage policy has been increasingly unimportant as a mechanism to guide the wage setting in Brazil; (b) the official minimum wage, on the other hand, has increased its importance in wage bargaining; (c) the "institutional factors" have been increasingly important in the process of nominal wage determination; and (d) the "market factor" has also worked as a relevant mechanism to steer the wage bargaining in Brazil.

1. INTRODUCTION

This article analyzes in what sense the government intervention (through its formal wage policies), the labor's organization and mobilization power and the market forces (labor demand and labor supply) have affected the wage bargaining process in the Brazilian economy. The discussion of this issue at the current juncture becomes relevant as further government deregulation policies are envisaged, including the end of the official wage policy for the private sector. Assuming that this process of political overture, based on a reduced government participation in the economy, reaches not only the market of products, but also the market of factors (including there the labor market), the study of the process of nominal wage setting can yield valuable subsidies to discuss the course of the country's income policy. Therefore, a nominal wage equation is specified in order to capture the government participation and the role of institutional and market factors in the wage bargaining of two sectors: Manufacturing Industry (representing the organized sector of the economy) and Commerce (representing the competitive sector). Institutional factors, broadly defined, represent the labor market imperfection in the process of nominal wage formation, where the occurrence of "informal agreements" between employers and employees would guarantee a different wage level than that which could be achieved in a perfectly competitive environment; the market factor, on the other hand, indicates how the demand component affects this process.

This article is a short version of the Chapter 5 of my M.Sc. Dissertation presented to the Department of Economics of the University of Brasilia in 1991. It has been published in the proceedings of the XIX Annual Meeting of the Brazilian Economic Association, Curitiba, December 1991. M.Sc. in Economics by the University of Brasilia (UnB). Readers should be advised that any economic policy implication that our results might suggest do not apply to the public sector. First because the database used here does not comprise information on government salaries, and second because discussing the particulars associated to this sector is not among the main objectives of this paper.

Cód. AEA 913

Palavras-chave: Wage equation, bargaining, government intervention.

ANÁLISE ECONÔMICA ANO 12 março/setembro 95 p. 19-36
The methodology to be used consists of: (i) running a nominal wage equation for the two sectors mentioned above by the usual OLSQ method using monthly data for the period 1986-89; (ii) testing if changes in the macroeconomic context observed during this period (Cruzado Plan, Bresser Plan and Summer Plan) altered significantly the stability of the structural parameters, what is done by means of the Chow Test; and (iii) using the Kalman's Filter Algorithm, which is considered a powerful tool to verify how the structural parameters behave in a context of successive institutional changes.

After this Introduction, the next sections of the paper bring a theoretical discussion which will serve as background to explain the specification of the wage equation (section 2); the general form of the equation to be run (section 3); the specification of the variables, where it will be explained how the measured both the government participation and the influence of institutional and market factors in the wage setting (section 4); the analysis of the results (section 5); the Chow Test (section 6); the Kalman’s Filter Algorithm (section 7); and the conclusions (sect. 8).

2. THE THEORETICAL DEBATE

This section presents a brief theoretical discussion on the process of nominal wage determination, what is considered essential to understand the specification of the wage equation to be analyzed next (see section 3).

It can assumed that up to the end of the 60’s, the predominant view in the economic literature on employment and wage was that the market played the most important role in the wage setting. The base argument was that the salary payable to a worker represented the price of his/her work, which, in turn, could be freely negotiated in the market (the labor market) as an ordinary commodity and where the interaction of the labor demand and labor supply would determine its equilibrium price. This idea became stronger in the argument of those who tried to identify a trade-off between the rate of change of nominal wages and the unemployment level, giving origin to a series of discussions on the existence of the Phillips Curve.

Actually, the debate on the existence of such wage/unemployment trade-off was always centered in the classical principles of homogeneity, perfect mobility and perfect substitution of labor. Secondly, because recognizing labor homogeneity implies in accepting that the price of labor is determined by the market (given the constraint that no more than one commodity can be associated to each market). Secondly, because by assuming perfect mobility, what one supports is that there are no costs associated with the transfer of workers from an occupation to the other. And, combining, then, homogeneity and perfect mobility, one can conclude that there is also perfect labor substitution, what by its turn, ensures that labor can be considered an ordinary commodity. It corroborates thus the general idea on the postulated trade-off between wages and unemployment.

In the early 70’s, however, some papers started to deny these classical postulates by admitting some rigidity in the labor market, originating what is now called the Dual Labor Market Theories. In the line with this new stream of thought, the old assumptions of the classical model were replaced by imperfect mobility and labor heterogeneity, what allowed to recognize the existence of obstacles associated with the mobility of workers (turnover costs) and also that the skills of some workers

---

2 See R. Lipsey (1960)
could worth something in the labor market.

Thus, institutional factors, understood as the interaction of employers and employees in the wage bargaining with the objective of maintaining a stable labor force, began to be taken into consideration in the analysis of nominal wage determination. The role of the bosses on this process would be to keep the labor productivity at high levels and reduce the turnover costs (selection and training), while workers would struggle for a stable labor force with the aim of reducing the competition for jobs and protecting their salaries.  

3. THE WAGE EQUATION

After this brief theoretical discussion on the wage setting process, one can concentrate now on the wage equation to be estimated. As mentioned before, the wage equation to be focused on should capture the government interference as well as the influence of both institutional and market factors in the wage setting. Its general form is as follows:

\[ LN_W_i = B_0 + B_1 LWP + B_2 LMW + B_3 LSALD_i + B_4 LD_i + z \]  

where: \( LN_W_i \) = rate of change of nominal wages in sector \( i \); \( LWP \) = rate of change of the average institutional salary, as defined by the official wage policy; \( LMW \) = rate of change of the nominal minimum salary, fixed by the government; \( LSALD_i \) = rate of change of the degree of workers' dissatisfaction with their salaries in sector \( i \); \( LD_i \) = unemployment rate in sector \( i \); and \( B_0 \) = constant term which can represent the influence of exogenous factors not reflected by the explanatory variables; it gives also an idea of wage floor in each sector. The coefficients' expected signals are: \( B_0 < 0 \); \( B_1 > 0 \); \( B_2 > 0 \); \( B_3 > 0 \) and \( B_4 < 0 \).

For \( B_1 \) e \( B_2 \) one can expect positive signals, provided that the government laws for the minimum salary and wages in general have always ensured a minimum indexation. As for the institutional factors, represented by the degree of dissatisfaction (coefficient \( B_3 \)), the expected signal is also positive, what is seen as an indication that the higher the lag between the desired and the effective wage (as determined by the wage law) the higher the labor mobilization and, therefore, the higher the pressure for the wage increases. As one assumes that institutional factors act not only through the supply side but also through the demand side, the lag between desired and effective wage could yet encourage initiatives from the employers' party (demand side) to keep a stable force and, therefore, avoid labor turnover and its associated costs; this kind of attitude could also have the objective of avoiding a drop in labor productivity in periods of accelerated prices increases, for example. Finally, the \( B_4 \) coefficient is expected to be negative since an inverse relationship between labor and nominal wages assumed.

4. SPECIFICATION OF THE VARIABLES

In the case of government intervention, one can consider that nominal wages are strongly affected by economic policy mechanisms, such as the official wage law and the government rules for the minimum salary. Thus, the variables capturing this influence in the equation (WP and MW) tried to reflect exactly what was determined
by the government. That is, (a) WP is simply an average nominal wage index for the formal sector of the economy which is calculated taking into consideration all wage laws observed between 1986 and 1989 and weighted by the numbers of workers per base-dates (anniversary dates); and (b) MW is the official minimum salary in force in each month of the considered period.

The greater difficulty, however, consists in obtaining a reasonable proxy to capture the influence of institutional factors in the labor of market. It is assumed here that the difference between the desired wage (the effective nominal wage adjusted for inflation by the labor unions' consumer price index - ICV-DIEESE - assuming that it would represented the labor's preferred indexation formula) and the effective wage is an adequate proxy. One of the assumptions in the specification of this variable is that workers always try to guarantee their wage peak (the desired wage) during the wage bargaining; thus, the more they are mobilized/organized, the higher is their power to interfere in the process of nominal wage determination. Therefore, this variable can be seen as a proxy for the labor mobilization power (the lower the relative difference between the desired and the effective wages, the higher is the mobilization power, and vice-versa). As mobilization depends upon certain organization, it is reasonable to assume that this variable reflects some relative influence of institutional factors by the labor supply side. The theoretical justification can be searched in the segmented labor market theories - the idea is that labor unionization and organization, in general, allow workers some degree of control; that is, organized labor unions could be able to control the entrance of new members or even the internal structure of mobility into the firm.

One should yet admit the influence of institutional factors by the labor demand side. In this regard, it can be argued that a profit maximizing firm can be also interested in keeping both a stable labor force and a high level productivity. Thus, the proxy for institutional factors defined above would capture not only the labor mobilization power, but also eventual "informal agreements" between employers and employees (such as causes of a job tenure, work conditions, salary advances etc.), that would seek the stability of the labor force and the labor productivity levels in periods of large gaps between the desired and effective wages.

In the case of the demand component (the market factor), there is no problem in assuming that the unemployment rate might represent the labor excess demand; the discussion on the Philips Curve provides a theoretical background to justify this choice, since it presents a consistent argument on the existence of a trade-off between the rate of change in nominal wages and the unemployment level.  

5. THE RESULTS

Initially, the equations were run by the traditional OLSQ method using monthly data for period 1986-89. However, the residual presented some auto-correlation, which was detected by the Durbin-Watson Test. The CORC method was then used to obtain coefficients free of auto-correlation. The results are summarized in table 1 below (the "L" in the beginning of each variable indicates its natural log, while the "D" in the end indicates moving-average seasonal adjustment). The sources for the
gross data were: (a) the Labor Ministry, which supplied its Hiring Wage Series (Série de Salários de Contratação) and the adjustment index for the minimum salary and for the overall wage policy; (b) the IBGE, that supplied the data on sectoral unemployment.

In broad terms, the results presented the expected signals; that is, positive for the wage policy, minimum wage and institutional factors, and negative for the unemployment rate. This indicates that there is no apparent inconsistency among the data series used that the equation is not misspecified. The regressions’ explanatory power, represented by the $R^2$, were satisfactory in all equations as well as the $F$ and $d$ statistics, confirming the efficiency of the coefficients. Concerning the t-statistics, the majority of them were significant with 95% of confidence, what means that the coefficients are significantly different from zero.

| Table 1 - NOMINAL WAGE EQUATIONS PER ACTIVITY SECTORS - PERIOD 1986-1989 |
|-----------------------------|---------------------|---------|---------|---------|
| EQ. | METHOD | SPECIFICATION | N | R2 | DW |
| MANUFACTURING INDUSTRY |
| 1 | CORC | $LAI \text{ITID} = 2.48 + 0.47LWP + 0.50LMW + 0.41LSALD - 0.18LDITD$ | 45 | 0.995 | 1.83 |
| 2 | CORC | $LACOMD = 1.48 + 0.63LWP + 0.36LMW + 0.46LSALD - 0.20LDCOMD$ | 45 | 0.992 | 1.98 |
| COMMERCE |
| (*) Not significant at the 5% level |

The Chow Test is applied in the next section to check for the coefficients stability during the period analyzed.

6. THE CHOW TEST

The Chow Test will be useful to verify in the pattern observed in the analysis of the period 1986-89 would be the same if one analyzed different sub-periods separately. Thus, the original sample was divided in three distinct periods, comprising, respectively, the months in which three heterodox stabilization attempts were implemented in Brazil (March 1986 to May 1987, Cruzado Plan; June 1987 to December 1989, Summer Plan). During the Cruzado Plan, in the first sub-period, the wage policy in force was totally different form its predecessor, which allowed wage adjustments in six-month intervals. Under the new rule, wages began to be automatically adjusted whenever the cumulative inflation reached 20% (the so-called trigger mechanism). It should be noted that this period was also marked by a complete lack of austerity in both monetary and fiscal policies, what ended up fomenting a phase of quick economic prosperity accompanied by increases in real wages and stability in employment levels. In the second sub-period, the Bresser Plan, there were new changes in the command of the economic policy and, therefore, in the official wage policy. The trigger mechanism was replaced by a geometric average rule which granted wage increases in a quarterly basis based on
the average inflation of the previous quarter. The Bresser Plan also tried to enforce contractionist monetary and fiscal policies, contrarily to what happened in the Cruzado Plan.

In the last sub-period, a new economic team took over and a new heterodox stabilization plan was implemented - the Summer Plan. Again, the wage policy was altered and wage increases became monthly and differentiated by wage brackets. It is worthwhile to mention that the country watched some indefiniteness concerning the salary indexation rules, during this period. From January to May, 1989 the country lived without an official wage policy due to the lack of political agreement between the Executive and Legislative branches on the new rules to be implemented. Hence, as these three intervals the economic policy, and also the wage policy, faced sudden changes, it is reasonable to expect that the test of stability of the coefficient might indicate structural changes in the estimated parameters. The methodology to be applied is the following: for the equations found in table 1, one should test, for each set of equations run for the periods defined above, the following hypotheses:

\[ H_0: B_{01} = \ldots = B_0; B_{11} = \ldots = B_1; B_{21} = \ldots = B_2; B_{31} = \ldots = B_3; B_{41} = \ldots = B_4 \]

\[ H_1: \text{Not all coefficients have the same value.} \]

The first step towards it consists in running, for each activity sector, three new wage equations for the new sub-periods. One should then verify whether the sum of the square of the residuals for these three new equations are statistically different from the total sum of the square of the residuals of the original equation, what is done through the F test. Thus, in case these two figures are statistically equal, one cannot reject the null hypothesis \( H_0 \) and the conclusion is that the coefficients were not structurally altered during the period analyzed (or that the data come from a homogenous sample). The equations for the 3 sub-periods can be found in table 2.

As the critical value of \( F_{0.05; 10, 30} \) is 2.16 (note that 10 and 30 refer to the degrees of freedom of \( S \) and \( S_1 \))\(^9\), the ratios \( F_1 = 2.33 \) and \( F_2 = 3.04 \) are sufficient to reject \( H_0 \) and one can, therefore, affirm with 95% of confidence that there were structural changes in the estimated parameters; that is, the coefficients are not the same in each sub-period of the sample, what places some doubts on the results obtained by the OLSQ method.

7. THE KALMAN’S FILTER ALGORITHM

Provided that the empirical evidence indicated the existence of structural change in the parameters for the periods 1986-89, in this section new wage equations will be run, but allowing that the parameters vary throughout the time. The technique used for this purpose consists of an algorithm which makes possible running new equations which will have their coefficients updated as one adds an additional

---

\(^9\) The Chow Test consists of calculating the following ratio \( F = \frac{(S - S_1)}{(2k)} \), where \( S = \text{total sum of the square of the residual of the equations in each sub-periods; } S_1 = \text{difference between } S \text{ and the sum of the square of the residual of the original equation; } k = \text{number of parameters; and } n_i = \text{number of observations in each equation. One can reject } H_0 \text{ if } F \text{ is greater then the critical value of the } F \text{ distribution.}\)

\(^10\) The calculation of the degrees of freedom is done as follows: for each sector there is a set with 3 equations with \( n-k \) d.f. each (where \( k = \text{number of explanatory variables} \)); once the sum of the square of the residual is obtained (\( S_i \)), the number of d.f. becomes \( n-k \), which is equal to 30. For \( S_{i} \), the difference \( S_i - S_{i} \) leads to \( (n_1 + n_3 + n_3 - k) - (n_1 + n_3 + n_3 - 3k) = 10 \). Therefore, \( F \) has to be observed in the interval between 10 and 30 degrees of freedom.
observation to the sample, such technique is known as the Kalman's Filter\textsuperscript{11} and its application to Brazilian problems has barely been tried before\textsuperscript{12}

\begin{table}[h]
\centering
\begin{tabular}{l|l|l|l|l|l|l}
\hline
EQUATION & PERIOD & R$^2$ & DW & SSR \\
\hline
\hline
MANUFACTURING INDUSTRY

LAITD = -0.29 + 1.24LWP - 0.08LMW + 0.25LSALD - 0.25LDITD & 1986M3 - 1987M5 & 0.98 & 2.66 & 0.0116294 \\
(-0.2) & (4.5) & (-0.3) & (2.5) & (-2.8) & N = 15 \\
LAITD = 4.52 + 0.52LWP - 0.47LMW + 0.07LSALD - 0.6LDITD & 1987M6 - 1988M12 & 0.99 & 1.65 & 0.0367308 \\
(1.7) & (2.3) & (2.2) & (-0.2) & (-0.4) & N = 18 \\
LAITD = -3.68 + 1.03LWP - 0.02LMW + 1.03LSALD - 0.10LDITD & 1989M1 - 1989M12 & 0.99 & 2.43 & 0.0096326 \\
(-2.1) & (4.5) & (-0.1) & (5.1) & (-1.0) & N = 12 \\
LAITD = 2.48 + 0.47LWP - 0.50LMW + 0.41LSALD - 0.18LDITD & 1986M3 - 1989M12 & 0.99 & 1.83 & 0.1033140 \\
(2.7) & (3.7) & (4.2) & (4.0) & (-2.5) & N = 45 \\
\hline
COMMERCE

LACOMD = 0.49 + 1.10LWP + 0.02LMW + 0.24LSALD - 0.24LDCOMD & 1986M3 - 1987M5 & 0.99 & 2.13 & 0.0110504 \\
(0.4) & (4.2) & (0.1) & (1.9) & (-3.2) & N = 15 \\
LACOMD = 3.64 + 0.63LWP + 0.37LMW + 0.06LSALD - 0.29LDCOMD & 1987M6 - 1988M12 & 0.99 & 1.75 & 0.0212422 \\
(1.5) & (2.8) & (1.7) & (0.2) & (-1.0) & N = 18 \\
LACOMD = -3.15 + 0.96LWP + 0.03LMW + 1.05LSALD - 0.23LDCOMD & 1989M1 - 1989M12 & 0.99 & 2.11 & 0.0122699 \\
(-1.7) & (4.0) & (0.1) & (4.4) & (-0.9) & N = 12 \\
LACOMD = 1.48 + 0.63LWP + 0.36LMW + 0.46LSALD - 0.20LDCOMD & 1986M3 - 1989M12 & 0.99 & 1.98 & 0.0897603 \\
(1.5) & (4.9) & (3.0) & (3.5) & (-1.8) & N = 45 \\
\hline
\end{tabular}
\caption{WAGE EQUATIONS, PER ACTIVITY SECTOR, FOR DIFFERENT SUB-PERIODS}
\end{table}

The Kalman's Filter method assumes as main hypothesis the existence of a vector of parameters $B_t$ with length $m \times 1$ which is potentially different in each period $t$. As the objective is to search an updating of the coefficients ($B_t$) based on the information available for the previous periods, the vector of coefficients $B_t$ is linked to a vector of coefficients of previous periods by means of a transition matrix and also to random elements which capture the economy's stochastic moves. This pattern of evolution of the $B_t$ is characterized as a first order markovian process and can justified by the fact of allowing, in a sample way, "the combination of the effect of the previous structure with the impact of the random elements over $B_t"$\textsuperscript{13}. It is worthwhile to emphasize that, assuming as plausible a behavioral pattern in which agents learn with their previous experience as plausible, changes in economic policy and in the macroeconomic, political and institutional context may introduce instability and provoke transformation in the structural parameters of economic models\textsuperscript{14}. Therefore, adopting a model which assumes constancy of coefficients implies in

\textsuperscript{11} For a detailed discussion and survey of the literature on the Kalman's Filter see A. Mizala and M. Bugarin (1988).
\textsuperscript{12} See, for example, M. Bugarin (1989), and A. Mizala (1989).
\textsuperscript{13} A. Mizala and M. Burgarin (1988), op. cit. Page 8.
\textsuperscript{14} This observation is based on the criticism of Lucas (1976). On the stability of the structural parameters of economic models applied to economies which face "changes in the political context."
assuming that economic agents do not review their actions before observed changes in the macroeconomic context - what seems unlikely for the Brazilian economy during this period analyzed here. The model can be written as:

\[ Y_t = x_t B_t + U_t, \quad t = 1, \ldots, N \text{ with } U_t \sim N(0, H_u) \]  
(A)

\[ B_t = TB_{t-1} + V_t, \quad t = 1, \ldots, N \text{ with } V_t \sim N(0, Q_v) \]  
(B)

where \( Y_t \) is the behavioral equation and \( B_t \) represents the transition equation, while \( T \) is the so called transition matrix.

It is assumed that the vectors \( U_t \) and \( V_t \) do not present serial and time correlation and also there is no correlation between these vectors and the initial states vector. What is ignored, however, is the initial structure of the coefficients \( B \) and how they are dispersed in time. Thus, it is necessary to determine an initial \( B \) which might be best fitted to the data and to the variance and covariance matrix associated to this \( B \) (that is, the \textit{a priori} distribution of vector \( B_t \)). After that, one should use the Kalman’s Filter Algorithm to obtain the \textit{a posterior} distribution of the vector of states \( B_t \). In broad terms, the method of the Kalman’s Filter can be divided in two main steps. First, one should obtain the better estimator in instant \( t \) based on all information available up to the instant immediately anterior \( t - 1 \); thus one can obtain the better estimator (\( \hat{B}_t \)), the prediction equation, and also its variance and covariance matrix (\( P_t \)):

\[ B_{t-1} = TB_{t-1}, \quad \forall t \]  
(C)

\[ P_{t-1} = TP_{t-1}T' + Q_t, \quad \forall t \]  
(D)

Second, after obtaining a new information already available, one should use it to update the estimators obtained in the previous step, what is done through the following updating equations:

\[ B_{t-1} = B_{t-1} + P_{t-1}X_t' (X_t'P_{t-1}X_t' + H_t)^{-1} e_t \]  
(E)

\[ P_{t-1} = P_{t-1} - P_{t-1}X_t' (X_t'P_{t-1}X_t' + H_t)^{-1} X_tP_{t-1} \]  
(F)

Equations (E) and (F) above are updating equations and the values of \( B_{t-1} \) and \( P_{t-1} \) represent the Kalman’s Filter estimates. Note that the algorithm consists of: (i) obtaining the better estimator up to the instant \( t-1 \) (or up to a sub-period of the sample) through equations (C) and (D); and (ii) incorporating this new observation to the sub-period considered and update the initial states vector through equations (E) and (F). New equations were then run for the two activity sectors using the methodology of the Kalman’s Filter. The results are summarized in table 3. In broad terms, the information provided by the last result of the algorithm allowed the observation that the institutional factors had a larger relative importance than that of the market factor in the equation for the organized sector, while the importance of the market factor was relatively greater in the wage bargaining process of the competitive sector. The fact that the coefficient of the wage policy in the organized sector equation was relatively when compare to that for the competitive sector caused some surprise. As analyzed in Carneiro (1991), the government wage policy can be

\[ \text{For a mathematical derivation of these equations, see Mizala and Bugarin (1988), op cit} \]

\[ \text{See chapter 4 in F.G. Carneiro (1991).} \]
considered ineffective in Industry, which indicates some independence from the
government tutelage. Firstly, because the industrial sector where one can find
internal labor markets, can be easily associated with the idea of labor mobilization.
As the wage policy consists of an official indexation mechanism which guarantees a
minimum indexation to salaries in general, the sample obedience to the government
rules would guarantee some relative importance to this variable in the wage
equation. Therefore, the relatively high coefficient for the wage policy in the case of
the Manufacturing Industry reflects, basically, the wage indexation and not the
sector's independence from the government. Secondly, one should also analyze why
the coefficient of this same variable was relatively less significant in the competitive
sector. In this case, what can be said is that in this sector it is not so common to
existence of internal labor markets and also that the lack of organization of the labor
hand, added to the lack of a satisfactory degree of qualification, make the workers
linked to these sectors much more vulnerable to the market forces. Thus, there is
some room to the practice of labor turnover provided that the tasks usually
undertaken do not require complex skills. This, therefore, would explain the relative
lower importance of the wage policy in the competitive sectors.

<table>
<thead>
<tr>
<th>VARIABLE ELASTICITIES OBTAINED BY THE KALMAN'S FILTER METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MANUFACTURING INDUSTRY</td>
</tr>
<tr>
<td>LAITID = 2.6 + 0.45LWP + 0.52LMW + 0.43LSALD - 0.23LDITD</td>
</tr>
<tr>
<td>R2 = 0.99</td>
</tr>
<tr>
<td>(3.6) (4.1) (5.1) (5.9) (-3.8)</td>
</tr>
<tr>
<td>DW = 1.5                                            N = 45</td>
</tr>
<tr>
<td>COMMERCE</td>
</tr>
<tr>
<td>LACOMD = 3.8 + 0.36LWP + 0.61LMW + 0.31LSAD - 0.34LDCOMD</td>
</tr>
<tr>
<td>R2 = 0.99</td>
</tr>
<tr>
<td>(6.6) (3.7) (7.0) (5.1) (-4.5)</td>
</tr>
<tr>
<td>DW = 1.4                                            N = 45</td>
</tr>
</tbody>
</table>

Other result that is not in line with the expected patterns is concerned with
the relatively high coefficient obtained for the minimum wage in the equation for the
Manufacturing Industry. The fact that this is an organized sector should be enough
to ensure a relative independence from the minimum salary. However, the equation
for the whole set of information seems to indicate the opposite. The explanation for
this particular case will be provided later in the analysis of the path of the variable
parameters for the organized sectors. In broad terms, the results obtained suggest
that (i) the value of the variable elasticities for the two sectors apparently present
important changes and fluctuations; and (ii) the unique estimator, supplied by the
OLSQ method, does not illustrate in a satisfactory fashion the changes
experimented by the elasticities since it represents only an average of the variables’
standard behavior. The evolution of the coefficients filtered by the Kalman’s
technique can be observed in the accompanying graphs. As affirmed before, the
filtered paths describe the coefficients' behavior under the assumption that in period
t there is only a set of information available up to (t-1), that is $B_{t-1}$.

7.1 The organized sector

Figures 1 to 5 show the filtered path of the variable parameters for the

---

17 The analysis will start in April 1988 for the previous period was used as sub-sample to undertake the first loop
required by the Kalman's algorithm. Thus, the Cruzado Plan period is included in the pool of information required for the
first loop and, therefore, will not be analyzed in next paragraphs.
Manufacturing Industry. In the case of the constant term (figure 1), as noted before, one can say it gives an idea of the wage floor and also of the labor conquests not reflected by the other variables. In generic terms, there was an increase in the importance of the variable parameter representing the constant term, which may indicate that the base salary (or the entry salary level) in Industry increased during the period analyzed; the variable coefficient of the constant term started at 0.8 and reached 2.6 by the end of 1989.

Figures 2 and 3 show the path of variable coefficients which represent the government influence in the wage setting. As for the wage policy (figure 2), one can notice the policy-elasticity ranged from 0.90 to 0.45 indicating that the analysis of the wage equation obtained with the whole sample (as in table 3) does not allow the

---

18 The reader should pay attention to the fact that the first three coefficients in each graph did not present a uniform behavior and were not, therefore, considered relevant for the analysis.
conclusion that the official wage policy was essential for the industrial sector; contrarily, the punctual results provided by the Kalman's Filter (figure 2) show the increasing independence of this sector from the official wage policy.

Figure 3 - MANUFACTURING INDUSTRY
Filtered Parameters

Minimum Salary

Figure 4 - MANUFACTURING INDUSTRY
Filtered Parameters

Desired Wage

In the case of the nominal wage minimum salary-elasticity, the path described in figure 3 allows the return to the discussion on the relative importance of this variable, raised in the previous section. As one can observe in the figure, the minimum salary coefficient also raged considerably during the period, jumping from an initial value of 0.10 up to 0.50 by the end of 1989. Once again, it should be argued that the analysis based on the total sample equation, supplied by the OLSQ estimate, is short-sighted since it does not reflect adequately the coefficient's behavior throughout the period analyzed. A good illustration on this regard is the fact that the minimum salary coefficient remained around what one could expect up to April 1989 (roughly 0.20). It was only from April on that there was an increase in importance for this variable in the Industry wage equation.
But what could explain this change on the path of the minimum salary variable elasticity in the organized sector? As mentioned before, given the characteristics of this sector, one should expect that such parameter kept the path described for the period between April 1988 and April 1989, what would reflect, by its turn, the reduced influence of the minimum wage rule in the organized sector's wage setting. It is necessary to remember, however, that it was exactly in April 1989 that the National Congress approved the new minimum wage law ensuring a bimonthly real 6.09% increase to this salary. Thus, it is necessary to explain what was the impact of this law on the behavior of the firm to understand why there was an increase in the minimum salary coefficient in the Industry's wage setting.

At this point, one should remember that the overall wage policy which was in force during this period was considered too complex in operational terms (requiring the division of a worker's salary in number of Treasury Bonds so that one could apply the specific adjustment index) and that the market practice was already one of allowing monthly wage adjustments based on the full inflation rate of the previous month, independently from what ruled the government wage law. Thus, as the minimum wage rule began to ensure monthly overture for this salary, added to a real 6.09% each two months, one can say that there was an approximation between what the market had already been doing for a period and what was granted by the minimum wage law.

Thus, the increase in the relative importance of the minimum wage variable coefficient during this period could be reflected in the fact that the full indexation rule allowed to the minimum wage represented almost the same situation already observed in the market. Therefore, such "coincidence" allows the inference that what became strongly important was the influence of institutional factors in the wage setting of the organized sector and not the minimum wage rule. The existence of internal labor markets and the presence of strong labor unions with mobilization power, contributed, therefore, towards the internalization of an indexation mechanism similar to that applied to the minimum salary. The analysis of the institutional-elasticity shall reinforce this argument.

Regarding the proxy for institutional factors (figure 4), one can also note the upward trend of its variable coefficient throughout the period studied; its absolute value ranges from 0.33 in July 1988 to 0.43 in December 1989. The path described in figure 4 indicates, therefore, that there was an increase in the relative importance of institutional factors in Industry. The existence of "informal agreements" between employers and employees and also the labor mobilization power became more and more important in this sector's wage bargaining process. This could also be seen as an indication that internal labor markets became stronger in Industry, since the occurrence of such segmentation allows for the influence of institutional factors not only by the labor demand side but also by the labor supply side. See also the case of the minimum salary variable elasticity discussed above.

As for the market factor (Fig. 5), there is an erratic change of the coefficients around their mean (which was roughly -0.23). The Industry's nominal wage market-elasticity starts around -0.20, reaches -0.27 and decay to -0.23. As one can see, there is a modest change in absolute terms (with an amplitude of just 0.07 units between the extreme points), although, by a problem of scale, the figures give the opposite impression. But even with a small variation in absolute terms, the market
factor elasticity showed two distinct moments. The first, between July 1988 and April 1989, when the coefficient remained steady around -0.19, reflected the reduced importance of such variable in the organized sector's wage bargaining.

The second moment, between April and December 1989, shows a slight increase in the degree of importance of the market factor. Once again, one can note that the change in the path takes place at the moment of implementation of the new minimum salary law. This may be reflecting exactly the effect of labor turnover in the inferior scales of the internal market (the secondary internal markets), which are linked to the minimum salary in a stronger sense. This period would work in such a fashion that as the labor supply increases, because of increases in the minimum salary, the firms would observe the appropriate conditions to replace the workers who earn salaries next to the minimum salary (say, between 1.2 MWS and 2MW, for example). As the importance of these workers in the organized sector is relatively small, the effect of labor turnover was translated also in a small amplitude of change of the market factor variable elasticity.

In general, one can say that the Kalman's Filter methodology allowed to confirm that institutional factors have been much more relevant than the market factors in the wage bargaining process of the Manufacturing Industry. Furthermore, the path of the filtered parameters also allowed to verify how the variables behaved before institutional changes in the economic environment. It was possible to confirm that, in Industry, the government intervention in the labor market has been increasingly less important to explain the process of nominal wage formation, while the role of institutional factors has decreased considerably throughout the time.

7. THE COMPETITIVE SECTOR

Figures 6 to 10 show the path of the filtered parameters for the Commerce sector. The constant term showed a similar trend when compared to that of the organized sector (see figures 1 and 6). As mentioned before, the constant term can
be interpreted mainly as an indicator of the wage floor of each category, besides representing other factors such as possible increase in skills and education. Thus, factors such as an increase in the level of skills required to new entrants and the new law for the minimum salary approved in 1989 may be raised to explain the wage floor increase observed in the competitive sector during the period considered.

Concerned to the wage policy, figure 7 shows that, for the competitive sector, this variable also lost importance between 1988 and 1989. As mentioned before, this could be reflecting some independence of the competitive sectors from the government wage policy, what could be caused by the labor turnover mechanism. Given the characteristics of this sector, which hire cheap labor hand without valuable qualifications, the costs associated with the labor turnover could be more than compensated if the firm managed to fire employers in the upper wage range and the re-hire others who will start in the lower wage range. It should be noted though that the period analyzed was marked by a large indefiniton on the general indexation rules, opening some room for other factors in the wage bargaining. This argument will be made stronger later.

The path described by the minimum salary variable elasticity shows the increase importance of this variable in the wage bargaining of the competitive sector (figure 8). The nominal wage minimum-salary-elasticity jumped from 0.30 in July 1988 to roughly 0.60 by the end of 1989. The importance of this parameter is reinforced in April 1989 when it was established that the minimum salary would receive real increases of 3% monthly (payable, however, in a bimonthly basis) What can be said on this regard is that the period of indefiniton experimented at that time contributed to transform the minimum salary in a leading indicator for the competitive sectors increasing, therefore, its importance. What happened, thus, was that the rules applied to the minimum salary ended up filing in the gap left by the lack of an overall wage policy.
The competitive sector's institutional-elasticity (figure 9) ranged from 0.24 to 0.31. Again, one can notice modest variations (also in the range of 0.07 units), although the graphs give a false idea of large variations. It should be emphasized once more that the competitive sectors concentrate the poorly qualified labor hand which is, therefore, easily replaceable and faces enormous difficulties to become consistently organized. These factors seem to be illustrated in the path described by the institutional-elasticity which, besides showing a small amplitude, remained in relatively low levels.

However, as confirmed previously, the period analyzed corresponded to phase of large uncertainty in terms of wage policy, besides presenting a picture of rapid inflationary acceleration. Consequently, a large number of strikes was observed in the country, culminating also in a large number of agreements between employers.
and employees. Thus, the small increase in importance for the competitive sectors' institutional-elasticity seems to suggest that, in these sectors, there was also an increase in the mobilization power and organization of the labor hand accompanied also by the bosses' higher willingness to negotiate.

![Figure 9 - COMMERCE Filtered Parameters](image)

 Desired wage

![Figure 10 - COMMERCE Filtered Parameters](image)

 Market Factor

The nominal wage market-elasticity for the competitive sector reached high values, as one should expect, ranging from -0.25 to -0.36. The path described in figure 10 shows the importance of the market forces in the competitive sector's process of nominal wage determination. Although the amplitude was not that high,

---

19 See R. Maia (1990)
the coefficients start at a relatively high level (roughly -0.26) and become slightly more important in early 1989. In broad terms, one could argue that this behavioral pattern can be justified by the fact that these sectors concentrate a more homogeneous and unskilled labor hand, what contributes for a higher vulnerability of these workers to the market forces.

8. CONCLUSION

The preceding analysis has been useful to observe the power of the Kalman's Filter algorithm in providing a worth set of empirical information. It has also been possible to verify that the traditional Ordinary Least Square method is a very limited tool to analyze periods of intense changes in the economic-institutional context. The use of the Kalman's Filter, on the other hand, allows the observation of how the structural parameters change in periods of institutional changes, what is essential in the decision taking process. The exercise reported here has found that not only the institutional factors but also the market factor were relevant to explain the process of nominal wage determination in Brazil between 1986 and 1989. Government participation in this process, however, was found increasingly less important. Thus, the path of the variable elasticities for both sectors (organized and competitive) seems compatible with the overall government speech of implementing the free wage negotiation in the country.

Firstly, this argument could be supported by the fact that the wage policy variable coefficient showed a decreasing trend in time in all sectors. As mentioned previously, this behavioral pattern could be the consequence of several factors, such as the own indefiniteness regarding the overall wage policy, the increased importance of institutional agreements and also the utilization of the labor turnover mechanism. Secondly, because the path of the variable elasticity for the institutional factors seems to suggest that the country has watched some progress in the relationship between employers and employees.

And finally, because the path of the variable elasticity for the market factor seems to indicate that this factor also works as an important mechanism in the wage setting of the two sectors. In a higher or lower level, depending on the sector that has been considered, market forces seem to become more present in periods of increased government intervention, this was verified when both the Summer Plan and the benevolent minimum salary law were implemented.

Therefore, the results reported here have demonstrated that the country has already the basic conditions to face the free wage negotiation. It should be acknowledged, however, that the organized sectors present the best environment for this practice. But there is also evidence on an increased importance of institutional factors in both sectors. Nevertheless, maintaining an official policy for the minimum salary could provide workers employed in competitive sectors with an efficient mechanism to protect their salaries.
BIBLIOGRAPHY

CAMARGO, J M. Demanda por trabalho, salários e preços Brasilia: SES/MTb, 1988 (Discus Paper, n 13).

SINOPSE

INTERVENÇÃO DO GOVERNO, FATORES INSTITUCIONAIS E DE MERCADO: UMA ANÁLISE DA DETERMINAÇÃO SALARIAL NO BRASIL.

Este artigo analisa o processo de determinação do salário nominal no Brasil. Uma equação salarial é especificada para capturar a participação do governo e o papel dos fatores institucionais e do mercado na barganha salarial em setores organizados e competitivos da economia brasileira. O teste de Chow foi aplicado para resultados preliminares e, então, a equação salarial foi reestimada usando o algoritmo do Filtro de Kalman. As principais conclusões do trabalho são: (a) a política salarial do governo tem ficado cada vez menos importante como mecanismo para guiar a determinação salarial no Brasil; (b) o salário mínimo oficial, por outro lado, tem aumentado sua importância na barganha salarial; (c) os fatores institucionais têm aumentado de importância na determinação do salário nominal; (d) o fator mercado tem se tornado um mecanismo relevante para guiar a barganha salarial no Brasil.