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# WAGE DETERMINATION AT THE INDUSTRY LEVEL

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# Wage Determination At the Industry Level

by

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During the past decade a considerable amount of econometric research has been devoted to the explanation of movements in wages. Most of these studies have been stimulated by the disequilibrium model first suggested and tested by Phillips[1] and Lipsey[2] in which the change in money wage rates is primarily related to labour unemployment. By presumably relaxing some of the more rigid theoretical assumptions, the basic Phillips curve explanation has been expanded in a very ad hoc fashion to include a number of other variables such as profits, prices, productivity, employment mix, etc.[3] While many of these studies have provided valuable insights into the wage determining process, one cannot help but be amazed by how many different Phillips curves can be constructed from the same body of data, by how key explanatory variables appear and disappear almost randomly in the relationship, and by how unstable the Phillips curve has been over time.[4]

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[1]Phillips, A.W., "The Relation Between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1861-1957", Economica, XXV (November 1958), 283-299.

[2]Lipsey, R.C., "The Relation Between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1862-1957; A Further Analysis", Economica, XXVII (February 1960), 1-31.

[3]See for example Perry, G.L., Unemployment, Money Wage Rates and Inflation. Cambridge: M.I.T. Press, 1966.

[4]Levy ("U.S. Phillips Curves and Target Unemployment Rates", Business Economics, Fall 1967, 70-76) rejected unequivocally the stability of the Perry version of the Phillips curve over the 1948-1967 period.

In a recent paper Gordon Sparks and I have presented a
brief critique of existing aggregate research, noting in parti-
cular the failure of the current modified Phillips approach to
deal adequately with the institutional features of the labour
market, as well as the ominous serial correlation, with its
inherent inefficiency and potential biases, built into the typical
quarterly model through the use of overlapping annual wage
changes.[5] Attempts to overcome some of the inherent institutional
difficulties in aggregate wage analysis were moderately successful.
Our analysis of a moving cross-section of wage negotiations in
Canadian manufacturing industry revealed several highly signifi-
cant effects[6] but, unfortunately, a relatively large unexplained
variance.[7] Better interaction variables are required to capture
the varying degrees of union militancy and management resistance
which exist in each individual sector.

This paper outlines a workable statistical model which
circumvents some of the severe institutional problems which exist
at the disaggregate or individual industry level. In addition,
this model should permit the generation of useful sectoral infor-
mation for the refinement of aggregate analysis. In essence,
the following wage analysis is divided into two parts:

> (1) The determination of basic wage rates as
> negotiated in periodic collective
> bargaining sessions,

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[5]Sparks, G.R. and Wilton, D.A., "Determinants of Negotiated
Wage Increases: An Empirical Analysis", Econometrica, forthcoming.

[6]The key explanatory variables were found to be profit
levels, unemployment, price changes, relative productivity,
relative wage rates and a strike dummy expressed in a non-linear
formulation.

[7]In terms of $R^2$, our best fit was only .43.

(2) The linking of this negotiated wage
rate series to average hourly
earnings, the variable typically
explained in conventional analysis.

While the individual ingredients of this approach are all well-known in the literature, the complete mix may be somewhat novel.

As a guide for describing this model in operation, as well as providing a suitable testing ground, the Canadian automobile manufacturing industry will be used as the illustrative sector. The institutional features and implications of a highly disaggregated sector are discussed in Section I followed by an analysis of wage bargaining in Section II. The linking mechanism to generate average hourly earnings is presented in Section III and some concluding comments are given in the final part of the paper.

I

Since a central feature of this analysis concerns the role of the union in collective bargaining, a few words concerning the development of the United Automobile Workers union, hereafter referred to as the U.A.W., are in order. Having been organized in the United States shortly after the turn of the century, the U.A.W. moved to Canada in the late thirties. After several bitter struggles, membership in the U.A.W. began to grow rapidly in the early forties, and by the end of the war virtually the entire hourly-rated labour force in the Canadian automotive manufacturing industry was under the control of the U.A.W. In the post war era the basic growth in the industry resulted in a corresponding growth in the U.A.W., and by the mid-sixties the U.A.W. had grown to a powerful, wealthy, efficient organization, ranking third in total membership behind the United Steelworkers

Union (U.S.U.) and the Canadian Union of Public Employees
(C.U.P.E.).

The most important element in the following analysis is
the institutional feature of multi-year contracts. Over the
post war period, the shortest wage contract negotiated by the
three major Canadian automobile producers was for one year and
a half, while the longest contract was for five years. The
statistical implications of this fact are crucial as we can no
longer assume that wage changes occur evenly over time - the
standard assumption in most wage research. While under appropri-
ate assumptions long term contracts will probably not introduce
any systematic bias[8], the unexplained variance will be greatly
increased. To illustrate this point, let us assume a three year
contract, most typical of the industry, calling for wage incre-
ments at the beginning of each year of the contract. These
increments, including the future "locked-in" wage increases, will
be based primarily on conditions existing at or preceding the
date of the contract signing. Consequently, any attempt to
explain the future negotiated wage increases in terms of condi-
tions existing at the time of their implementation would be
inefficient and misleading.

The existence of multi-year contracts has, in effect,
placed many quarterly and annual wage studies in serious question.
This problem becomes particularly acute when highly disaggregated
data are used since there is much less chance for any evening out.

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[8]See Perry, G.L., op. cit., page 33.

In a study of an industry dominated by a powerful union signing coincidental multi-year contracts with all firms, an analysis which fails to explain these future "locked-in" wage increases in terms of conditions at the time of the contract signing is doomed to failure.[9]

In addition, the Canadian automotive industry, like many other highly unionized sectors, has been characterized by coincidental, pattern-setting collective bargaining. The fact that the major firms bargain on a single company basis has resulted in the U.A.W. attempting to win major concessions from one of the leading firms, and then, with this settlement as a source of strength, pressing for similar settlements in other company bargaining sessions immediately thereafter. In this regard, the U.A.W. has been very aggressive in achieving agreement on coincidental termination dates with all firms to heighten their advantage in future bargaining.

While there can be no question concerning the existence of multi-year contracts, the "pattern" of contracts must be examined more closely. As shown in Table 1, wage contracts signed between each of the three major Canadian automobile producers and the U.A.W. during the post war era follow a definite pattern and can be grouped into eight separate wage rounds. The

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[9]This institutional feature probably accounts more than any other single factor for the poorer fits when quarterly wage analysis is carried out on a disaggregated level. An excellent illustration of this point is found in a recent study by Reuber (Wage Determination in Canadian Manufacturing Industries, unpublished paper, November 1968) which indicates that industries with the highest degree of unionization and prevalence of long-term contracts have the poorest fits in a sample of two-digit Canadian manufacturing industries. For example, the highly unionized iron, steel, and transportation equipment industries have wage equations with $R^2$'s on the order of .15 to .20.

## TABLE 1

### Dates of Wage Contract Signings
### in the Canadian Automotive
### Industry

| Wage Round | General Motors | Ford | Chrysler |
|---|---|---|---|
| 1 | June 1948 | July 1948 | August 1948 |
| 2 | June 1950 | September 1950 | June 1950 |
| 3 | | February 1952 | June 1952 |
| 4 | | January 1955 | February 1955 |
| 5 | February 1956 | August 1956 | December 1956 |
| 6 | December 1958 | January 1959 | January 1959 |
| 7 | December 1961 | January 1962 | April 1962 |
| 8 | December 1964 | January 1965 | March 1965 |

Source:  Canadian Department of Labour.

one possible exception concerns the second round when General Motors signed a five year contract, while the other two firms signed for only two years.  Consequently, Ford and Chrysler were involved in two additional wage rounds to offset the longer G.M. contract.  In general, wage settlements for the major Canadian automotive producers follow a definite coincidental, pattern-setting format which should provide the basis for a more useful approach to wage analysis at this highly disaggregate level.

Two statistical avenues would appear to be open.[10]  First

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[10]The use of lengthy distributed lag models for the explanatory variables is rejected because variable weights in the lag distribution would be required to produce efficient results. The specification of these variable weights involves similar considerations as discussed above.

one could identify all future increases and utilize explanatory variables which persisted at the time of the contract signing. However, such an approach would seriously overstate the appropriate degrees of freedom since each contract signing is represented by two to five observations.[11] A more suitable approach is to consider each contract as one observation and explain the total package wage increase over the entire contract. This approach, I believe, is in the true spirit of the Eckstein-Wilson study[12] which, unfortunately, was subject to a number of questionable assumptions and statistical procedures.[13]

## II

To implement this model, an operational approach to the collective bargaining process is required. This process is in direct contrast to the classical demand-supply adjustment model envisioned by Phillips and others, and must necessarily reflect institutional and inter-industry effects as well as pure economic variables. No new formal bargaining theory is presented, but rather I adopt the Eckstein-Wilson approach that the problem can be viewed in terms of "utility functions of union leaders and corporate managements,"[14] which are assumed to shift with various

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[11]For example, if a contract called for x¢ at the beginning of each year of a three year contract, then the time series would consist of three identical observations for one economic event.

[12]Eckstein, O. and Wilson, T.A., "The Determination of Money Wages in American Industry", Quarterly Journal of Economics, LXXVI (August 1962), 379-414.

[13]See Sparks, G.R. and Wilton, D.A., op.cit.

[14]Eckstein, O. and Wilson, T.A., op. cit., p. 381.

economic conditions and factors, thus influencing wage settle-
ments. Consequently, the approach taken here is somewhat
eclectic, encompassing a number of variables which might influence
either side's demands in the wage bargain.

Many theories of wage rate determination assign a key role
to a measure of profitability[15]. There can be little doubt that
union leaders will be much more aggressive in wage bargaining
when profits are high. Labour solidarity tends to be much higher
when increased wage prospects look good, and the rank and file
members make it very difficult for union leaders, who are usually
elected by popular vote, to accept anything but a large settle-
ment in the face of substantial corporate profits. On the other
side of the bargaining table, high profit rates also tend to
weaken management's resistance to union demands. While it is
often asserted that high profits increase the ability of firms
to pay a given wage increase, the wage-price mechanism in a tight
oligopolistic industry may simply dictate price increases to
offset wage increases[16]. More important, however, is the threat
of a strike, labour's principal weapon. In a very real sense
the profit rate tends to indicate the cost to the firm of engaging

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[15]Perhaps the strongest proponent of profits has been
Kalder who argues that relative strength at the bargaining table
depends solely on profits (Kalder, N., "Economic Growth and the
Problem of Inflation, Part II", Economica, XXVI (November 1959)
287-298). See also Eckstein, O. and Wilson, T.A., op.cit. and
Perry, G.L., op.cit.

[16]For empirical verification of this point see Wilton, D.A.,
"An Econometric Model of the Canadian Automobile Manufacturing
Industry", unpublished paper.

in a long strike.[17] Increased profitability definitely shifts the contract curve to the advantage of labour as higher profit rates increase the cost of management resisting labour's strengthened demands.

Even though actual wage bargaining takes place in terms of money rates, this is not to say that money illusion is involved. Labour is only too aware of the real nature of economic affairs. In many respects, an increase in the cost-of-living may have an even greater effect in strengthening union wage demands than increased profitability as it directly affects the welfare of the individual worker. While not greatly influencing management's resistance to increased wage demands, the increased aggressiveness of labour resulting from an increase in the cost-of-living definitely results in a net plus on labour's side of the bargaining table.

A third important factor in wage bargaining, particularly on labour's side of the table, is the effect of wage movements in industries outside the Canadian automobile industry. As Eckstein and Wilson point out, individual settlements are likely to be influenced by recent wage increases obtained by other workers[18]. There are two possible exogenous wage rates to which the U.A.W. may respond. The first possibility concerns those Canadian industries which the automobile workers feel they must closely resemble, presumably the highly mechanized, durable

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[17]This effect may be particularly strong in the automobile industry given the cyclical nature of automobile demand, and hence profits, and the fierce competition between major producers. High profits typically coincide with a strong and buoyant new car market with each firm coveting an increased share of this enlarged market. Inventories are generally low and any halt in production results in loss of customers to one's competitor. The tendency of repeat sales in the automotive market magnifies this potential effect into the future as well.

[18]Eckstein, O. and Wilson, T.A., op.cit.

manufacturing industries. In the previously cited Sparks-Wilton study, it was found that of all the large Canadian manufacturing industries, automobile workers received the highest basic wages. Thus, one would expect the U.A.W. to vigorously defend its position at the top of the wage ladder during each wage bargaining session.

The second possible relative wage effect focuses on the level of wage rates in the parent U.S. industry.[19] The wage parity issue is one of the oldest in Canadian labour relations[20] and currently one of the hottest topics. In the latter part of the fifties, the wage parity issue began to gather steam in the Canadian automobile industry and became an explicit union bargaining objective.[21] By the sixties it was an over-riding concern of the U.A.W., both in Canada and the United States. The avowed intention of the U.A.W. to eradicate all international wage discrepancies would thus appear to be a major factor in recent collective bargaining.

The level of unemployment typically plays a major role in aggregate wage-adjustment analysis.[22] However, it is not at all

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[19]One of the initial studies recognizing the possibility of U.S. spillovers is Bodkin, R.G. et al., _Price Stability and High Employment: The Options for Canadian Economic Policy, An Econometric Study_. Ottawa: Queen's Printer, 1967., which discusses this possibility in a Phillips curve context.

[20]It dates back to at least the late nineteen twenties when Canadian railroad workers attempted to regain wage parity with their U.S. counterparts.

[21]The first public reaction by the U.A.W. came in 1956 when union leaders argued that the Canadian wage package settlement should bear a strong resemblance to the American wage settlement.

[22]For examples of aggregative Canadian Phillips curve studies, see Kaliski, S.F., "The Relation Between Unemployment and the Rate of Change of Money Wages in Canada", _International Economic Review_, V (January 1964), 1-33; and Bodkin, R.G., et al., _op. cit._

clear that such a theoretical "Phillips curve" approach would be satisfactory at a very disaggregative level, such as an individual industry. In particular, the role of unemployment, a proxy for disequilibrium in the given industry labour market, is almost completely obscured by the mobility of labour between industries, trade union activity, and the existence of wage differentials[23]. While a recent paper by Phelps stressing the importance of vacancy and turnover rates in addition to unemployment is a step in the right direction, the lack of adequate data presents a severe stumbling block to the implementation and testing of such a modified unemployment analysis.[24] The complete domination of labour in a number of manufacturing industries by powerful unions and the potentiality for spillover wage effects tend to militate against any sectoral theory based primarily on conventionally measured labour market variables.

In summary, profitability, cost-of-living considerations and both domestic and American relative wage effects are postulated as being important factors in the wage negotiations of the Canadian automotive industry. The limited degrees of freedom necessitate drawing the line early, and it is hoped that these factors will provide a reasonable degree of explanatory power.[25]

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[23]For example, a high wage industry located in the industrial heartland of Canada, i.e. the automobile manufacturing industry, may rarely know what positive unemployment is.

[24]Phelps, E.S., "Money-Wage Dynamics and Labor-Market Equilibrium", The Journal of Political Economy, LXXVI (July-August 1968), 678-711.

[25]The limited degrees of freedom also prevented the use of multiplicative variables which might have been more appropriate since the latter "labour factors" produce the greatest effect when a strike is the most costly (i.e. high profits).

A few brief comments concerning the definition and construction of the variables used in the empirical analysis. The dependent variable is strictly in terms of changes in the basic wage rate, the critical variable in collective bargaining. This measure should provide an improvement over those used in previous studies since it does not reflect non-bargaining factors such as cyclical variations in overtime hours and premiums, or changes in employment mix.[26] To construct the dependent variable, the total wage increase over the life of the individual company contract is expressed as a percentage of the base rate at the time of the bargaining session[27]. These firm percentages are reduced to an annual industry increase by considering the length of the contract and the number of firms, usually three, involved in the particular wage round.[28]

The profit variable is simply total profits in the industry[29] divided by current dollar output. The profit specification focuses directly on increases in profitability as an increase in profits accompanied by an equal percentage increase in output

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[26]Theoretically, wage supplements and fringe benefits should also be included as many settlements involve a trade-off between actual monetary wage increases and fringe benefits such as pension plans, increased vacation, etc. The lack of data precludes the use of this more relevant definition of the dependent variable.

[27]The data originate from the Department of Labour (1952-65) with the early wage round estimates being obtained from newspaper clippings. Complete data are available on request.

[28]The weights employed in the firm averaging were .40, .33, .26 respectively for General Motors, Ford, and Chrysler which should approximately reflect the employment levels in the industry.

[29]Profit data, taxable corporate income before taxes, are taken from Department of National Revenue, Taxation Division. All other data were obtained from published Dominion Bureau of Statistics documents unless otherwise specified.

should have little effect on boosting basic wage rates. A cost-of-living factor may be incorporated into the analysis either by reducing money wage rates to real terms or by simply including it as an additional explanatory variable. The former alternative is rejected since it seems unnecessarily restrictive and inconsistent with a bargaining model in terms of basic money wage rates. Furthermore, the introduction of the escalator clause midway through the period would tend to confuse a "price effect" and make it desirable to examine its role independently of all other variables. Consequently, the annual percentage increase in the consumer price index is included as a separate explanatory variable.

The incorporation of the relative wage effects into a statistical relationship is a difficult problem. Simply introducing an appropriate external wage change variable thought to influence current negotiations would tend to obscure the role of other variables by greatly increasing multicollinearity. In an attempt to minimize this problem, a relative wage variable, defined as the external wage rate divided by the existing Canadian automotive basic wage rate, is utilized.[30] This variable will capture the Eckstein-Wilson spillover effects as recent wage increases in other industries will push up the relative wage variable, thus resulting in increased union demands in the Canadian automobile industry.

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[30]This particular type of specification was found to work quite successfully in Sparks-Wilton, op.cit., and in a subsequent paper by Reuber, G.L., op.cit.

It will also capture a "catch-up" or "stay ahead" effect.
If the relative variable is in terms of a higher wage than that
of the Canadian automobile industry, such as the parent U.S. wage
rate, it will then create an inducement for the union to close
the gap between these two wage levels (the greater the gap, the
greater the relative variable, the greater the positive induce-
ment on domestic automobile wages). If, on the other hand, the
relative variable is in terms of a lower wage rate, i.e.
Canadian wages, then its effect again is likely to be positive
as there will be an incentive for the automobile industry to
stay ahead of the other industries. Any closing of the gap,
say through a recent settlement in another major industry, will
cause an aggressive defensive response by the U.A.W. to maintain
its position at the top of the wage totempole.

The inability of previous researchers to distinguish a key
wage group in Canada[31] has necessitated the use of durable manu-
facturing wage rates[32] in the first relative wage variable.
Minimum straight-time hourly earnings for General Motors in the
U.S. are employed in numerator for the second relative wage
effect. The average existing Canadian automotive base rate[33]
forms the denominator for both relative wage variables.

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[31]See Reuber, G.L., op.cit.

[32]While it would have been more appropriate to use an average
base rate as the numerator, lack of data over the entire sample
period precluded the use of such a variable. Consequently, some
undesired cyclical variation is introduced into the analysis.

[33]This average base rate is constructed by taking the
average base rate in the industry for the year 1947 and applying
the annual industry negotiated percentage wage increases for
each respective year.

The final step before empirical estimation is to isolate the relevant time period for each explanatory variable. Since profits are only expected to make their influence felt through their effect on relative bargaining power, profitability at or proceeding the bargaining session is the relevant temporal specification. As a general rule I selected the previous annual profit rate if contracts were negotiated in the early part of the year and a two year average for those contracts negotiated in the middle part of the year (rounds 1, 2, 3, and 5).

Defining the relevant time period for the cost-of-living variable presents a serious problem since this variable underwent a structural change during the sample period. As mentioned above, an escalator clause was introduced in the early fifties which tended to capture cost-of-living effects independently of the money wage bargain. However, it is not clear whether some of the early wage increases might be escalator increases and, more important, whether a number of the basic wage increases may in fact represent an incorporation of part of the existing cost-of-living allowances into the basic wage rate, a frequent union demand. As a compromise solution, the relevant time period is chosen in the same manner as done in the profit specification for those contracts before the introduction of the escalator clause. For the remaining contracts, the time period is broadened to include the entire contract period.

Finally, the relative wage variables are simply taken at their annual level in the previous year. The fact that the horizons of the Canadian union may have shifted over the post war era poses a major question concerning the role of these two

variables. As I pointed out earlier, wage parity has become an explicit bargaining demand only in the last decade with demands in earlier years presumably being affected by comparable Canadian wage rates. To test for this phenomenon, both relative variables are included in their entirety as well as being included only for their hypothesized time horizon.

As expected, the inclusion of both relative variables at the same time, or only one of them over the entire sample period, produced unsatisfactory results. Consequently, the shift in union horizons from the domestic scene to international wage parity questions is captured by multiplying each relative wage variable by a dummy variable taking the value of unity when the particular relative effect is expected to dominate. As is evident from the following equation, this specification works remarkably well. All variables have the correct signs and are significant at the 98% level or better (standard errors are presented below the coefficients); and the standard error of estimate is below a third of one percent.

$$\frac{\Delta W}{W} = \begin{matrix} -25.39 \\ (5.41) \end{matrix} + \begin{matrix} 45.93 \\ (5.65) \end{matrix} \pi + \begin{matrix} .4436 \\ (.0973) \end{matrix} \frac{\Delta CPI}{CPI} + \begin{matrix} 22.31 \\ (4.44) \end{matrix} DUS \times (USW/W)_{-1}$$

$$+ \begin{matrix} 28.26 \\ (5.75) \end{matrix} DCAN \times (CANW/W)_{-1}$$

S.E.E. = .32          $R^2$ = .97          D.W. = 2.55          $n = 8$

where  W:  base wage rate for Canadian automobile manufacturers, as negotiated in collective bargaining sessions

   $\pi$ :  total profits in industry divided by industry output

   CPI:  Canadian consumer price index

DUS: dummy variable with value of unity for last three wage rounds (wage parity period), zero elsewhere.

USW: minimum U.S. General Motors base wage rate in U.S. currency.

DCAN: dummy variable with value of unity for the first five wage rounds, zero elsewhere.

CANW: average hourly earnings in Canadian durable manufacturing industries.

The relatively low coefficient on the cost-of-living variable is presumably a reflection of the introduction of the escalator clause midway through the period, thus picking up part of the price effect independently of basic wage rate negotiations. While there is some difficulty in interpreting elasticities of rate of change variables, the effect of profitability on wage changes can be examined by varying the profit rate. For example, a movement of .05 in the profit rate, other factors constant, results in about a 2½% change in basic wage rates. Given the range of profit rates over the sample period (.01 to .11), fluctuations in profitability would appear to play an important role in basic wage rate negotiations.

Turning to the spillover or relative effects, the coefficient on the Canadian durable manufacturing variable is an indication of the strong "stay ahead" desire of the U.A.W. For example, recent settlements in other industries which close this wage gap from, say .85 (the mean value) to .90, will produce a 1½% annual wage increase in automotive base rates regardless of the changes in the other explanatory variables.[34] Varying the relative U.S.

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[34]It should also be noted that the particular specification of these relative variables accounts for the large negative constant in the relationship. Assuming an average value for the relative Canadian variable, a minimum profit rate of about .04, and no price inflation will result in a virtually constant basic wage level, i.e. zero wage increase.

wage variable produces an almost identical result as a comparable percentage movement from the mean of this "parity variable" results in an annual wage change of 1.53% in the Canadian industry.

One final comment concerning the wage parity variable. Most, if not all, union demands are made strictly in terms of wage parity in domestic currencies, i.e. a dollar is a dollar regardless of country. This assumption of "currency illusion" was found to work quite successfully above. However, direct attempts were also made to adjust the U.S. wage rate for foreign exchange fluctuations. The unsuccessful statistical results (in terms of significance levels) for such an experiment suggest, at least indirectly, that currency illusion does exist in wage parity demands. Given the devalued Canadian dollar, this could have a substantial dampening effect on potential wage increases arising from wage parity considerations.

## III

The preceding analysis focuses directly upon the explanation of basic wage rates, the key concept in the collective bargaining process. However, in the day to day operations of the firm, average hourly earnings represent the important cost variable to the entrepreneur. Furthermore, such average wage concepts are typically employed in econometric wage research and model building, and thus it is desirable to link the previously generated basic wage rate to the conventional average hourly earnings data. The principal and overwhelming determinant of average hourly earnings is obviously the level of negotiated wages; and, in an attempt to isolate other important explanatory variables, attention will be directed to the spread between average hourly earnings and basic

wage rates[35]. The following discussion briefly outlines the type of factors which are deemed to be important in determining this wage spread, hereafter referred to as the differential, with very simple proxies used to test their importance.

A most important determinant of the differential is overtime hours and premiums. Assuming for the moment that this factor alone accounts for the entire differential, we can represent average hourly earnings in the following manner:

$$AHE = \frac{(W*H_{st}) + \tilde{a}(W*H_{ot})}{H}$$

where

W : basic negotiated wage rate

$H_{st}$ : straight-time hours

$H_{ot}$ : overtime hours

$\tilde{a}$ : overtime premium factor (approximately 1.5)

H : total hours worked per week

Rearranging terms produces the following result:

$$AHE - W = W \times \frac{(\tilde{a} - 1) \times H_{ot}}{H}$$

Unfortunately, data do not exist specifically for overtime hours. While the straight time work week has been 40 hours throughout the entire period, simply setting overtime hours equal to average hours less forty is not appropriate. The <u>weekly</u> determination of overtime pay and the <u>quarterly</u> (or <u>annual</u>) average for hours worked rule out a straight forward calculation

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[35]This type of analysis was suggested some time ago by Klein, L.R. and Ball, R.J. ("Some Econometrics of the Determinants of Absolute Prices and Wages", <u>Economic Journal</u>, LXIX (September 1959), 463-482) but has received little subsequent attention. It should be noted, however, that Eckstein ("Money Wage Determination Revisited", <u>Review of Economic Studies</u>, XXXV (April 1968), 133-143) has recently attempted to incorporate his wage round analysis

of overtime hours.[36] As a proxy for $(\tilde{a} - 1) \times H_{ot}/H$, I have simply employed hours worked per week (H). These two measures will typically move together since any increase in H will presumably increase overtime work at some point in the period. While it will not capture the non-linearities of the above expression, it should give some indication as to the relative effects of overtime premiums[37]. This variable is multiplied by lagged basic wage rates in an attempt to diminish any spurious correlation that might result from having current basic rates on both sides of the equation.

A second factor influencing the differential is the level of the consumer price index, or more specifically, the presence of a cost-of-living escalator clause. If a constant escalator factor existed throughout the entire period without any incorporation into the basic rate; then, it could also be represented in the differential identity by the following expression:

$$\tilde{c} \; (CPI - X)$$

where

$\tilde{c}$ : the escalator factor

CPI : Canadian consumer price index

X : the value of CPI when the escalator clause was introduced

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into a quarterly format by adding a wage round rate of increase variable to a Perry-type of wage equation. While he achieves reasonable success, his procedures are aimed at the question of aggregate wage movements, not the explanation of the relationship between basic wage rates and average hourly earnings.

[36]For example, annual hours data may conceal the fact that employees worked 44 hours per week for four months during peak production runs and 38 hours for the remaining eight months. Thus, there would be overtime premiums pushing annual average hourly earnings above the basic rate even though average hours worked per week is given as 40 hours (the 'normal' work week).

[37]Such a specification would appear to be superior to the

Unfortunately, none of the previous assumptions is correct; and since the necessary data to construct a proxy variable again do not exist, the current level of the CPI is used to provide a rough test as to the effect of the escalator clause.

The final variable introduced into the differential equation is a dummy variable to correct for any potential biases in the generation of the negotiated basic wage rate series. As discussed above, this latter series is constructed by applying the average annual industry wage increase over the life of each contract to the initial industry base rate. A possible bias exists in this type of calculation since it assumes that the total wage increase is spread evenly over the life of the contract. In fact, the usual practice is for the union to push for a larger portion of the increase in the early years with a smaller annual increment in the final year. To correct for this possibility, I have included a dummy variable taking a value of one for the first year of each contract. Its effect should be positive since the average annual negotiated wage increase will likely be larger than I have represented it to be in the first year of the contract; therefore, the differential will be overstated in the regression analysis for those years.

Other variables may also be important but again lack of data precludes their inclusion. For example, the negotiated basic wage rate consists solely of the minimum base rate with no allowance for higher skilled labour classes. If the labour mix varies through time, one would naturally expect the differential to change. Furthermore, the base rate is strictly in terms of

use of indirect measures of industry labour market tightness as a proxy for overtime premiums.

negotiations with the "Big Three". No recognition is given to other smaller firms. Any changes in these smaller firms' wage schedules not reflected in the basic wage rate of the "Big Three" will result in slight variations in the differential.

To test the empirical validity of these simple proxies in the linking equation, annual data over the 1948-1964 period are employed. Although the overall fit of the following equation is reasonable, the significance level on the overtime premium variable is not up to par. The possibility of spurious correlation between the  negotiated basic wage rate and its lagged value,

$$AHE - W = \underset{(.137)}{-1.084} + \underset{(.00177)}{.00926} \; CPI + \underset{(.00132)}{.00174} \; H*W_{-1} + \underset{(.0172)}{.0283} \; DYR1$$

$$S.E.E. = .033 \qquad R^2 = .95 \qquad D.W. = 1.22 \qquad n = 17$$

where  AHE : average hourly earnings in the Canadian auto-
              motive industry
       W   : basic wage rate in the Canadian automotive
              industry, as constructed from wage contract data
       CPI : Canadian consumer price index, 1949 = 100.0
       H   : average hours worked per week
       DYRI : dummy variable taking the value unity for years
              which correspond to the initial year of a wage
              contract period, zero elsewhere

as well as the inappropriateness of the particular representation for the overtime premium factor[38], may be affecting the significance level of this variable.

While the lack of adequate data presents serious  difficulties in the specification of the appropriate factors in the differential equation, the above estimates provide  a reasonable representation of the forces at work in this linking equation. For example the

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[38]Other non-linear representations of the overtime premium factor did not improve the significance level.

escalator factor is about .9*CPI (in cents) while the dummy
variable implies a re-allocation of 3¢ to the first year of the
contract from latter years.  One should recall that I purposely
set up a stiff empirical test for average hourly earnings by
expressing the dependent variable in differential form.  Thus,
the strong effect of negotiated wages on average hourly earnings
is implicit in the entire relationship.


## IV

In summary, existing wage research has failed to consider
adequately the institutional forces at play in the industry labour
market.  This market is characterized predominantly by bilateral
monopoly, not free and continuous wage determination.  The
preceding analysis explicitly recognizes the existence of powerful
unions, the implications of coincidental multi-year wage contracts,
and the possibility of spillover or inter-industry effects.  It
is argued that any attempt to explain effectively industry wage
rates must first examine discontinuous changes in basic wage
rates as negotiated during periodic collective bargaining sessions.
Only after such an analysis can one develop an industry average
wage function.

Following this strategy, eight independent wage rounds are
identified in the Canadian automobile manufacturing industry and
analyzed in the context of a simple bargaining model.  The changes
in basic negotiated wage rates are found to be strongly affected
by profitability, price effects, Canadian relative wage effects,
and wage parity considerations.  However, I would briefly
reiterate some of the major limitations still involved in this

type of analysis. First, the lack of data on fringes is a most important omission as many settlements have involved substantial non-wage gains. Secondly, the union strategy of attacking the most vulnerable firm first may introduce aggregation problems, even at this highly disaggregate level, as the pattern-setting agreement may be based on particular firm conditions which are unlike those in the industry in general. Also, the role of cost-of-living considerations is somewhat ambiguous with the escalator clause being introduced midway through the period. Finally, the U.S. influence on both sides of the bargaining table may not be completely quantified in the empirical analysis. Despite these limitations and the few degrees of freedom, the remarkably tight fit for a wage regression and the high significance levels of all factors lend credence to this type of approach.

The second step in the hypothesized wage model concerns the linking of the basic wage rate to average hourly earnings. In spite of inherent data deficiencies, proxy variables representing overtime premiums and escalator clauses perform adequately in this second stage. However, future work is required to refine these effects.

On the whole, this two step model for analyzing wage determination at the highly disaggregate level seems to be appropriate for this one particular industry. The general adaptability to any industry remains to be seen.[39] If successful

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[39]The author is currently testing this model on a number of other industries as well as attempting to refine some of the proxy variables employed in Section III.

for a number of industries, it should present a useful method for

overcoming some of the major statistical problems arising from

peculiar institutional features in the labour market.  Furthermore

it should also provide useful sectoral information for the refine-

ment of aggregate wage analysis.[40]

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[40]As pointed out above, such sectoral information should be
most useful in refining the interaction variables employed in
the type of aggregate analysis suggested by Sparks-Wilton, op.cit.