

## Canadian Union Growth La croissance des syndicats canadiens

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### Résumé de l'article

Les apports récents aux études qui mettent en relief les causes déterminantes de la croissance des syndicats indiquent que leur développement est relié au comportement de l'activité économique et de l'inflation. Plusieurs spécifications n'ont que la croissance des syndicats comme seule variable endogène, les autres permettent de déterminer simultanément la croissance des syndicats, l'augmentation des salaires et la variation des prix. La recherche sur le développement du mouvement ouvrier au Canada en a été une de type d'équation simple.

Le présent article constitue une tentative en vue de combler le manque d'équations simultanées pour apprécier la croissance des syndicats canadiens. Il présente une analyse empirique des variations dans le temps des effectifs des syndicats et des conséquences qui s'y rattachent. Les données analysées portent sur la période qui va de 1947 à 1970.

Dans la première partie de l'article, on explique la variation des effectifs des syndicats par le pourcentage de changement dans l'indice des prix à la consommation, le taux d'emploi dans l'industrie manufacturière, le chômage chez les travailleurs et la proportion des effectifs syndicaux par rapport aux emplois « syndicalisables », la variable indépendante étant le pourcentage annuel de changement dans le taux des effectifs syndicaux.

Ainsi, le pourcentage de changements dans l'indice des prix à la consommation est positif, car les travailleurs ont la perception que les syndicats sont plus efficaces pour maintenir les salaires en période d'inflation rapide et que, par conséquent, les effectifs des syndicats ont tendance à s'accroître.

De même, le pourcentage de changement dans le taux d'emploi a également un effet. Le développement des syndicats varie en fonction de l'emploi. Par exemple, la hausse du taux d'emploi favorise les campagnes de recrutement, d'une part, et, d'autre part, l'application des clauses de sécurité syndicale apporte de l'eau au moulin des syndicats.

Par contre, le chômage donne un résultat plutôt négatif, car les employeurs peuvent plus facilement contrer l'action syndicale lorsqu'il y a un chômage marqué, mais certaines forces économiques peuvent atténuer cet effet négatif du chômage sur le taux de croissance des syndicats.

Enfin, dans certains secteurs fortement syndicalisés, le recrutement est rendu plus difficile, parce que le nombre des travailleurs « syndicalisables » décroît.

Une deuxième équation consiste à choisir comme variable dépendante le pourcentage annuel de changement dans le taux de salaires et, dans ce cas, on retient comme variables indépendantes le taux de chômage, les changements dans l'indice des prix à la consommation, la croissance des syndicats et les grèves. On y voit que plus il y a de chômage, moins les taux de salaires ont tendance à s'accroître. De même, l'augmentation de l'indice des prix à la consommation a un effet sur les taux de salaires. Le taux annuel de changement des salaires est directement relié au taux de changement des effectifs syndicaux. Quand les effectifs syndicaux s'accroissent, la moyenne des salaires augmente à son tour, tandis que les grèves favorisent la croissance des salaires.

La troisième équation retient comme variable dépendante l'indice des prix à la consommation et le taux de croissance des salaires et le taux de la productivité comme variables indépendantes. On constate que, par exemple, la hausse des taux de salaire a une influence sur l'inflation. Quant au taux de croissance de la productivité, s'il est positif, il est de nature à faire infléchir l'inflation.

On peut donc conclure de ce qui précède que plusieurs forces exercent une influence sur le développement des syndicats ainsi que sur l'augmentation des salaires et des prix. Les trois variables dépendantes s'influencent les unes les autres.

Parce que la seule analyse antérieure de la croissance des syndicats canadiens en est une de type d'équation simple et qu'il s'agit ici de la première analyse d'un type d'équations simultanées relativement à la croissance des syndicats, à l'augmentation des salaires et à la hausse de l'inflation, les résultats doivent être considérés avec beaucoup de circonspection. Toutefois, on peut en tirer certaines conclusions. En premier lieu, on peut noter que l'inflation des prix, contrairement aux constatations de Swidinsky, est une cause très importante du développement des syndicats au Canada et ceux-ci doivent être considérés comme un organisme de défense, même si, fait intéressant, il peut arriver que des syndicats pris individuellement puissent subir une diminution dans leur taux de croissance. En deuxième lieu, le chômage dans son ensemble ne paraît pas exercer d'influence sur le degré de croissance des syndicats. Finalement, bien que l'on puisse dire que les syndicats influencent les salaires, il est apparent que c'est la croissance des salaires qui a le plus d'effet sur la syndicalisation. Cela est d'autant plus intéressant que l'on est porté à penser le contraire, c'est-à-dire que les travailleurs adhèrent aux syndicats pour améliorer leurs salaires.

# Canadian Union Growth

**Byron Eastman**

*This paper specifies a model of trade union membership growth in Canada. Because union growth affects and is affected by wage and price inflation, the model incorporates simultaneous equations with these three variables in endogeneous roles.*

Recent contributions to the literature on union density by Hines<sup>1</sup>, Ashenfelter and Pencavel<sup>2</sup>, Ashenfelter, Johnson and Pencavel<sup>3</sup>, Swidinsky<sup>4</sup> and Bain and Elsheikh<sup>5</sup> focus on the determinants of union growth over time and suggest that such growth is related to the level of economic activity and wage and price inflation. Several specifications incorporate union growth as the only endogenous variable; others estimate the simultaneous determination of trade union growth, wage change and price inflation. Research into the growth of the Canadian labour movement has been primarily of the single equation variety (e.g., Swidinsky<sup>6</sup>).

This paper develops and tests a model of the simultaneous determination of union growth and wage and price inflation in Canada.

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<sup>1</sup> A.G. HINES, "Trade Unions and Wage Inflation in the United Kingdom 1893-1961", *Review of Economic Studies*, Vol. 31, No. 4, October 1964, pp. 221.-52.

<sup>2</sup> Orley ASHENFELTER and John H. PENCAVEL, "American Trade Union Growth: 1900 to 1960", *Quarterly Journal of Economics*, Vol. 83, No. 2, August 1969, pp. 434-48.

<sup>3</sup> Orley ASHENFELTER, George E. JOHNSON and John H. PENCAVEL, "Trade Unions and the Rate of Change of Money Wages in United States Manufacturing Industry", *Review of Economic Studies*, Vol. 39, No. 1, February 1972, pp. 27-54.

<sup>4</sup> R. SWIDINSKY, "Trade Union Growth in Canada: 1911-1970", *Relations Industrielles*, Québec, Vol. 29, No. 3, 1974, pp. 435-51.

<sup>5</sup> G.S. BAIN and Farouk ELSHEIKH, *Union Growth and the Business Cycle: An Econometric Analysis*, Oxford, Blackwell, 1976.

<sup>6</sup> R. SWIDINSKY, *op. cit.*

## THE SPECIFICATION OF THE MODEL

### Union Growth

In this section we discuss the specification of an equation explaining rate of growth of trade union membership.

#### *The Dependent Variable*

The dependent variable is the annual percentage change in the level of union membership<sup>7</sup>. The primary measure is total trade union membership in Canada. This includes workers belonging to international unions in Canada, national unions, directly chartered local unions and independent local organizations. In addition to the total union membership, 129 different measures are examined, each a subset of the total figure. In all cases the percentage rate of change in the union membership figure is used in the estimation.

#### *The Independent Variables*

The explanatory variables in the union growth equation are price changes, employment in manufacturing, unemployment in trade unions, and the ratio of union membership to "unionizable" employment. The rationale for their inclusion in the model is as follows.

*The Percentage Rate of Change of the Consumer Price Index (P)*. The predicted relationship between the rate of change in prices and union growth is positive. The price variable is used as a proxy for real wages<sup>8</sup>. Ashenfelter and Pencavel<sup>9</sup> and Ashenfelter, Johnson and Pencavel<sup>10</sup> argue that the difference between expected growth in wages and actual wage

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<sup>7</sup> The rates of change of all variables are defined as  $X_t = (X_t - X_{t-1})/X_t$

This differs from Swidinsky, *op. cit.* who uses central differences in percentage calculations. The problem with Swidinsky's method is that it has the effect of smoothing the time series which may give rise to unrealistically high coefficients of multiple determination. Further, it may generate smaller standard errors on the partial regression coefficients causing otherwise insignificant coefficients to appear significant.

<sup>8</sup> Wages are not used explicitly because of the high correlation with prices. Although it may be argued that such a procedure may misspecify the equation and yield potentially biased and inconsistent estimates, the alternative is excessive multicollinearity which may nullify attempts to separate the effects of P and W on TU. This point is discussed at some length by Bain and Elsheikh, *op. cit.*

<sup>9</sup> Orley ASHENFELTER and John H. PENCAVEL, *op. cit.*

<sup>10</sup> Orley ASHENFELTER, George E. JOHNSON and John H. PENCAVEL, *op. cit.*

growth will be greatest when prices are rising rapidly. This may have the effect of reducing real wages. If real wages are perceived as falling then workers may join or organize unions in an effort to maintain or increase real wages. High rates of price inflation are therefore seen as generating militancy in unions with a concomitant increase in union membership.

What is not obvious in such arguments is why workers wait until there is some level of price inflation to begin worrying about real wages. Specifically, why should an individual conclude only during an inflation that if he were a union member his real wage would be higher than otherwise? Perhaps a better reason is that workers *perceive* that unions are more effective in maintaining real wages in times of rapid inflation. If the perception is that unionized workers' real wages are keeping up with or ahead of inflation then union membership will increase.

*Annual percentage Change in Employment in Manufacturing (E)*. This variable is a proxy for the rate of growth of the "unionizable" sectors of the economy. Union growth is postulated to vary directly with employment in unionizable sectors. Ashenfelter and Pencavel<sup>11</sup> suggest that one of the costs of joining a union is employer retaliation and that there is less likelihood of this when labour markets are tightening. Also, because rising employment levels are perceived by unions as conducive to successful membership drives, there is less difficulty and hence lower cost in joining a union. One other reason why employment growth may lead to union growth is that union security arrangements tend to automatically cause a direct relationship between the membership increases and employment increases<sup>12</sup>.

In addition to the concurrent relationship outlined above there is also the possibility of a lagged relationship between employment growth and union growth. This is because workers may not cease to be union members immediately when employment falls. This may be because of personal and political ties. Further, some union membership figures report workers as members for some period after they have ceased to pay their dues because they have lost their jobs.

*Unemployment in Trade Unions (U)*. Unemployment in trade unions is suggested to negatively affect union growth. This variable is a proxy for the relative bargaining strength of trade unions. The argument is that employers may more easily oppose unionization when the unions are experiencing high unemployment. Also, when workers see that unemployment

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<sup>11</sup> Orley ASHENFELTER and John H. PENCAVEL, *op. cit.*

<sup>12</sup> *This effect may be very small in Canada. The Department of Labour estimates that less than one per cent of employees working in manufacturing establishments of over 300 non-office employees participated in closed shops.*

in unions is low they may feel more inclined to join unions whereas if the union unemployment rate is high they may decide that being a union member would not improve their chances of obtaining or retaining their jobs. Further, if unemployment is high, union dues may have a stronger, negative impact on potential membership. Bain and Elsheikh argue that unemployment in unions may have an effect on the decision to remain a union member: "The benefits which unions bring through collective bargaining have little relevance for unemployed members while the cost of membership is relatively greater for them. Moreover, in as much as unemployment reduces the ability of unions to win collective bargaining advances, the benefits of membership are reduced even for members who are not unemployed, and they may come to feel that union membership is no longer worthwhile<sup>13</sup>."

However, there are economic forces at work which may attenuate the negative effect of unemployment on union growth. Perhaps, as Shister<sup>14</sup> argues, unions may pay some sort of unemployment benefit which may only be received by remaining a union member. There may also be political or social reasons for maintaining membership during periods of unemployment.

*Ratio of Union Membership to "Unionizable" Employment (T/E).* This ratio is a proxy for the degree of difficulty of recruiting new members in an already highly unionized sector. Hines points out that "As membership increases, there is a diminishing response to a given intensity of recruiting effort<sup>15</sup>." The use of union density is therefore an attempt to capture what Bain and Elsheikh call the "saturation effect" described as "the greater difficulty of further increasing union membership as union density rises, partly because there are fewer workers left to recruit and partly because those who are left have less propensity and/or ability to unionize<sup>16</sup>." For these reasons the rate of union growth is predicted to be inversely related to the ratio of union membership to "unionizable" employment.

There is also the possibility of a positive relationship between these variables. This would be the case of union density is initially very low. As unions grow, employers would have greater difficulty retaliating against the unionized labour force and this, combined with a more favourable social

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<sup>13</sup> G.S. BAIN and Farouk ELSHEIKH, *op. cit.* p. 66.

<sup>14</sup> Joseph SHISTER, "The Logic of Union Growth", *Journal of Political Economy*, Vol. 61, No. 2, 1953, pp. 425-6.

<sup>15</sup> A.G. HINES, *op. cit.*, p. 229.

<sup>16</sup> G.S. BAIN and Farouk ELSHEIKH, *op. cit.*, p. 67.

and political climate, may yield a direct relationship between union density and union membership growth. These conflicting forces may generate a parameter estimate which is statistically insignificant<sup>17</sup>.

### **The Rate of Change of Wages**

In this section we discuss the specification of an equation explaining aggregate wage growth. The variables included in the equation are the aggregate unemployment rate, the rate of change of the consumer price index, the rate of union growth and the number of work stoppages.

#### *The Dependent Variable*

The dependent variable is the annual percentage rate of change of average weekly wages in all industries.

#### *The Independent Variables*

*The Unemployment Rate (UN).* This variable is the aggregate unemployment rate and is negatively related to wage inflation. The negative relationship reflects the well-known theory of the Phillips curve developed by Lipsey<sup>18</sup> wherein firms compete for a common pool of labour<sup>19</sup>. Wage increases are used to attract labour when the desired level of employment is too low (or the labour turnover rate is too high). The common inverse relationship between unemployment and wage inflation is found by aggregating across all agents in the economy<sup>20</sup>.

<sup>17</sup> Because the time period for our analysis is quite short, the latter, positive effect seems unlikely. However, inserting (T/E) in quadratic and inverse forms to test for the possible nonlinearity does not alter the basic results.

<sup>18</sup> Richard G. LIPSEY, "The Relation Between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom 1862-1957: A Further Analysis", *Economica*, Vol. 27, No. 2, February 1960, pp. 1-31.

<sup>19</sup> For an excellent critical review of the numerous econometric studies of the Phillips curve see A.M. SANTOMERO and J.J. SEATER, "The Inflation — Unemployment Trade-Off: A Critique of the Literature", *Journal of Economic Literature*, Vol. 16, No. 2, March 1978, pp. 499-544.

<sup>20</sup> Of course, aggregated data will only yield accurate results if each individual economic agent making up the aggregate reacts identically to changes in the variables. Therefore, the estimated effect is an average of the true effects for each agent. Further discussion of such problems in the context of unemployment-wage change analysis is presented in G.J. PARSLEY, "Labor Union Effects on Wage Gains: A Survey of Recent Literature", *Journal of Economic Literature*, Vol. 18, No. 1, March 1980, pp. 1-31.

*The Annual Rate of Change in the Consumer Price Index (P)*. Following Ashenfelter, Johnson and Pencavel it is postulated that there will be direct variation between the rate of price inflation and the rate of wage change "... because of union efforts to protect members' living standards and increased wage demands from non-union workers<sup>21</sup>."

*Union Growth (T)*. The annual rate of change of wages is predicted to be directly related to the rate of change of union membership. As Hines<sup>22</sup> and Lewis<sup>23</sup> suggest, unions will desire a greater union-nonunion differential the greater is the rate of growth and unionism<sup>24</sup>. Further, as union membership increases in the economy, the weighted average of the aggregate wage will be higher.

*Work Stoppages (S)*. This variable is the number of workers involved in strikes and lockouts each year. It is a proxy for the aggressiveness of unions and is predicted to be directly related to the rate of wage growth. Some research has found strong positive correlation between strike activity and wage growth (e.g. Godfrey and Taylor<sup>25</sup>, while other studies find no significant relationship (Johnson and Timbrell<sup>26</sup>).

Of course, strike activity may not reflect union pushfulness at all — it may simply reflect a mismatch of expectations due to a lack of information (see Addison and Siebert<sup>27</sup>).

### The Rate of Change of Prices

The variables included in the specification of the function explaining price inflation are wage growth in the current year, wage growth lagged one year and the rate of growth of productivity.

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<sup>21</sup> Orley ASHENFELTER, George E. JOHNSON and John H. PENCAVEL, *op. cit.*, p. 33.

<sup>22</sup> A.G. HINES, *op. cit.*

<sup>23</sup> H. Gregg LEWIS, *Unionism and Relative Wages in the United States. An Empirical Inquiry*, Chicago, University of Chicago Press, 1963.

<sup>24</sup> See the survey by Parsley, *op. cit.*

<sup>25</sup> L. GODFREY and J. TAYLOR, "Earnings Changes in the U.K., 1954-70: Excess Labour Supply, Expected Inflation, and Union Influence," *Bulletin of the Oxford University Institute of Economics and Statistics*, Vol. 35, No. 2, 1973, pp. 197-216.

<sup>26</sup> J. JOHNSON and M. TIMBRELL, "Empirical Tests of a Bargaining Theory of Wage Determination", *Manchester School of Economic and Social Studies*, Vol. 41, No. 2, June 1973, pp. 141-67.

<sup>27</sup> ADDISON and SIEBERT, *The Market for Labor: An Analytical Treatment*, Santa Monica, Goodyear Publishing Company, 1979.

### *The Dependent Variable*

The dependent variable is the annual rate of change in the consumer price index (P).

### *The Independent Variables*

*The Rate of Wage Growth (W).* The annual rate of change in the average wage level is postulated to have a positive effect on the rate of price inflation. Ashenfelter, Johnson and Pencavel<sup>28</sup> argue that this relationship relates to the product market. An increase in wages increases marginal costs to the firms. An increase in marginal costs, given a level of aggregate demand, generates an increase in prices for profit-maximizing firms. This may operate in the current period or it may operate with a lag.

*The Rate of Growth of Productivity (Q).* The rate of price inflation is suggested to be inversely related to the rate of growth of output per man-hour in manufacturing<sup>29</sup>. Again, this is the product market effect. In essence, the argument is based on the supply side — for any given wage, an increase in output per man-hour will lower the cost of production. If the firm is a profit maximizer, the price of the (larger) output will be lower.

### **The Operational Model**

A variety of forces are postulated to exert an influence on the growth of unions, wages, and prices. However, the causal sequence is not clear. The three dependent variables influence each other — there is a simultaneity problem. Estimating the three equations by OLS may produce biased and inconsistent estimates of the three coefficients. Because of this the estimation technique used is two stage least squares (2SLS). The operational formulation of the model is given by the following three equations.

$$\dot{P}_t = \alpha_{0t} + \alpha_1 \dot{P}_t + \alpha_2 \dot{E}_t + \alpha_3 \dot{E}_{t-1} + \alpha_4 U_t + \alpha_5 (T/E)_{t-1} + e_{1t} \quad (1)$$

$\alpha_1, \alpha_2, \alpha_3 > 0; \alpha_4 < 0; \alpha_5 \geq 0$

$$\dot{W}_t = \beta_{0t} + \beta_1 UN_t + \beta_2 \dot{P}_t + \beta_3 \dot{T}_t + \beta_4 S_t + e_{2t} \quad (2)$$

$\beta_1 < 0; \beta_2, \beta_3 > 0; \beta_4 \geq 0$

$$\dot{P}_t = \gamma_{0t} + \gamma_1 \dot{W}_t + \gamma_2 \dot{W}_{t-1} + \gamma_3 \dot{Q}_t + e_{3t} \quad (3)$$

$\gamma_1, \gamma_2 > 0; \gamma_3 < 0$

<sup>28</sup> ASHENFELTER, JOHNSON and PENCAVEL, *op. cit.*

<sup>29</sup> See ASHENFELTER, JOHNSON and PENCAVEL, *op. cit.*, for a rigorous exposition underlying the hypothesis relating productivity to price inflation.



The data for the complete model are for the period 1947 to 1970.

### THE EMPIRICAL ESTIMATION

The results of the estimation are presented in columns 1, 2 and 3, of Table 1 corresponding to the union growth, wage growth and price inflation equations, respectively. The right hand side of the union growth equation explains 73 per cent of the variation in the rate of change of total union membership. The Durbin-Watson statistic permits rejection of the null hypothesis that the time-series exhibits first order serial correlation in the estimated residuals.

TABLE 1  
Regression Results, Annual Data, Canada, 1947-1970  
(S.E. in parentheses)

Dependent Variable	Equation		
	(1)	(2)	(3)
<i>Independent Variables</i>	$\dot{T}U$	$\dot{W}$	$\dot{P}$
$\dot{T}U_t$		.1281 (.1932)	
$\dot{W}_t$			1.1162 (.4861)
$\dot{P}_t$	1.4043 (.3939)	.4189 (.1800)	
$UN_t$		-.4080 (.4127)	
$S_t$		.0002 (.0003)	
$\dot{W}_{t-1}$			.0143 (.0330)
$\dot{Q}_t$			-.1096 (.4861)
$\dot{E}_t$	-.1325 (.2186)		
$\dot{E}_{t-1}$	.4316 (.2052)		
$U_t$	.1573 (.1132)		
$(T/E)_t$	1.7878 (3.5044)		
Constant	2.4162 (5.2008)	5.1965 (2.1766)	-3.0151 (3.8985)
SEE	2.675	1.779	3.346
$R^2$	.730	.622	.438
DW	2.153	1.063	2.731

Equation 1 reveals that price inflation has a powerful effect on union growth — a one percentage change in price inflation generates a 1.4 per cent change in the rate of union growth. There does appear to be a strong causal effect running from price changes to union growth suggesting that unions are indeed to some extent attempting to defend their members against losses due to inflation. The coefficient on the employment in manufacturing (lagged) variable is significant and illustrates that an increase of one percentage point in the rate of change of such employment increases union growth by about .43 of a percentage point. The remaining variables are statistically insignificant at conventional levels. However, analysis of the zero-order correlation matrix reveals that multicollinearity may be the cause of the measured insignificance. Because multicollinearity gives rise to abnormally high standard errors, the coefficients calculated as insignificant may not be so. The intercorrelations are between unemployment in trade unions and price inflation ( $r = .7375$ ) and between (T/E) and price inflation ( $r = .6451$ ). Reestimating the equation without price inflation did not change the statistical significance of these coefficients.

Equation 2 shows that the estimate of the wage growth equation performs reasonably well explaining almost two thirds of the movement in the rate of change in wages while the Durbin-Watson statistic suggests the possibility of positive autocorrelation<sup>30</sup>.

The hypothesis that price changes generate wage changes is supported in that the coefficient on the price change variable is well over twice as large as its standard error. An increase of one percentage point about the mean in the rate of change of the consumer price index produces an increase in the rate of change of wages of .42 percentage points. The remaining variables in the equation are statistically insignificant, perhaps due to some intercorrelation among the independent variables. The rate of inflation is correlated with union growth ( $r = .6912$ ) and union growth is correlated with aggregate unemployment ( $r = .7194$ ). Reestimating the equation with the collinear variables appropriately removed alters the initial findings somewhat. The exclusion of the inflation and unemployment variables leaves the union growth variable statistically significant at the 99 per cent level. Growth of union membership by one percentage point is associated with an increase of about one-half a percentage point change in the rate of change of wages. Removal of the collinear union growth variable does not

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<sup>30</sup> Positive autocorrelation, if present, may invalidate the tests for statistical significance as well as suggest misspecification of the equation. It may also imply that the dependent variable has large measurement errors. The result is that conclusions based on the wage growth equation should be received cautiously.

change the statistically insignificant status of the unemployment variable. Strikes and lockouts do not appear to have any effect on wage growth.

The equation explaining the variation in price inflation does not fit the data as well as the other two equations. About 44 per cent of the variation in price inflation is accounted for by the variation in the independent variables. Equation 3 reports that the rate of change in wages is the only significant explanatory variable indicating that a one percentage point change in the rate of change of wages causes the rate of price inflation to increase by just over one percentage point. Multicollinearity between the wage growth variable and the lagged wage growth variable ( $r = .6915$ ) was suspected as part of the cause for the latter variable's insignificant coefficient. When the former variable is removed, the lagged wage growth variable becomes statistically significant but with a much smaller coefficient — a one percentage point change in the lagged wage growth produces a 0.06 percentage point change in price inflation. The data reveal no statistical relationship between the percentage rate of change in output per man-hour and the percentage rate of change in the consumer price index.

### **Alternative Tests of the Model**

#### *Union Growth Substitutes*

In the original formulation of the model, trade union growth is measured as the percentage rate of change in total trade union membership in Canada. However, the economic forces involved may be better or differently captured by other union growth measures. To test for this, 129 alternative measures are substituted into the model in place of the original union variable<sup>31</sup>.

In the union growth equation only a few of the coefficients are statistically significant with the substitution of the alternative union membership measures as dependent variables. Union membership growth in the Atlantic provinces is negatively affected by the growth of persons employed in manufacturing. This may reflect the exodus of workers generally from the Atlantic provinces into the manufacturing sector in other parts of Canada. The parameter estimate indicates that employment growth in manufacturing of one percentage point leads to a decline in the rate of growth of unions in the Maritimes of just over three percentage points. Such a large coefficient may reflect the relatively small size of union

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<sup>31</sup> A list of all union membership measures employed is available from the author upon request.

membership on the east coast of Canada compared to the size of the Canadian manufacturing labour force.

An interesting result was found in examining the union membership behaviour in Windsor, Ontario. When the rate of unemployment in unions increases by one percentage point, the growth rate of union membership in Windsor falls by 0.03 percentage points. Now, although the response of membership in Windsor is small, it does reflect the underlying economic forces outlined in the formulation of the model.

When the membership in public works is analysed, the rate of change of the consumer price index is statistically significant. The coefficient is negative indicating that an increase of one point in the inflation rate reduces membership growth in public works' unions by 1.10 percentage points. Perhaps unions in public works are not maintaining the real wages desired by their labour forces. The result may be the transfer of their workers to other, perhaps more successful unions, or maybe, to nonunion labour forces which are not locked into poor contracts that are not keeping up with inflation.

Certain sizes of international unions generate interesting results. The rate of growth of international union membership between 10,000 and 14,999 and membership between 20,000 and 29,999 is positively affected by the rate of growth of employment in manufacturing lagged one year. In both cases an increase of one percentage point in the rate of growth of the (lagged) manufacturing employment increases the international union membership by half a point. This may be because international unions are so heavily represented in the manufacturing sector.

In all cases the point estimates on union growth are statistically insignificant in the wage growth equation.

### *Productivity Substitutes*

The basic model uses output per man-hour as the productivity measure. However, other measures may better reflect the economic forces underlying the model. Twenty-seven alternative productivity calculations are substituted for the basic measure<sup>32</sup>. In all instances, the substitute measures have insignificant coefficients. Analysis of the zero-order correlation matrixes for every equation revealed multicollinearity between the wage growth variables and the productivity growth measure. Removing the

<sup>32</sup> A list of all productivity measures used in the estimation is available from the author upon request.

collinear variables and reestimating the price inflation equation did not change the statistically insignificant status of any measure.

## CONCLUSION

This paper has analyzed the behaviour of union growth, wage growth and price inflation in Canada in the post World War Two period. Its principal novelty is that it applies a simultaneous equations framework to a model of union growth in Canada. In addition to this there is a considerable expansion in the analysis of union growth in that many different subsets of total unionization are examined.

Because the only previous analysis of Canadian union growth is of the single equation variety (Swidinsky<sup>33</sup>) and because this is the first analysis of the simultaneous determination of Canadian union growth, wage growth and price inflation, the results must be received with caution. However, some tentative conclusions can be made. The first is that price inflation, contrary to the findings of Swidinsky, is a very important determinant of union growth in Canada — unions may indeed be viewed as defensive organizations. Interestingly, individual unions may experience falling rates of growth with increasing rates of inflation. Secondly, aggregate unemployment does not seem to affect total union growth whereas unemployment in unions does have an impact on the rate of change of membership of certain subsets of union membership. Lastly, although unions may tentatively be said to influence wages, it appears that wage growth has a much stronger effect on unionization. This is interesting as many workers are presumed to join unions because they believe that the causation runs from unions to wages rather than vice versa.

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<sup>33</sup> R. SWIDINSKY, *op. cit.*

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### ***La croissance des syndicats canadiens***

Les apports récents aux études qui mettent en relief les causes déterminantes de la croissance des syndicats indiquent que leur développement est relié au comportement de l'activité économique et de l'inflation. Plusieurs spécifications n'ont que la croissance des syndicats comme seule variable endogène, les autres permettent de déterminer simultanément la croissance des syndicats, l'augmentation des salaires et la variation des prix. La recherche sur le développement du mouvement ouvrier au Canada en a été une de type d'équation simple.

Le présent article constitue une tentative en vue de combler le manque d'équations simultanées pour apprécier la croissance des syndicats canadiens. Il présente une analyse empirique des variations dans le temps des effectifs des syndicats et des conséquences qui s'y rattachent. Les données analysées portent sur la période qui va de 1947 à 1970.

Dans la première partie de l'article, on explique la variation des effectifs des syndicats par le pourcentage de changement dans l'indice des prix à la consommation, le taux d'emploi dans l'industrie manufacturière, le chômage chez les travailleurs et la proportion des effectifs syndicaux par rapport aux emplois «syndicables», la variable indépendante étant le pourcentage annuel de changement dans le taux des effectifs syndicaux.

Ainsi, le pourcentage de changements dans l'indice des prix à la consommation est positif, car les travailleurs ont la perception que les syndicats sont plus efficaces pour maintenir les salaires en période d'inflation rapide et que, par conséquent, les effectifs des syndicats ont tendance à s'accroître.

De même, le pourcentage de changement dans les taux d'emploi a également un effet. Le développement des syndicats varie en fonction de l'emploi. Par exemple, la hausse du taux d'emploi favorise les campagnes de recrutement, d'une part, et, d'autre part, l'application des clauses de sécurité syndicale apporte de l'eau au moulin des syndicats.

Par contre, le chômage donne un résultat plutôt négatif, car les employeurs peuvent plus facilement contrer l'action syndicale lorsqu'il y a chômage marqué, mais certaines forces économiques peuvent atténuer cet effet négatif du chômage sur le taux de croissance des syndicats.

Enfin, dans certains secteurs fortement syndicalisés, le recrutement est rendu plus difficile, parce que le nombre des travailleurs «syndicalisables» décroît.

Une deuxième équation consiste à choisir comme variable dépendante le pourcentage annuel de changement dans les taux de salaires et, dans ce cas, on retient comme variables indépendantes le taux de chômage, les changements dans l'indice des prix à la consommation, la croissance des syndicats et les grèves. On y voit que plus il y a de chômage, moins les taux de salaires ont tendance à s'accroître. De même, l'augmentation de l'indice des prix à la consommation a un effet sur les taux de salaires. Le taux annuel de changement des salaires est directement relié au taux de changement des effectifs syndicaux. Quand les effectifs syndicaux s'accroissent, la moyenne des salaires augmente à son tour, tandis que les grèves favorisent la croissance des salaires.

La troisième équation retient comme variable dépendante l'indice des prix à la consommation et le taux de croissance des salaires et le taux de la productivité comme variables indépendantes. On constate que, par exemple, la hausse des taux de salaire a une influence sur l'inflation. Quant au taux de croissance de la productivité, s'il est positif, il est de nature à faire infléchir l'inflation.

On peut donc conclure de ce qui précède que plusieurs forces exercent une influence sur le développement des syndicats ainsi que sur l'augmentation des salaires et des prix. Les trois variables dépendantes s'influencent les unes les autres.

Parce que la seule analyse antérieure de la croissance des syndicats canadiens en est une de type d'équation simple et qu'il s'agit ici de la première analyse d'un type d'équations simultanées relativement à la croissance des syndicats, à l'augmentation des salaires et à la hausse de l'inflation, les résultats doivent être considérés avec beaucoup de circonspection. Toutefois, on peut en tirer certaines conclusions. En premier lieu, on peut noter que l'inflation des prix, contrairement aux constatations de Swidinsky, est une cause très importante du développement des syndicats au Canada et ceux-ci doivent être considérés comme un organisme de défense, même si, fait intéressant, il peut arriver que des syndicats pris individuellement puissent subir une diminution dans leur taux de croissance. En deuxième lieu, le chômage dans son ensemble ne paraît pas exercer d'influence sur le degré de croissance des syndicats. Finalement, bien que l'on puisse dire que les syndicats influencent les salaires, il est apparent que c'est la croissance des salaires qui a le plus d'effet sur la syndicalisation. Cela est d'autant plus intéressant que l'on est porté à penser le contraire, c'est-à-dire que les travailleurs adhèrent aux syndicats pour améliorer leurs salaires.