

AN ANALYSIS
OF
INTER-INDUSTRY
EARNINGS DIFFERENTIALS
IN
CANADA,
1957, 1962 AND 1969

BY
CHRISTOPHER GERALD WEST

A THESIS SUBMITTED TO THE DEPARTMENT OF ECONOMICS IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS

LAKEHEAD UNIVERSITY
THUNDER BAY, ONTARIO, CANADA

OCTOBER, 1974

Abstract

Given that considerable inter-firm and inter-industry wage differentials in fact exist, much empirical work has been undertaken to discover the factors influencing earnings differentials. A majority of these studies have attempted to explain changes in these differentials over time rather than to explain the levels of these differentials as they existed at points in time.

This study will attempt to explain the levels of these differentials as they existed in Canada in 1957, 1962 and 1969. The methods and results of earlier studies will be used as reference sources in the present study.

Table of Contents

| | Pages |
|---|-------|
| Abstract | i |
| Table of Contents | ii |
| List of Tables | iii |
| Chapter I - Introduction | 1-13 |
| Chapter II - The Basic Framework | 14-28 |
| Chapter III - Some Modifications: Introduction of the Overtime Variable | 29-40 |
| Chapter IV - Role of Employment Changes Reinvestigated | 41-51 |
| Chapter V - Conclusions | 52-54 |
| Bibliography | 55-57 |
| Appendix A - F test and Durbin-Watson Statistic | 58-59 |
| Appendix B - Tables | 60-70 |

List of Tables

| | |
|---------|---|
| Table A | Regression Results |
| Table B | Regression Results |
| Table C | Regression Results |
| Table D | Regression Results |
| Table E | Industries Ranked By Average Hourly Earnings |
| Table F | Industries Ranked By Overtime Workers |
| Table G | Annual Average Percent Unemployment Rate for Canada, 1955-71 |
| Table H | Regression Results |

CHAPTER I

INTRODUCTION

In the long run under perfectly competitive conditions, economic theory postulates that all labor of a given level and degree of skill will receive a return that is equal irrespective of the industry in which they are employed. Differences in money wages may, however, exist and these are assumed to be caused by non-pecuniary factors and to differences in spatial locations. In the absence of such factors, differences in real wages across individuals will reflect differences in the level of skills, and hence to labor productivity.

If we assume that labor is perfectly spatially mobile, money wage differentials across locations for a given skill will be related to differences in living costs between locations and other non-pecuniary factors.

In the short run, however, the above hypothesis may not be valid. Inelasticities in the supply of various types of labor coupled with changes in the demand for labor, may lead to inter-industry wage differentials or to changes in the existing differential.

Given that the amount of labor employed and the average wage rate paid can be determined for any industry by the intersection of the industry's labor supply and demand curves, and that wage differentials in

skill and other non-pecuniary factors exist in the short run, the perfect competitive hypothesis predicts that labor mobility will lead to the long run situation where labor of a given skill receives equal remuneration. The theory says that in the long run labor will move from low wage to high wage industries, thus effecting shifts in the supply curve of labor and from this that equality of wages will finally result. (It must also be remembered that capital is assumed to be mobile and can move between regions and industries according to its marginal physical product.)

Therefore, according to the theory of perfect competition the long run and short run situations may vary, but are consistent with each other. If, however, there are any restrictions on the mobility of labor, inter-industry wage differentials will persist. In real life, considerable inter-firm and inter-industry differentials of course exist. Labor mobility is far from perfect and far from being efficient.

The volume of literature which has been devoted to the topic of migration indicates that labor markets are imperfect and that adjustment of labor supply to changes in demand is not instantaneous. Some of the factors which inhibit mobility are insufficient knowledge of job opportunities and openings, uncertainty regarding not only such topics as wage rates and working conditions, but also housing conditions, and, of course, the influence of local ties.

The topic has been treated fairly extensively¹ and care has been taken to include both the economic and psychic costs of migration. The fact that such impediments exist leads to a blurred and delayed response and the length of such lags in response will vary with the character of the labor market in question, the educational system and on such factors as the efficiency of manpower offices and exchanges.

Given that perfect adjustment does not take place, not only between regions but also between industries, it has thus been recognized that inter-industry differences in wages will persist. Accordingly, a majority of empirical research has been concentrated on discovering factors which account for changes in these inter-industry wages differentials. This is somewhat surprising in that little research, by comparison at least, has been undertaken to explain the existence of these same differentials.

There is a wealth of theoretical maxims regarding the firm's demand for labor under varying product market conditions. For example, the monopolist will hire units of labor to the point at which the price of labor is equal to the marginal revenue product of labor (MRP_L). The fact that MRP_L depends on the form and the parameters of the production function and the quantities of the other factors of production in use

¹ For example: T. J. Courchene, "Interprovincial Migration and Adjustment", Canadian Journal of Economics, Nov. 1970; J. Vanderkamp, "Inter-regional Mobility in Canada: A Study of the Time Pattern of Migration", Canadian Journal of Economics, Aug. 1968; L. Sjaastad, "The Costs and Returns of Human Migration", Journal of Political Economics, Oct. Supplement, 1962.

as well as on the form and parameters of the product demand curve, makes it possible to determine the firm's demand for labor at any given wage level. It has, however, been found more difficult to determine the labor supply curve due to the fact that non-economic factors may enter into the argument.

One of the earliest attempts to contend with the problem of wage determination and specifically with the phenomena of inter-industry wage differentials was carried out by Dunlop² and his hypothesis can readily be represented in a theoretical analysis. Increases in the productivity of labor and in output result in an increase in the industry's demand for labor which tends to raise the wage rate at the equilibrium point. It is through this mechanism, whereby productivity increases which are associated with expanding output, necessitate higher wage rates to attract a larger labor force, that Dunlop sees his close connection between productivity and wages. This mechanism, however, presupposes a type of supply elasticity which is not necessarily associated with industries in which greater than average productivity gains occur.

Dunlop further postulated that if labor costs represented only a small proportion of total costs there will be less resistance on the part of employers to grant wage increases since these wage increases will result in only a relatively small reduction of profits or in only a small

²J. T. Dunlop, "Productivity and the Wage Structure" in Income, Employment and Public Policy - Essays in Honor of Alvin H. Hansen (New York, W. W. Norton and Co. Inc., 1948).

increase in the price of the product. He then recognized that the more monopoly power on the product market which the employer possessed, the more likely he was to pass on the wage increase in the form of product price increases.

From this one can see that the important factors influencing wages were productivity, output labor costs and concentration in the product market. Dunlop's proposition thus represents a catalogue of factors which were considered as the most important determinants of the movements in the inter-industry wage structure.

It has been noted that all of the factors considered by Dunlop relate to the influence of shifts in the demand for labor with no consideration given to the influence of shifts in the supply of labor. Supply curves in different industries could be expected to be influenced by such an obvious factor as union strength and the omission of such supply factors seems a mistake.

The hypothesis put forward by Dunlop has been subjected to empirical tests by a number of writers. Ross and Goldner³ for example applied simple correlation analysis to U.S. industrial data for the 1933-1946 period and found a positive correlation between changes in average earnings and changes in employment, but they failed to find any simple association between changes in earnings and labor costs. They also

³A. M. Ross and W. Goldner, "Forces Affecting the Inter-Industry Wage Structure", Quarterly Journal of Economics, May, 1950.

tended to believe that industries with oligopolistic market structures showed larger wage increases than the more competitive industries.

J. W. Garbarino⁴ took the period 1923-1940 and examined selected industrial groups in the U.S. by means of simple rank correlations. His findings were that the movements in the inter-industry wage differentials can be explained by productivity, concentration and unionization. He therefore corrected, to some extent at least, the demand factor bias of the Dunlop hypothesis.

In a further study of the U.S. Eiseman⁵ found a positive correlation between changes in wages and

- (a) the original level of wages
- (b) changes in production
- (c) changes in employment
- (d) labor costs as a proportion of total costs.

Concerning factor (c) it should be remembered that the competitive hypothesis explains variations in employment and earnings as resulting from increasing wages in industries experiencing expanding employment. Conversely, wages will fall in industries where employment is shrinking due to labor immobility.

Due to the fact that labor markets are not perfect and adjust-

⁴J. W. Garbarino, "A Theory of Inter-Industry Wage Variation", Quarterly Journal of Economics, May, 1950.

⁵D. M. Eiseman, "Inter-Industry Wage Changes 1937-1947", Review of Economics and Statistics, November, 1956.

ments are not instantaneous there may well be lags both in response of employment to changes in earnings and also in the response of earnings to changes in employment. For example, it may be the case that industries which are expanding employment are well placed to fill their labor requirements at the existing rates of pay. This may be because these industries are already among the high paying industries, or because the overall level of unemployment in the economy is high so that labor is available and there is no need to bid up its price.

Thus there may be no association between employment changes and wage changes. Continued prosperity in an industry may, however, induce labor to seek wage increases which may be granted. This may mean a lagged relationship between employment and earnings changes.

In their study of the English economy for the 1948-1959 period Phelps Brown and Browne⁶ found no association between changes in productivity and changes in earnings, but they came up with a positive relationship between changes in earnings and the concentration of employment which they defined as the proportion of the industry's employment given by the three largest firms.

Sylvia Ostry⁷ in her study of thirty-six Canadian industries, found that for the period 1945-56 both absolute and percentage wage

⁶E. H. Phelps Brown and M. H. Browne, "Earnings in Industries of the U.K., 1948-59", Economic Journal, September, 1962.

⁷S. Ostry, "Inter-Industry Earnings Differentials in Canada, 1945-56", Industrial and Labor Relations Review, April, 1959.

increases tended to be highest in industries in which employment was expanding most rapidly and that the percentage wage increases tended to be greatest in those industries in which wages formed a small proportion of total costs. She further found that both the degree of unionism and degree of product market concentration were positively correlated with absolute increases in earnings.

Her results showed no association between wage changes and productivity changes and she concluded that the most important determinants of wage changes among industries were the original level of earnings and changes in employment.

Although the majority of empirical studies have been devoted to explanations and accounts of factors which determine the changes in the inter-industry wage differentials some studies have tried to explain the existence of these same differentials at selected points in time.

The studies quoted up to now have, while attempting to explain how wage differentials changed over time, resorted to the use of simple and rank correlation techniques to obtain their results. Such a procedure can be criticized because simple correlation techniques do not separate the effects of individual factors. This makes it impossible to use statistical tests of significance unless the factors which may influence the wage differentials are known or assumed to vary independently of each other. Such independence is unlikely to be the case and the relationship between changes in wages and any one particular variable may be distorted by an off-setting influence of some other factor or

factors.

It is partly for this reason that multiple regression techniques have been used and an example of this technique to determine inter-industry wage differences at a point in time is the study done by Masters⁸ in which he attempts to explain the level of wages in terms of a plant size variable which is the percentage of workers in the industry in plants of over 100 employees, a concentration variable and a union variable. His model was then expanded to include the relative importance of labor and capital in the industry, on the grounds that the marginal productivity of labor will be positively related to the capital-labor ratios. His main results indicate that plant size is an important determinant of wages in manufacturing, the only sector analyzed in his study.

Masters' model was further expanded by Haworth and Rasmussen⁹ to include labor quality variables to represent worker characteristics. These were a measure of human capital and sex.

The inclusion of worker characteristics increased the explanatory power of Masters' model by 25 percent, while the variables representing concentration and unionization exerted positive but insignificant influences on wages.

⁸S. M. Masters, "Wages and Plant Size: An Inter-Industry Analysis", Review of Economics and Statistics, August, 1969.

⁹C. T. Haworth and D. W. Rasmussen, "Human Capital and Inter-Industry Wages in Manufacturing", Review of Economics and Statistics, November, 1971.

A study carried out by Johansen¹⁰ concluded that one may expect not the changes in wage differentials, but the wage differentials themselves to be correlated with changes in productivity and that the level of the wage rate differential to be correlated with changes in employment.

Thus the role of employment changes is once more introduced and before leaving this brief survey of recent literature, reference will be made to the study on wages and mobility carried out by the O.E.C.D.¹¹ in which the results of a large scale investigation of the relation between wage rates and employment in the countries are presented. The main conclusion is that there is no evidence of a strong systematic statistical relationship between changes in earnings and changes in employment among industries. The most obvious interpretation of these findings is that changes in wages have not played an important role in the allocation of labor between different industries. This is obviously in contrast with the traditional theory, which holds that increases in wages are often used by employers to attract or retain labor, and which has been the basic reason for the inclusion of a variable representing employment changes in many of the statistical studies quoted above.

The authors of the study, however, modify this conclusion by stating that although the movements of labor have been predominantly

¹⁰Quoted in J. Kmenta, "Inter-Industry Wage Differentials in Australia 1947-54", American Economic Papers, June, 1963.

¹¹O.E.C.D. Wages and Labor Mobility, Paris July, 1965. The countries examined are: Belgium, Canada, France, Germany, Italy, the Netherlands, Norway, Sweden, United Kingdom and the United States of America.

wage insensitive, additional evidence strongly suggests that

- (1) the observed changes in the allocation of labor are often brought about by mechanisms other than changes in the wage structure and
- (2) the observed changes in the wage structure are often brought about by forces other than those that allocate labor.¹²

The alternative mechanisms which the authors have in mind are brought about by the fact that financially motivated mobility may indeed be very important, but to the extent that it reflects such factors as economic security or opportunity for advancement, or other fringe benefits it may not lead to a rise in wage levels. Even where mobility is strictly motivated by financial considerations, it may be in response to differences in wages in the existing structure as distinct from changes in them. Given these considerations then, the wage insensitivity in the study becomes reasonable.

Rosenbluth¹³ in a recent article has taken issue with such findings. He takes seventeen manufacturing industries in Canada and compares the time path of the monthly employment index with that of average hourly earnings of hourly rated production workers for the period 1951 to 1965. He presents his data in chart form and finds a great degree of positive conformity and concludes that the common trends of earnings and employment are the strongest evidence for the operation of a price

¹²op. cit., p. 17.

¹³G. Rosenbluth, "Wage Rates and the Allocation of Labor", Canadian Journal of Economics, August, 1969.

mechanism.

He emphasizes, however, that the small changes in wage rates which his graphs show make it difficult to accept the hypotheses that wage rates influence labor supply which is what his conclusions might lead one to think. All that he claims is "that relatively small wage differentials play a role in the re-employment decisions of persons who, for one reason or another, have already left or are about to leave their present employment."¹⁴

Much study has been devoted to the problem of inter-industry wage differentials not only because of their observation in the real world but also because of the belief that labor supply must be made more responsive to shifts in demand. The remainder of this paper will attempt to explain such differentials as they existed in Canada for the years 1957, 1962 and 1969. The preceding discussion of studies determining the factors directly influencing wage differentials between industries have generally used average earnings rather than average wage rates. The empirical results reported in the following chapters will also make use of similar data. This procedure is dictated by the manner in which industrial wage data are compiled and presented.

This presents a difficulty in that the total hours of work recorded include overtime hours and the total wages reported include straight line wages and overtime as well as payments to persons absent

¹⁴op. cit., p. 581.

because of holidays, sickness, etc. For clarity, therefore, the results to be reported will be for inter-industry earnings differentials and the use of the term wage differentials will be avoided lest one construes it to mean differences in rates per hour which it does not.

CHAPTER II

In this chapter the basic framework within which to study inter-industry earnings differentials is introduced, together with the variables by means of which these differentials will be explained.

The variables chosen represent supply factors in the form of worker characteristics as well as in the organizational strength of each industry's work force. The second factor will be measured by the number of employees in an industry who belong to a union. Demand factors will be represented primarily in the form of employment changes and a variable representing the proportion of total costs denoted to labor.

The basic framework is as follows:

$$W_i = a_0 + a_1E_i + a_2A_i + a_3M_i + a_4T_i + a_5U_i + a_6R_i + a_7L_i$$

where

- W_i - annual average hourly earnings of hourly rated workers
- E_i - percentage of employees by industry who completed 4-5 grades of secondary school
- A_i - average age of employees in years
- M_i - percentage of employees by industry who are male
- T_i - percentage change in employment by industry for the 5 year period centered on the year in question
- U_i - percentage of total industry employment belonging to unions

R_i - percentage of total industry employment occurring in establishments of at least 200 employees.

L_i - ratio of the total wages of production and related workers to the value of factory shipments

and where the subscript i refers to the i th industry.

Effects of labor characteristics on wages have been included by means of the variables E , A and M which represent labor quality. The E variable, which represents the number of years of schooling, is included in keeping with the theory of human capital. This states that higher levels of skill will increase worker productivity which reflects itself in a higher level of wages. In order to account for differences in human capital among industries a measure of worker productivity is required, and the most commonly used measure is median years of schooling. The E variable is thus included, but it is to be noted that the variable ignores quality differences in the education received by individuals and to that extent it is mis-specified. It should also be pointed out that such a variable was available for the year 1961 only, and the same data was assumed to apply also in 1957 and 1969.

It is generally recognized that men have higher incomes than women of similar age and educational achievements. This may be due to simple discrimination, but it is also possible that many positions pay higher wages because of requirements of physical strength or discomfort which may preclude women. It may also be the case that higher male incomes reflect higher levels of on-the-job training or the desire of secondary workers (who tend to be female) to work in more pleasant

surroundings.

Whatever the reason, since wage rates reflect these constraints, one would expect higher wages in those industries in which males make up a large share of the labor force. Conversely, industries employing large numbers of female workers relative to male workers may pay lower wages to these female workers because discrimination itself may lower the opportunity costs for the female workers involved.

The union variable represented by U_i measures the degree of unionization among industries for the years in question. Since Dunlop's study, much consideration has been given to the role of union bargaining strength as a determinant of industrial wage levels. It also has been held that the stronger the union is, the more likely it is to ask for and obtain wage increases.

High wages, however, could result from the unionization of profitable industries or from managerial attempts to prevent such organization. In contrast, less profitable industries might pay lower wages because such a threat of organization might be less or because management might be less willing to pay to keep the unions weak.

It should also be noted that unionism and concentration in the product market are closely related. In unconcentrated industries strong unions may be able to obtain high wages, but it should be noted that in industries which are already concentrated wages may be high and the unionization may add little, if anything. So a situation can be en-

visaged in which high wages in unorganized but concentrated industries may result from the threat of unionism and consequently both unionism and concentration represent the same force.

Therefore, one may consider that the combined effects of the two may be less than the sum of the two effects when they are treated separately. An argument can be made for not including both variables or alternatively, for including both variables and an interaction variable which accounts for the combined effect of the two forces.¹⁵ Results have shown that this interaction variable takes on a negative sign which suggests that for a given degree of union strength in an industry a greater degree of concentration may yield a smaller rate of increase in wages. Thus, contrary to popular belief, a union's ability to obtain wage increases may be hindered rather than helped by the presence of greater concentration in the product market.

Not all theorists have accepted the basic proposition that the ability of a union to achieve wage increases is facilitated by the presence of a more monopolistic product market. A. Rees¹⁶ has challenged this proposition on the grounds that because of data limitations most studies have been confined to manufacturing industries where almost all

¹⁵See for example L. W. Weiss, "Concentration and Labor Earnings", American Economic Review, March, 1966.

¹⁶Quoted in H. M. Levinson, "Unionism, Concentration and Wage Changes: Towards a Unified Theory", in Industrial and Labor Relation Review, January, 1967.

strong unions deal with concentrated industries. This he claims had led theorists to believe that this is so for the whole economy, which he contests.

He points out that in such industries as coal mining, entertainment and building construction, there is a high degree of union organization coupled with conditions of competition in the product market, yet these industries have not been lacking a higher relative wage than otherwise might be the case.

The variable R_i , representing employment concentration in an industry, may be seen as a plant size variable following the recent work of Masters'.¹⁷ Although the significance of plant size as a determinant of industrial wages has been open to argument, empirical studies seem to verify the fact that larger plants exhibit wages and benefit differentials.

Conversely, wage-benefit differentials offered by the larger plants permit these higher paying plants to attract and to hold a higher quality of labor; so in effect, they receive a better work force in return for their higher wages. However, the disadvantage arising from the more impersonal and confining aspects of large establishments necessitate the payment of higher levels of compensation in order to attract and to hold a given quality of labor.

¹⁷Op. cit.

The connection (in theory at least) between plant size and monopsony power in the labor market needs to be kept in mind. Monopsony theory predicts that in a labor market area a firm with significant monopsony power will be able to exert a depressing effect on the wage scales for any particular type of labor which it hires and will thus be able to achieve a work force quality differential which is greater than its wage benefit differential.¹⁸

Whether in fact plant size and monopsony power are closely related depends on the labor market area in which the plant operates and obviously the bigger the area the less the monopsony power is likely to be. It also depends on the individual establishment's demand for particular types of labor in the area and on the possibilities of substitution between various types of labor as well as between factors of production.

The ratio of labor costs to the value of factory shipments has been introduced because of the role it has been assigned in traditional theory. The theory suggests that if labor costs represent only a small proportion of total costs there will be less resistance on the part of employers to satisfy the claims for higher wages, since any such increase will result in a relatively small reduction of profits or alternatively in a relatively small increase in the price of the product. The final outcome will depend on the degree of product market monopoly

¹⁸The conclusion is tempered with the knowledge that monopsony can also lead to restrictions in the purchasing of the factor involved, or a combination of the two consequences.

power possessed by the firm (industry) as well as on the price (elasticity of demand for the product).¹⁹

This variable has often been represented by taking total wages as a ratio of total value added in the industry. While the procedure could be used in this analysis, the value of factory shipments was chosen since the value of factory sales would appear to be a better working guide both for management and labor than the value added concept.²⁰

These were the variables chosen to explain the inter-industry earnings differentials and the basic framework was tested using cross-sectional data for 36 Canadian industries for the three different years, 1957, 1962 and 1969. The data used are to be found in Tables 1-8 in the Appendix at the back and the regression results are shown in table form on the next page.

The results obtained in equation 1 (which applies to 1957) indicates that the only significant variables are the education variable E, and the Male/Female ratio variable M. Thus it appears that the only factors exerting a major influence on the 1957 level of industrial earnings are two factors which both account for labor force quality. It is

¹⁹The final outcome will depend on the degree of product market monopoly power possessed by the firm (industry) as well as on the price elasticity of demand for the product.

²⁰This seems a reasonable conclusion since the value of sales is a commonly known and available statistic and would be more likely to be the basis of decisions (especially on the labor side) than the alternative.

TABLE A - REGRESSION RESULTS
t values (.) d. f. 9^a

| Eqn. | R ² | CONSTANT | E | A | M | T | U | R | L |
|------|----------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|-------------------|----------------------|
| 1 | .8065 | .6739 (.8868) | .0364 (2.7960) | .0021 (.0917) | .0052 (2.2442) | .0237 (1.3882) | .0013 (.3441) | .0047 (1.8263) | -1.7357 (1.8218) |
| 2 | .8845 | .2346 (.3106) | .0423 (3.4417) | .0022 (.0993) | .0095 (4.4947) | -.0214 (2.9633) | .0051 (1.3523) | .0082 (3.5124) | -.0921 (.1037) |
| 3 | .7566 | 2.8863 (1.8721) | .0641 (2.6765) | -.0473 (1.0008) | .0107 (2.1890) | -.0051 (.3235) | .0113 (1.4350) | .0038 (.7626) | - 3.3019 (2.4742) |

^a The number of observations was limited to 17 due to the limitation of union data to 20 observations and non-availability of labor costs and plant size data for mining and construction.

also noted that the variables contained in equation (1) explain some 80 percent of the variance of earnings among industries.²¹

These findings are supported by the results obtained from equation (2) which deals with the year 1962, where again E and M are significant. In addition, the variable T, representing the percentage change in employment over the 1960-64 period is significant but displays a negative sign. This implies that contrary to traditional theory, changes in employment had a depressing effect on earnings.

The plant size variable R, is also significant but with a positive sign. This is, of course, in keeping with the postulated theory noted in the introductory chapter. This variable may, however, be seen as a proxy for labor force quality. The rationale behind this is simply that firms with larger plants usually experience higher rates of turnover of workers and in order to be able to fill their continuous vacancies offer higher wages. This in itself will not assure a higher quality of labor but the higher wages being offered may also attract such a large pool of reserve labor that the firms may in fact be able to choose their recruits carefully. Thus, they may be able to not only fill their recurring vacancies but also obtain higher skilled labor.

An obvious answer to the problem of continuous turnovers would be to reduce the quit rates. This could be carried out to the point where

²¹All tests of significance are two-tailed and will be carried out at the 5 percent level. The R²s have everywhere been adjusted for degrees of freedom.

the marginal saving in indirect employment costs in the form of personnel departments equals the increase in direct wage costs involved in reducing the quit rate. The practicality of such a measure is another question.

The only significant factors influencing the 1969 level of earnings are E, M and the proportion of total labor costs to the selling value of factory shipments (L) which has the expected negative impact.

These preliminary results indicate that the only important factors influencing the level of industrial earnings are the labor force quality variables E and M. The plant size variable was significant only for 1962, while the labor ratio variable was significant only for 1969.

Perhaps the most unexpected result is the lack of any systematic influence from employment changes. As noted the 1962 results indicate a negative (significant) influence that is unexpected. The measurement of the employment changes may be introducing cyclical factors, this being particularly so for the 1969 variable which was calculated for the period 1967-71.

In fact for both the 1957 and 1969 dates the unemployment rate for Canada was quite high, and this fact alone might cause one to anticipate little positive influence on wages. However, the negative sign displayed in both equations (2) and (3) is surprising. An alternative form of the variable will be adopted for use in Chapter IV.

Before leaving the discussion of these preliminary results it

should be pointed out that nowhere did the union variable display significance. It yielded everywhere the expected positive sign but the fact that it does not appear to be a significant determinant of industrial earnings is unexpected in light of the underlying theory calling for its introduction and use in any such study as this.

Empirical studies, however, have shown that except in the case of new organization unionism had had little effect on relative wages in industries.²² Even allowing for this, the fact that unionization had little impact on earnings is surprising.

The variable capturing labor quality as measured by age, A, shows no significance for any of the years under investigation. In two of the three years it exerts a small positive impact on earnings, but in 1969 its impact is seen to be negative. This is again a surprising result since it is usual to conclude that experience comes with age and that experience tends to be rewarded.

Before concluding that age is of no significance in determining industrial earnings, it is necessary to point out that the measure used (average age) may not be a perfect substitute for experience, and also that experience itself may not capture everything.

Firstly, experience may be less important in some industries than in others, so that a relatively young work force may not be a handicap

²²For example, Ross and Goldner, op. cit.

or a constraint on earnings. Secondly, the average age of the work force says nothing about the length of time each individual worker has been working in that particular industry. Given that labor mobility exists, it is therefore possible that even in industries in which experience is important a relatively older work force may be inexperienced.

Lastly, on the job training is of importance particularly in those industries requiring a skilled work force. This training is likely, therefore, to differ across industries and the fact that the average age variable implies that this training is the same across industries means that the variable is mis-specified.

There is a very extensive overlap of skill and experience and in many cases skill is just a by-product of experience in a particular type of work. In reality, when an employer seeks an experienced worker, what he is seeking is a relatively skilled worker, since successful experience is deemed to be an indication of skill. The behavior of earnings data classified by years of experience of the earner was presented for engineers in a 1957 study by Blank and Stigler²³ making it one of the few studies on experience differentials available.

Given that the three labor force quality variables, E, M and R were the only significant ones and that all the variables combined were capable of explaining some 75% to 88% of the variance in earnings among

²³D. M. Blank and G. J. Stigler, The Demand and Supply of Scientific Personnel, New York, National Bureau of Economic Research, 1957.

TABLE B - REGRESSION RESULTS
t values () d. f. 22

| Eqn. | R ² | CONSTANT | E | M | R |
|------|----------------|-------------------|-------------------|-------------------|-------------------|
| 4 | .8163 | .3109 (2.4470) | .0365 (3.4511) | .0068 (4.1130) | .0071 (6.2508) |
| 5 | .8153 | .2923 (1.8331) | .0509 (3.8219) | .0083 (3.8696) | .0086 (5.6025) |
| 6 | .7622 | .5570 (2.1860) | .0633 (3.1012) | .0145 (4.6878) | .0093 (3.9072) |

industries, further regressions were run using only those three significant variables. The results are presented on the next page. From these results it is clear that these three variables can in fact explain much of the inter-industry earnings differentials for the years in question. The major determinants of industrial earnings per hour appear to be the different measures of labor quality. That is, the differences in earnings among industries are due to differences in labor force quality coinciding with the long run predictions of the competitive hypothesis.

From the results obtained in equations (4) to (6) these labor quality variables alone can explain up to 81% of the hourly earnings obtained in an industry. The magnitude of the result is somewhat surprising given that the variables used are but crude measurements of labor force characteristics.

Nonetheless, these results do appear to minimize the role of demand factors and particularly the role played by employment changes. As reported in the introduction, some previous studies have found employment changes to be an important factor influencing earnings. The preliminary findings here, therefore, tend to agree with those of the O.E.C.D. study noted previously. It could be helpful, therefore, to keep in mind the conclusion drawn by the authors of that study with regard to the allocative role of wages. There they noted that labor may be allocated by mechanisms other than changes in wages and that changes in wages may be due to forces other than those that allocate labor.

Seen in this context, then, the failure of employment to be a systematic significant influence on earnings may not be all that strange. Indeed, the wage insensitivity hypothesis gains more credence when the overall economic picture as it existed throughout the period under study is taken into account.

For much of the period the unemployment rate was high and the economy depressed so that it may be reasonable to expect no positive association to exist between earnings and unemployment changes.

CHAPTER III

SOME MODIFICATIONS: INTRODUCTION OF THE OVERTIME VARIABLE

The results reported in chapter II imply that the greater part of industrial hourly earnings can be explained by means of labor quality. In this chapter further investigations will be undertaken in an attempt to explore these findings.

As noted in the introductory chapter, the purpose of the study is to examine earnings differences among industries. The nature of the data itself dictated the use of hourly earnings rather than hourly wage rates. Given that this is the case and that these average hourly earnings are calculated for each industry by dividing the total weekly wages of hourly rated wage earners by the total weekly hours worked by these wage earners, it is then possible that the average hourly earnings of an industry may be influenced by factors which affect the total weekly wages and the total weekly hours.

By definition total hours include overtime actually worked and the wage-earner total includes part-time wage-earners and casuals working more than the equivalent of one day a week. The inclusion of overtime hours is of obvious significance because average hourly earnings rise with increases in overtime. The fact that such overtime hours may be

different for various industries means that a case can be made for including such an overtime variable in the study. If overtime influences average hourly earnings and if overtime varies among industries then overtime can be considered to be a factor influencing inter-industry earnings differentials.

The overtime variable for each industry (OT) was calculated by taking average weekly hours as a percentage of the unweighted all-industry average. If an industry showed an average higher than the all-industry average it is represented in Table 10 in Appendix B, by a figure in excess of 100. Although this measure of overtime may not be ideal, in that it does not show each industry's standard work week in hours, it does tend to distinguish between those industries working relatively longer hours and those working relatively shorter hours.

Such a distinction is, however, made with respect to the all-industry average so that any deviations from this mean are recorded as overtime if the deviations are upwards. That this measure of overtime is not ideal may be indicated by recalling that an industry like textiles working an average of 41.6 hours and according to the measure being used worked overtime. However, it may have been the case that this industry had a standard work week in excess of 40.9 and in effect worked little real overtime. In other words, a more perfect measure of overtime would be calculated for each industry by referring to its own standard work week. This may not, however, always be feasible since many industries may not operate on a pre-arranged schedule. Such data

are not readily available so the measure adopted was then introduced into the argument.

With this variable included, the basic framework was again set up and the regression results are shown in table form on the next page. The results for 1957 from equation (1) once again reaffirm the results of Chapter II. The number of years of schooling, the percentage of males in the work force and the plant size variable are again the significant determinants of industrial hourly earnings. In addition, the labor ratio variable L displays a significant negative impact on earnings. These results are, of course, a repetition of those in Chapter II, but with the inclusion of the overtime variable the employment change variable T assumes a positive and an almost significant sign.

This indicates that the level of hourly earnings in 1957 was influenced by the percentage changes in employment occurring at that time.²⁴ This is the more usual form of relationship suggested by theory which the results in Chapter II seem to deny. The overtime variable itself, however, displays a negative sign which is almost significant.

Such a negative sign indicates industries in which overtime was worked were industries with low earnings, or alternatively, that overtime had a negative effect on earnings. The latter form of the argument

²⁴It will be remembered that the employment change variable covers the period 1955-59.

TABLE C - REGRESSION RESULTS
t values () d.f. 8a 19b

| Eqn. | R ² | CONSTANT | E | A | M | T | OT | U | R | L |
|------|----------------|--------------------|-------------------|--------------------|--------------------|--------------------|--------------------|------------------|-------------------|---------------------|
| 1 | .8466 | 4.1800 (2.0628) | .0319 (2.6916) | -.0142 (.6503) | .0081 (3.1184) | .0274 (1.7892) | -.0311 (1.8355) | .0007 (.2053) | .0051 (2.1980) | -.18710 (2.1990) |
| 2 | .9096 | 4.2490 (1.8900) | .0334 (2.8141) | -.0132 (.6290) | .0130 (4.8938) | -.0136 (1.7872) | -.0357 (1.8702) | .0017 (.4334) | .0087 (4.1690) | -.2546 (.3220) |
| 3 | .8074 | 6.7755 (2.2235) | .0551 (2.3486) | -.0597 (1.3140) | .0169 (2.6875) | -.0094 (.6163) | .0365 (1.4525) | .0077 (.9850) | .0039 (.8357) | -3.3340 (2.6474) |
| 4 | .8510 | 2.5261 (2.6054) | .0329 (3.3568) | .0084 (4.5341) | .0084 (1.0959) | .0084 (1.0959) | -.0218 (2.1739) | | .0064 (5.8382) | -.7065 (1.5056) |
| 5 | .8987 | 4.3427 (3.4140) | .0397 (3.7619) | .0116 (5.7708) | -.0055 (1.1132) | -.0055 (1.1132) | -.0403 (3.1596) | | .0076 (6.0096) | -.5422 (.9270) |
| 6 | .7916 | 3.2132 (1.7307) | .0591 (3.0734) | .0151 (3.8113) | .0000 (.0006) | .0000 (.0006) | -.0238 (1.1913) | | .0101 (4.0995) | -2.0704 (2.1293) |

a applies to equations (1) - (3)

b applies to equations (4) - (6)

is contrary to the theory upon which the inclusion of such a variable was based, and at first sight seems unreasonable.

However, an examination of Tables 1 and 10 indicates that there is no clear pattern whereby only low wage industries worked hours in excess of the all-industry average. In fact, the data are such that both the high and the low wage industries fall on either side of the average.

If then neither of these two interpretations fit, how does the variable come to show a negative sign? A further discussion of the variable will be delayed until the equations dealing with 1962 and 1969 have been considered.

Equation (2) shows that the explanatory power is a high 90 percent while again the significant variables are E, M and R. The overtime variable is significant and negative and the employment change variable is negative once more and almost significant. It thus seems that the 1957 situation, where employment changes exerted a strong positive influence on earnings, has been reversed to one where the employment changes are exerting a strong negative impact on earnings.

The 1969 situation is characterized by a similar conclusion regarding E and M, but this time the labor ratio L displays significance while the plan size variable fails to do so. Once more the overtime and employment change variables are negative and not significant.

The introduction of the overtime measure has increased the ex-

planatory power everywhere, but on the whole it has tended to reaffirm the results of Chapter II. The overtime variable itself shows a systematically negative sign which tended towards significance. The use of simple correlation techniques was used to test for a direct relationship between average hourly earnings and the overtime measure.

The 1957 correlation coefficient was $r = .32$ which is both positive and significant indicating that the greater number of hours worked the greater the level of hourly earnings. The result for 1962 shows $r = .25$ which is positive but not significant while the result for 1969 shows $r = .57$ which is again both positive and significant. Even with the limitations of the straight correlation technique, these results indicate a strong positive association in the light of which the systematically negative impact recorded through the regression are all the more unusual.

So far the average age of the work force and the degree of union organization have failed to show any significance, and consequently, these two variables have been temporarily omitted from the framework and the regression results are shown in equations (4) to (6) in Table C. The results, however, show little change with the same three variables E, M and R showing up once again. The overtime variable remains systematically negative and the employment change variable of relative unimportance.

Table D on the next page shows the results when only the education, male, and plant size variables were used in conjunction with the

TABLE D - REGRESSION RESULTS
 t values () d. f. 21

| Eqn. | R ² | CONSTANT | E | M | R | OT |
|------|----------------|--------------------|-------------------|-------------------|-------------------|--------------------|
| 1 | .8306 | 2.1860 (2.2074) | .0340 (3.3663) | .0090 (4.6532) | .0066 (5.9931) | -.0200 (1.9075) |
| 2 | .8854 | 4.6851 (4.0335) | .0390 (3.5552) | .0127 (6.2034) | .0073 (5.8278) | -.0456 (3.8042) |
| 3. | .7654 | 2.7600 (1.4160) | .0615 (3.0242) | .0174 (4.3633) | .0093 (3.9324) | .0241 (1.1400) |

overtime variable. The results show that from 76 to 88 percent of the variance in average hourly earnings among industries is explained by these four factors. As noted previously, the labor force quality representatives, E, M and R are explainable; it is the overtime variable that needs investigation.

One approach is to look at the ranking of industries in terms of average hourly earnings and in terms of overtime. Table E ranks the 36 industries by earnings while Table F ranks those industries in which overtime was worked, i.e. those industries showing percentages in excess of 100 in Table 10 in Appendix B.

For 1957, of the fifteen industries showing overtime, seven were industries whose average hourly earnings placed them in the lower half of the earnings structure. In fact, of the top 5 overtime industries, four were low wage industries. In this sense then, there is some justification for the negative sign displayed by the overtime variable in the regression results.

Looking at this ranking from another side, ten of the fifteen industries which recorded overtime hours in 1957 fall outside the top 25 percent of the earnings structure. This implies that possibly the earnings-overtime relationship is not captured by the straight correlation coefficient. From these observations, it appears that even though both the high and low wage industries participated in overtime, overtime was more common among the lower-paying industries.

The picture in 1962 is such that seven out of sixteen industries showing overtime were in the lower half of the earnings structure and five out of the top six overtime industries were similarly placed. The picture is more striking when the top 25 percent of the earnings structure is used as reference; then eleven out of the sixteen industries fall below this figure.

Finally, the 1969 data show that only eleven out of the twenty-four industries showing overtime are in the lower half of the earnings structure and four of the top ten overtime industries are in such a position. However, once the hotels, restaurants and taverns industry, which recorded a low average weekly total of 32.3 hours for 1969 and thus drags down the all-industry average, is omitted, thirteen out of the nineteen industries recording overtime are below the top 25 percent of the earnings structure. Even more striking is the fact that six out of the top nine overtime industries are similarly placed.

In the light of these observations the negative sign recorded by the overtime variable in the regression results is more explainable than seems at first sight. Using this particular measure, overtime appears more common among the lower paying industries. A more likely interpretation, however, may be that these industries worked longer standard hours per week and consequently, little real overtime. Such an interpretation casts doubts on the appropriateness of the measure used.

The fact that the OT variable was significantly negative on several occasions in the regression results and yet significant and

positively correlated with earnings also leads one to doubt the appropriateness of the variable as formulated. The OT variable changes sign once the effects of the other factors (such as education, age, etc.) on earnings have been removed in the multiple regressions.

It may then be the case that the OT variable is not representing overtime at all, but some other factor or factors, the exact nature of which is not clear.

TABLE E - INDUSTRIES RANKED BY AVERAGE HOURLY EARNINGS

| 1957 | 1962 | 1969 |
|--------------------------|-----------------------------|-----------------------------|
| Petroleum & Coal | Petroleum & Coal | Petroleum & Coal |
| Iron & Steel | Iron Mining | Construction |
| Iron Mining | Iron & Steel | Iron Mining |
| Pulp & Paper | Smelting | Pulp & Paper |
| Smelting | Pulp & Paper | Breweries |
| Metal Mining | Breweries | Iron & Steel |
| Breweries | Printing | Smelting |
| Printing | Metal Mining | Metal Mining |
| Mining | Transportation equipment | Transportation equipment |
| Paper & allied | Paper & allied | Printing |
| Transportation equipment | Mining | Aircraft & parts |
| Aircraft & parts | Distilleries | Paper & allied |
| Construction | Aircraft & parts | Mining |
| Chemicals | Construction | Distilleries |
| Beverages | Chemicals | Beverages |
| Meat | Meat | Tobacco |
| Distilleries | Beverages | Meat |
| Rubber | Rubber | Chemicals |
| Electrical | Non-Metallic minerals | Non-Metallic minerals |
| Non-Metallic minerals | Electrical | Rubber |
| Coal Mining | Tobacco | Grains |
| Tobacco | Grains | Electrical |
| Grains | Coal Mining | Wood |
| Wood | Wood | Wood |
| Dairy | Dairy | Dairy |
| Food & beverages | Food & beverages | Coal Mining |
| Soft drinks | Soft drinks | Soft drinks |
| Bakeries | Bakeries | Food & beverages |
| Furniture | Furniture | Bakeries |
| Textiles | Textiles | Furniture |
| Leather | Leather | Textiles |
| Clothing | Clothing | Leather |
| Shoes | Shoes | Clothing |
| Knitting | Knitting | Shoes |
| Hotels | Hotels | Knitting |
| Laundries | Laundries | Hotels |
| | | Laundries |

Source: Calculated from Table 1 in Appendix.

TABLE F - INDUSTRIES RANKED BY OVERTIME

| 1957 | 1962 | 1969 |
|-----------------------|-------------------------------|--------------------------|
| Iron Mining | Iron Mining | Petroleum & Coal |
| Soft drinks | Non-Metallic minerals | Iron Mining |
| Bakeries | Soft drinks | Non-Metallic minerals |
| Non-Metallic minerals | Dairy | Coal Mining |
| Dairy | Furniture | Furniture |
| Construction | Textiles | Mining |
| Furniture | Mining | Pulp & Paper |
| Mining | Rubber | Aircraft & parts |
| Metal Mining | Metal Mining | Distilleries |
| Pulp & Paper | Grains | Rubber |
| Grains | Bakeries | Paper & allied |
| Paper & allied | Transportation equip- ment | Smelting |
| Textiles | Petroleum & Coal | Textiles |
| Petroleum & Coal | Pulp & Paper | Metal Mining |
| Aircraft & parts | Paper & allied | Chemicals |
| | Chemicals | Transportation equipment |
| | | Grains |
| | | Soft drinks |
| | | Beverages |
| | | Knitting |
| | | Dairy |
| | | Electrical |
| | | Iron & Steel |
| | | Meat |

Source: Calculated from Table 10 in the Appendix.

CHAPTER IV

THE ROLE OF EMPLOYMENT CHANGES RE-INVESTIGATED

The results to date have indicated that changes in employment have had little influence on industrial earnings, that is, employment changes have failed to be a systematically significant determinant of average hourly earnings among industries.

In this chapter not only will the employment change variables used to date be reconsidered, but new measures of employment changes will be introduced into the study.

It will be recalled that the employment change variable generally took on a negative sign which implies that the disequilibrium process, whereby employment changes in response to wage increases which in turn are brought about by increases in demand for labor, was not operating. A possible interpretation for such a sign may, however, be that this disequilibrium process occurs only on the up side, that is, when employment changes are positive, and not on the downside when employment changes are negative.

That this may be the case is given some credence by the fact that the results for 1957 show the T variable to be positive but negative for 1962 and 1969, the two years in which employment was falling in more industries than was the case for 1957. As noted in Chapter II, the method

by which these employment change variables were calculated may be introducing cyclical factors into the analysis and for much of the periods in question this cyclical effect had a depressing effect on employment.

In the O.E.C.D. study quoted above, the authors claim that while a rise in relative earnings is not generally indispensable in order to increase labor supply "the stimulus to leave a given employment is evidently greater when earnings there are exceptionally low relative to those in most alternative employments than when earnings in only one or few other employments are exceptionally high."²⁵ In this sense then, some form of inverse relationship is postulated where employment changes are made in response for low earnings rather than the more usual case of employment changing in response to positive wage differentials.

An examination of Table E in Chapter III and Table 5 in Appendix B shows that for 1962 the largest decrease in employment took place in coal mining which ranked twenty-third in the earnings structure, but the second largest decline took place in distilleries which ranked twelfth. (It should be noted that output per man increased in coal mining, but employment decreased due to increased substitution of capital for labor. That is, employment opportunities may be declining because capital is being substituted for labor.) Of the thirteen industries recording declines in employment, only four were industries in the lower half of the earnings structure. The suggested hypothesis, therefore,

²⁵O.E.C.D., op. cit., p. 19.

cannot be considered to be very relevant for the year 1962.

The picture in 1969 is somewhat different in that of the fourteen industries recording declines in employment, ten were placed in the lower half of the earnings structure of the nine industries showing the largest decline, seven were so placed. These observations seem to make a case for the hypotheses but the fact that evidence is limited to 1969 renders it incapable of being suggested as a universally applicable explanation of employment changes in relation to inter-industry earnings.

Melvin Reder²⁶ quotes a study carried out by Bowen in which he computed correlation coefficients between percentage changes in average hourly earnings and percentage changes in employment during six sub-periods of the interval 1947-59 for twenty manufacturing industries in the U.S. His coefficients showed a positive correlation in the three subperiods in which unemployment was relatively low (less than 4.3 percent) but mixed results in the three subperiods in which unemployment was relatively high.

From these findings Reder draws support for the competitive hypothesis only for the periods in which low unemployment occurred where the short-run elasticities of labor supply are more likely to be smaller, thus allowing differential increases in employment to produce differential wage increases.

²⁶Melvin Reder, Aspects of Labor Economics (New York, National Bureau of Economic Research, 1962).

In table G on the following page, the annual percent unemployment rates for Canada for the period 1955-71 are presented. The employment change variable introduced in Chapter II was calculated for a five-year period centered on the three years of study, that is, the three variables were calculated for the periods 1955-59, 1960-64 and 1966-71. Applying this same technique to the unemployment rates, Bowen's conclusions can be tested.

The 1957 observation then holds in a period in which the average annual unemployment rate was 5.1 percent which is in excess of the 4.3 percent ceiling set by Bowen. Accordingly, this would be considered a period of relatively high unemployment so that there will be no positive association between employment changes and wages. The regression results yielding a positive (but insignificant) sign then disagree with this proposition, for the year 1957 at least.

The period for which the 1962 employment change variable applies was a period in which the annual average unemployment rate was 6.1 percent, again making it a period of relatively high unemployment. As a result, Bowen's theory would predict the absence of any positive association between employment changes and earnings. The regression results show that the employment change variable T was both negative and significant in 1962; this proposition fails to explain such a result.

A similar conclusion is drawn for the 1969 variable because it too was negative and the period in question was one of high unemployment, the

TABLE G

ANNUAL AVERAGE PERCENT UNEMPLOYMENT RATE FOR CANADA, 1955-1971

| Year | Rate |
|------|------|
| 1955 | 4.3 |
| 1956 | 3.3 |
| 1957 | 4.8 |
| 1958 | 7.1 |
| 1959 | 5.9 |
| 1960 | 7.1 |
| 1961 | 7.1 |
| 1962 | 5.9 |
| 1963 | 5.5 |
| 1964 | 4.7 |
| 1965 | 3.9 |
| 1966 | 3.6 |
| 1967 | 4.1 |
| 1968 | 4.8 |
| 1969 | 4.7 |
| 1970 | 6.0 |
| 1971 | 6.4 |

Source: Calculated from Seasonally Adjusted Labor Force Statistics,
January, 1953 - December, 1971, in D.B.S Catalogue No. 71-201.

annual average being 5.2 percent. Thus Bowen's findings, and Reder's interpretation of them, fail to fit the facts as observed in the regression results of Chapters II and III.

The employment change variable for 1969 was redefined to measure the percentage change in employment by industry for the period 1965-68 and the results of the regression run with the redefined variable included are shown in Table H on the following page. Equation (1) which includes the new employment change variable plus the seven other variables used previously indicates that only M, the percentage of males in the work force, and L, the labor ratio variable, are significant. This result then is quite surprising in light of the results of Chapters II and III. Although the explanatory power is quite high at 79 percent, the inclusion of eight variables limits the degrees of freedom to eight which may explain this odd result.

In equation (2) only the variables E, M, T, OT and R were included and the results show that E, M and R are once again the significant variables. From these results the new measure of employment changes still fails to show any significant impact on earnings and the three variables which came to the fore in the previous two chapters once again dominate. The overtime variable, OT, also fails to be significant but maintains the negative sign.

The period 1965 to 1968 was a period in which the annual average unemployment rate was 4.1 percent. According to Bowen's analysis, this was then a period of relatively high employment, and as such a positive

TABLE H - REGRESSION RESULTS
 t values () d.f. 8^a 20^b

| Eqn. | R ² | CONSTANT | E | A | M | T | OT | U | R | L |
|------|----------------|--------------------|-------------------|--------------------|-------------------|--------------------|--------------------|-------------------|-------------------|---------------------|
| 1 | .7992 | 6.8598 (2.1594) | .0513 (1.0569) | -.0610 (1.1125) | .0155 (2.2880) | .0050 (.1951) | -.0361 (1.2690) | .0088 (1.0891) | .0047 (.8450) | -3.5400 (2.6030) |
| 2 | .7628 | 2.3277 (1.0925) | .0711 (3.0663) | | .0168 (4.1363) | -.0078 (.8777) | -.0196 (.9002) | | .0104 (3.8977) | |
| 3 | .9186 | 6.7308 (3.3983) | .1060 (5.3590) | -.1175 (3.6762) | .0089 (2.3810) | -.0493 (3.4387) | -.0170 (1.0163) | .0160 (3.0936) | .0097 (1.7713) | -4.1783 (4.9881) |
| 4 | .7585 | 2.1821 (1.0017) | .0717 (2.7368) | | .0163 (3.7331) | -.0114 (.6325) | -.0186 (.8067) | | .0096 (3.9268) | |

^a Equations (1) and (3)

^b Equations (2) and (4)

association should exist between change in employment and wages. The results in Table H do not support the proposition to any great extent - in fact, the variable has a negative sign in equation (2). Thus, this particular interpretation of the relationship does not seem to hold for the period under study.

Yet another variant of the employment change variable was tried for 1969; this particular form covered the period 1966-69 and the results are given in equation (3) and (4) in Table H. The surprising thing about equation (3) is that E, A, M, T, U and L are all significant, A and U both for the first time. According to this result, then, the percentage change in employment among industries had a strong negative impact on earnings in 1969.

The 1966-69 period was one of relatively low unemployment, the annual average being 4.3 percent, so that contrary to Bowen's proposition and indeed general theory, employment changes even in tight labor markets exert a negative impact on earnings.

The results in equation (4), where the E, M and R variables have been omitted, again indicate that E, M and R are important determinants, while the results for the employment change variable and the overtime variable indicate that both have a small negative effect on earnings. The overall conclusion therefore must be that these two alternative formulations of the employment change variable shed little additional light on the relationship, if indeed any such relationship exists at all.

Part of the O.E.C.D. study²⁷ was devoted to an examination of variations in the relationship between changes in earnings and employment and the results of the numerous correlations carried out indicate that higher employment-earnings relationships tend to be more frequently observed in periods of low unemployment. However, negative coefficients did occur and often enough to reach the general conclusion that no close and consistent relationship between changes in relative earnings and changes in relative employment could be claimed to exist. The lack of any consistent relationship between employment changes and the level of earnings is, therefore, not unprecedented.

Up to now the plant size variable has been seen as a labor force quality variable, in that larger plants pay higher wages and obtain a higher quality of labor in return. In Chapter II reference was made to the fact that large plants generally have a larger turnover of workers than smaller plants. It may be the case that for such plants, it is this gross movement of labor that is important and not changes in employment, which are net change to which attention has been so far denoted. The results indicate that these net changes have little real impact on earnings. Since plant size has been shown to be a significant variable, examination of gross labor movements in relation to plant size is next undertaken.

The hypothesis that industries which are expanding can increase their labor force without increasing their wages relative to other in-

²⁷ Op. Cit.

dustries noted above in Chapter II is made possible by the fact that gross mobility rates are many times greater than the changes in net employment. This, of course, means that relatively little change in net employment may occur, yet the gross movements of labor may be very large.

A firm with a large plant or plants, facing large turnovers of labor, may be forced to offer relatively higher wages than a corresponding firm with a smaller plant and fewer turnovers in its labor force. This may be caused by the fact that the firm with the large plant may find it necessary to maintain a reserve pool of labor from which it can select its replacements, and the only way in which it can generate this reserve pool is to offer higher wages, or rather the possibility of higher earnings than otherwise might be the case.

A firm finding itself in such a situation may either be an expanding or a contracting firm and it may, consequently, be increasing or decreasing net employment over any given period of time. The important point is that regardless of the changes in net employment which the firm is experiencing it may still experience these large changes in turnovers, i.e. gross movements into and out of the labor force, and its wage policy may reflect this latter fact rather than its net employment performance.

If this is the case, then a positive association between earnings and gross flows of employment would exist and there would be little grounds for expecting such a positive association between changes in net employment and earnings. A case can be made for believing that net employment changes and earnings may be negatively associated.

An industry which has shown itself to be a declining industry in terms of employment opportunities may find it has to offer relatively high wages in order to attract and hold its workers, even if the number of workers it requires each year is a smaller number than in the previous year. Such an industry offers little hope to the workers for the future. It offers little prospect of security or long-term advancement or promotion so that many workers may choose to move to another industry in which the long-term prospects are brighter and they would need to obtain some sort of premium to induce them to enter or to remain within the declining industry.

During periods of significant unemployment, workers if they move at all move to where jobs are available and wage differentials play a secondary role. The same logic may be applied to workers in declining industries, and earnings differentials, if they work at all, can quite obviously be negatively related with net changes in employment.

It may then be incorrect to look for any clear and systematic relationship between net employment changes and earnings, or to assume that wages play an allocative role without recognizing that non-pecuniary factors (security, advancement, etc.) enter the picture and the gross flows of labor are an important factor influencing the wage policy of a firm.

CHAPTER V

CONCLUSIONS

The results of the various regressions out in the first four chapters indicate that labor quality is the main determinant of earnings and that variations in quality account for the differences in earnings among industries.

Labor quality was represented by a crude measure of educational attainment, sex, and, in part, by plant size. Even with these relatively crude measures of labor quality, some 79 to 83 percent of the variance in earnings among industries was explained.

The degree of unionization among industries showed little significance, although it should be borne in mind that unionism and plant size are highly correlated and that plant size was recognized to be a systematically important factor influencing earnings. The correlation coefficient between unionism and plant size was positive and significant for each of the three years studied²⁸ indicating the degree of unionization as a relevant factor, simply because it failed to show significance when used in a particular fashion. Perhaps the correct approach would be to incorporate it indirectly in some fashion since it appears to influence earnings in an indirect way.

²⁸The values were $r = .66$ for 1957, $r = .61$ for 1962 and $r = .69$ for 1969.

Neither the ratio of labor costs to the selling value of factory shipments nor the average age of the work force seem to play a significant role in determining hourly earnings, although the remarks made in Chapter II concerning the age variable need to be kept in mind.

Net changes in employment do not appear to influence earnings in any close or systematic fashion and a more appropriate measure may be gross movements of labor among industries. Such turnovers of labor may be more closely related to actual policies of firms particularly for firms with large plants than the longer term changes in employment which net out these flows.

The variable OT, formulated to represent overtime, appears with a negative sign and is significant on occasion. As suggested in Chapter III the variable may be representing a factor or factors other than overtime and the manner in which the variable was formulated makes such an occurrence not totally unlikely.

In summary then, much of the inter-industry earnings differentials in evidence in 1957, 1962 and 1969 can be explained by differences in the quality of the labor force of each industry and this result stands up through considerable testing.

The results further suggest that additional studies on the allocative role of wages should concern themselves with the gross flows of labor and with the non-pecuniary (as well as financial) factors influencing such turnovers. Such a study would obviously make the collection

and analysis of such gross flow data of prime importance and yet such data are sadly lacking for Canada.

BIBLIOGRAPHY

- Allen, B. T. "Market Concentration and Wage Increases in U.S. Manufacturing, 1947-64", Industrial and Labor Relations Review, April, 1968.
- Behman, S. "Wage Determination Process in U.S. Manufacturing", Quarterly Journal of Economics, February, 1968.
- _____ "Wage Changes, Institutions and Relative Factor Prices in Manufacturing", Review of Economics and Statistics, August, 1969.
- Blank, D.M. and G.J. Stigler. The Demand and Supply of Scientific Personnel, New York, National Bureau of Economic Research, 1957.
- Bunting, R. L. Employer Concentration in Local Labor Markets, Chapel Hill The University of North Carolina Press, 1962.
- Courchene, T. J. "Interprovincial Migration and Economic Adjustment", Canadian Journal of Economics, November, 1970.
- Cullen, D. E. "The Inter-Industry Wage Structure 1889-1950", American Economic Review, June, 1956.
- Dunlop, J. T. "Productivity and Wage Structure" in Income Employment and Public Policy: Essays in Honor of Alvin H. Hansen (New York, W. W. Norton and Company, Inc., 1948).
- Eckstein, O. and T.A. Wilson, "The Determination of Money Wages in American Industry", Quarterly Journal of Economics, August, 1962.
- Eiseman, D. M. "Inter-Industry Wage Changes, 1937-41", Review of Economics and Statistics, November, 1956.
- Garbarino, J. W. "A Theory of Inter-Industry Wage Variation", Quarterly Journal of Economics, May, 1950.
- Haworth, C.T. and D. W. Rasmussen, "Human Capital and Inter-Industry Wages in Manufacturing", Review of Economics and Statistics, November, 1971.
- Kaun, D. E. "Union - Non-Union Wage Differentials Revisited", Journal of Political Economy, August, 1964.
- Keat, P. G. "Long-Run Changes in Occupational Wage Structure 1900-1956", Journal of Political Economy, December, 1960.

- Kmenta, J. "Inter-Industry Wage Differentials in Australia 1941-54", Australian Economic Review, June, 1963.
- Lester, R. "Pay Differentials by Size of Establishment", Industrial Relations, October, 1967.
- Levinson, H. M. "Unionism, Concentration and Wage Changes: Toward a Unified Theory", Industrial and Labor Relations Review, January, 1967.
- Lewis, H. G. Unionism and Relative Wages in the U.S., Chicago, University of Chicago Press, 1963.
- Masters, S. M. "Wages and Plant Size: An Inter-Industry Analysis", Review of Economics and Statistics, August, 1969.
- Ober, H. "Occupational Wage Differentials, 1907-1947", Monthly Labor Review, August, 1948.
- O.E.C.D. Wages and Labor Mobility, Paris, July, 1965.
- Ostry, S. "Inter-Industry Earnings Differentials in Canada 1945-56", Industrial and Labor Relations Review, April, 1959.
- Peitchinis, S. G. "The Canadian Industrial Wage Structure" (mimeo) Department of Economics, University of Calgary, October, 1970.
- Perlman, R. "Forces Widening Occupational Wage Differentials", Review of Economics and Statistics, May, 1958.
- _____. "Value Productivity and the Inter-industry Wage Structure", Industrial and Labor Relations Review, October, 1956.
- Phelps Brown, E. H. and M.H. Browne, "Earnings in Industries of the U.K. 1948-59", Economic Journal, September, 1962.
- Reder, M. W. "The Theory of Occupational Wage Differentials", American Economic Review, December, 1955.
- _____. Aspects of Labor Economics, New York, National Bureau of Economic Research, 1962.
- Rees, A. "The Effects of Unions on Resource Allocation", The Journal of Law and Economics, October, 1963.
- _____ and M. T. Hamilton, "Post-War Movements of Wage Levels and Unit Labor Costs", Journal of Law and Economics, October, 1963.

- Reynolds, L.G. and C.H. Taft, The Evolution of Wage Structure, New Haven, Yale University Press, 1956.
- Rosenbluth, G. "Wage Rates and the Allocation of Labor", Canadian Journal of Economics, August, 1968.
- Ross, A.M. and W. Goldner, "Forces Affecting the Inter-Industry Wage Structure", Quarterly Journal of Economics, May, 1950.
- Rothschild, K.W. The Theory of Wages, London, Routledge and Kegan Ltd., 1954.
- Saunders, G. Wage Determination in Canada, Occupational Paper No. 3, Canada Department of Labor, April, 1965.
- Schwartzman, D. "Monopoly and Wages", Canadian Journal of Economics, August, 1960.
- Sjaastad, L. "The Costs and Returns of Human Migration", Journal of Political Economy, Supplement, October, 1962.
- Turner, H. A. "Inflation and Wage Differentials in Great Britain", from J. T. Dunlop (ed.) The Theory of Wage Determination, London, Macmillan, 1957.
- Vanderkamp, J. "Inter-regional Mobility in Canada: A Study of the Time Pattern of Migration", Canadian Journal of Economics, August, 1968.
- Weiss, L. W. "Concentration and Labor Earnings", American Economic Review, March, 1966.
- Woods, H.D. and S. Ostry, Labor Policy and Labor Economics in Canada, Toronto, Macmillan, 1962.

APPENDIX A

F Test and Durbin Watson Statistic

Calculations were made for an F test and autocorrelation. Unfortunately, due to a limited number of observations, the variables V, R, and L were excluded from these calculations.

The results are divided into two categories - those including the OT variable and those excluding it. Examining the former group first, it is found that the F value is substantially greater than the critical value, which is 2.67. The F value is equal to 12.57 for 1957, 10.1 for 1962 and 10.34 for 1969. This indicates that the variation in earnings is largely explained by the quality of labor force variables, E, A, M and T. The regression results reported in Chapter II are therefore reinforced. Concerning autocorrelation, the Durbin-Watson statistic is equal to 2.101 for 1957, 2.265 for 1962 and 2.394 for 1969. The four regions of the Durbin-Watson statistic were calculated to be : 1.24 ($=d_L$), 1.73 ($=d_U$), 2.27 ($=4-d_U$), and 2.76 ($=4-d_L$). The Durbin-Watson statistic indicates that for the years 1957 and 1962 we must accept the hypothesis that the disturbance is random and thus no autocorrelation is present. The test statistic for 1969 falls in the inconclusive range and thus the question of autocorrelation cannot be resolved.

Considering the group which includes OT, but now excludes T, the F values are once again found to be significant, and greater than the critical value 2.67. The F value for 1957 is equal to 8.53, 9.92 for

1962 and 11.07 for 1969. The OT contributed to the explanatory power and tends to reaffirm the results of Chapter III. The Durbin-Watson statistic was equal to 2.184 for 1957, 2.171 for 1962, and 2.519 for 1969. Again, the four regions were calculated to be the same as the first regression run. Thus, the test statistics for years 1957 and 1962 indicate no autocorrelation, while the third fell in the inconclusive region.

APPENDIX B
TABLE 1

Average Hourly Earnings in 36 Canadian Industries 1957-69
(in dollars)

| Industry | Average Hourly Earnings | | |
|--------------------------------|-------------------------|------|------|
| | 1957 | 1962 | 1969 |
| Mining including milling | 1.87 | 2.18 | 3.28 |
| Metal mining | 1.94 | 2.26 | 3.38 |
| Food and beverages | 1.39 | 1.65 | 2.47 |
| Tobacco Products | 1.52 | 1.85 | 3.06 |
| Rubber Products | 1.66 | 1.94 | 2.91 |
| Leather Products | 1.10 | 1.27 | 1.90 |
| Textiles | 1.21 | 1.42 | 2.21 |
| Paper & allied | 1.87 | 2.23 | 3.28 |
| Printing, publishing & allied | 1.90 | 2.33 | 3.31 |
| Furniture & fixtures | 1.28 | 1.49 | 2.22 |
| Petroleum & coal products | 2.23 | 2.68 | 3.81 |
| Chemical Products | 1.73 | 2.10 | 2.98 |
| Iron & Steel Mills | 2.16 | 2.60 | 3.49 |
| Transportation equipment | 1.85 | 2.24 | 3.31 |
| Electrical Products | 1.65 | 1.92 | 2.70 |
| Construction | 1.84 | 2.14 | 3.71 |
| Knitting Mills | 1.01 | 1.14 | 1.70 |
| Clothing | 1.06 | 1.23 | 1.87 |
| Wood Products | 1.45 | 1.71 | 2.68 |
| Non-Metallic minerals | 1.62 | 1.93 | 2.95 |
| Meat Products | 1.69 | 2.06 | 2.98 |
| Bakeries | 1.29 | 1.54 | 2.43 |
| Soft drinks | 1.31 | 1.54 | 2.48 |
| Pulp & paper mills | 2.01 | 2.42 | 3.57 |
| Smelting & refining | 2.01 | 2.43 | 3.42 |
| Aircraft & parts | 1.84 | 2.15 | 3.30 |
| Dairy Products | 1.39 | 1.70 | 2.65 |
| Breweries | 1.93 | 2.36 | 3.56 |
| Shoes | 1.06 | 1.23 | 1.84 |
| Distilleries | 1.68 | 2.17 | 3.27 |
| Iron Mining | 2.13 | 2.61 | 3.58 |
| Coal Mining | 1.60 | 1.83 | 2.59 |
| Grain Mill Products | 1.52 | 1.84 | 2.75 |
| Beverages | 1.71 | 2.05 | 3.08 |
| Laundries, cleaners & pressers | .90 | 1.06 | 1.62 |
| Hotels, Restaurants & Taverns | .94 | 1.07 | 1.62 |

Source: Review of Manhours and Hourly Earnings, 1957-67, 1967-69,
D.B.S. Catalogue No. 72-202.

TABLE 2

Education Attainment by Industry Canada, 1961

| Industry | Percent Completing 4-5 Years Secondary Schooling |
|--------------------------------|---|
| Mining including milling | 7.34 |
| Metal Mining | 7.40 |
| Food & beverages | 7.60 |
| Tobacco Products | 6.36 |
| Rubber Products | 7.25 |
| Leather Products | 4.26 |
| Textiles | 5.69 |
| Paper & allied | 10.71 |
| Printing, publishing & allied | 19.17 |
| Furniture & fixtures | 12.28 |
| Petroleum & coal products | 13.61 |
| Chemical Products | 15.19 |
| Iron & steel mills | 8.16 |
| Transportation equipment | 12.10 |
| Electrical Products | 10.73 |
| Construction | 6.58 |
| Knitting Mills | 6.42 |
| Clothing | 7.33 |
| Wood Products | 7.32 |
| Non-Metallic minerals | 8.69 |
| Meat Products | 9.04 |
| Bakeries | 8.00 |
| Soft drinks | 10.99 |
| Pulp & paper mills | 10.70 |
| Smelting & refining | 7.82 |
| Aircraft & parts | 9.86 |
| Dairy products | 8.67 |
| Breweries | 10.56 |
| Shoes | 3.98 |
| Distilleries | 10.56 |
| Iron Mining | 7.30 |
| Coal Mining | 7.40 |
| Grain Mill Products | 6.14 |
| Beverages | 10.56 |
| Laundries, cleaners & pressers | 6.64 |
| Hotels, restaurants & taverns | 10.09 |

TABLE 3

Average Age in Years by Industry, Canada, 1961

| Industry | Average Age |
|--------------------------------|-------------|
| Mining | 35.5 |
| Metal Mining | 35.5 |
| Food & beverage | 37.6 |
| Tobacco Products | 36.5 |
| Rubber Products | 36.0 |
| Leather Products | 36.8 |
| Textiles Products | 34.5 |
| Paper & allied | 36.0 |
| Printing, publishing, & allied | 36.0 |
| Furniture & fixtures | 37.5 |
| Petroleum & coal products | 33.0 |
| Chemicals | 36.0 |
| Iron & steel mills | 39.5 |
| Transportation equipment | 41.0 |
| Electrical | 34.5 |
| Construction | 33.5 |
| Knitting Mills | 33.0 |
| Clothing | 38.5 |
| Wood | 34.3 |
| Non-Metallic minerals | 34.5 |
| Meat | 35.3 |
| Bakeries | 37.0 |
| Soft drinks | 37.5 |
| Pulp & paper mills | 36.0 |
| Smelting & refining | 39.8 |
| Aircraft & parts | 34.0 |
| Dairy | 34.0 |
| Breweries | 37.5 |
| Shoes | 39.5 |
| Distilleries | 37.5 |
| Iron Mining | 35.5 |
| Coal Mining | 35.5 |
| Grains | 37.0 |
| Beverages | 37.5 |
| Laundries, cleaners & pressers | 37.5 |
| Hotels, restaurants & taverns | 38.0 |

Source: Occupations by Sex, Showing Age, Marital Status and Schooling, Census of Canada, 1961, D.B.S. Catalogue No. 94-509.

TABLE 4

Male Workers as a Percentage of Total Industry Employment

| Industry | 1957 | 1961 | 1968 |
|--------------------------------|-------|-------|-------|
| Mining ^a | 99.96 | 99.96 | 99.96 |
| Metal Mining | 99.96 | 99.96 | 99.96 |
| Food & beverages | 71.15 | 72.98 | 72.68 |
| Tobacco products | 36.80 | 41.58 | 50.05 |
| Rubber Products | 78.29 | 79.63 | 82.08 |
| Leather Products | 55.18 | 53.00 | 48.38 |
| Textiles Products | 64.15 | 65.59 | 63.73 |
| Paper & allied | 89.07 | 89.58 | 90.09 |
| Printing, Publishing & allied | 79.90 | 79.93 | 78.06 |
| Furniture & fixtures | 91.45 | 89.08 | 86.14 |
| Petroleum & coal products | 99.37 | 99.33 | 99.62 |
| Chemicals | 83.15 | 83.64 | 81.88 |
| Iron & steel mills | 95.51 | 99.38 | 99.34 |
| Transportation equipment | 97.21 | 95.75 | 93.29 |
| Electrical | 70.50 | 70.45 | 64.16 |
| Construction | 99.85 | 99.85 | 99.85 |
| Knitting Mills | 30.81 | 30.99 | 32.32 |
| Clothing | 27.67 | 25.80 | 22.21 |
| Wood | 94.81 | 95.95 | 95.75 |
| Non-Metallic minerals | 94.18 | 92.77 | 93.11 |
| Meat | 80.54 | 80.34 | 82.37 |
| Bakeries | 70.28 | 71.09 | 73.00 |
| Soft drinks | 92.41 | 94.36 | 93.71 |
| Pulp & paper mills | 98.16 | 98.04 | 98.13 |
| Smelting & refining | 92.17 | 99.80 | 99.82 |
| Aircraft & parts | 97.24 | 97.94 | 97.11 |
| Dairy | 94.48 | 94.48 | 93.41 |
| Breweries | 99.38 | 99.38 | 99.75 |
| Distilleries | 64.24 | 64.24 | 76.16 |
| Iron Mining | 99.96 | 99.96 | 99.96 |
| Coal Mining | 99.96 | 99.96 | 99.96 |
| Grains | 92.87 | 92.87 | 95.14 |
| Beverages | 87.81 | 87.81 | 91.89 |
| Laundries, cleaners & pressers | 28.58 | 28.58 | 28.58 |
| Hotels, restaurants & taverns | 22.98 | 22.98 | 22.98 |
| Shoes | 51.45 | 49.01 | 45.29 |

^a The census figures were the only such figures available.

Sources: Calculated from General Review of Manufacturing Industries of Canada, 1957, D.B.S. Catalogue No. 31-201; Manufacturing Industries of Canada, Section A, Summary for Canada, 1961, 1968 D.B.S. Catalogue No. 31-203; 1961 Census of Canada, D.B.S. Catalogue No. 94-509.

TABLE 5

Percentage Employment Changes by Industry

| Industry | 1957 ^a | 1962 ^a | 1969 ^a | 1969 ^b | 1969 ^c |
|--------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Mining | 6.4 | -4.5 | 10.9 | 4.5 | 0.8 |
| Metal Mining | 5.7 | -5.5 | 5.9 | 0.6 | -5.8 |
| Food & beverages | 1.9 | 2.4 | 10.8 | -14.3 | -0.7 |
| Tobacco Products | -1.7 | 1.8 | -16.4 | 2.0 | -1.9 |
| Rubber Products | 5.5 | 13.0 | - 8.4 | 2.2 | 0.1 |
| Leather Products | 3.0 | 5.9 | - 4.3 | -1.4 | -4.2 |
| Textiles Products | 1.5 | 18.2 | - 3.8 | -1.2 | -0.2 |
| Paper & allied | 3.4 | 6.8 | 3.3 | 5.9 | 3.6 |
| Printing, publishing, allied | 2.3 | 1.4 | 1.8 | 8.5 | 4.1 |
| Furniture & fixtures | 4.7 | 10.1 | 6.1 | 3.3 | 1.1 |
| Petroleum & coal products | 2.3 | -4.0 | 5.8 | 7.0 | 4.3 |
| Chemicals | 1.9 | 4.2 | -1.4 | 6.8 | 2.8 |
| Iron & steel mills | 11.3 | 9.8 | 0.6 | -0.9 | - 13.3 |
| Transportation equipment | 0.4 | 25.8 | -4.2 | 7.3 | 4.2 |
| Electrical | 6.3 | 18.1 | -5.1 | 12.1 | 5.9 |
| Construction | 8.2 | -1.7 | 6.9 | 0.8 | -7.6 |
| Knitting Mills | 3.0 | 1.6 | 0.8 | 2.0 | 0.5 |
| Clothing | 2.1 | 11.1 | 0.0 | -2.9 | -4.6 |
| Wood | 1.7 | 11.0 | 12.9 | -4.4 | -0.1 |
| Non-Metallic minerals | 8.3 | 10.9 | -2.6 | -3.7 | -4.9 |
| Meat | 5.2 | -2.3 | 4.4 | 0.9 | 0.7 |
| Bakeries | 1.1 | 0.9 | -11.7 | -6.1 | -7.6 |
| Soft drinks | 6.3 | 8.5 | 4.2 | 14.1 | 4.2 |
| Pulp & paper mills | 2.9 | 4.7 | 3.5 | 3.8 | 1.2 |
| Smelting & refining | 4.0 | -6.9 | 7.0 | 7.3 | -2.9 |
| Aircraft & parts | -10.1 | 6.1 | -38.0 | 31.7 | 2.8 |
| Dairy | 2.2 | -0.5 | -0.2 | 0.5 | -4.4 |
| Breweries | 4.4 | -4.0 | 14.1 | -1.6 | -1.3 |
| Shoes | 3.7 | 1.2 | -4.2 | -1.1 | -4.1 |
| Distilleries | 0.3 | -9.3 | 6.1 | 14.9 | 8.6 |
| Iron Mining | 11.0 | 13.9 | -1.3 | -4.1 | -13.1 |
| Coal Mining | -8.9 | -20.3 | -5.5 | 3.4 | -20.5 |
| Grains | -2.4 | -4.5 | 7.5 | 9.4 | 2.7 |
| Beverages | 4.4 | -0.2 | 8.3 | 8.8 | 3.6 |
| Laundries, cleaners, and pressers | 4.3 | -1.0 | -19.6 | -1.6 | -7.0 |
| Hotels, restaurants and taverns | 3.6 | 15.7 | 36.4 | 26.3 | 26.9 |

^a The percentage changes were calculated over a five year period centered on the year in question.

^b Percentage change calculated over the period 1965-68.

^c Percentage change calculated over the period 1966-69.

Sources: Calculated from Review of Employment and Average Weekly Wages and Salaries, 1957-67, 1967-69, D.B.S. Catalogue No. 72-201; Review of Employment and Payrolls, 1956, D.B.S. Catalogue No. 72-201; Employment Earnings and Hours, July-Sept. 1971, D.B.S. Catalogue No. 72-002.

TABLE 6

Union Membership by Industry, Canada, 1957, 1962, 1967

| Industry | 1948 S.I.C. | | 1960 S.I.C. | |
|-------------------------------|-------------|--------|-------------|--------|
| | 1957 | 1962 | 1962 | 1967 |
| Mining & quarrying | 59020 | 54900 | 50000 | 57871 |
| Metal Mining | 35486 | 36600 | 32400 | 40482 |
| Food & beverages | 50877 | 62400 | 73300 | 82282 |
| Beverages | 8766 | 10500 | 10100 | 10689 |
| Tobacco | 5984 | 5400 | 5400 | 6126 |
| Rubber | 14743 | 10300 | 10900 | 15723 |
| Leather | 9244 | 9800 | 9800 | 12889 |
| Textiles | 33710 | 31100 | 30700 | 38690 |
| Furniture & fixtures | n.a. | n.a. | 9100 | 13211 |
| Paper & allied | 63879 | 74100 | 74400 | 209558 |
| Printing, publishing & allied | 23466 | 28300 | 28100 | 73319 |
| Transportation equipment | 98043 | 71000 | 70300 | 30542 |
| Electrical products | 33418 | 40000 | 42400 | 123935 |
| Petroleum & coal products | 3388 | 47000 | 4500 | 56680 |
| Chemicals | 14749 | 13500 | 14700 | 3936 |
| Knitting mills | n.a. | n.a. | 3200 | 22024 |
| Clothing | 46552 | 47000 | 44100 | 3158 |
| Wood products | 38497 | 33100 | 24500 | 51182 |
| Primary Metals | n.a. | n.a. | 62200 | 42690 |
| Non-Metallic minerals | 16925 | 16600 | 17700 | 70393 |
| Construction | 140194 | 143800 | 143800 | 23143 |

Source: Table IV in Union Growth in Canada 1921-67, Canada Department of Labor, Catalogue No. L41-970.

TABLE 7

Union Membership by Industry as a Percentage of
Employment by Industry, Canada, 1957, 1962, 1969

| Industry | 1957 | 1962 ^a | 1962 ^b | 1969 |
|-------------------------------|------|-------------------|-------------------|------|
| Mining* | 52.9 | 53.2 | 48.5 | 51.3 |
| Metal Mining* | 55.7 | 58.9 | 52.2 | 64.9 |
| Food & beverages | 26.4 | 29.6 | 34.8 | 35.9 |
| Tobacco products | 60.4 | 48.4 | 48.4 | 58.0 |
| Rubber products | 66.4 | 45.1 | 47.8 | 58.4 |
| Leather products | 29.7 | 29.7 | 29.7 | 40.9 |
| Paper & allied | 67.7 | 73.5 | 73.8 | 63.5 |
| Printing, publishing & allied | 31.4 | 37.4 | 37.1 | 36.5 |
| Furniture & fixtures | 22.1 | 24.0 | 26.4 | 30.0 |
| Petroleum & coal products | 19.0 | 28.8 | 27.6 | 25.1 |
| Chemical products | 26.9 | 21.1 | 23.0 | 29.2 |
| Primary metals | 53.0 | 55.4 | 56.1 | 62.3 |
| Transportation | 67.7 | 67.7 | 67.0 | 82.4 |
| Electrical products | 41.0 | 41.4 | 43.8 | 44.4 |
| Construction* | 51.5 | 54.7 | 54.7 | 90.6 |
| Knitting mills | 11.3 | 12.7 | 13.9 | 13.8 |
| Clothing | 51.1 | 51.2 | 48.1 | 52.1 |
| Wood | 30.4 | 39.7 | 29.4 | 47.5 |
| Non-Metallic minerals | 42.2 | 36.5 | 38.9 | 45.1 |
| Textile products | 49.2 | 45.8 | 45.2 | 50.0 |

* Employment was obtained from Employment & Payrolls 1957, 1962 and Employment and Average Weekly Wages and Salaries, 1967, D.B.S. Catalogue No. 72-002.

^a Using Membership according to 1948 S.I.C.

^b Using Membership according to 1960 S.I.C.

Source: Calculated from Table 6 above; employment figures by industry were obtained from sources used in Table 5.

TABLE 8

Employment Concentration Indices* for Canadian Industries,
1957, 1961 and 1967.

| Industry | 1957 | 1961 | 1967 |
|-------------------------------|------|------|-------------------|
| Food & beverage | 38.9 | 38.7 | 41.6 |
| Tobacco Products | 88.7 | 82.9 | 77.4 |
| Rubber Products | 90.0 | 84.1 | 78.2 |
| Leather Products | 28.9 | 32.0 | 80.7 ^a |
| Textiles Products | 62.5 | 62.7 | 61.9 |
| Paper & allied | 73.1 | 73.0 | 83.5 ^b |
| Printing, publishing & allied | 37.8 | 35.9 | 39.6 |
| Furniture & fixtures | 16.7 | 15.1 | 23.3 |
| Petroleum & coal products | 64.6 | 55.6 | 38.5 |
| Chemical Products | 48.1 | 47.0 | 48.1 |
| Primary metals | 92.9 | 93.7 | 94.8 |
| Transportation | 89.3 | 84.2 | 89.3 |
| Electrical Products | 80.7 | 75.2 | 69.9 |
| Construction | n.a. | n.a. | n.a. |
| Knitting mills | 43.6 | 33.5 | 35.6 |
| Clothing | 21.3 | 20.9 | 26.4 |
| Wood | 19.6 | 24.4 | 29.6 |
| Non-Metallic minerals | 91.3 | 35.3 | 36.4 |
| Meat Products | 78.8 | 75.5 | 73.3 ^c |
| Bakeries | 29.8 | 29.6 | 31.4 ^c |
| Soft drinks | 22.2 | 24.2 | 22.1 ^c |
| Pulp & paper | 89.5 | 89.7 | 90.0 |
| Smelting & refining | 91.7 | 93.1 | 93.6 ^c |
| Aircraft & parts | 95.0 | 92.0 | 93.3 ^c |
| Dairy products | 32.4 | 27.8 | 23.4 |
| Breweries | 38.9 | 38.7 | 41.6 |
| Shoes | 38.6 | 38.0 | 48.6 ^c |

* The percentage of total employees in the industry working in establishments of 200 or more employees.

^a 1967 data was used for establishments employing 50 or more.

^b 1967 data used for establishments employing 100 and more.

^c Using 1966 data.

Sources: Calculated from General Review of the Manufacturing Industries of Canada, 1957, D.B.S. Catalogue No. 31-201; Type of Ownership and Size of Establishments Engaged in Manufacturing in Canada 1961, D.B.S. Catalogue No. 31-210; Annual Census of Manufacturers, Preliminary Bulletin Size of Establishment 1967, Catalogue No. 31-201 P.

TABLE 9

Ratios of Labor Costs in Canadian Industries, 1957, 1962, 1969

| Industry | Ratio of Wages* to Selling Value of Factory Shipments | | |
|-------------------------------|--|------|------|
| | 1957 | 1962 | 1969 |
| Food & beverages | .104 | .082 | .087 |
| Tobacco products | .106 | .092 | .089 |
| Rubber products | .178 | .187 | .165 |
| Leather products | .255 | .244 | .252 |
| Textile products | .191 | .167 | .166 |
| Paper & allied | .163 | .158 | .169 |
| Printing, publishing & allied | .221 | .212 | .208 |
| Furniture & fixtures | .291 | .233 | .235 |
| Petroleum products | .035 | .033 | .035 |
| Chemical products | .102 | .091 | .100 |
| Primary metals | .197 | .192 | .177 |
| Transportation | .185 | .159 | .129 |
| Electrical products | .175 | .167 | .170 |
| Construction | n.a. | n.a. | n.a. |
| Knitting mills | .233 | .203 | .200 |
| Clothing | .220 | .224 | .241 |
| Wood | .217 | .214 | .204 |
| Non-Metallic minerals | .189 | .186 | .191 |
| Meat | .078 | .073 | .070 |
| Bakeries | .250 | .146 | .175 |
| Soft drinks | .096 | .093 | .089 |
| Pulp & paper | .168 | .164 | .176 |
| Smelting & refining | .080 | .074 | .170 |
| Aircraft & parts | .248 | .217 | .233 |
| Dairy products | .107 | .054 | .057 |
| Breweries | .110 | .101 | .107 |
| Shoes | .255 | .244 | .252 |
| Distilleries | .099 | .076 | .069 |

* Wages are for production and related workers only.

Sources: Calculated from General Review of the Manufacturing Industries of Canada 1957, D.B.S. Catalogue No. 31-201; Manufacturing Industries of Canada, Section A, Summary for Canada, 1962, D.B.S. Catalogue No. 31-203; Annual Census of Manufactures, Preliminary Bulletin, 1969, D.B.S. Catalogue No. 31-201 P.

TABLE 10

Average Weekly Hours of Hourly Rated Wage Earners
By Industry as a Percentage of the Industry Average

| Industries | 1957 | 1962 | 1969 |
|--------------------------------|-------|-------|-------|
| Mining | 103.4 | 102.2 | 103.5 |
| Metal Mining | 103.2 | 101.7 | 101.8 |
| Food & beverages | 99.3 | 98.8 | 98.5 |
| Tobacco products | 97.6 | 96.6 | 92.5 |
| Rubber products | 98.3 | 102.2 | 102.8 |
| Leather products | 96.8 | 98.3 | 96.0 |
| Textiles products | 101.7 | 103.2 | 102.0 |
| Paper & allied | 101.7 | 100.7 | 102.8 |
| Printing, publishing & allied | 97.3 | 94.9 | 94.8 |
| Furniture & fixtures | 103.4 | 104.4 | 103.8 |
| Petroleum & coal | 101.2 | 101.2 | 107.3 |
| Chemicals | 100.0 | 100.5 | 101.8 |
| Iron & steel mills | 99.5 | 98.8 | 100.3 |
| Transportation equipment | 96.8 | 100.5 | 101.5 |
| Electrical | 98.8 | 100.0 | 100.3 |
| Construction | 103.7 | 99.8 | 99.5 |
| Knitting mills | 97.3 | 100.0 | 100.5 |
| Clothing | 89.7 | 91.9 | 91.3 |
| Wood | 97.8 | 99.5 | 98.3 |
| Non-Metallic minerals | 104.4 | 105.1 | 106.0 |
| Meat | 97.8 | 99.5 | 100.3 |
| Bakeries | 104.9 | 101.5 | 98.0 |
| Soft drinks | 105.9 | 104.9 | 101.3 |
| Pulp & paper mills | 102.0 | 101.0 | 103.5 |
| Smelting & refining | 99.0 | 98.3 | 102.3 |
| Aircraft & parts | 100.2 | 100.0 | 103.3 |
| Dairy | 104.2 | 104.0 | 100.5 |
| Breweries | 98.0 | 96.8 | 99.8 |
| Shoes | 95.4 | 97.8 | 96.3 |
| Distilleries | 96.1 | 99.5 | 102.8 |
| Iron Mining | 110.3 | 107.4 | 106.8 |
| Coal Mining | 96.6 | 98.8 | 104.8 |
| Grains | 102.0 | 101.7 | 101.5 |
| Beverages | 98.8 | 100.0 | 101.0 |
| Laundries, cleaners & pressers | 97.8 | 98.0 | 93.5 |
| Hotels, restaurants & taverns | 98.0 | 93.1 | 80.8 |

Sources: Calculated from Review of Manhours and Hourly Earnings 1957-67, 1967-69, D.B.S. Catalogue No. 72-202.