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EFFICIENCY WAGE MODELS AND INTERINDUSTRY WAGE DIFFERENTIAL: NEW EVIDENCE FOR CANADA FOR 1990

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ABSTRACT

This paper contains a review of several publications on the topic of efficiency wage models and a research study aiming to estimate interindustrial wage differentials in Canada using data from the 1991 census. The findings of this study were quite similar to those of a previous empirical study conducted in 1986 in Canada even though the 1991 database comes from a different source. The major changes were detected in the construction industry, lower level occupations (fabrication), blue collar workers, and the Ontario and the Atlantic provinces. These results do not contradict the trend identified in Canada toward increasing polarization in the labour market. Neither do they contradict reports about increasing similarities in activities in the workplace in the goods and service industries, or about economic changes in the industries of the provinces mentioned above.

INTRODUCTION

Studies conducted in the 1980's have demonstrated the existence of stable interindustrial wage differentials in Canada, the United States, and a few other countries. In Canada, evidence drawn from the years 1970, 1980, 1985, and 1986 shows that the pattern of these wage differentials remained stable in spite of the changes taking place in industrial technology and in the dynamics of income and job creation. This dynamics consisted of a growth in the 'gap' between skilled and unskilled workers (Betcherman, 1992) and an increased polarization in earnings and jobs opportunities (Sharpe, 1993), which seemed to be encouraged by the process of 'restructuring' that the service industry was experiencing (Patrinos, 1993). While these changes were taking place in the labour market, the economy became more responsive to the competitive global environment, unemployment persisted, and there were indications of market segmentation. These facts seemed to indicate that changes in the economy and in the composition of the labour market had little impact on the wage structure, and they favoured the hypotheses of the efficiency wage theories which postulate that wages can be set above equilibrium in spite of the forces of supply and demand, and firms have a predominant role in the process of wage determination.

To define this process of wage determination, efficiency wage theories analyse the pattern of interindustrial wage differentials and firm characteristics. Since the verification of the stability of this pattern amid economic changes is what motivates this paper, I address the question as to whether or not Canada's wage structure changed by the end of the 1980's. This study examines the existence of interindustrial wage differentials in Canada for the year 1990, and looks for evidence in favour of the efficiency wage hypothesis. To identify possible variations in wage differentials, I update part of the study of Gera and Grenier (1991) on this topic, follow their approach, and use a different data set. I also review theoretical and empirical aspects of efficiency wage theories to stress their contributions and contrast with the classical approach.

The efficiency wage and competitive approaches rely on different market forces, and explain equilibria in the labour market from two different perspectives. *Efficiency wage*, *insider-outsider* or

unions (Lindbeck and Snower, 1984 and 1986), and *implicit contracts* models (Azariadis, 1975, Baily, 1974, and Gordon, 1974), were developed in the 1980's, when the problem of unemployment received more attention. They explain the simultaneous existence of wage differentials and unemployment assuming, just as Keynes (1936) and Pigou (1927) did in the 1930's, that nominal wages are rigid. On the other hand, classical competitive explanations deal with either wage differentials or unemployment but not both: for example, the theory of *compensating differentials* and the *human capital model* explain wage differentials, and models such as the *sectoral shifts model* (Lilien, 1982) and *search model* (Stigler, 1962, and Phelps, 1970) explain unemployment independent of wage differentials. These classical models assume wages to be flexible, affirm that labour market equilibrium always achieves an efficient allocation of resources, and they are consistent with the classical Walrasian approach, which stresses the role of supply and demand forces in clearing all markets including the labour market.

This new generation of equilibrium and disequilibrium wage models were developed after the 1960's. They brought new directions into economic analysis with the inclusion of micro-economic elements to explain macroeconomic stylised facts. However, their developments did not resolve the basic dichotomy that exists between classical and Keynesian models and which turns around the issue of equilibrium unemployment. Efficiency wage models explain this phenomenon by describing a process of wage determination in which firm characteristics generate a wage structure different from the wage differentials streaming from classical models. Since this process is the core of this paper, the more relevant classical models will be those that infer, from a certain distribution of wages, the importance of working conditions (compensating differentials) or workers' characteristics (human capital model) to determine the wage rate.

The process of wage determination takes place according to efficiency wage theories through a wage function which also associates workers' effort with their relative wages. In this theoretical setting, firms and workers optimize their behaviour in the market, and firms, not supply and demand forces, set the wage in the labour market. The equilibrium achieved is not Pareto-optimal because firms set wages above the market-clearing level to motivate or recruit better workers. It coexists with a

situation of 'search' or 'involuntary structural unemployment', and the wage distribution at this point is stable. The wage-effort function also explains the phenomena of market segmentation, discrimination, and cyclical employment (Akerlof and Yellen, 1986).

In contrast with this alternative view, the traditional theory of compensating differences (Rosen, 1986) and human capital model (Mincer, 1958 and 1962, Schultz, 1961, and Becker 1962 and 1964) explain the existence of wage differentials from the competitive perspective. The human capital model is built on the notion of education as an investment explaining wage differentials as a result of workers' pattern of human capital accumulation (workers' skill mix) and labour quality. The theory of compensating differentials describes a 'matching and sorting' function that allocates specific workers to specific work characteristics. Two types of transactions take place between workers and employers, one implies a payment for the service offered to the employer, the other, a payment for the attributes of the job, or compensating differentials. These two theories assume that the distribution of wages at the market-clearing level tends to converge in the long run when the supply curve is more elastic (compensating differentials), or lifetime earnings and schooling equate supply and demand for workers (human capital model).

Because classical models assume that the labour market clears in the long run, they consider that government intervention is undesirable, and benefits and taxes reduce economic efficiency. Thus, minimum wage laws and unemployment insurance programs would create unemployment and an unemployment subsidy has no effect if it is financed by a tax levied in the same market. But in practice, the economy includes many labour markets. A subsidy in one market where the wage distortion is worse, say the unskilled workers, financed by a tax in the market of skilled workers can improve efficiency. Moreover, a two-sector supply demand model can be applied to analyse the extra effects of training on unemployment. In contrast to Walrasian models, efficiency wage models offer more scope for labour market policy. A policy recommendation that flows from these models focus on progressive payroll taxes and tax-based income policies. For example, a lump-sum subsidy offered to a firm for each worker employed and financed by a proportional tax on the wage bill in the same market will create employment. An example of a tax-based income policy is when the

proceeds of an incremental wage tax are distributed as a per worker subsidy. (Johnson and Layard, 1986, p. 924). Studies based on this approach have opened the door to alternative industrial and trade policies which could raise real wages and national productivity due to the relation that exists between job creation and firm characteristics.

In Canada, empirical studies have followed both approaches, with some of them aiming to explain the hight unemployment rates that existed in this economy throughout the 1980's[1] and to offer policy recommendations. In recent research, most of the evidence for the existence of efficiency wage differentials comes from studies conducted in developed countries. For example, the studies conducted in Canada and the US examined in this paper, have demonstrated the existence of interindustrial wage differentials and the role of high-wage industries in stimulating job creation, reducing unemployment, ensuring job stability, and creating additional jobs through spillover effects (Gera and Grenier, op. cit.). In developing economies, the evidence of efficiency wage differentials across industries is not always conclusive, but the findings of some studies conducted in Latin America (Romaguera, 1991) are favourable to the efficiency wage approach. In studies that were conducted in Mexico in 1984, Colombia in 1976, Brazil in 1979, and Chile in 1986, there is evidence of a relation between wage differentials and certain characteristics of the firm, such as size, state of modernization, and value added.

This analysis of characteristics of the firm has also been relevant to explain the existence of dual labour markets. In Canada, primary and secondary markets have been identified on the basis of industry size characteristics (high and low-wage industries[2]). In Latin America, there has been evidence of other types of market segmentation. Studies conducted in the Dominican Republic, Paraguay, and El Salvador in 1978, and in Chile in 1983, found evidence of wage differentials between the formal and informal sectors, and in Brazil in 1985, between the public and private

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1 See appendix, table No. 14.

2 Low-wage industries had the larger share of industry employment in the years 1986-1989, despite the fact that employment grew three times higher in high-knowledge industries in the period 1984-1991, (OECD, 1994).

sectors. Another study conducted in Chile in 1987, found evidence of different earning equations across protected sectors, those covered by the minimum wage law and unprotected sectors.

For the purpose of this paper, the key issue is how the existence of efficiency wages is detected instead of the analysis of firm characteristics. Therefore, I begin the paper with a survey of the efficiency wage literature to highlight the more relevant efficiency wage models, followed by a synthesis of three empirical studies which analyse interindustrial wage differentials in two economic contexts: Canada and the US, two developed economies, and Chile, a less developed one. The major traits of the countries selected are the following: the Canadian economy is one in which the industrial sector has experienced deep changes over the last three decades. The US economy is one for which most empirical studies of the 1980's have been conducted. And Chile's economy has been subject to industrial growth and changing political conditions, of which the mix of dictatorship with free markets and trade makes Chile an interesting case.

In the empirical analysis, I focus on the stability of the pattern of wage differentials and the contrast between the efficiency wage and classical analysis. I cannot test the predictions of any efficiency wage models due to the limited information provided by the data set on firm characteristics. Hence, I analyse the wage structure and the dispersion of wage differentials after controlling for workers' characteristics and working conditions. The analysis of the wage structure and dispersion of wages under these type of controls provides information on whether or not wages are determined by supply and demand (market-clearing) forces or are paid instead according to efficiency considerations. The analysis also provides information about the differences between the predictions of the efficiency wage and competitive models.

The organization of the paper is the following: Section I focuses on the theoretical foundations of efficiency wage models and explains the rationale behind the predictions of the most relevant models. Section II discusses the econometric techniques used by the three selected country-cases. Section III reports the results of this study and compares these estimates with those based on data from 1986. Finally, the last section presents some concluding remarks.

Section I

THEORETICAL BACKGROUND

1.1. An overview

A worker's productivity, or effort, is at the basis of the efficiency wage analysis. The basic hypothesis is that a firm's characteristics determine how the wage will be set, and thus will affect workers' effort. Efficiency wage models assume that real wages are 'potentially' flexible, and predict that firms end up setting a wage above the market-clearing level. A basic property of efficiency wage models is that wages are set by the firm to maximize profits as the interior solution to a maximization problem. Thus, the wage-effort function explains the rational choices of workers and firms (at the microeconomic level), and the resulting non-Pareto-optimal equilibrium (at the macroeconomic level) with unemployment and a stable distribution of wages across industries.

The basic effort-wage function can be applied to explain the existence of dual labour markets (workers' effort is not relevant in some industrial sectors), discrimination among different groups (different groups have different efficiency labour costs), and employment fluctuations (productivity must move procyclically with business cycles, and more skilled workers have lower unemployment rates). The effort-wage relationship is emphasized differently in each efficiency wage model. The 'malfeasance' models consider this relationship to be rooted in a costly problem of supervision (shirking model) or recruiting (turnover model). The other models define certain minima which bound the firm's choice. There could be a need for minimum work rules or higher morale (sociological model), minimum standards to ensure workers' physical productivity (nutrition model), or minimum abilities to guarantee a qualified workforce (selection models).

Three of these models, turnover, shirking, and sociological model, have been applied in empirical analyses of wage differentials including the three studies examined in the next section. Despite the differences in the analysis of the effort-wage relationship, all efficiency wage models assume that firms and workers are heterogeneous (workers differ in abilities and labour endowments) and that

information is asymmetric (although firms' know a worker's utility function). They consider that wages are positively correlated with characteristics of the firm and can be used to analyse the relation between these characteristics and their impact on workers' motivation. As a result, they predict the existence of interindustrial wage differentials not explained, or 'additional' to those explained, by classical models.

1.2. The basic model

In the basic model, the effort-wage function is such that workers' effort (e) depends positively on the real wage (w) paid: $e'(w) > 0$, $e''(e) < 0$, and it can be summarized as follows:

(a) $\mathbf{Q=f[L, e(w)]}$, **Production function**, where L is the only variable input.

The first order conditions imply (b) and (c):

(b) $\mathbf{e(w^*) f'[L, e(w^*)] = w^*}$ **efficiency wage** (minimizes the cost of a unit of effort)

(c) $\mathbf{\frac{e'(w^*)\, w^*}{e(w^*)} = 1}$ **Solow equilibrium condition**[3] (wages are sticky)

This model is the result of the contributions of Liebenstein (1957) and Solow (1977). The origins of these models date back to as early as the 1950's, even though it was in the 1980's that the interest in the issue of wage differentials gained momentum. The first efficiency explanation of wage differentials was developed by Liebenstein in the form of the theory of X-efficiency, to demonstrate the existence of wage differentials in rural areas of developing countries. In these areas, although surplus labour had a marginal productivity equal to zero (Lewis, 1952), wages remained above their market-clearing level. Liebenstein developed the wage-productivity relationship, [e(w)], which explained that wages were rigid due to a direct effect of income on nutrition and emphasized the health and psychological impact of a high-calorie diet on workers' effort. In the 1970's, Solow expanded Liebenstein's wage productivity relationship. He showed that the effort-wage elasticity equals one (c), when $\mathbf{d(w^*)/d(Q) = 0}$ and $\mathbf{L_{w^*}.L_Q - L.L_{w^*Q} = 0}$.

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[3] The effort-wage elasticity of unity minimizes the costs per labour efficiency unit.

1.3. Micro foundations of efficiency wage models

It is clear in the basic model that workers' output increases with effort, and that higher morale or higher quality of personnel affects production like an increase in effort. Consequently, the firms' optimal response to a reduction in the demand for output is to lay off workers. In the 1980's, most efficiency wage models were developed (the exception is the nutrition model) when they tried to answer the question as to why wage cuts were costly for the firm. They expanded the initial analysis on the supply side of the labour market, and emphasized different effort effects into the wage function.

The work effort effect: Shirking and Turnover models

These models predict that firms will pay higher wages to reduce the costs of monitoring or turnover. They highlight a correlation between wage premiums and firm size or quit rates.

The shirking model[4], which has drawn the most attention, is based on the existence of a tradeoff between firm size and supervision, and emphasizes the discretion of workers with respect to their effort. Supervision is costly, and the model predicts that a wage in excess of market-clearing is an effective way for firms to provide workers the incentive to work rather than shirk. The worker's utility is $\mathbf{U = w - e}$, and the worker will choose not to shirk if, and only if, the lifetime utility of an employed 'non-shirker' (Vn) is higher than that of an employed shirker (Vs), and that of the expected utility associated with being unemployed (Vu). The relation: $\mathbf{Vn \geq Vs \geq Vu}$ defines the **No shirking condition** (NSC), and $\mathbf{q(Vs - Vu) \geq e}$ defines how effort is associated with the penalty for being unemployed (q is the probability of being caught if shirking). Hence, the real (efficiency) wage is set above the market-clearing level ($w^* > w$, where $w = Vs = Vu$), which shows that 'no-shirking' is inconsistent with full employment, and thus, the minimum wage consistent with no shirking depends on the aggregate wage and the unemployment rate (u). The model also indicates that firms prefer to keep wages in line with others when unemployment rates change.

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[4] Shapiro and Stiglitz, 1984. Calvo, 1985. Sparks, 1986. Bulow and Summers, 1986.

In this model, *interindustrial wage differentials* occur because firms are heterogeneous, and equilibrium occurs where the aggregate demand for labour intersects the aggregate NSC. At this point, there is equilibrium with *a higher 'natural' unemployment* rate (non-Pareto-optimal), and an optimal equilibrium can be achieved by taxing away profits to finance a wage subsidy. However, there will not be a Pareto improvement because profits will fall. The unusual result is that the Pareto optimality of the equilibrium "depends upon the distribution of wealth", and thus, "the standard separation between efficiency and income distribution does not carry over to this model" (Stiglitz, 1986, p. 52).

The Turnover model[5] has a similar structure to the shirking model and predicts that premium wages may reduce the cost of hiring, recruiting, and training new workers. The model assumes that turnover is costly and also that workers will be more reluctant to quit the higher the unemployment rate and thus, their relative wage (w/ z). Here (z) is a measure of labour market tightness, (i.e., average wage rates adjusted for the probability of getting a job). The quit rates (a) are a decreasing function of the wage paid: $\mathbf{a = a(\ w/\ z)}$, where $a'[(w/\ z)] < 0$, and $a''[(w/\ z)] > 0$, and new workers (N) must be trained at increasing marginal costs ($T(N)' > 0$, $T(N)'' > 0$). The first order conditions define the **wage-turnover cost tradeoff** : $\mathbf{T'(N) = -\ \frac{z}{a'(w^*/z)}}$. (Salop, op. cit., p. 96)

This formularepresents the wage level at which marginal replacement (training) cost of an additional worker equals the worker's marginal retention (turnover) cost.

Different firms have different turnover costs which generate *turnover-cost induced wage differentials*. In equilibrium there is *search unemployment* due to the optimal behaviour of new applicants who choose a queue to maximize z.

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5 Salop, 1979. Stiglitz, 1986 and 1974.

The morale effect: Sociological Model [6]

The model predicts that firms raises workers effort by paying a higher wage (gift) and in reciprocity workers will work harder than the minimum standard (reciprocal gift). The model emphasises social conventions rather than individual maximization. The model predicts a positive correlation between wages and profits and a pattern of high correlation across occupations inside the firm. It also assumes that a worker's effort depends on the norms of his group (social conventions), and will be negatively affected by 'unfair' disparities between workers and firms' earnings (fairness considerations). A worker's effort should exceed the firm's minimum work rules: $\mathbf{e \geq e_{min}}$. Thus, $[\mathbf{Q= f (e_{min})}]$. To raise this level of effort the firm pays a wage according to the type of worker (ε). The firm chooses the number of workers according to the wage function: $\mathbf{w^* = w\ (e, \varepsilon)}$, which maximize the firm's profits: $\mathbf{pQ - \Sigma\, w^*(e_j, \varepsilon_j)}$, where j is the number of workers, p is the price of output, and $\Sigma w^*(e_j, \varepsilon_j)$ is the sum of wage costs.

In this model, *wage differentials* are the result of the relation between the firm's work rules and wages, and there is a situation of *involuntary structural unemployment* at equilibrium. Akerlof and Yellen also developed a model assuming monopolistic competition [7] with other macroeconomic implications, which identify the aggregate demand effects of the wage and price behaviour of firms and *cyclical fluctuations*.

The selection effect: Adverse Selection and Recruitment Models.

These models were also developed in the 1980's, although not mentioned in the analysis of wage differentials in Canada or the other studies selected for this paper. They predict that the firm will pay higher wages to assure a better quality of the labour force and highlight the firm's problem of having imperfect information on workers' abilities.

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6 Akerlof, 1982. Akerlof andYellen, 1988. Solow, 1979 and 1980.

7 The model is: $Y_i = (P_i / P)^{-\eta}\ (M/P)$, where Y_i = output; P_i = individual firm's price; P= average price of all firms; M= money supply; $\eta > 1$. (Blanchard and Fisher, op. cit.)

The Adverse Selection model[8] assumes that wages determine the quality of the labour hiring pool, and that workers are heterogeneous in ability but 'observationally indistinguishable'. Better workers have better alternative offers, and their acceptance wage (w) is a strictly increasing function of their labour endowment (θ). Thus, $\theta = \mathbf{f(w)}$, where $f'(w) > 0$. The expected labour endowment or ability of a worker, hired when the wage (w) is offered, is $\underline{f}$ (w). The cost, or ratio of wages to labour endowment, is: $w / \underline{f}(w)$. This cost is minimized when $w = w^*$.

By announcing a willingness to work below the efficiency wage (w^*), the individual reveals that his true acceptance wage is less than, or equal to, ($w^* - D$), where $w^* > w^* - D$, the worker's expected ability is $\underline{f}(w^* - D)$ and D is the difference in wage. Since $\frac{(w^* - D)}{\underline{f}(w^* - D)} > \frac{w^*}{\underline{f}(w^*)}$, the cost of paying w is higher than the cost of paying w^*.

In consequence, the individual becomes less likely to be hired when he announces a lower acceptance wage. And the firm would not reduce the wage offered even if they have long queues of applicants at wage w^*. As a result, there are *wage differentials* and, like the turnover model, equilibrium with *search unemployment.*[9]

The Recruitment model [10] assumes that workers may hold more than one job offer simultaneously and focus on the probability that the firm's employment offer will be accepted by the worker. The model predicts that high capital firms, and those firms that find vacancies more costly, will offer higher wages.

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8 Weiss, 1980. Garen, 1985. Weiss and Landau, 1984.

9 In a situation of search unemployment, classical policies suggest a reduction in UI benefits. In 1987, a study by Ham and Rae (Gera and Grenier, p.37) found the behaviour of Canadian individuals to be affected by the duration of their UI potential benefits.

10 Lang and Montgomery, 1988.

Section II

SURVEY OF PREVIOUS WORK

2.1. An overview

The three studies examined in this section tested the hypothesis that a firm's 'ability to pay' has a positive influence on wage differentials across industries. They examined the relation between firms' characteristics and the average wages of equally skilled workers to identify the magnitude of interindustrial wage differentials, their nature, and the stability of their pattern. To conduct these tests and examinations the researchers estimated several equations applying the methodology of Krueger and Summers, whose study, examined in this section, is already part of the classical literature on the topic of wage differentials.

The study of Krueger and Summers focussed on the role of industry filiation in explaining relative wages in the United States. The study of Gera and Grenier had a similar goal for Canada and also aimed to determine if these wage differentials represented wage premiums or economic rents. Romaguera bring the less developed countries (LDCs) into our sample with her investigation of how interindustrial wage differentials explain the behaviour of the 'formal' labour market in Chile. In a review of previous studies, the studies in Canada and the US found indications of 'regularities' in the wage structure and association between the industrial structure, wage differentials, and dual labour markets. In Latin America, Romaguera found that most studies focussed on the relation between wage differentials and development. In a second, and much smaller, group wage differentials arose as an extension of the analysis of the human capital model in particular countries.

Despite the differences among the economies, the results were quite similar and consistent: the interindustrial wage differentials identified were significant and difficult to link to competitive and institutional explanations. The evidence showed that a worker's industry exerts a substantial impact on his/her wage, and rent sharing explanations which discuss the failure of wages to adjust to excess

supply in the labour market were closely related to efficiency wage theories. The studies in Canada and the US paid particular attention to the turnover model and the analysis of job tenure helped to identify a prominent role for high-wage industries in job creation. In this regard, Krueger and Summers suggested that the source of wage differentials have to be isolated because different efficiency wage models have different positive and normative implications. In Chile, Romaguera tested several industry characteristics finding that in most cases they were associated with the wage differentials of particular groups of workers (i.e. blue collar workers).

In Canada, the evidence helped to identify market segmentation and the unemployment performance in the 1980s. The evidence of a stable pattern of interindustrial wage differentials across time and for various groups of workers across industry favoured the argument of the existence of dual markets in the economy on the basis of industry. Segmentation emerges in Canada as the result of changes in the distribution of the labour force by industry which is due, in its turn, to the fact that low-wage industries had grown faster than high-wage industries. This evidence favours those reports indicating that economic growth tends to polarize the Canadian economy between good and bad jobs (Economic Council of Canada, 1990). The study of Gera and Grenier suggests that policies that can improve the health of the high-wage sector, in particular the manufacturing sector, can help reduce unemployment. Thus, they suggest that the impact of stabilization policies on different economic sectors should be analysed in advance.

In Chile, the findings indicated the existence of wage rigidities, a higher dispersion of wages at lower level occupations, and a more heterogeneous industrial structure in the country. The fact that wages tend to move together over time was an indication of the existence of stickiness in the wage structure. Equity constraints apparently lead firms to pay similar wages to all occupations, but Romaguera does not mention the nature of these equity constraints, which are clearly not the consequence of pressures from the unionised sector. The evidence indicated the existence of wage differentials and a more heterogenous industrial structure in the country. It also challenged the hypotheses that a country with a lower level of development have smaller wage differentials and that their pattern is different to that of developed countries. During the period of the study, the

'modern'[11] sector of Chile reported interindustrial wage differentials and wage dispersions similar to those of the US manufacturing sector.

The data

The data sources in the three countries included censuses and industrial surveys. The quality of the information permitted the analysis of some domestic issues. In Canada and the United States, the researchers could add more sophistication to their estimates due to the addition of the variable job tenure (length of employment) to the variable firm size in both cross-sectional and panel data. These studies examined the relation between wage premia and quit rates by industry by adding models of binary limited dependent variables (probit) and maximum likelihood to ordinary least squares (OLS) models.

The study in the US used data from 1974, 1979, and 1984 from the Current Population Survey (CPS), Quality Employment Survey (QES), and census industries (CIC). In Canada, the major source was the Labour Market Activity Survey (LMAS) from 1986, and the authors also used data from the Canada Census from 1971, 1981, and 1985. In Chile, the data sources were manufacturing censuses from 1937, 1957, 1967 and 1979, employment household surveys (with information for the country's capital, Santiago) and occupational wage surveys of the manufacturing sector.

The sample

The three studies included private and semiprivate industries and excluded agriculture. Public administration and self-employment were excluded in Canada to reduce complications for the analysis. However, in the US, the self-employed were included, and the primary industry was limited to mining. In Chile, the sample focussed on manufacturing industries. Public servants were included, but the primary sector was excluded. It is important to note that public administration showed unique results in Chile, and also that the exclusion of the primary sector eliminates an

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[11] The 'modern' or 'formal' sector in this case exclude mining and include only workers paid above minimum wage.

important economic sector in this country (mining).

The size of the samples seemed to be set according to the data available. In the US, Krueger and Summer analysed a sample of more than 10,000 workers including more than 200 industries. In Canada, Gera and Grenier analysed a sample of 32, 945 workers including 46 industries. In Chile, the sample included only industries paying wages above the legal minimum, a restriction which limited the evaluation of 'malfeasance' models (shirking, turnover) for lower level occupations. The sample included nearly 3,000 observations and 86 'modern' firms, but only 21 industries were reported

2. 2. Evidence of the existence of interindustrial wage differentials

The estimating equation

Interindustrial wage differentials were identified by applying ordinary least square (OLS) to a semi-log model of earnings. The model was specified by expanding the statistical earning function of the human capital model with the inclusion of industrial controls as follows:

$$\mathbf{Ln\ W = XA + YB + u} \qquad \mathbf{(i)}$$

Ln W = the natural logarithm of wages;
X = a matrix of workers' characteristics (human capital, demographic factors, and working conditions);
Y = a matrix of industrial dummies;
A, B = vectors of coefficients;
u = error term.

This equation was restricted to express the industry coefficients as deviations from their weighted mean. The restriction specified that the sum of the estimates of the interindustrial wage differentials (B) equals zero, where B is the vector of the estimated industry coefficients multiplied by the weight or share of each respective industry in total employment. To identify equally skilled workers, the researchers controlled for work and workers' characteristics and ability bias or workers' unmeasured qualities. In the case of the longitudinal data set, used in the studies for Canada and the US, the

effect of workers' job selection was controlled, and measurement errors were corrected.

The dependent variable of the equation was the log of individual earnings which includes hourly and/or annual wages, and fringe benefits in the case of the US. Workers' characteristics included human capital controls (education, experience and experience squared) plus age and sex (in Chile), and union status and marital status (in Canada), and race, inner cities, and veteran status (in the US); geographic factors, which were not included in Chile, were provinces, in Canada, and states, in the US; the variable for working conditions were weeks of work, hours of work, and occupation. Industry controls included firm size and either job tenure (in Canada and the US), or a different group of specifications (Chile).

Testing the specification of industry characteristics in Chile

In Chile, additional specifications of the industry variables were required. Previous studies conducted in Latin American countries indicated the existence of a relation between wage differentials and firms' characteristics other than firm size and such as firm concentration in Brazil; modernization in Mexico; and value added, capital intensity, and foreign investment in Colombia. The Chilean study included five additional specifications intended to facilitate the examination of those industry characteristics associated with high and low-wage industries. The purpose of that procedure was to help find the appropriate specification of the model, and to cope with the problem of multicollinearity that exists among industry variables. The tests showed that the results were sensitive to certain measures of the variables. The better measure of *firm size* was the number of workers; of *profits*, was profit per worker; for *capital intensity*, were HP (horsepower) and KWH (kilowatt per hour) per worker; for *growth*, was investment by firm, and *firm concentration* was also measured. The measure of *market power*, which was profit (value added minus wages) to sales, showed inconsistent results.

The findings

1. - *The Industry variables are jointly and individually statistically significant.*

The statistical tests (F tests) rejected that interindustrial wage differentials jointly equal zero (at the 0.00001 level, in the US). Also in the US, the standard errors fall 4.3% once industry controls were added compared to 5.1%, 1.6% and 0.2% when human capital, union, and race-sex controls were added. This finding suggested that industry wage differences are not competitive and have a greater impact on the allocation of resources than the wage differences associated with unions or discrimination (Krueger and Summer, op. cit. p. 266). In Canada, the industrial effect was significant when comparing the R^2 of the model estimated with and without the industry dummies. This test reported two different levels of significance due to the high correlation that exists among the industrial variables, a problem raised by Dickens and Katz in 1987[12].

2. - *The dispersion in wages across industries is substantial.*

Interindustry wage dispersion (WASD) was measured as follows:

$$\mathbf{WASD = [var\,(B_i) - Sum\,(w_i \,.\, \sigma_{iI})^2 \,/\, K]^{1/2}} \qquad \text{(ii)}$$

$Var\,(B_i)$ = weighted variances of estimated industry coefficients;
K = number of industries
σ_i = estimated standard error of the industry i regression, or $Var\,(u_i)$
w_i = weight of industry i where the sum of weights is equal to the number of industries.

This measure slightly underestimates the standard deviation of wage differentials because it neglects the covariances among the standard errors, $Cov\,(u_j, u_i)$.

The dispersion of interindustrial wage differentials is the most important prediction of efficiency wage models. It is measured with the weighted adjusted standard deviation (WASD). The result, at

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[12] See the application of this methodology in Gera and Grenier (op. cit.) and a replication in Section III of this paper.

a one-digit level (seven industry groups), was 7% in Canada and 9% in the US[13]. For the industry groups at large, it was 16% in the US and 15% in Canada and Chile as Exhibit II-1 shows. In Chile, this result indicated that wage dispersion in the industrial sector, at least in the modern sector, was not lower than that of the industrial sector of the US. This evidence leads to question the hypothesis of a more heterogeneous industrial structure in less developed countries (LDCs), which was confirmed, however, by a further analysis of correlation by firm size.

Exhibit II-1

Inter-industry wage differentials in the US, Canada, and Chile.

Country	WASD	Sample size	Industries	R^2
US: (1984) [1]	0.160	11,512	200	Not available [5]
Canada: (1986) [2]	0.151	32,945	46	0.462
Chile: (1987) [3]	0.154	2,598	84 [4]	Not available

Source: [1] Krueger & Summers, [2] Gera & Grenier, [3] Romaguera, (p. 20).
[4] Only 21 industries are reported. [5] In a sample of 1,033 observations the R^2 reported was 0.519.

The industry wage structure

Capital intensive industries, such as primary in Canada (mining in the US), construction, manufacturing and transportation and communication payed the higher wages in Canada and the US, followed by finance. In Chile, finance industries paid the higher wages, followed by public utilities, some manufacture industries, and wholesale trade. Customer oriented industries, such as retail trade and services, payed lower-than-average wages in the three countries, with some exceptions in the service industry of Canada and the US. In Chile, the public sector paid lower-than-average wages in the last two years of the study. The wage structure was similar to that of the US even though wage differentials are supposed to be smaller in LDCs due to their lower degree of skill and product market differentiation which is not the case in Chile.

In Canada and the US the industry wage structure was highly correlated between large and small

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13 See op. cit.: Krueger & Summers, p. 264-266; Gera & Grenier, p. 5-8.

firms. The dispersion of wages increased sharply with firm size in the US but it was slightly lower for smaller firms in Canada. This evidence suggest that monitoring difficulties increase with firm size in the US and in some industries in Canada. In Chile, the industry wage structure of large firms was correlated with medium size firms but not with small ones a fact that indicates the existence of a more heterogeneous industrial structure, as expected in a less developed country. The dispersion of wages in Chile was similar to that of the US, although it is expected to be lower in LDCs due to the lower level of human capital that their labour force represents.

Exhibit II-2

Interindustrial Wage Differentials for Selected Industries: US, Canada, and Chile.

Industry	US	Canada	Chile
Mining *	0.222	0.255	----
Transp.,Comm.&Utilit.	0.145	0.080	(0.090 [1] / 0.257) [2]
Construction	0.108	0.134	0.118
Manufacture	0.091	0.024	-----
(Paper) *	(0.178)	(0.120)	0.150 [3]
Finance	0.055	0.061	0.493
Wholesale trade *	0.047	0.038	0.108
Retail trade *	-0.155	-0.111	-0.170
Services	-0.078	-0.053	------
(Education) *	(-0.194)	(-0.010)	(-0.083)
Public Administration	------	------	-0.266

[1] Include only transportation; [2] Include only public utilities; [3] Include Paper and printing
* Estimated for the industry groups at large.

The existence of size-wage differentials appeared to be an important dimension of the wage structure in the US and Chile. In Chile, high-wage firms had not only higher average size and capital intensity, but they were also more profitable and experienced greater growth in terms of capital investment. The finding that high-wage industries are associated with high capital firms proved the importance of monitoring costs to wage determination and the hypothesis that in some industries monitoring difficulties increase with firm size. In Canada and the US, turnover appeared accompanying higher wages. Additional tests in the US, showed that the industry wage structure was highly correlated with job tenure in the case of workers with one year or less of job tenure, or more than ten years of

job tenure, and displaced workers experienced substantial wage changes. In Canada, the results using a probit model indicated an association between wage premiums and lower quit rates. Job switchers received the wage premium of the industry they joined, and the dispersion of wages was higher for job quitters.

2.3. Testing competitive and other explanations of wage differentials

3. - *The role of demand shocks, geographic location, and union threats was not significant.*

The pattern of interindustry wage differentials was stable across time. This evidence provided grounds to reject competitive explanations of wage differentials as a transitory phenomenon which results from short-run immobility of labour in the event of demand shocks. In Canada, the dispersion of interindustry wage differentials (WASD) changed only slightly between the years 1970, 1980, and 1985, even after taking into consideration unions. In the US, wage differentials were fairly constant during the years 1974, 1979, and 1984. The industry wage differentials for 1984 were even correlated with the average wage of unskilled male manufacturing workers in 1923. In Chile, interindustrial wage differentials were stable between the years 1969, 1978, and 1987, in spite of the political changes that took place in the country. Only public servants showed an important change with a 200% decrease with respect to 1978 [14]. This evidence showed that only changes in economic policies, such as those in the public sector, had an important impact on the country's wage structure, which appeared to be more affected by the process of development.

Interindustrial wage differentials appeared fairly constant across space in Canada and the US, challenging structural explanations and the hypothesis of the sectorial shifts model. These models consider wage differentials as the result of either geographic location or a slow re-allocation of labour across sectors.

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[14] In 1985, a study in Brazil showed that wages in state firms exceeded those paid by private firms. In 1978 public administration paid wage 24.9% above average in Chile (See Romaguera, op. cit.).

In the US, the analysis of longitudinal data also showed that changing between industries with similar high-wage or low-wage status had about as little impact on wages as did changing union status. Non-union workers showed greater dispersion in wage differentials in Canada and the US, showing that union threat was not a major determinant of wage differentials. Furthermore, southern states of the US, which are more resistant to unionization, reported substantial wage differentials after controlling for unions, and a high correlation with the industry wage structure of the rest of the country. The role of unions and geographic location was not tested in Chile but the fact that the pattern of inter-industrial wage differentials persisted through the period 1937-1987, challenged previous reports suggesting that wage differentials in Chile were the result of the influence of unions that existed prior to 1973 maintained by indexation mechanisms.

4. - *The role of worker's characteristics was not significant.*

The fact that the dispersion of wages barely changes after controlling for workers' characteristics leads to question explanations of the human capital models. In the US, the self-employed also reported smaller variations in wages, in spite of the fact that skills are likely to be more diverse among them. When testing labour quality, the results of fixed effects models showed a decrease in the WASD but its value stayed above the value estimated for the regression with all the variables showing that *unmeasured labour quality* or abilities did not explain wage differentials. In Chile, the value decreased more dramatically due to the higher educational variances across industrial sectors and the higher returns to human capital generally present in LDCs.

5. - *The role of job characteristics in the occupational structure was not significant.*

The pattern of interindustrial wage differences was stable across occupations not technically related and between white collar and blue collar workers. This evidence favoured sociological explanations of wage differentials (Krueger and Summers, p. 278) but questioned monitoring explanations (i.e., shirking, turnover) because monitoring costs are likely to vary across occupations. However, the monitoring hypothesis was supported by the analyses of the wage structure and wage dispersion across firm size.

In Chile, interindustrial wage differentials were similar for workers in different occupations, including blue collar and white collar workers. These two categories of workers also showed a higher correlation over time, just as all private workers did. The study concluded that equity constraints apparently lead firms to pay similar wages to all occupations following the postulates of sociological models. It also suggested that the growing correlation across time between white collar and blue-collar workers is the result of a relative decline in the proportion of blue collar workers in the Chilean workforce, and the fact that firms seemed to set wages more imprecisely at lower rank occupations when there are few workers. Finally, the dispersion of wages was higher across occupations, but it was not necessarily in top ranked positions as would be expected by classical explanations.

6. - *The role of working conditions (compensating differences) was not important.*

Workers' relations to the firm appeared as an important factor in explaining wage differences. After controlling for working conditions, those industries that pay more to one occupation also tend to pay more to workers in other occupations not technically related. This evidence favoured the hypothesis of sociological models and cast doubts about the unmeasured labour quality argument. In the US, controlling for working conditions also demonstrated that wage differentials are 'additional' rather than 'compensating' because the dispersion of wages tend to rise when these conditions were taken into account.

There were four different methods used to control for *compensating differences*. The first test was to compare the equation with and without controls for working conditions. The second was to compare full-time versus part-time workers, and the third was the analysis of the pattern across occupations, mentioned above. The fourth was to compare wage premiums with quit rates and job tenure on longitudinal data. The analysis of longitudinal data led to results similar to cross-sectional estimates. These tests were conducted only in Canada and the US, and they showed that wage premiums did not reflect compensating differences.

Section III

EMPIRICAL RESULTS FOR CANADA

3.1. An update based on data from the year 1991

This section of the paper analyses the existence of interindustrial wage differentials in Canada in the year 1990 and compares the results with those from 1986. Our estimation was conducted on cross-sectional data using several OLS equations. The methodology used to obtain the 1986 estimates (Gera and Grenier op. cit.) was closely followed and a similar econometric technique applied. This similarity in the methodology facilitated the use of figures from the previous study as a reference, even though the estimates for the year 1990 are not strictly comparable because of differences in the data set. They are similar, however, in that they both suggest that interindustrial wage differences are stable in Canada, and they both question classical explanations of these wage differentials.

The data

The data from the 1991 census included extensive information on workers' characteristics and a limited number of industrial categories, but it excluded information on firms' characteristics and union status. This limitation left union membership, job tenure, and firm size out of the estimating equations, thus reducing the scope of the analysis in two ways. First, the role of union threat and specific characteristics of the firms (firm size, quit rates, or profits) could not be analysed to explain wage differentials. Secondly, the applicability of a particular efficiency wage model, such as turnover and shirking, could not be tested. What the census information did permit was the analysis of the industrial wage structure, the stability of the pattern of interindustrial wage differentials across time, space, and occupations, and the test of alternative competitive explanations of wage differentials.

With respect to the role played by union membership, the 1986 study had already demonstrated that in Canada, just as in the US, unionization did not appear to play an important role in explaining

interindustrial wage differences. With respect to characteristics of the firms, such as job tenure and, firm size, which are critical to a test of the turnover and shirking models, the studies conducted in Canada and the US were conclusive. There is a negative relation between turnover and wage premiums. In the US, there was also a positive correlation between wage dispersion and firm size.

Although these important variables were excluded in the data set, all the variables for workers' characteristics (age, sex, and marital status), and human capital (education, experience, and experience squared) and their interaction terms are included. Also included are the variables for working conditions (hours of work, weeks of work, and occupation) and demographic background (provinces). The measures of dispersion and correlation are estimated following the same methodology as that of the previous studies which imposed restrictions on the industry coefficients. The industry groups are reported at a one-digit level, for seven and twelve groups.

The sample

The sample was selected randomly to include male and female Canadian workers 16 to 64 years old, employed full and part-time, and to exclude self-employed workers and paid workers in agriculture, public administration and defence. The size of the total sample is 28,997 observations. The dependent variable of the model is the natural logarithm of individual wages, and this notion of earnings follows the classification of the census. Hence, it included both salaried individuals and those paid by the hour and excluded non-wage benefits.

A total of 25 earnings equations was estimated, along with 25 subsequent tables to estimate the weighted adjusted standard deviation (WASD). The equations used cross-sectional data. The dummy variables are the econometric tools used as a control for workers characteristics, human capital, working conditions, and demographic backgrounds. The industry coefficients were restricted and normalized around the weighted mean, which represented the employment shares for 1990 as

determined by the program. The Spearman correlation coefficients[15] were also calculated separately because it was impossible to have the dispersion and correlation of wages estimated into the basic program. All the census micro data were obtained at the computer centre of the University of Ottawa. The model was developed on the mainframe (CMS -Conversational Monitoring System) of the University, using SAS (Statistics Analysis System) software. The estimations were carried out by the author, but a previous model was used as a reference. Technical assistance was provided by the SAS advisor at the computer centre of the university.

The results provided a clear indication of the existence of wage differentials in the wage payments received by the workers of the sample. The following pages report, analyse, and compare the pattern of these wage differentials across time, regions, and occupations, and the role played by individual characteristics, occupational structure, and compensating differentials in explaining these differentials. All the tables mentioned in this section are in the appendix which starts at page 38.

Specification of the model

Major issues were the following: first, the construction and finance industries were sensitive to the specification of the variables for working conditions. Secondly, workers by level of education are classified differently in the sample which, however, continues to respond to the national proportions in this matter[16]. Finally, the reduction in the number of industry categories seems to have affected the values of the dispersion and correlation coefficients. The values for the dispersion of wage differentials are consistently lower than the results for 1986 even when the number of industry variables is the same, and they are closer to 1986 estimates in those equations which were run in a separate sample. In the case of separate samples, only the equations for male and female, up-to-high school and above-high school education, and full-time workers reported dispersions of wages similar

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15 The Spearman rank correlation coefficient (Rs) measures the correlation between two different sets of industrial wage differentials (i.e., male and female): $Rs = 1 - 6 [\text{Sum } di^2 / N^2 (N - 1)]$ where N = number of observations, di = difference in the ranks of two characteristics.

16 OECD figures for 1994 indicate that 17.2% of Canadian workers had university education, 20% post-secondary diploma, 9% some post-secondary, and 37.7% high school.

to the 1990 national estimates. The values for the wage correlations (Spearman coefficients) were higher in all cases.

3.2. Evidence of the existence of inter-industry wage differentials

Table No. 1 indicates that inter-industry wage differentials existed in Canada 1990 and were statistically significant[17] at the 0.0001 level. The F test rejected at the 0.0001 level that all the industry coefficients are zero. The industry coefficients are reported at a one-digit level for seven industry groups, and the standard errors are the values in parentheses. Therefore, the coefficients are jointly and individually significant even after taking into account (through the explanatory variables) that workers in various industries do not have the same characteristics. A positive sign indicates an average wage above the industrial mean, and a negative sign indicates an average wage below the industrial mean.

Table No. 2 reports the wage status by industry, and a more detailed picture of interindustry wage differentials in the trade and service industries. The results show that all industries maintained the same wage status as reported in 1986, except for the construction and health and welfare industries which moved down from high-wage to average-wage statuses. The coefficients are jointly significant at the 0.0001 level, and they are individually significant at, at least, the 0.003 level except for the four industries showing average wages. When the industry variables are specified in more detail in the model (from seven to twelve groups) the WASD rises from 4.1% to 5.3%. With respect to the wage status, the criterion followed to classify the industries is the same as in the 1986 study: if the level of significance of the industry coefficient is greater than 90%, the industry is either low or high-wage depending on the sign. If the level of significance is less than 90% (not significant) the industry is classified as average-wage, independent of the sign.

Table No. 3 indicates the significance of industry dummy variables in explaining variations in the

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17 Only the coefficient for the construction industry is not significant.

individual earnings. Jointly, all the variables of the model explained 61% of the total variation in the log of wages (the R^2 is 0.611), and the industry variables alone explained 8.9% of this variation. The difference between the R^2 of the equation with and without industry variables shows a very different result. It suggests that industry dummies explain only 1% of the total variation in wages. In 1986, the minimum industry effect was 2.7% and for the industry variables alone was 20.5%. This difference was explained by the high correlation that exists among the industry variables. The large difference between the explanatory power of the industry variables in the two samples can be explained partly by the fact that there are fewer industry groups in the 1990 regression (12 in 1990 versus 46 in 1986).

The wage structure

In 1990, there was no change in the wage structure of high-wage industries, except for the construction industry which paid average-wages in 1990 instead of higher-than-average as in 1986. There was also greater diversity in the wage structure of the service industry. Service to business reported higher-than-average wages, while other services[18] (23% below the mean) and accommodation and food services (14% below the mean) reported lower-than-average-wages. Education and related services, and health and welfare paid average wages. The only change within the service sector, with respect to 1986, was in the health and welfare industry which moved up from low wages to average wages in 1990.

Table No. 1, where the industries are divided in seven groups, reports that primary and transportation industries continued to pay higher-than-average wages, while trade and service industries continued to pay lower-than-average wages. Interindustrial wage differentials ranged from 24% above the mean in the primary industry, to 10% below the mean in the trade industry. Table No 2, where industries are divided in twelve groups, reports a similar structure for high-wage industries, but there is a change in low-wage industries. Wholesale trade reports average-wages instead, and retail trade

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[18] Other Services include: Religious Organizations, Amusement and Recreation, Personal Services, and Miscellaneous.

reports lower wages (from 10% to 19% below the mean). The service industry reports various wage statuses, as described above.

3. 3. Test of competitive explanations versus efficiency wages

The role of demand shocks

Table No. 4 reports that the pattern of interindustrial wage differentials was stable across time. When comparing the estimations for 1990 with figures from 1970, 1980, and 1985, the pattern in the variation of industry wage differentials appears quite stable. The two changes are as follows: a decrease in wage differentials in the construction industry with respect to 1985, and a decrease in the dispersion of wage differentials (WASD) of 4% in 1990, versus 10% in 1970 and 1980, and 9% in 1985. The reduction of more than half in the dispersion of wages could indicate higher competitiveness in the country. However, no major trends were identified, other than a slight increase in transportation and a decrease in the construction industry.

The fact that the industry coefficients remained stable in 1990, with the exception of that for the construction industry, casts doubt about the explanations of the sectorial shifts model. This model explains the existence of transitory wage differentials as due to a slow reallocation of labour across economic sectors which is, in turn, caused by aggregate demand shocks, such as rapid technological changes, shifts in product demand, or major changes in relative prices. These demand shifts are considered a precipitating cause of business cycles which are measured, approximately, by shifts in employment.

The role of geographic location

Table No. 5 reports a stable pattern of inter-industrial wage differentials across Canadian regions. The coefficients are jointly significant, and their structure in each province is quite similar to the national level. In the provinces of Ontario and Quebec the wage structures are similar to the national estimates, except for a change in the primary industry of Ontario. In the other regions, the finance

and service to business industries report average wages. The more important change is the report of average wages in the primary industry in Ontario and the Atlantic provinces. The latter also reports average wages in manufacture. These findings can be explained by the fact that the fishing industry is very important in the Atlantic provinces. It was identified as a low-wage industry in 1986 (Gera and Grenier, op. cit.) and has experienced a decline in recent years. In the province of Ontario there have been losses with respect to national levels in the wage structure of sectors that are not labour intensive (Baldwin and Rafiquzzaman, 1994) which explains the change in the ranking of the primary industry.

Exhibit A

Estimated inter-industry wage dispersion by region. Canada 1986, 1990.

Region	WASD (1986)	WASD	sample size	R^2
Canada	0.151	**0.053**	28,997	0.611
Regions:				
The Atlantic	0.158	**0.264**	1,476	0.635
Ontario	0.136	0.122	9,840	0.560
Quebec	0.168	0.106	9,512	0.680
Prairies	0.160	0.150	3,935	0.581
British Columbia	0.180	0.128	4,234	0.586

Source: LMAS Survey 1986. Source: Census 1991

*The figures for 1986 are a reference. The data are not strictly comparable.

The provincial variation in the inter-industry wage differentials (WASD) is higher in 1990 than the average for all of Canada and varies from an unexpectedly higher dispersion of 26% in the Atlantic region to a more conventional, although low, value of 11% in Quebec. Exhibit A shows the difficulty of drawing any conclusion when comparing the dispersion of wage differentials of table No. 5 with the results from 1986. The only clear fact deducible from the figures is that, in 1990, the dispersion of wages was lower than in 1986 with the exception of the Atlantic provinces. This higher value may

indicate that wages are set more imprecisely in these provinces due to their particular circumstances. Otherwise, it may indicate that geographic location does play a role only in the Atlantic provinces. However, this sole example is not strong enough evidence in favour of this structural argument.

The role of job characteristics

The occupational structure

Table No. 6 shows that the pattern of interindustrial wage differentials across occupations is also stable. This table reports the wage differentials for three specific subgroups of workers performing similar tasks. They are managerial (administration) and related occupations, clerical and related occupations, and fabrication (machinery, assembly, and repairing) occupations, according to the classification of the census. The wage differentials for these specific groups of workers are fairly uniform with only minor changes in the finance and service to business industries which moved down to average-wages. The construction industry shows unique results. It ranks as a low-wage industry for managerial occupations, as average-wage for clerical, and as high-wage for fabrication occupations. Finally, fabrication occupations report higher premiums across industries with the exception of the retail trade industry.

Exhibit B

Estimated inter-industry wage dispersion by occupation. Canada 1986, 1990.

Occupation	WASD (1986)	WASD	Sample size	R^2
Managerial	0.182	0.108	4,801	0.484
Clerical	**0.204**	0.130	4,364	0.570
Fabrication	0.159	**0.532**	911	0.551
Source: LMAS Survey 1986.			Source: Census 1991	

*The figures for 1986 are a reference. The data are not strictly comparable.

Exhibit B shows an increase in the dispersion of wage differentials for fabrication occupations (53% in 1990) and a decrease for managerial occupations. This higher level of dispersion may indicate that

abilities play a role in fabrication occupations. It could also indicate that in Canada, as in Chile, wages are set more imprecisely at lower rank positions, in particular if we consider the fact that the proportion of workers in fabrication occupations in the sample dropped from 24% of the sample in 1986 to only 9% in 1990.

The results cast doubt about competitive explanations, based on the role of job characteristics, which consider that differences in skill are the main cause of industry wage differentials. From this perspective, a higher dispersion of wages would be expected at top level occupations and not at lower ranking positions as reported in table No. 6. Furthermore, the evidence of a higher dispersion of wages, and a lower number of workers for fabrication occupations does not contradict reports about the process of polarization mentioned in section II, page 21.

White collar and blue collar workers

The occupational structure is also stable for white collar and blue collar workers. Table No. 7 reports a stable pattern of interindustrial wage differentials for these two categories of workers. They both report average wages in the finance and service to business industries, and blue collar workers also report average wages in all services industries (and thus, higher wages in the food and other service industries). The evidence of a stable pattern of inter-industrial wage differentials across occupations and white and blue collar workers questions competitive explanations of these wage differentials based on the theory of compensating differences.

Exhibit C reports a dramatic increase in the dispersion of wages for blue collar workers. This particularly high dispersion of wages (28%) is, however, lower than that of fabrication occupations. Conversely, white collar workers report a dispersion of wages close to the national level. There is also a higher correlation between blue collar and white collar workers. While it is true that our results involve consistently higher correlation coefficients, the fact that the correlation between white and blue collar workers rises from 49% in 1986 to 75% in 1990 merits some consideration, as does the decrease in the proportion of blue collar workers in the sample (from 35% of the sample in 1986 to only 8% in 1990). This evidence of a higher dispersion of wages for blue collar workers cast

doubts regarding explanations of the human capital models if we consider the fact that blue collar workers are not necessarily placed at top ranking positions.

Exhibit C

Estimated industry wage dispersion for white and blue collar workers. Canada 1986, 1990.

White/Blue collar	WASD (1986)	WASD	Sample size	R^2
White collar	0.189	0.063	25,622	0.460
Blue collar	0.136	**0.277**	2,394	0.575
Correlation (Spearman)	0.490	**0.748**		

Source: LMAS Survey 1986. Source: Census 1991

*The figures for 1986 are a reference. The data are not strictly comparable.

The role of workers' characteristics

Patterns of human capital accumulation

Tables No. 8, No. 9, and No. 10 report that the individual characteristics of age, sex, and education are not major factors in explaining wage differentials because the pattern of these wage differentials remains consistent across workers with different characteristics. The only relevant change is that females and older workers report lower wages in the retail trade and construction industries.

Exhibit D shows that the way the dispersion of wages is distributed across workers with different characteristics is similar in 1986 and 1990. It also shows that the correlation is higher in 1990 for all categories, in particular between workers with up-to-high-school and above-high-school education. The proportion of women are only slightly higher in the 1990 sample (51%) than in 1986 (46%), which is not what is expected according to reports of changes in the composition of the Canadian labour force (Betcherman, 1992), such as a greater number of women, minorities, and part-time workers. Furthermore, younger workers, who had acquired less human capital than older workers, and women showed a greater dispersion of wages, just as in the year 1986, contradicting what is expected from classical explanations and showing that rent-sharing was not a major factor

explaining wage differential in 1990.

Exhibit D

Estimated interindustry wage dispersion for different types of workers. Canada 1986, 1990.

Characteristics	WASD (1986)	WASD	Sample size	R^2
Age				
20 to 24	0.176	**0.173**	3,226	0.528
45 to 64	0.143	0.140	5,746	0.505
Correlation (Spearman)	*0.597*	*0.755*		
Sex				
Male	0.143	0.069	14,259	0.601
Female	0.162	**0.096**	14,738	0.585
Correlation (Spearman)	*0.749*	*0.986*		
Education				
Up-to-High School	0.169 (1)	0.059	7,025	0.618
Above-High School	0.179 (2)	0.063	21,970	0.619
***Correlation** (Spearman)*	*0.524*	***0.979***		

Source: LMAS Survey 1986. Source: Census 1991

*The figures for 1986 are a reference. The data are not strictly comparable.

(1) Refers to Elementary and High School education; (2) Refers to University education

Labour quality

Fixed effects models were estimated to control for those differences in workers' abilities not well captured in the micro data of the census. According to the unmeasured labour quality argument, if inter-industrial wage differentials are due to unmeasured labour quality, then a substantial drop in the dispersion of wages is expected when the measured human capital is controlled. Table No. 11 reports the results after including the human capital controls of age, sex, and education and shows a decrease in the standard deviation from 7.4% to 6.9%. However, the fact that the dispersion of wages remains above 5% (the dispersion of wages for twelve industry groups) shows that labour quality factors do not play a significant role in explaining the inter-industrial wage differentials

reported in tables Nos 1 and 2.

The role of compensating differences

Compensating differences explain the existence of interindustrial wage differences as being a compensation for adverse conditions in the workplace, or for 'desamenities', such as risk of injury or health hazards, shift work or nonstandard weekly hours. A first dimension of compensating differentials includes the analysis of the impact of working conditions on the wage equation.

Table No. 12 reports wage differentials at a one-digit level for seven industry groups, by using equations estimated with and without working conditions. With the exception of the finance and manufacturing industries, wage differentials are higher in most industries when working conditions are taken into account. This evidence suggests that wage differentials are additional rather than compensating. Initially, the drastic decrease in wage differentials for the construction industry seemed to indicate that working conditions played a greater role in this industry. However, the test reported in table No. 12, column (3), indicated that this is not the case. Instead, when working conditions are controlled for, wage differentials are lower in finance, and to a lesser extent, in manufacturing and in transportation industries. This evidence shows that working conditions may have some effect in the determination of wages in these industries, but can only partly explain the wage differentials reported in tables No. 1 and 2 for these industries.

A second dimension of compensating differentials is the distinction between full-time and part-time work. Table No. 13 reports that the pattern of wage differentials is very similar for full-time and part-time workers. Part-time workers report wage premiums in the primary and health and welfare industries higher than full-time workers, which report, in turn, higher wage premiums only in the wholesale trade industry.

Exhibit E

Estimated industry wage differentials for full-time and part-time workers.

Canada 1986, 1990.

Characteristics	WASD (1986)	WASD	Sample size	R^2
Full-time	0.141	0.062	24,430	0.365
Part-time	0.196	**0.243**	4,565	0.447
All workers	0.151	0.053	28,997	0.611
Correlation (Spearman)	*0.546*	*0.720*		

Source: LMAS Survey 1986. Source: Census 1991

*The figures for 1986 are a reference. The data are not strictly comparable.

Exhibit E reports a higher dispersion of wage differentials for part-time workers in 1990. The dispersion of wages for full-time workers is closer to that for all workers. The proportion of part-time workers in the sample in 1990 was similar to the proportion in 1986 (15%), which provides no indication of an increase in part-time work in Canadian industries as mentioned in previous reports.

Tables Nos. 6, 12, and 13, show a stable pattern of interindustrial wage differentials for full and part-time workers, across occupations, and when working conditions are controlled. This evidence contradicts what could be expected according to the classical theory of compensating differences.

CONCLUSIONS

The purpose of this paper was twofold. First, it was to test the existence of interindustry wage differentials in Canada in the year 1990 using a different data set. Secondly, it was to highlight the major traits of the efficiency wage theories and empirical studies and their differences with the classical approach. The latter was achieved via a synthesis of the progress in macroeconomic theory in the last three decades, and the analyses of the firm decision in the process of wage determination, as well as a review of the evidence of some efficiency wage studies.

As a result, efficiency wage models emerge as Keynesian in nature. They show that wage rigidity prevents the adjustment in the labour market, and that equilibrium coexists with unemployment requiring government intervention. The optimal policy choices that stem from efficiency wage models focus on wage subsidies. The empirical studies focus on high-wage firms due to their role in job creation. Furthermore, the examination of the empirical studies selected for this paper showed how efficiency wage analysis challenge classical results and how the concerns of the researchers differ from one type of economy to the other.

The results in Canada and the United States indicate that, in those industrialized countries, high-wage industries have a predominant role in creating jobs and reducing unemployment. In Canada, small and medium size enterprises requiring high technology or high knowledge in their production activities showed similarities with high-wage firms if we consider their impact on job creation. The findings in Chile, and in other developing countries characterized by a more heterogeneous industrial structure, indicate that wage rigidities and market segmentation across economic sectors are major concerns. In general, the studies examined in this paper suggest that firms behave basically according to the postulates of those efficiency wage models based on work effort considerations (shirking and turnover models) and sociological models, and also that firm size was an important but not unique characteristic to define a high-wage firm.

In pursuing the first goal, our evidence from Canada indicated that inter-industrial wage differentials

did exist in the year 1990, that they were significant even when tested from a different data source, and that they are consistent with efficiency wage considerations. The fact that the pattern of interindustrial wage differentials emerged stable and similar to what it was in 1986 suggests that the wage structure was unaffected by the economic changes that were taking place throughout the 1980's, and also that the tendency toward greater competitiveness in the Canadian economy has not necessarily translated into a more competitive labour market. Finally, at regional level, the provinces of Ontario and Quebec appeared as representative of Canada's wage structure (except for a small variation in the primary industry of Ontario).

Although the pattern of wage differentials was stable, the dispersion of interindustrial wage differentials was particularly higher for blue collar workers, for lower level occupations such as fabrication, and in the Atlantic provinces. This finding coincides with reports describing a greater polarization in worker's earnings and between skilled and unskilled workers, as well as changes in the composition of the Canadian labour force, and variations in the ranking of the industries in the Atlantic and Ontario provinces. The fact that the level of wage dispersion for these two categories of workers was so high may be the result, as it was in Chile, of a lower participation in the labour force, if we take into account the fact that there is a smaller proportion of blue collar and fabrication workers in our sample. However, this evidence seems to indicate that while policies to promote job creation take into consideration high-wage firms, policies to promote competitive wages should take into consideration the fact that there may be more polarization of wages at lower level occupations.

The estimates of this study are less precise than those of 1986 partly because the industry variables from the census are less aggregated than those of the LMAS. Consequently, further analysis of the wage structure reported in the Atlantic provinces, for blue collar workers, and for fabrication occupations will require additional tests of the variables for working conditions. Nevertheless, the objective was achieved: in 1990, in Canada there were inter-industrial wage differentials unquestionably significant and stable not explained by the competitive paradigm.

APPENDIX

Table No. 1

Estimated wage differentials for one-digit industries (seven industry groups), Canada 1990.
(Standard errors in parenthesis)

Industry	**1990**	
Primary	0.240 (0.027)	(Higher)
Manufacture	0.064 (0.010)	
Construction	**0.0001** (0.022)	(Average)
Transportation	0.163 (0.012)	
Trade	-0.102 (0.010)	(Lower)
Finance	0.046 (0.011)	
Service	-0.031 (0.004)	
WASD 1/	***0.041***	
R^2	*0.606*	
Sample size	*28,997*	

All variables are significant at 0.0001 level except in the construction industry
The F test that industry wage differentials jointly equals zero is rejected at 0.0001 level.

Explanatory variables include: education, experience, experience squared, one marital status dummy, 4 dummies for weeks worked, 6 dummies for hours worked, a sex dummy, a sex dummy interacted with education, marital status, experience, and experience square, 16 occupation dummies, 4 regional dummies, a constant.

Source: Estimated by the author with data from the 1990 census.

1/ The weights used are the employment shares estimated from the 1990 census.

Table No. 2

Estimated wage differentials for one-digit industries (twelve industry groups),Canada 1990.
(Standard errors in parenthesis)

Industry	1990		Wage Status
Primary	0.244 (0.027)	(Higher)	HW
Manufacture	0.060 (0.010)		HW
Construction	**-0.008** (0.022)		**MW**
Transportation	0.158 (0.012)		HW
Wholesale trade	0.027 (0.016)		MW
Retail Trade	-0.191 (0.012)		LW
Finance	0.040 (0.011)		HW
Services to business	0.031 (0.011)		HW
Education and related services	0.006 (0.011)		MW
Health and welfare	**-0.004** (0.011)		**MW**
Accommodation and food services	-0.142 (0.015)		LW
Other Services	-0.233 (0.015)	(Lower)	LW
WASD 1/	***0.053***		
R^2	*0.611*		
Sample size	*28,997*		

-The F test that industry wage differentials jointly equals zero is rejected at 0.0001 level.
-When industry controls are added standard error fall from 8992.5 to 8752.6.
- Explanatory variables include: education, experience, experience squared, one marital status dummy, 4 dummies for weeks worked, 6 dummies for hours worked, a sex dummy, a sex dummy interacted with education, marital status, experience, and experience square, 16 occupation dummies, 4 regional dummies, a constant.
- Source: Estimated by the author with data from the 1990 census.
1/ The weight used are the employment shares estimated from the 1990 census.

Table No. 3

Significance of the industry variables
Analysis of the sources of wage variation 1/, Canada 1990.

Sources of variation	Share of total sums of squares
Covariates and industry (RCI)	0.611
Error (1 - RCI)	0.389
Covariates alone (RC)	0.601
Industry alone (RI)	**0.089**
Industry (RCI - RC)	**0.010**
Covariates (RCI - RI)	0.522
Variance of natural log wages	0.77632
Mean of natural log wages	10.0713
Standard deviation of natural wages	0.88109
Total number of observations	*28,997*
Number of industries	*12*
Number of Covariates	*44*

1/ Based on estimated wage differentials for one-digit industries (twelve industry groups).

RCI = The R^2 from a (natural) log wage regression that includes both the covariates and industry variables.
RC = The R^2 from a (natural) log wage regression on the covariates alone.
RI = The R^2 from a (natural) log wage regression on industry dummies alone.

- Explanatory variables include: education, experience, experience squared, one marital status dummy, 4 dummies for weeks worked, 6 dummies for hours worked, a sex dummy, a sex dummy interacted with education, marital status, experience, and experience square, 16 occupation dummies, 4 regional dummies, a constant.

- Source: Estimated by the author with data from the 1990 census.

Table No. 4

Analysis of industry wage differentials across time

Estimated wage differentials for one-digit industries. Canada 1970 1980, 1985, and 1990.
(Standard errors in parenthesis)

Industry	1970	1980	1985	1990
Primary	0.234 (0.032)	0.270 (0.030)	0.313 (0.033)	0.240 (0.027)
Manufacture	0.062 (0.010)	0.043 (0.010)	0.068 (0.011)	0.064 (0.010)
Construction	**0.115** (0.022)	**0.082** (0022)	**0.042** (0025)	**0.0001** (0.021)
Transportation	**0.105** (0.015)	**0.129** (0.015)	**0.147** (0.016)	**0.163** (0.012)
Trade	-0.104 (0.012)	-0.112 (0.011)	-0.108 (0.012)	-0.102 (0.010)
Finance	0.030 (0.021)	0.038 (0.017)	0.051 (0.018)	**0.046** (0.011)
Service	-0.092 (0.011)	-0.065 (0.010)	-0.070 (0.009)	-0.031 (0.004)
WASD 1/	0.105	0.090	0.102	**0.041**
R^2	0.666	0.573	0.539	0.606
Sample size	14,994	17,433	19,161	28,997

- Explanatory variables include: education, experience, experience squared, one marital status dummy, 4 dummies for weeks worked, 6 dummies for hours worked, a sex dummy, a sex dummy interacted with education, marital status, experience, and experience square, 16 occupation dummies, 4 regional dummies, a constant.
- Source: Figures for 1970, 1980, and 1985 are obtained from the Gera and Grenier op. cit. Figure for 1990, estimated by the author with data from the 1990 census.

1/ The weight used are the employment shares estimated from the 1990 census.

Table No. 5

Analysis of industry wage differentials across Regions

Estimated Wage Differentials for one digit industries, Canada 1990.

(Standard errors in parenthesis)

Industry	ATL.	ONT.	QUE.	B.C.	PRAI.	Total
Primary	**-0.139** (0.160)	**-0.041** (0.090)	0.242 (0.069)	0.165 (0.066)	0.361 (0.039)	0.244 (0.027)
Manufacture	0.051 (0.054)	0.044 (0.016)	0.094 (0.016)	0.041 (0.035)	0.070 (0.030)	0.060 (0.010)
Construction	-0.061 (0.077)	-0.004 (0.039)	-0.038 (0.041)	0.050 (0.059)	-0.004 (0.052)	-0.008 (0.022)
Transportation	0.212 (0.053)	0.153 (0.022)	0.180 (0.020)	0.147 (0.033)	0.130 (0.030)	0.158 (0.012)
Wholesale trade	0.028 (0.070)	0.019 (0.028)	0.049 (0.027)	0.071 (0.047)	-0.012 (0.043)	0.027 (0.016)
Retail Trade	-0.232 (0.055)	-0.143 (0.022)	-0.216 (0.021)	-0.200 (0.035)	-0.198 (0.033)	-0.191 (0.012)
Finance	0.045 (0.059)	**0.050** (0.018)	**0.036** (0.019)	0.044 (0.033)	0.032 (0.031)	0.040 (0.011)
Services to business	0.070 (0.062)	**0.032** (0.018)	**0.034** (0.017)	0.009 (0.033)	0.041 (0.030)	0.031 (0.011)
Education and related services	0.064 (0.048)	0.037 (0.020)	-0.001 (0.017)	-0.002 (0.035)	-0.069 (0.030)	0.006 (0.011)
Health and welfare	0.005 (0.045)	-0.012 (0.019)	-0.018 (0.017)	0.037 (0.033)	0.054 (0.027)	-0.004 (0.011)
Accommodation and food services	-0.127 (0.089)	-0.160 (0.036)	-0.166 (0.035)	-0.158 (0.050)	-0.087 (0.050)	-0.142 (0.020)
Other services	-0.407 (0.071)	-0.252 (0.027)	-0.213 (0.024)	-0.259 (0.044)	-0.170 (0.038)	-0.233 (0.015)
WASD 1/	**0.264**	0.122	0.106	0.150	0.128	0.053
R^2	0.635	0.560	0.680	0.581	0.586	0.611
Sample size	1,476	9,840	9,512	3,935	4,234	28,997

- ATL= Atlantic; ONT= Ontario; QUE= Quebec; BC= British Columbia; PRAI= Prairies
- Explanatory variables include: education, experience, experience squared, one marital status dummy, 4 dummies for weeks worked, 6 dummies for hours worked, a sex dummy, a sex dummy interacted with education, marital status, experience, and experience square, 16 occupation dummies, 4 regional dummies, a constant.
- Source: Estimated by the author with data from the 1990 census.

1/ The weight used are the employment shares estimated from the 1990 census.

Table No. 6

Controlling by Job Characteristics: Occupation

Estimated wage differentials for one-digit industries, Canada 1990.

(Standard errors in parenthesis)

Industry	Managerial	Clerical	Fabrication	Total
Primary	0.181 (0.049)	0.264 (0.070)	**0.459** (0.143)	0.244 (0.027)
Manufacture	0.040 (0.017)	0.085 (0.025)	0.051 (0.059)	0.060 (0.010)
Construction	**-0.109** (0.037)	**0.021** (0.055)	**0.222** (0.091)	-0.008 (0.022)
Transportation	0.141 (0.023)	0.091 (0.023)	0.255 (0.074)	0.158 (0.012)
Wholesale trade	0.011 (0.029)	-0.099 (0.035)	0.056 (0.080)	0.027 (0.016)
Retail trade	-0.127 (0.029)	-0.165 (0.025)	-0.164 (0.069)	-0.191 (0.012)
Finance	0.027 (0.018)	0.009 (0.020)	-0.153 (0.282)	0.040 (0.011)
Services to business	0.009 (0.018)	0.041 (0.023)	0.083 (0.098)	0.031 (0.011)
Education and related services	0.003 (0.021)	-0.007 (0.025)	-0.120 (0.124)	0.006 (0.011)
Health and welfare	0.027 (0.021)	0.038 (0.023)	0.092 (0.163)	-0.004 (0.011)
Accommodation and food services	-0.178 (0.053)	-0.120 (0.047)	-0.113 (0.303)	-0.142 (0.020)
Other services	-0.167 (0.030)	-0.208 (0.041)	0.059 (0.110)	-0.233 (0.015)
WASD 1/ R^2 **Sample size**	0.108 0.484 4,801	0.130 0.570 4,364	**0.532** 0.551 **911**	**0.053** 0.584 28,997

- Explanatory variables include: education, experience, experience squared, one marital status dummy, 4 dummies for weeks worked, 6 dummies for hours worked, a sex dummy, a sex dummy interacted with education, marital status, experience, and experience square, 16 occupation dummies, 4 regional dummies, a constant.
- Source: Estimated by the author with data from the 1990 census.

1/ The weight used are the employment shares estimated from the 1990 census.

Table No. 7

Controlling by working conditions: White collar/Blue collar workers

Estimated wage differentials for one-digit industries, Canada 1990.

(Standard errors in parenthesis)

Industry	White collar	Blue collar	Total
Primary	0.259 (0.030)	0.320 (0.060)	0.244 (0.027)
Manufacture	0.077 (0.011)	0.113 (0.039)	0.060 (0.010)
Construction	0.009 (0.028)	0.072 (0.044)	-0.008 (0.022)
Transportation	0.112 (0.013)	0.192 (0.042)	0.158 (0.012)
Wholesale trade	- 0.012 (0.017)	0.068 (0.061)	0.027 (0.016)
Retail trade	-0.245 (0.122)	-0.132 (0.052)	-0.191 (0.012)
Finance	0.001 (0.011)	-0.256 (0.165)	0.040 (0.011)
Services to business	0.036 (0.011)	0.023 (0.066)	0.031 (0.011)
Education and related Services	0.062 (0.008)	-0.039 (0.079)	0.006 (0.011)
Health and welfare	0.066 (0.008)	-0.035 (0.113)	-0.004 (0.011)
Accommodation and Food	-0.379 (0.018)	-0.137 (0.107)	-0.142 (0.020)
Other services	-0.299 (0.016)	-0.167 (0.071)	-0.233 (0.015)
WASD 1/ R^2 **Sample size** *Correlation (Spearman)*	0.063 0.593 25,622 *0.748*	**0.277** 0.575 **2,394**	**0.053** 0.611 28,997

- Explanatory variables include: education, experience, experience squared, one marital status dummy, 4 dummies for weeks worked, 6 dummies for hours worked, a sex dummy, a sex dummy interacted with education, marital status, experience, and experience square, 16 occupation dummies, 4 regional dummies, a constant.
- Source: Estimated by the author with data from the 1990 census.

1/ The weight used are the employment shares estimated from the 1990 census.

Table No. 8

Controlling by workers characteristics: Gender

Estimated wage differentials for one-digit industries, Canada 1990.

(Standard errors in parenthesis)

Industry	Male	Female	Total
Primary	0.232 (0.031)	0.268 (0.054)	0.244 (0.027)
Manufacture	0.058 (0.012)	0.070 (0.019)	0.060 (0.010)
Construction	-0.005 (0.024)	-0.056 (0.046)	-0.008 (0.022)
Transportation	0.156 (0.015)	0.172 (0.020)	0.158 (0.012)
Wholesale trade	0.017 (0.020)	0.036 (0.026)	0.027 (0.016)
Retail trade	-0.164 (0.017)	-0.212 (0.018)	-0.191 (0.012)
Finance	0.043 (0.015)	0.038 (0.016)	0.040 (0.011)
Services to business	**0.019** (0.014)	0.046 (0.017)	0.031 (0.011)
Education and Related Services	0.007 (0.017)	0.008 (0.015)	0.006 (0.011)
Health and Welfare	-0.014 (0.019)	-0.003 (0.013)	-0.004 (0.011)
Accommodation and Food	-0.154 (0.027)	-0.134 (0.029)	-0.142 (0.020)
Other Services	-0.197 (0.021)	-0.270 (0.022)	-0.233 (0.015)
WASD 1/	0.069	0.096	0.053
R^2	0.601	0.585	0.611
Sample size	14,259	14,748	28,997
Correlation (Spearman)	*0.986*		

- Explanatory variables include: education, experience, experience squared, one marital status dummy, 4 dummies for weeks worked, 6 dummies for hours worked, a sex dummy, a sex dummy interacted with education, marital status, experience, and experience square, 16 occupation dummies, 4 regional dummies, a constant.
- Source: Estimated by the author with data from the 1990 census.

1/ The weight used are the employment shares estimated from the 1990 census.

Table No. 9

Controlling by workers characteristics: Age

Estimated wage differentials for one-digit industries, Canada 1990.

(Standard errors in parenthesis)

Industry	20 -24	45 - 60	Total
Primary	0.183 (0.088)	0.298 (0.075)	0.244 (0.027)
Manufacture	0.076 (0.038)	0.064 (0.023)	0.060 (0.010)
Construction	0.014 (0.068)	**-0.092** (0.054)	-0.008 (0.022)
Transportation	0.065 (0.044)	0.173 (0.029)	0.158 (0.012)
Wholesale trade	-0.037 (0.055)	0.080 (0.040)	0.027 (0.016)
Retail trade	-0.158 (0.032)	**-0.213** (0.034)	-0.191 (0.012)
Finance	0.029 (0.039)	0.050 (0.027)	0.040 (0.011)
Services to business	0.039 (0.036)	0.008 (0.027)	0.031 (0.011)
Education and Related Services	0.00003 (0.043)	0.042 (0.022)	0.006 (0.011)
Health and Welfare	0.011 (0.039)	0.007 (0.023)	-0.004 (0.011)
Accommodation and Food	-0.122 (0.045)	-0.262 (0.058)	-0.142 (0.020)
Other Services	-0.147 (0.043)	-0.306 (0.034)	-0.233 (0.015)
WASD 1/ R^2 Sample size *Correlation (Spearman)*	0.173 0.528 3,225 *0.755*	0.140 0.505 5,745	0.053 0.611 28,997

- Explanatory variables include: education, experience, experience squared, one marital status dummy, 4 dummies for weeks worked, 6 dummies for hours worked, a sex dummy, a sex dummy interacted with education, marital status, experience, and experience square, 16 occupation dummies, 4 regional dummies, a constant.
- Source: Estimated by the author with data from the 1990 census.

1/ The weight used are the employment shares estimated from the 1990 census.

Table No. 10

Controlling by human capital: Education

Estimated wage differentials for one-digit industries, Canada 1990.

(Standard errors in parenthesis)

Industry	Up-to-High School	Above-High School	Total
Primary	0.236 (0.033)	0.249 (0.011)	0.244 (0.027)
Manufacture	0.062 (0.012)	0.058 (0.012)	0.060 (0.010)
Construction	-0.002 (0.068)	-0.005 (0.054)	-0.008 (0.022)
Transportation	0.155 (0.015)	0.158 (0.014)	0.158 (0.012)
Wholesale trade	0.027 (0.020)	0.026 (0.019)	0.027 (0.016)
Retail trade	-0.189 (0.015)	-0.186 (0.015)	-0.191 (0.012)
Finance	0.036 (0.014)	0.040 (0.013)	0.040 (0.011)
Services to business	0.035 (0.013)	0.038 (0.012)	0.031 (0.011)
Education and Related Services	0.005 (0.014)	0.001 (0.013)	0.006 (0.011)
Health and Welfare	0.002 (0.013)	-0.005 (0.013)	-0.004 (0.011)
Accommodation and Food	-0.160 (0.025)	-0.135 (0.023)	-0.142 (0.020)
Other Services	-0.233 (0.019)	-0.237 (0.017)	-0.233 (0.015)
WASD	0.059	0.063	0.053
R^2	0.618	0.619	0.584
Sample size	7,026	**21,971**	28,997
Correlation (Spearman)	*0.979*		

- Explanatory variables include: education, experience, experience squared, one marital status dummy, 4 dummies for weeks worked, 6 dummies for hours worked, a sex dummy, a sex dummy interacted with education, marital status, experience, and experience square, 16 occupation dummies, 4 regional dummies, a constant.
- Source: Estimated by the author with data from the 1990 census.

1/ The weight used are the employment shares estimated from the 1990 census.

Table No. 11

Role of Labour Quality

Alternative Degrees of Control for Human capital and Industry Wage Differentials

Controls	WASD of Industry Wage Differentials
1. Marital status dummy, sex dummy, marital status/sex interaction, 16 occupation dummies, 4 regional dummies.	0.074
2. Row 1 controls plus 6 age dummies and age/sex interactions.	0.070
3. Row 2 plus 4 education dummies and 1 education/sex interaction	**0.069**

(1) Based on estimated industry wage differentials for 12 industry groups.

Source: Census 1991

Table No. 12

Controlling by Working Conditions

Estimated wage differentials for one-digit industries, Canada 1990.
(Standard errors in parenthesis)

Industry	**(1)**	**(2)**	**(3)**
Primary	0.240 (0.027)	0.245 (0.025)	0.238 (0.033)
Manufacture	**0.064** (0.010)	0.085 (0.009)	**0.108** (0.012)
Construction	**0.0001** (0.021)	0.087 (0.020)	-0.073 (0.026)
Transportation	0.163 (0.012)	0.159 (0.011)	0.180 (0.014)
Trade	-0.102 (0.010)	-0.132 (0.006)	-0.144 (0.012)
Finance	**0.046** (0.011)	0.006 (0.010)	**0.103** (0.013)
Other services	-0.031 (0.004)	-0.025 (0.003)	-0.039 (0.004)
Working conditions	**yes**	yes	**No**
WASD 1/ R^2 Sample size: 28,997	**0.041** 0.606	0.038	0.044 0.584

(1) Working conditions include: 4 dummies for weeks worked, 6 dummies for hours worked, 16 occupation dummies. Explanatory variables include: education, experience, experience squared, one marital status dummy, a sex dummy, a sex dummy interacted with education, marital status, experience, and experience square, 4 regional dummies, a constant.

(2) Working conditions are specified as the explanatory variables: weeks worked, hours worked, occupation. Other explanatory variables: same as (1).

(3) No working conditions. Explanatory variables: same as (1).

- Source: Estimated by the author with data from the 1990 census.

1/ The weight used are the employment shares estimated from the 1990 census.

Table No. 13

Controlling by working conditions: Full/Part-Time Jobs

Estimated wage differentials for one-digit industries, Canada 1990.

(Standard errors in parenthesis)

Industry	Part-time	Full-time	Total
Primary	**0.467** (0.164)	0.200 (0.030)	0.244 (0.027)
Manufacture	0.036 (0.055)	0.058 (0.011)	0.060 (0.010)
Construction	0.062 (0.093)	-0.073 (0.024)	-0.008 (0.022)
Transportation	0.155 (0.058)	0.176 (0.013)	0.158 (0.012)
Wholesale trade	-0.073 (0.073)	**0.029** (0.018)	0.027 (0.016)
Retail trade	-0.167 (0.036)	-0.137 (0.015)	-0.191 (0.012)
Finance	0.048 (0.043)	0.051 (0.012)	0.040 (0.011)
Services to business	-0.078 (0.046)	0.025 (0.012)	0.031 (0.011)
Education and Related Services	-0.048 (0.037)	0.010 (0.013)	0.006 (0.011)
Health and Welfare	**0.107** (0.032)	-0.007 (0.013)	-0.004 (0.011)
Accommodation and Food	-0.086 (0.052)	-0.189 (0.025)	-0.142 (0.020)
Other Services	-0.260 (0.044)	-0.265 (0.018)	-0.233 (0.015)
WASD 1/	**0.243**	0.062	0.053
R^2	0.447	0.365	0.611
Sample size	**4,565**	24,430	28,997
Correlation (Spearman)	*0.720*		

- Explanatory variables include: education, experience, experience squared, one marital status dummy, 4 dummies for weeks worked, 6 dummies for hours worked, a sex dummy, a sex dummy interacted with education, marital status, experience, and experience square, 16 occupation dummies, 4 regional dummies, a constant.
- Source: Estimated by the author with data from the 1990 census.

1/ The weight used are the employment shares estimated from the 1990 census.

Table No. 14-A

Unemployment rates (%) by Country-Case.

	1960	1970	1975	1980	1985	1986	1990
Canada	4.7	5.6	6.9	7.4	10.5	9.5	8.1
USA	5.2	5.9	8.5	7.1	7.1	6.9	5.4
Chile	5.3	5.9	15.0	12.0	12.1	8.8	5.6

Source: ILO, 1994, 1984, and 1974.

Table No. 14-B

Job creation and Wages in the Canadian Industry

Industry	Employment shares (%)					wages (Can$/hours)	
Goods sectors	1961	1970	1980	1985	1990	1985	1990
Primary *	1.3	1.5	1.8	1.7	1.4	16.09	19.69
Manufacture	24.0	23.4	19.7	17.5	15.9	11.64	14.25
Construction	6.2	6.2	5.8	5.2	6.2	13.98	16.90
Service sectors							
Trans./Communi.	9.3	8.9	8.5	7.7	7.5	13.1**	14.94**
Trade	16.9	16.6	22.5	23.3	24.0	--	--
Finance	3.9	4.5	9.5	10.1	11.6	--	--
Service	25.3	30.7	26.7	29.5	29.2	--	--

* Excludes agriculture; ** Includes only Transportation industry

Source: OECD, 1995, 1984, and 1974.

Table No. 14-C

Income and wage Trends in Canada

	1947-73	1973-81	1981-89
Real per capita GDP	2.8	2.5	2.2
Real per capita personal income	3.2	3.0	1.8
Real labour income	3.6	1.0	0.5
Real family income	*	1.9	0.9

Source: Sharpe, 1993.

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