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**Exploring the Link between Quality Management and the
Polarization of Earnings in Canada**
by
Paul Johanis, M.P.A.

A thesis submitted to
the Faculty of Graduate Studies
in partial fulfillment of
the requirements for the degree of

Doctor of Philosophy

Carleton University
Ottawa, Ontario
September 19, 1997
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and the Polarization of Earnings in Canada***

submitted by

Paul Johanis, M.A.

in partial fulfillment of the requirements
for the degree of Doctor of Philosophy

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Abstract

The objective of this dissertation is to take a first step toward understanding the role of firm-specific management strategies in the increased polarization of earnings observed in Canada. This is done by using data provided by employers on the wage rates associated with jobs classified by detailed occupational categories and on the adoption of quality management practices. The goal is to determine if jobs in establishments that have adopted quality management practices are associated with higher average wages than jobs in establishments that have not, while controlling for other relevant factors. If this wage premium exists, then an increase over time in the share of firms having adopted these practices could play a role in the increased polarization of earnings observed in Canada.

In the empirical section of this dissertation, I estimate a regression model in which the dependent variable is the hourly wage rate associated with specific jobs for each employer. The independent variables include required experience level, unionization, full or part-time status, occupation, industry, size of establishment and management practices. The management practices variable is a summary measure that describes the number and type of quality management practices used by firms in the sample. The results show that firms that make extensive use of quality management practices pay higher wages but that this is true for unionized jobs only.

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Introduction

There is a broad consensus in the research community that the earnings distribution of full-time full-year male workers in Canada has become more polarized over the last 20 years, with an increase in the number of workers at the bottom and at the top of the distribution and a decline in the middle levels.¹ Beach and Slotsve report a 9.7 point increase in the share of this population in the tails of the distribution of earnings, of which around 40% is accounted for by an increase in the number of workers in the bottom of the distribution while the balance represents an increase in the number of workers in the upper part of the distribution.² A similar trend has been documented in the United States.³

1. G. Picot, J. Myles and T. Wannell, *Good Jobs, Bad Jobs and the Declining Middle 1967-1986*, Statistics Canada, Research Paper Series no.28, Cat. 11F0019E (Ottawa: 1990); R. J. Morissette, J. Myles and G. Picot, *What is Happening to Earnings Inequality in Canada?*, Statistics Canada, Research Paper Series no. 60, Cat. 11F0019E (Ottawa: 1993).

2. C. Beach and G. Slotsve, *Are We Becoming Two Societies? Income Polarization and the Myth of the Declining Middle Class in Canada* (Toronto: C.D. Howe Institute, 1996).

3. F. Levy and R. J. Murnane, "U.S. Earnings Levels and Earnings Inequality: A Review of Recent Trends and Proposed Explanations," *Journal of Economic Literature* 30 (1992):1333-1381; P. Gottschalk and T. M. Smeeding, "Cross National Comparisons of Earnings and Income Inequality," (photocopy of draft manuscript, March 1996).

There is no consensus, however, on the importance of these changes. In the media and in the public imagination, the middle class is under great duress and appears to be on the verge of extinction. The academic community has taken a more sanguine view. First, by all accounts, what polarization has occurred has affected earnings only, not total income, the distribution of which is regulated through taxation and transfers. Second, it seems that only the earnings of male workers have been affected, as the earnings of female workers have been subjected to the different dynamics associated with their increasing participation in the labour force and the closing of the gender gap. As a result, it seems that household or family incomes have not become more polarized. Finally, it is difficult to interpret the magnitude of what polarization has occurred. Wolfson reports an increase of a few decimal points in his polarization index.⁴

Are these large shifts or are they marginal changes? To a certain extent, the absolute magnitude of the polarization observed over the last 20 years is not the most important consideration. Of greater concern is the possibility that polarization is a process that can eventually lead to a society fractured into irreconcilable groups of “haves” and “have nots”. This is why research into the causes of the observed polarization is important.

There is also no clear consensus on the reasons for these changes. While Beach and

4. M.C. Wolfson, *Divergent Inequalities - Theory, Empirical Results and Prescriptions*, Statistics Canada, Research Paper Series no.66, Cat. 11F0019E (Ottawa: 1995).

Slotsve ascribe the increased polarization primarily to cyclical factors. Other explanations are based on changes in structural factors. These explanations can be grouped into three categories: changes in labour supply, changes in wage-setting institutions and changes in labour demand. Labour supply explanations are based on a theory of "generational crowding", caused by the influx of baby boomers on the labour market. Changes in institutional mechanisms regulating the labour market refer primarily to changes in the incidence and effectiveness of labour unions in protecting the wages of workers.

Changes in labour demand encompass a number of explanations. All are premised on the emergence of fundamental changes in the structure of the Canadian economy. These include shifts in the industrial structure of the economy, shifts in the occupational composition of jobs within industries, changes in skills required within occupations and changes over time in firm-specific characteristics such as size and management strategies.

Explanations that are based on changes in the industrial composition of the economy or on shifts in the occupational mix within industries are found extensively in the theoretical literature. However, most empirical work in this area concludes that these factors account for a relatively minor share of the observed changes in the distribution of earnings. Moreover, explanations based on educational differentials, skills and experience, also fail to account for the bulk of the changes. Rather, most of the polarization of earnings seems to stem from changes within groups of workers of similar age and education, in the same occupations and industries. This has led authors such as

Levy and Murnane and Picot *et al.* to propose the hypothesis that differences in firm-specific factors, which result in workers with otherwise identical observable characteristics being paid higher wages in some firms and not in others, are at the root of the increasing wage disparity.⁵

Levy and Murnane suggest that firm-specific wage differentials may be caused by different responses at the firm level to increasing international competition. A strategy of price competition requires cost cutting measures, including a low wage strategy of outsourcing and job simplification. In contrast, a response based on innovation and product differentiation requires a reorganization of work that calls upon the knowledge, creativity and empowerment of workers, a response consistent with high wage levels. If firms that adopt these management practices pay higher wages, this could explain wage differentials between workers with otherwise identical measurable attributes, thus, according to Levy and Murnane, contributing to the polarization of earnings.

“In sum, growing differences in the wages paid by different firms to workers with the same measured characteristics play an important role in explaining the increases in within-group earnings inequality.”⁶

5. Levy and Murnane, “U.S. Earnings Levels and Earnings Inequality”; Morissette, Myles and Picot, *What is Happening to Earnings Inequality?*

6. Levy and Murnane, “U.S. Earnings Levels and Earnings Inequality” 1368.

Testing the Levy-Murnane hypothesis in the Canadian context

To test this hypothesis in the Canadian context, one would require firm-level data on wages, worker or job characteristics and firm characteristics, including the management strategies they have adopted. In this dissertation, I will focus on one such strategy, the adoption of what has been called “quality management” (QM) practices. The goal is to determine if jobs in establishments that have adopted quality management practices are associated with higher wages (which will be referred to as a “QM wage premium”) than the same jobs in other establishments, while controlling for other relevant factors. This will be accomplished by using data provided by employers on the wage rates associated with jobs classified by detailed occupational categories and on the adoption of quality management practices by those same employers. The absence of time series data on quality management practices precludes, however, addressing directly the thesis that a QM wage premium has contributed to increased polarization of earnings. The objective of this dissertation, therefore, is to take what can only be a first step toward understanding the relationship between firm-specific management strategies and the polarization of earnings.

In the empirical section of this dissertation, I estimate a regression model in which the dependent variable is the hourly wage rate associated with specific jobs for each employer. The independent variables include required experience level, the union status

of the job, full or part-time status, occupation, industry, size of establishment and management practices. The management practices variable is a summary measure that describes the number and type of quality management practices used by firms in the sample.

The dissertation sheds light on the possibility that the spread of QM practices *might* be a factor in the observed increase in inequality. It does so by showing that, within groups defined by industry, size, occupation, union status, full- and part-time status and experience, wages are higher in firms that use QM practices extensively. This establishes the possibility that QM practices might be a factor in the observed increased inequality because: a) it is unlikely the opposite finding (no effect of QM on wages) is consistent with increasing inequality; b) depending on the initial distribution, a wage premium that affects a subset of firms only, but all jobs in those firms, can, in some circumstances, cause a distribution to become more polarized.

Implicit in this argument is the assumption that jobs that were the same before the advent of the QM premium, in terms of industry, firm size, occupation, union status, full- or part-time status and level of experience required, were paid the same or very similar wages. Therefore, the QM premium must have increased the dispersion of wages within these narrowly defined groups. Whether the effect of the increases in within-group inequality causes the overall distribution to become more polarized is indeterminate and depends on the initial distribution.

Firms have only started adopting QM practices in the last 10 or 15 years and currently only a subset make extensive use of these practices. Assuming that the QM wage premium identified in 1996 appeared some time over that 10 or 15 year period, as more and more firms adopted these practices, the effect would have been to increase the wages of workers within those firms, while leaving unchanged the wages of other, identical, workers in other firms. Holding constant the observable variables presented above, the effect on the distribution of wages would be two-fold: 1) increasing the average wage and, 2) changing the shape of the distribution.⁷ Although the effect of a QM premium (combined with a growing number of firms using QM practices) on the overall distribution of earnings is indeterminate, I will argue that the outcome has probably been polarizing.⁸

Organization of the dissertation

The dissertation is divided into six chapters. Following this introductory section, chapter 1 contains a review of the literature on the potential causal factors associated with the polarization of income and earnings. This review serves to identify and justify the inclusion of relevant control variables in the empirical model. Chapter 2 is devoted to a

7. Characteristics such as age and education are not observed as the wage data used for this dissertation relate to jobs, not workers.

8. Note that it is possible also for the increase in wages caused by QM to reduce polarization. For example, if the initial distribution of wages is negatively skewed, an increase in a subset of wage rates can move a sufficient number of observations toward the mean so as to reduce the number of observations in the tails of the distribution.

the development of measurable indicators of management practices. in particular the practices subsumed under the label Quality Management. In chapter 3. the data used for the analysis are described. The analytical techniques are presented. along with similar models found in the literature. in chapter 4 while the results of the analysis are presented in chapter 5. The dissertation closes with a discussion of the implications of the results for public policy.

Chapter 1 - Factors associated with the polarization of earnings

Introduction

One of the objectives of this dissertation is to determine whether firms that have adopted a particular set of management practices pay higher wages than other firms, holding constant other relevant factors. The results will be used to explore whether an increase over time in the share of firms using these practices holds the potential of being a contributing factor to the polarization of earnings.

To specify the empirical model appropriately, it is necessary to ensure that other relevant factors are included. In this chapter, I will identify what these other factors might be and provide a theoretical justification for the variables I have included in the model. In all cases, the selected factors must be capable of explaining differences in wages paid at a point in time.

What explanatory variables are relevant depends on the specific concept of polarization being explained. For the purposes of this dissertation, polarization means the simultaneous increase in the proportion of observations in the tails of the distribution. But which observations? And the distribution of what? As regards the latter, the income concepts can vary. For example, they can refer to income in general or to earnings only. Income can also be defined as pre-transfer or post-transfer and may or may not include the impact of taxation. The definition of income can be further complicated by consideration of non-cash items, such as employee benefits. As regards the former, the observations can refer to households, families or individuals. Individuals can be further defined according to demographic characteristics, such as gender or age. They can also be defined according to labour force activity (for example, labour force participants or employed workers only). The income profiles of these different populations may evolve differently over time and different explanatory theories may apply to each sub-population. I will give three examples to illustrate these differences.

Example 1:

After a rapid increase in the seventies, average family income has been stable since 1980. Dual earner families, however, with an average annual income of nearly \$60,000 in 1992, have fared better than single earner families, whose average income was a little over

\$40,000, who in turn earn more than families with no earners at around \$30,000.¹

Changes in the distribution of these family types could result in a polarization of family incomes. If the relative share of dual earner and no-earner families increases while the relative share of single earner husband-wife families decreases, the number of high and low income families would increase while the number of middle income families would shrink. This is in fact what has happened over the period 1970 to 1992. The share of dual earner families increased from 38.8% to 60.8% and of no earner families from 9% to 15.9%, while the share of single-earner families dropped from 52.3% to 23.2%.²

Although these trends hold the potential for increased polarization of family incomes, Beach and Slotsve present evidence that post-transfer family incomes were no more polarized in the 1990s than they were in the 1970s.³

Example 2:

Growing unemployment could be a factor in the increased polarization of income of individuals. If the increase in unemployment is concentrated in certain parts of the population (for example, among blue collar workers), it can explain a polarization of the

1. Statistics Canada, *Characteristics of Dual Earner Families*, Cat. 13-215 (Ottawa: Supply and Services Canada, 1992): Table 1.

2. Statistics Canada, Cat. 13-215, 1992, Table 1.

3. Beach and Slotsve, *Are We Becoming Two Societies?*

distribution of income, by dropping this group from middle income to low income status, while leaving the high income group unchanged.

In 1983, the unemployment rate reached 11.9% (annual average, Canada, both sexes, over age 15). It fell slowly to reach pre-recession levels by 1989, then returned to the 11% range in 1992 and 1993.⁴ These peaks in unemployment are associated with periods of rapidly expanding inequality in pre-transfer personal incomes.

Between 1981 and 1983, the Gini coefficient for individual income before transfers increased from .437 to .472. It remained at this level until 1989, after which it increased to .491 by 1992. Transfers and the tax system have served to smooth these changes and to lower the general level of inequality so that, after tax, the incomes of individuals were no more unequally distributed in 1992 than in 1971.⁵

Example 3:

If the focus is on employed individuals only, other factors come into play. For example, there was an increase in the proportion of part-time workers over this period. In 1975, 11% of the employed labour force worked part-time. By 1994, this proportion had

4. Statistics Canada, *Historical Labour Force Statistics*, Cat. 71-201, February 1995, Cansim matrix D767289.

5. Statistics Canada, *Income After Tax, Distributions by Size in Canada*, Cat. 13-210 (Ottawa: March 1994); Table VIII.

increased to 17%. of which one third was involuntary compared to one eighth in 1975.⁶

If the trend to part-time employment is concentrated in groups that were previously middle income, then this shift can potentially contribute to increased polarization of earnings.

As these examples illustrate, changes in the number of earners in families, rising unemployment and the increase in part-time employment can all contribute to increased polarization. To maintain a consistent focus in terms of the trend to be examined and the associated explanatory factors, the dissertation will focus on a trend on which there is near unanimous agreement in the literature: increasing polarization of earnings within the full-time employed labour force, especially among male workers. From 1973 to 1989, Morissette *et al.* report that the earnings distribution of full-time full-year male workers had become more polarized, with an increase in jobs at the bottom and at the top of the distribution and a decline in the middle levels.⁷ As noted above, Beach and Slotsve corroborate this conclusion, reporting a 9.7% increase in the tails of the earnings distribution for this sub-population.⁸

6. Statistics Canada, *Historical Labour Force Statistics*, Cat. 71-201, February 1995, Cansim matrix D769813.

7. R. J. Morissette, J. Myles and G. Picot, *What is Happening to Earnings Inequality in Canada?* Statistics Canada, Research Paper Series no. 60, Cat. 11F0019E (Ottawa, 1993); M.C. Wolfson, *Divergent Inequalities - Theory, Empirical Results and Prescriptions*, Statistics Canada, Research Paper Series no.66, Cat. 11F0019E (Ottawa, 1995).

8. Beach and Slotsve, *Are We Becoming Two Societies?*

The explanatory variables retained for this dissertation will therefore be restricted to those that can explain differences in wages paid by employers for full-time full-year workers. A search of the literature has identified the following: industry, occupation, skills, hours worked, unionization, size of establishment and management practices. The rationale for retaining this set of variables follows.

Explanations

In a review of recent trends in US earnings levels and inequality, Levy and Murnane state that articles on this topic should answer three questions:

- What is the trend in earnings inequality over the period under study?
- Along what dimensions is inequality changing?
- What shifts in demand, shifts in supply, and/or changes in wage setting institutions are responsible for the observed trend?⁹

Accordingly, explanations for the observed polarization of the earnings of full-time workers in Canada can include changes in labour supply, changes in wage-setting mechanisms and changes in labour demand.

9. Levy and Murnane, "U.S. Earnings Levels and Earnings Inequality".

Labour supply

The significant change in labour supply that is most frequently proposed as a possible explanation for the polarization of earnings is the influx of a large number of young persons onto the labour market as the baby boom generation reached working age. This increase in supply would have the effect of competing entry-level wages down, thus leading to a disparity between the wages of newly hired workers and those hired previously for the same jobs, with the same qualifications. This assumes there are rigidities in the labour market that protect the wage levels of older workers. If the distribution of earnings of the older workers remains the same, the distribution of earnings of the new entrants will flatten the overall distribution, depending on the size of the entering cohort.

Whether the wages of these new entrants are permanently depressed or eventually catch up to those of their more senior peers has been the object of much controversy. Bloom and Freeman have published an account of the findings of studies conducted in the US on this subject, which, at the time, showed mixed results.¹⁰ In a Canadian context, a visible proponent of this view has been the demographer David Foot. In an 1986 article with Jeanne Li, he argued that the youth unemployment problem was in the process of solving itself with the advent of the less populous “baby bust” generation and that, instead, the

10. D. Bloom and R. Freeman, *The Youth Problem: Age or Generational Crowding?* National Bureau of Economic Research Working Paper no.1829 (Washington, D.C.: 1986).

baby boom bulge would now produce a "young adult" unemployment problem.¹¹ In a clarification and reply published in 1988, Li extends the argument to cover depressed wages.¹² The degree to which cohort size affects employment or wages depends on the responsiveness of wages in adjusting to the increased supply. In Canada, it seems that a fall in wages moderated the unemployment effects of generational crowding.¹³ Dooley also reported that the entry of the large baby boom cohort depressed entry wages but that there was some catch-up in relative wages over time.¹⁴ If these explanations are correct, the polarization of earnings would tend to disappear on its own as the entry wages of newly arriving generations recovered to pre-boom levels and as the catch-up in relative wages was completed. Baby boomers are by now long past the labour market entry stage and the wage lowering effect should have worn off with time. By the same token, the scarce "baby bust" cohort that followed it should have enjoyed increasing entry level wages. Youth wages, however, have continued their downward trend throughout the 1980s, regardless of changes in the relative composition of supply.¹⁵

The Economic Council of Canada had earlier observed that changes in the composition of

11. D. K. Foot and J.C. Li, "Youth Unemployment in Canada: A Misplaced Priority?" *Canadian Public Policy* 12, no.3 (1986): 499-506.

12. D. K. and J.C. Li, "Youth Unemployment: A Reply," *Canadian Public Policy* 14, no.1 (1988): 109-111.

13. Organization for Economic Cooperation and Development, *Economic Outlook 1986* (Paris:1986), Chapter V.

14. M. D. Dooley, "The Over-Educated Canadian? Changes in the Relationship Among Earnings, Education and Age for Canadian Men: 1971-1981," *Canadian Journal of Economics* 19, no.1 (1986):142-159.

15. G. Betcherman and R. Morissette, *Recent Youth Market Experience in Canada*, Statistics Canada, Research Paper Series no.63, Cat. 11F-0019E (Ottawa, 1994).

supply had contributed to the increased income inequality but viewed it as a partial explanation as increased income disparity was observed in all age/sex groups.¹⁶ The view that changes in relative supply have a limited impact on wages is corroborated by Hammermesh in an exhaustive survey of the literature.¹⁷ He cites two empirical studies that explicitly examined the impact of the increase in supply caused by the baby boom on their own wages, which find that own-quantity elasticities are small.¹⁸ Hammermesh concludes that "large changes in the size of labour force cohorts affects the cohorts' earnings, but not very strongly."¹⁹

Based on this review, labour supply variables will not be included in the model specified for this dissertation.

Changes in wage-setting institutions

Wage-setting institutions are rules or norms that govern how wage levels are determined. These arrangements vary in complexity and comprehensiveness from contracts between individual workers and employers, through group wages negotiated in collective

16. Economic Council of Canada, *Good Jobs, Bad Jobs: Employment in the Service Economy: A Statement by the Economic Council of Canada* (Ottawa: Minister of Supply and Services, 1990).

17. D. Hammermesh, *Labour Demand* (Princeton, New Jersey: Princeton University Press, 1993).

18. F. Welch, "Effects of Cohort Size on Earnings: The Baby Boom Babies' Financial Bust," *Journal of Political Economy* 87 (summer 1979):65-98; M. Berger, "The Effect of Cohort Size on Earnings Growth: A Reexamination of the Evidence," *Journal of Political Economy* 93 (1985):561-573.

19. Hammermesh, *Labour Demand*, 123.

bargaining to state determination of wages, as in the case, for example, of minimum wage legislation. A polarized distribution of earnings might result if particular forms of wage-setting institutions are associated with higher wages and the coverage of such institutions throughout the economy is not uniform. For example, if collective bargaining is associated with higher wages and only 50% of a sector is covered by collective agreements, there would result a polarized distribution of earnings in that sector.

In the terminology of the Regulation school in political economy, wage-setting institutions are part of "regimes of accumulation", which describe the form of accommodation between capital and labour in an economy. A major characteristic of the emerging regime in their view is flexibility. Harvey proposes the concept of "flexible accumulation".²⁰ The labour market under such a regime must offer both functional and numerical flexibility and this is assured through a core-periphery model. In the core are found full-time, high job security and high pay employees who are adaptable, flexible and geographically mobile. Wages and benefits are not collectively bargained but are set through patriarchal and paternalistic labour systems. Numerical flexibility is provided by the periphery where are found full-time employees whose skills are in oversupply, short-term contract workers, casuals, temporaries and part-timers. The polarization in earnings would then follow core-periphery lines. This line of thinking first emerged in the 1970s as the "dual labour market" of the institutionalist school of labour economics. Dual labour

20. D. Harvey, *The Condition of Post-Modernity* (London: Basil Blackwell, 1989).

market theorists hypothesized that there are two types of labour markets existing side by side.

"Jobs in the primary market possess several of the following characteristics: high wages, good working conditions, employment stability, chances of advancement, equity and due process in the administration of work rules. Jobs in the secondary market, in contrast, tend to have low wages and fringe benefits, poor working conditions, high labour turnover, little chance of advancement, and often arbitrary and capricious supervision."²¹

There is no consensus in this stream of the literature concerning the basis for the segmentation of the labour market. In a sense, what is proposed by Harvey is that changes in wage-setting institutions is one of the causal factors for the dualization of the labour market. This scenario has the virtue of combining the insights of dual-labour market theory, neo-classical international trade theory and some of the findings neo-classical dynamics of labour demand. Hammermesh reports evidence that unionization tends to slow the adjustment of labour demand, while it is fairly strongly established that demand for skilled labour is relatively less elastic with respect to wages than demand for unskilled labour.²² The factor price equalization theorem of neo-classical international trade theory postulates that, under free trade, wages in trading nations will tend to equalize over time. Therefore, if trade expands with nations with lower average wages, in goods that are labour-intensive, this would tend to drag down wages in the higher wage nation. This

21. M. J. Piore and P. B. Doeringer, *Internal Labour Markets and Manpower Analysis* (Lexington, Mass: Heath, 1971):175.

22. Hammermesh, *Labour Demand*, 275.

downward pressure would not, however, progress evenly throughout the economy, but would exert itself first on unskilled labour, by virtue of its higher elasticity of demand, in particular in areas where workers do not have union protection. This uneven distribution of the wage depressing effect would result in a polarization of earnings.

According to Bluestone and Harrison, such changes have occurred in the United States as a result of a deliberate policy of "zapping labour".²³ In the face of the squeeze on profits brought about by the slowing of productivity growth in the mid-seventies, American corporations mounted a concerted attack on labour in order to reduce labour costs. This attack took many forms: the globalization of production, wage freezes and pay cuts obtained through concessions, two-tiered wage structures and union avoidance. As a result, the rate of unionization has fallen from around 30% in 1970 to 16% in 1990.²⁴ There resulted a fundamental change in the basic rules governing the distribution of national income.

"Essentially, the restructuring process involved more than anything else the abrogation of the social contract that labour, management, and government had slowly but surely constructed in the course of nearly fifty years of union struggle, collective bargaining and government regulation of the age-old battle over the disposition of the national output."²⁵

23. H. Bluestone and B. Harrison, *The Great U-Turn: Corporate Restructuring and the Polarizing of America* (New York: Basic Books, 1988).

24. W. Riddell, "Unionization in Canada and the United States: A Tale of Two Countries" in *Small Differences that Matter: Labour Markets and Income Maintenance in Canada and the United States*, ed. D. Card and R. Freeman (Ann Arbor: University of Chicago Press, 1993).

25. Bluestone and Harrison, *The Great U-Turn*, 51.

The situation in Canada has been different, with the proportion of men in unionized jobs dropping from 41.9% to 39.4% while the proportion of unionized women actually grew slightly from 30% to 31.1% between 1981 and 1988.²⁶

The degree of unionization is a good measure of the size of the organized sector but it does not say anything about the effectiveness of unions in protecting the wage levels of their members. Wage cutbacks were obtained as concessions from workers even in unionized sectors.²⁷ The degree of unionization would not necessarily register a shift in the balance of power to employers due to slack labour markets or the possibility of moving production elsewhere. While it is difficult to measure this balance of power directly, the extent to which labour productivity and wages are coupled may be a good indirect measure. If unions were effective, wage gains would keep pace or outstrip productivity gains. If union power is on the wane, we should observe wages levels that are higher than marginal products in the 1970s, a closer link between wages and marginal products in the 1980s and perhaps wages below marginal products in the 1990s. Levy and Murnane cite two studies that report findings in support of this pattern in the relationship between wage gains and productivity gains over time and two that do not.²⁸

26. R. Morissette, *Why Has Inequality in Weekly Earnings Increased in Canada?* Statistics Canada, Research Paper Series no.80, Cat. 11F0019E (Ottawa: 1995).

27. Bluestone and Harrison, *The Great U-Turn*.

28. H. J. Holzer, "The Determinants of Employee Productivity: Some New Evidence," *Industrial Relations* (1990); J. J. Medoff and K. G. Abraham, "Are Those Paid More Really More Productive? The Case of Experience," *Journal of Human Resources* 16, no.2 (spring 1981):186-216; E. L. Groshen, "Employers, Occupations and Wage Inequality in Three Cities, 1957-89: Another Piece of the Puzzle," Federal Reserve Bank of Cleveland, working paper, (October 1990); S. J. Davis and J. Haltiwanger, "Wage Dispersion between and within U.S. Manufacturing Firms, 1963-86," *Brookings Pap Econ. Act.*, Special Issue (1991):115-180.

Morissette reports that a large proportion - between 55% and 62% of the increase in inequality of weekly wages for men - occurs within groups defined jointly by industry and union status. Nonetheless, based on this review, the degree of unionization may prove to be a significant causal factor in the polarization of earnings of full-time full-year workers in Canada.²⁹ A unionization variable will therefore be included in the empirical model specified for this dissertation.

Labour demand

Many proposed explanations of increased polarization are based on changes in labour demand. These changes include shifts in the share of employment by industry, changes in the occupational mix of jobs within industries, changes in the skills required within occupations and changes in firm-level characteristics such as firm size and management practices. I will review each of these categories of proposed explanations.

Shifts in the industrial structure of the economy

The stylized facts for this explanatory factor are that, just as agricultural employment declined dramatically over the last century, so too will well-paid industrial employment.

29. Morissette, *Why Has Inequality in Weekly Earnings Increased?*

to be replaced by low-paid service employment.³⁰ A shift in the industrial composition of the economy could have produced the observed polarization in earnings if employment decreased in industries with average wages, while employment in industries with high and low wages remained constant or increased. This is a plausible explanation as the relative ranking of the average wages in different industries tend to be very persistent over time.³¹

That increased productivity leads to higher incomes, which in turn leads to shifting relative demand for goods, has been known since the mid-nineteenth century when it was expressed as Engel's law, which held that the percentage of income devoted to food and other necessities decreases as an individual's income increases. This phenomenon was more explicitly articulated in a twentieth century context by Colin Clark:

"As relative income per head increases, it is quite clear that the relative demand for agricultural products falls all the time, and that the relative demand for manufactures first rises, and then falls in favour of services... Even when the relative demand for manufactures is increasing, we still generally expect, in the long run, a decreasing proportion of the labour force to be employed therein."³²

Offe presents an interesting framework for classifying the causes of the shift to a service

30. The agriculture sector represents only 3.2% of the labour force today. (Statistics Canada, *Historical Labour Force Statistics*, 1994, cat. no. 71-201.)

31. A. Helwege, "Sectoral Shifts and Inter-industry Wage Differentials," *Journal of Labour Economics* 10, no.1 (1992):55-84.

32. Colin Clark, *The Conditions of Economic Progress*, 3rd edition (London: Macmillan, 1957): 493-494.

economy.³³ In a two-by-two matrix, he first situates labour supply or demand factors as driving forces. On the other axis, he places forces of system integration and of social integration. The former refers to the intrinsic requirements of the operation of the economic system, the impersonal *deus ex machina* of the capitalist economy. The latter allows for human agency - forces that flow not from system requirements but from human needs and wants. These four dimensions (supply, demand, structure, agency) make up the classification scheme.

Table 1.1 Schematic representation of major explanations of the development of the service sector³⁴

	<i>Need Demand</i>	<i>Labour market supply</i>
System integration (equilibrium conditions)	1 Increasing need for control because of rising complexity	2 Absorption of structurally increasing labour market surplus
Social integration (action orientation)	3 Changes in demand of private households	4 Changes in preferences and autonomous power of service suppliers to define needs

We can see that the view stated in Engels' law and by Colin Clark is a third quadrant interpretation, in which the emergence of the service sector is based on changes in consumer demand. In the second and fourth quadrants, the growth of the service sector is the result of actions by producers, either as a method of absorbing the excess labour that

33. C. Offe, *Disorganized Capitalism* (Massachusetts Institute of Technology Press, 1985).

34. Offe, *Disorganized Capitalism*, 108.

is the inevitable result of the operation of a capitalist economy, or as a result of consumer demand that is artificially induced by producers through planned obsolescence. In the first quadrant, differentiation refers to the ever increasing complexity and specialization found in the economic system, which requires ever increasing mechanisms for coordination and integration, giving rise to new service industries or placing additional requirements on existing service industries, particularly in the non-commercial sector. This line of reasoning is akin to the post-industrial thesis put forth in the early 1970's, most notably by Daniel Bell.

For Bell, society is understood as comprising culture, polity and the social structure, the latter comprised of the economy, technology and occupational system.³⁵ Post-industrialism is seen as a phenomenon of the social structure. In Bell's view, the shift from goods producing to service producing activities is more specifically defined in terms of the expansion of health, education and government services, in particular at the state and local levels. Personal services and services to manufacturing (transportation, distribution) are legacies of previous ages and are not specific to post-industrialism. Another reading of the situation is offered by the "deindustrialization" theorists. In this view, the changing industrial structure of advanced market economies is caused more by human agency, most notably the choices and decisions of the owners of capital faced with decreasing profits.

35. D. Bell, *The Coming of Post-Industrial Society* (New York: Basic Books, 1973).

According to a symposium and resulting collection of essays edited by Blackaby, deindustrialization can be taken to mean one of three things: (1) a reduction, in absolute terms or as a proportion, of the labour force engaged in manufacturing; (2) a reduction in manufacturing's share of GDP; (3) a change in the mix of manufactured goods such that the value of exports of manufactures is less than the value of imports.³⁶ The effects of trade on the industrial structure of the domestic economy, essentially a reflection of the movement of manufacturing production off-shore, remain central to this line of thinking. For example, Cohen and Zysman argue that allowing manufacturing production to relocate offshore will ultimately destroy not only good manufacturing jobs but also good service sector jobs as most service employment is in support of manufacturing.³⁷ Other characteristics of de-industrialization are found in Drache: (1) a decline in industrial employment in relation to total employment; (2) a rise in structural unemployment due to the slowing down of the economy; (3) the erosion of export performance; (4) an increase in poorer quality jobs in services, clerical and sales and (5) significant import penetration of the domestic market.³⁸

The de-industrialization or post-industrialism scenarios provide an explanation for the growing earnings inequality puzzle if the emerging services sector itself bifurcates into

36. F. Blackaby, ed., *Deindustrialization* (London: Heinemann and National Institute for Economic and Social Research, 1979).

37. S. Cohen and J. Zysman, *Manufacturing Matters* (New York: Basic Books, 1987).

38. D. Drache, *The De-industrialization of Canada and its Implications for Labour* (Canadian Centre for Policy Alternatives, 1989).

low wage and high wage sub-sectors. For most deindustrialists, only the low wage subsector is emphasized.

"The key to job creation in the 1980s was in the service industries but the largest category of jobs within the service economy consists of jobs in "servant industries" such as retail trade, amusement and recreation, personal services and the like. These are poverty jobs where the pay and quality of work is poor, job security non-existent and where an increasingly larger number of women are being employed".³⁹

Bluestone and Harrison call this process "occupational skidding", where workers lose their jobs in mass production industries, to be re-absorbed in lower paid service employment.⁴⁰ This is not, however, an inevitable development. Not all service industries offer low paid, low security jobs. For Esping-Anderson, a country's post-industrial economic structure depends on the type of welfare state it had implemented during the industrial era.⁴¹ In countries with social democratic welfare states, such as Sweden, the post-industrial economic structure is dominated by service industries such as health, education and social services, which employ large numbers of highly paid professionals. In countries with liberal welfare states, such as the United States, the post-industrial economic structure is dominated by service industries such as retail and entertainment, which offer low paid jobs with little security.

39. Drache, *The De-industrialization of Canada*, 23.

40. H. Bluestone and B. Harrison, *The Deindustrialization of America?* (New York: Basic Books, 1982).

41. G. Esping-Andersen, *The Three Worlds of Welfare Capitalism* (Princeton, New Jersey: Princeton University Press, 1990).

It may be possible to guide an economy toward the high wage, high employment scenario.⁴² The Canadian economy, however, is seen as an exemplar, along with the United States, of a "dualization-high employment" model, where many new jobs are created, but in low wage sectors.⁴³ In Canada, 35.5% of the labour force was employed in the goods-producing sector in 1975. By 1994, that proportion had dropped to 26.7%, continuing a long-standing trend of employment growth in the services sector. Over the last 20 years, employment in the goods-producing sector has basically remained stable at about 3.5 million workers while employment in services grew from 6.4 million to 9.7 million.⁴⁴

While there is no doubt that employment in the service sector has continued to expand since 1975, and while wage differentials between various service industries create the potential for a bifurcation in employment flows that could contribute to the polarization of earnings, more recent research has established that the intersectoral shift in employment accounts only for a small share of the increased polarization observed over the reference period.

These trends were analysed by the Economic Council of Canada in "Good Jobs, Bad

42. R. Mahon, "From Fordism to ? : New Technology, Labour Markets and Unions," *Economic and Industrial Democracy* 8 (1987) 5-20.

43. J. Myles, *The Expanding Middle: Some Canadian Evidence on the Deskillling Debate*, Statistics Canada, Research Paper Series no.9, Cat.11F0019E (1991).

44. Statistics Canada, *Historical Labour Force Statistics*, Cat. 71-201, February 1995.

Jobs: Employment in the Service Economy'.⁴⁵ While the title suggests a polarization between high and low wage employment along sectoral lines, the evidence presented is less conclusive. The ECC divides the service sector into three subsectors: dynamic services (transportation, wholesale, finance, business services), traditional services (retail, personal) and non-market services (health, education, public administration). The annual growth rate in the three subsectors from 1967 to 1988 was 3.2%, 3.3% and 3.5% respectively. No data is presented on average wages in these sectors, although it is stated that health and social services are high wage while retail and personal services are low wage industries. It is also stated that occupations in the non-market and dynamic subsectors are characterized by high skill and educational requirements compared to the goods producing sector and that employment in the traditional subsector tends to be low skill. They conclude that the "employment shift to services is contributing to gains in highly skilled occupations, a decline in the share of middle-level skilled jobs, and a stable proportion of low-skill jobs."⁴⁶ However, absent data on average wages, the link between the shift in the industrial composition of employment and the polarization of earnings is not convincingly established. This is recognized by the authors themselves.

"Have structural changes in the economy itself played a role in the increasing income disparity? It has been argued that the transition from goods to services has been accompanied by a shift from activities with earnings profiles concentrated at middle levels to activities in either high- or low-wage industries. In this regard, we have already noted that, on balance, the distribution of skills is more polarized in the

45. Economic Council of Canada, *Good Jobs, Bad Jobs*

46. Economic Council of Canada, 14.

service sector than in the goods sector. It is also true that the service industries that have contributed the most to overall employment growth have either very high average wages (health and social services) or very low ones (retail trade and personal services). This level of analysis, however, is only partial, since it does not consider patterns of earnings distribution within industries. Once this is taken into account, it becomes apparent that the shift towards services is not a major explanation for the growth in income disparity."⁴⁷

Myles, Picot and Wannell had come to a similar conclusion for the period 1981-86.

"There was substantial change in the industrial mix of jobs by historical standards. It was in the direction expected: increasing job opportunities in the services - notably consumer services and health/education/welfare - and a declining share of jobs in the goods-producing sector. However, this redistribution of jobs among industries accounted for relatively little of the total change in the shape of the wage distribution (increased share of jobs at the bottom and upper middle of the distribution). Most of the change originated from a changing wage structure within industrial sectors."⁴⁸

These findings were based on a decomposition technique which ascribes portions of a change in an observed characteristic to changes in the distribution of a population between groups, changes within groups and to an interaction term between these two. In this case, changes in the distribution of the male full-time full-year employed population between industries was found to be a relatively minor contributor (13%) to changes in the distribution of earnings. Other, unidentified, factors within industries contributed more (84%) to the observed changes to the wage structure. Nevertheless, the industry variable explains part of the observed polarization of earnings and will therefore be retained for the purposes of this dissertation.

47. *ibid.*, 15.

48. Picot, Myles and Wannell, *The Declining Middle*, 8.

Shifts in the occupational structure of the workforce

The observed polarization of earnings could be the result of changes in the types of jobs found across all industries. If employment in middle wage occupations declines while employment in low and high wage occupations increases, holding industrial structure constant, the result would be the polarization of earnings. This shift might occur uniformly across all industries in reaction to economy-wide forces or it could occur in industry-specific ways in a sufficient number of industries to cause the observed polarization.

One of the factors associated with changes in the occupational structure across industries is the introduction of ever more sophisticated technology in the production processes.

This is reported by Mahon:

"Although a dualistic conception of the economy still persists in certain quarters - caught in the static distinctions between "sunset" and "high-tech industries" - there is a growing recognition that developments in the high-tech branch are transforming production processes and product and marketing strategies in all branches of the economy." ⁴⁹

How polarization of earnings might occur as a result of shifts in the occupational structure of the labour force can be analysed in a neo-classical approach. Empirical research has demonstrated that skilled and unskilled labour are fairly easily substituted

49. Mahon, "From Fordism to ?", 51.

and that capital and skill are complementary.⁵⁰ Therefore, an exogenous increase in capital ("capital deepening"), will cause a relative increase in the demand for skilled labour. The empirical research on the dynamics of labour demand suggests that the demand-side adjustment will occur more rapidly than on the supply-side, thereby creating a "structural" imbalance, which will increase wage differentials. In theory, the supply-side will eventually adjust and the differential will be absorbed, or at least returned to its original magnitude. If there are, however, constraints on the ability of supply to adjust, or if demand conditions change constantly, outstripping the ability of supply to adjust, increasing wage differentials may become a permanent feature of an economy experiencing rapid technological change.

A related, yet distinct, factor that can affect cross-sectoral occupational composition is the centrality of information in post-industrial economic activity. The creation, transmission, storage, analysis and dissemination of information have become such important activities that we now speak of the "information" economy.⁵¹ Such an economy gives rise to the "knowledge worker". In Beck, knowledge workers are defined as workers in professional and technical occupations along with certain senior management occupations, who create wealth by applying their knowledge and reasoning powers.⁵² In Osberg *et al.*, the term "knowledge worker" is reserved for those who create information, while the other

50. Hammermesh, *Labour Demand*.

51. L. Osberg, E.N. Wolff, and W.J. Baumol, *The Information Economy The Implications of Unbalanced Growth* (Halifax: Institute for Research in Public Policy, 1989).

52. N. Beck, *Shifting Gears Thriving in the New Economy* (Toronto: Harper-Collins, 1991).

workers in the information economy are information workers. They have in common with Beck's definition that these are new, well paid occupations that can be found in all sectors of the economy.

Reich offers a slightly different occupational mix scenario. He describes the emerging deconcentration of industrial activity, in which "webs" are the dominant organizational form, temporary networks coalescing around specific business opportunities.⁵³ Such industries are managed from strategic centres, with the international division of labour locating production and other facilities where they are best suited. The result in countries where the strategic centres are located is a polarization between highly paid "symbolic analysts", a new occupational group similar to "knowledge workers" and low paid personal service jobs.

Changes in organizational forms can also bring about shifts in the occupational structure across industries. The trend towards "delaying", that is reducing the number of levels in traditional hierarchies thereby flattening the organization, results in the elimination of middle management and supervisory jobs. Such organizations would display greater internal polarization of earnings.

The introduction of high tech production processes, the centrality of information in post-

53. R. Reich, *The Work of Nations* (New York: Simon and Schuster, 1991).

industrial economic activity and the emergence of new organizational forms could potentially bring about changes in the occupational structure within and across industries that explain the growing polarization of earnings.

The occupational mix of employment in Canada has reflected the emergence of these factors over the last 20 years. Of particular note is the large increase in the proportion of workers in managerial and professional occupations. In 1975, this category represented 22% of the employed labour force. In 1994, this proportion had grown to 32.6%, growing nearly three times faster than employment overall.⁵⁴ The share of the employed labour force in the clerical, primary, processing, construction, transportation, material handling and other occupational categories declined slightly, while the share of occupations in sales remained stable and the share of service occupations grew slightly. A shift of this nature - more high wage occupations and nearly unchanged proportions of low and medium wage occupations - would skew the distribution of income towards a higher mean but not necessarily towards more polarization.

"There was substantial occupational redistribution over the period, but this too accounted for relatively little of the total change in the wage distribution. The change in the wage distribution was related not so much to the rapidly growing number of managers and service workers, and declining number of blue collar workers, as to wage changes occurring within occupational groups."⁵⁵

54. Statistics Canada, *Historical Labour Force Statistics*, Cat. 71-201, February 1995.

55. Picot, Myles and Wannell, *The Declining Middle*, 8.

This conclusion was based on the results of a decomposition which found that only 19% of the change in the distribution of earnings was attributable to the change in the occupational composition of employment while 77% was attributable to changes in the wage distribution within occupations.⁵⁶

As occupation explains part of the polarization of earnings, an occupational variable will be included in the model specified for this dissertation.

Changes in skill profiles within occupations

It may be that occupation is too gross a measure to register changes in the wage earning power of workplace activities. The occupational label "processing occupation" or more finely, "lathe operator", may mask significant differences between job-related skill requirements within occupations. Earnings polarization may be explained by such skill differentials. There are two general types of explanations based on changes in skill requirements within occupations: those that focus on increasing skill requirements, and those based on reduced skill requirement, or deskilling.

⁵⁶. This decomposition based on occupation is independent of the decomposition based on industry reported earlier. It does not seek to explain the 84% of the observed polarization unexplained by between-industry change. Rather, it tries again to explain the overall observed polarization, but in terms of occupational change.

Increasing skill requirements

One class of covariates of movements in earnings inequality identified in Levy and Murnane includes "other ability indicators (beyond years of schooling) including aptitude test scores, ability to work with other people, and physical strength."⁵⁷ Polarization in earnings could result from changes in the abilities sought by employers, that go unmeasured in occupational labels, but that are linked to wage differentials. For example, if some "systems analysts" are required to have good interpersonal skills, and are paid higher wages as a result, and others are not, then we could witness the emergence of a polarization of earnings among systems analysts. Similar unmeasured changes could spread across occupations and industries, leading to an economy-wide polarization of earnings.

Findings in the US suggest that increases in inequality within groups are caused by increasing returns to skills that are not necessarily correlated with educational attainment.⁵⁸ These skill include mentoring, negotiating, instructing, supervising and persuading.⁵⁹ Changes in the skills profiles sought by Canadian employers have also been observed. The Conference Board in Canada reports that the demand outstrips supply for

57. Levy and Murnane, "U.S. Earnings Levels and Earnings Inequality," 1335.

58. C. K. Juhn, K. M. Murphy and B. Pierce, "Wage Inequality and the Rise in Returns to Skills," *Journal of Political Economy* 101, no.3 (1991):410-442; L. F. Katz and K. M. Murphy, "Changes in Relative Wages, 1962-1987: Supply and Demand Factors," *Quarterly Journal of Economics* 107, no.1 (1992):107-115.

59. D. R. Howell and E. M. Wolff, "Trends in the Growth and Distribution of Skills in the U.S. Workplace, 1960-1985," *Industrial and Labour Relations Review* 44, no.3 (April 1991):486-502.

workers with high communications, problem solving and interpersonal skills.⁶⁰

Bifurcation in earnings would result from higher wage levels being paid to these more highly skilled workers.

Reduced skill requirements

There is, however, another point of view: polarization of earnings resulting from a lowering of skill levels required, the so-called deskilling debate. With Braverman as its most notable exponent, the deskilling thesis is based on what is believed to be an intrinsic need of the capitalist mode of production.⁶¹ While the specialization of labour might be a desirable attribute of any production process on purely technical grounds, that is, as measured by volume of output for given inputs, the division of labour in the capitalist mode of production is not motivated by technical considerations but by economic ones. By considering labour as a commodity, to be bought and sold, it is most profitable to reduce the steps of a production process to their most elemental level, so that each can be performed by the least expensive labour resource capable of the task.

"Insofar as the labour process may be dissociated, it may be separated into elements some of which are simpler than others and each of which is simpler than the whole. Translated into market terms, this means that the labour power capable of performing

60. M. McLaughlin, "Employability Skills Profile: What Are Employers Looking For?" (Ottawa: Conference Board in Canada, 1992).

61. H. Braverman, "Labour and Monopoly Capital" in *Classes, Power and Conflict*, ed. A. Giddens and D. Held (Berkeley: University of California Press, 1974).

the process may be purchased more cheaply as dissociated elements than as a capacity integrated in a single worker."⁶²

First stated by Charles Babbage in 1832, this principle explains the fundamental tendency towards deskilling implicit in the capitalist mode of production.⁶³ From this point of view, the entire evolution of the labour process is not driven mindlessly by new technology, but by a constant struggle to wrest knowledge and control over work from the worker in order to increase profits. This same Babbage is credited as the inventor of the first automatic digital computer and so it is appropriate that the introduction of information technology in our times is the terrain over which this debate now rages.

The introduction of micro-electronic technologies in the production process can be interpreted from each of these two points of view. First, it could be considered that the introduction of micro-electronic technologies further distances those who think from those who do, thus exacerbating the deskilling tendencies of the specialization of work. Another possibility is that the use of this technology in the production process requires higher skill levels and that the polarization observed is the result of the wage differentials between the firms that have introduced it and those that have not. An insight into this question is supplied by Zuboff, who illustrates through case studies that what matters is not the technology per se, but how it is implemented.⁶⁴ If the technology is used simply

62. Braverman, 81.

63. Charles Babbage, *On the Economy of Machinery and Manufactures* (1832; reprint, New York: n.p., 1963).

64. S. Zuboff, *In the Age of the Smart Machine* (New York: Basic Books, 1988).

to accelerate the automation introduced in a previous era, the result is further deskilling and dehumanizing of work. If, on the other hand, the full potential of the technology is harnessed in an "infomation" pattern of implementation, in which all production processes are essentially transformed into text which can be accessed and operated upon by all workers, the result is an upgrading of skills required.

It is difficult to examine trends in the Canadian economy in this area as there are not many datasets that contain information on labour demand in general, let alone the demand for specific skill profiles. Studies that use educational attainment as a proxy for skills are flawed if in fact the critical skills that account for wage differentials are not necessarily correlated with educational attainment. Another measurable proxy that may be correlated with skills that are not captured by educational attainment is years of experience.

Polarization of earnings within groups defined by industry and occupation could be explained by changes in production processes that confer advantages to experienced workers over younger workers.⁶⁵ This interpretation also fits nicely with the observation of cleavages in earnings along age lines. However, Morissette, Myles and Picot report that while wage differentials have increased between age groups with similar education, most of the increase in inequality occurred within groups of similar age and education.

65. S. J. Davis, "Cross-Country Patterns of Changes in Relative Wages," National Bureau of Economic Research Working Paper no.4085 (Washington, D.C., 1992).

"Increases in within group inequality account for at least 83%, 76% and 65% of the increase in earnings inequality observed among all male earners, full-time full-year male workers and full-time full-year female workers respectively."⁶⁶

Wage differentials based on years of experience would therefore not be the principal basis for increasing earnings inequality. Although this conclusion regards inequality measures rather than polarization per se, in this range of values, both polarization and inequality measures move in the same direction.

In his review of the evidence on the deskilling debate in Canada, Myles concludes that the polarization of skills in the Canadian labour market in the 1970s was caused by intra-industry change rather than changes in the industrial composition of employment. basically a commentary on the post-industrializing/deindustrializing debate rather than on the deskilling debate.⁶⁷ While he speculates on the dynamics within industries that are at the root of the polarization - supply conditions, technological change and the international division of labour are proposed - Myles concedes that the evidence is ambiguous.

Based on this review of the role of changing skills requirement within occupations as an explanatory factor for the polarization of earnings, an experience variable will be retained for the purposes of this dissertation.

66. R. J. Morissette, J. Myles and G. Picot, *What is Happening to Earnings Inequality in Canada?* Statistics Canada, Research Paper Series no. 60, Cat. 11F0019E (Ottawa, 1993):15.

67. Myles, *The Expanding Middle*.

Changes in firm-specific characteristics

If increasing earnings inequality is only partly explained by shifts in the industrial mix of employment in the economy, shifts in the occupational composition of employment within industries and changes in the skills requirements within occupations, even more detailed phenomena must be considered as explanatory variables, the characteristics of individual employers.⁶⁸ Firm-specific variables that may explain increasing polarization of earnings include the size of the company, business establishment of employment and the management strategies, including human resource practices, adopted by the firm.

Whatever these factors may be, they operate on the polarization of wages through two mechanisms: changes in wage rates or changes in hours worked, or a combination of both. Picot, Myles and Wannell report that the patterns of working time are also polarizing.⁶⁹ Compounding the polarizing effect of this change is the fact that longer work weeks were associated with higher hourly paid workers. Full-time workers at higher rates of pay were working longer hours while fewer hours were being worked in low-paid jobs. They also determined, however, that the polarizing of hours worked was not the sole contributor to the polarizing of earnings. Using the decomposition technique, they ascribed 50% of the change in distribution of earnings to the hours effect and 41% to the wages effect. Morissette, Myles and Picot reported that changes in the distribution of

68. Levy and Murnane, "U.S. Earnings Levels and Earnings Inequality".

69. Picot, Myles and Wannell, *The Declining Middle*.

weekly and annual hours worked accounted for much of the rise in income inequality in the 1980s.⁷⁰ Morissette later confirms the trend in regard to weekly hours, reporting that the percentage of employees working 35–40 hours per week declined, while the fraction working either shorter or longer hours rose.⁷¹

Two conclusions can be drawn from these findings for the purposes of this dissertation. First, while the polarization of hours contributes significantly to the polarization of earnings, the dispersion of wages still plays a large role. Second, because the number of hours worked is such an important factor, it will be necessary to specify the dependant variable so as to control for this effect. This can be accomplished by using information on hourly wage rates.

Firm size

Polarization of earnings because of changes in firm size could occur if two conditions held over the period under review: (1) there were systematic differences in wages between large and small businesses, and (2) there has been a change in the firm size composition of the economy. For example, if small businesses pay less than large ones and employment in small business has grown as a share of all employment, we could observe a polarization of wages for workers with similar attributes in the same industries.

70. Morissette, Myles and Picot, *What is happening to earnings inequality?*

71. Morissette, *Why Has Inequality in Weekly Earnings Increased?*

These conditions may have in fact held in Canada over the last 20 years. In the discourse of international competitiveness, the focus in the 1980s was on innovation and niche marketing. Small, nimble firms were seen as best able to adapt quickly to changing demand conditions. This shift was facilitated by the computerization and miniaturization of communications and production technologies. The small business sector also benefited from the move towards outsourcing by the stagnant large firm sector, as that sector attempted to deal with high overheads and diseconomies of scale. Newly created small businesses were not encumbered by the high wages, benefits and other entitlements acquired by workers in the large firm sector over time, which were seen as obstacles in the pursuit of flexibility in an ever more competitive world. Conditions were thus right for the expansion of a small business sector with a lower wage structure.

Although the importance of small business in job creation was for a time contested, it is now fairly well established that small business has in fact been the engine of job creation in Canada in the 1980s.⁷² The net effect of job creation in the small business sector and stagnation in the large firm sector is a change in the distribution of employment by employer size. Wannell reports that the percentage of jobs found in small firms increased in the 1980s.⁷³ He also reports that this increase has had a small negative impact on average earnings. Morissette tackled the question head-on in "Canadian Jobs and Firm

72. G. Picot, J. Baldwin and R. Dupuy, *Have Small Firms Created a Disproportionate Share of New Jobs in Canada? A Reassessment of the Facts*, Statistics Canada, Research Paper Series no. 71, Cat. 11F0019E (Ottawa, 1994).

73. T. Wannell, *Trends in the Distribution of Employment by Employer Size: Recent Canadian Evidence*, Statistics Canada, Research Paper Series no.39, Cat. 11F0019E (Ottawa, 1991).

Size: Do Smaller Firms Pay Less?".⁷⁴ He concludes that jobs in larger firms are more likely to be unionized, are better covered by pension plans, are less subject to permanent layoffs and are paid higher wages. These findings suggest that changes in the distribution of employment by size of employer could explain part of the polarization of earnings of full-time full-year workers in the same occupations and industries. While empirical findings have not yet validated this hypothesis, Morissette does report that the decline in average firm size has had little effect on wage differentials across age groups, another dimension along which earnings differentials have been analysed.⁷⁵

The role of size as an independent explanatory factor in the polarization of earnings has yet to be demonstrated and a size variable will therefore be included in the model specified for this dissertation.

Management practices

The other class of firm-specific factors that may contribute to the polarization of earnings involves the adoption by firms of varying management strategies and practices. As noted in the introduction, Levy and Murnane suggest that firm-specific wage differentials may represent different responses to increasing international competition.⁷⁶ A strategy of price

74. R. Morissette, *Canadian Jobs and Firm Size - Do Smaller Firms Pay Less?* Statistics Canada, Research Paper Series no.35, Cat. 11F0019E (Ottawa, 1991).

75. Morissette, *Why Has Inequality in Weekly Earnings Increased?*

76. Levy and Murnane, "U.S. Earnings Levels and Earnings Inequality".

competition requires cost cutting measures, including a low wage strategy of out-sourcing and job simplification. In contrast, a response based on innovation and product differentiation requires a reorganization of work that calls upon the knowledge, creativity and empowerment of workers, a response consistent with high wage levels. In a sense, this is a variant of the skills debate, using the adoption of new organizational forms and management strategies as a proxy for higher skills requirements. If firms that adopt management practices that emphasize employee involvement pay higher wages, this could explain wage differentials between workers of identical measurable attributes (experience, education, occupation) within the same industry.

Conclusion

In a comprehensive review of potential explanatory factors for the polarization of earnings, Morissette, Myles and Picot conclude that "definitive explanations are elusive". They also acknowledge that they have come to the edge of what can be explored with available data.

"If changing technologies and associated changing skill mix required are a major part of the story, existing data sources are not up to the task. Similarly, if changing human resource practices of firms underlie some of the increase in within group inequality, available data are inappropriate. A firm or establishment survey focussing on human resource practices and labour demand would be needed, along with accompanying data on wages and other aspects of workers' position in the firm."⁷⁷

77. Morissette, Myles and Picot, *What is Happening to Earnings Inequality?* 23.

This dissertation takes a first step toward filling one of these gaps by testing the hypothesis that workers who are employed by firms that have adopted certain quality management practices are paid higher wages than workers who hold otherwise identical jobs in firms that have not and by examining the relationship between such a wage premium and the observed polarization of earnings in Canada.

Based on this review, the empirical model specified to test this hypothesis:

- will not include labour supply variables;
- will include a unionization variable from the wage-setting institutions category;
- will include industry, occupation, experience, firm size and management practices variables, from the labour demand category.

In addition, to control for the effect of hours worked, the dependent variable will be specified as hourly wage rates and a full-time or part-time status variable will also be included.

Indicators for most of these variables have been developed and are widely available.

There are no standard indicators, however, of management practices. It is necessary, therefore, to develop concepts of "firm strategies based on innovation and quality" that can be operationalized, and this is the topic of Chapter 2.

Chapter 2 - Management practices

Introduction

One of the goals of this dissertation is to establish whether there is any relationship between wages paid by employers and the management practices they adopt, the hypothesis being that employers who have adopted a strategy based on quality pay higher wages than those who have not. To test this hypothesis empirically, it is necessary to develop measurable indicators of an "approach based on quality". The purpose of this chapter is to develop such indicators and to provide a theoretical justification for them.

This will be done by first providing a historical survey of quality management, in which I will argue that an "approach based on quality" (referred to heretofore as QM) is not just a passing fad but a management approach with a long pedigree that has become the dominant management paradigm of our time. I will then describe a conceptual framework for analyzing QM, breaking it down into four categories of practices about which

information can be collected in a survey. I will then review the literature regarding each category in turn to develop the set of indicators that will be used for this dissertation.

Historical survey of QM

From a mainstream management sciences point of view, quality management appears as an esoteric specialty emanating from the engineering departments of manufacturing firms, tinged with Japanese exoticism. However, upon closer inspection, it emerges as a pervasive management paradigm, representing the current "best practice" synthesis of 100 years of management thought. In this section, I will demonstrate this by tracing the history of QM, linking it to the parallel evolution of mainstream management theory and showing how they have converged in the 1980s.

Despite protestations to the contrary, management theory is still on the lookout for the "one best way" and QM is today's solution to the problem. Because it is a synthesis of past theory and practice, there is nothing exotic about QM. We recognize all the parts: it's just that they have not been brought together in quite so elegant a package before. From scientific management, QM borrows the reliance on measurement and "management by fact". From the human relations school, it adopts a participative philosophy. From the systems theory approach, it takes its emphasis on processes and from strategic planning, it inherits its focus on the customer and the importance of leadership. For most of its

evolution, the quality movement followed developments in management theory. Now, it leads the field and has become the dominant management paradigm.

The parallel evolution of mainstream management and quality management is illustrated in Table 2.1 and is described in more detail in the section that follows.

Table 2.1 Parallel evolution of mainstream management and the quality movement

<i>Era</i>	<i>Mainstream management theory</i>	<i>Quality management</i>
1900-1930s	Scientific management	Quality control Statistical Process Control
1930-1950s	Human relations school	Quality circles Team approach
1960-1970s	Systems theory	Total quality control
1970-1980s	Strategic planning	Proactive customer focus
1980-1990s	Quality management	

Inspection of finished goods before shipment is a long standing manufacturing practice, starting as early as the 19th century with the advent of mass production. The inspection activity was described by the father of scientific management, F.W. Taylor, in the early 1900s, as one of the essential tasks of the production foreman.¹ In 1922, G.S. Radford

1. Much of the historical information on the quality movement is from "History and Evolution of the Quality Movement" by David A. Garvin, in *Readings in Total Quality Management*, ed. Harry Costin (New York: Harcourt Brace, 1994).

published *The Control of Quality in Manufacturing*, which established quality control as a distinct management function.² However, a truly scientific approach to quality control only emerged with the work of W.A. Shewhart in 1931, which introduced the use of simple statistical methods for monitoring and evaluating day-to-day production.³ Much of this work survives to this day in the various applications of Statistical Process Control, a fundamental component of QM. The influence of scientific management can therefore readily be discerned in the genesis of the quality movement.

The state of the art went essentially unchanged until the early 1950s. Quality management at this time continued as a separate and distinct specialty, the domain of quality control technicians and engineers. However, the next phase in the evolution of the quality movement took quality control from a narrow manufacturing activity to one with broader implications for management. The major contributors in this period, Deming, Juran and Feigenbaum, introduced two new fundamental ideas:

- the expansion of quality concerns to all aspects of company operations, and;
- the role of workers in achieving quality.

2. G. S. Radford, *The Control of Quality in Manufacturing* (New York: Ronald Press, 1922).

3. W. A. Shewhart, *Economic Control of Quality of Manufactured Product* (New York: D. Van Nostrand Company, 1931).

The former, best illustrated by Feigenbaum's Total Quality Control, is related to the systems view of organizations, which also started appearing in the literature in the 1950s, while the latter is influenced by the human relations school of management.⁴

This movement can be traced back to the Hawthorne experiments in 1927-33, through to Maslow's hierarchy of needs and McGregor's Theory X and Theory Y in the early 1960s.⁵ The idea that most workers have the capacity to exercise a high degree of imagination and creativity in the solution of organizational problems, a quintessential Theory Y assumption, is prominent in Deming's view of workers as thinking participants in the production process rather than automatons. "People are born with intrinsic motivation, self-esteem, dignity, curiosity to learn, joy in learning."⁶ Over this period, the systems approach and the human relations school both have had an impact on the quality movement.

Garvin points out that despite these changes, the approach to quality remained defensive, focussed on the prevention of defects.

"Quality was still viewed negatively - as something that could hurt a company if ignored - rather than as a possible basis for competition. This view finally

4. Armand V. Feigenbaum, "Total Quality Control," *Harvard Business Review* (Nov-Dec 1956): 94-98; Kenneth E. Boulding, "General Systems Theory - The Skeleton of Science," *Management Science* 2 (April 1956): 197-208.

5. Richard Daft and Patricia Fitzgerald, *Management* (Toronto: Holt, Rinehart and Winston of Canada Ltd., 1992): 43-44; Abraham F. Maslow, "A Theory of Human Motivation," *Psychological Review* 50 (1946): 370-396; Douglas McGregor, *The Human Side of Enterprise* (New York: McGraw-Hill, 1960).

6. Edward Deming, introduction to *The Fifth Discipline The Art and Practice of the Learning Organization*, by Peter Senge (New York: Doubleday Currency, 1990).

changed in the 1970s and 1980s, when the strategic aspects of quality were recognized and embraced."⁷

Here again developments in the quality movement parallel mainstream management theory, where strategic management made a breakthrough in the 1970s and 1980s. Contingency theory, which postulated that every situation called for its own management response, had taken the systems approach to its limit and left management theory aimless and without fixed reference points.⁸ Strategic planning emerged as the new approach, which emphasized the attainment of goals and objectives set in reference to the threats and opportunities perceived in an organization's environment and to its organizational values. At this point, mainstream and quality movement literatures started to converge, at least as regards the theme of listening to the voice of the customer.

Competitive strategies based on product differentiation, with quality as a differentiating variable, became the best practice standard along with the achievement of excellence.⁹ The quality movement, and in particular its Japanese vanguard, had evolved into a comprehensive approach to achieving both objectives, differentiation and excellence. This set of practices was known as Total Quality Control in Japan, and became Total Quality Management in North America. Incorporating elements from scientific

7. Garvin, *Readings in TQM*, 41- 42.

8. Fred Luthans, "The Contingency Theory of Management: A Path out of the Jungle," *Business Horizons* 16 (June 1973): 62-72.

9. Michael E. Porter, *Competitive Strategy* (New York: The Free Press, 1980); Thomas J. Peters and Robert H. Waterman, *In Search of Excellence: Lessons from America's Best-run Companies* (New York: Harper & Row, 1982).

management, the human relations school, systems theory and strategic management. QM, after decades of parallel evolution with mainstream management theory, had emerged as the leading edge of management thinking and has since become the dominant management paradigm.

Quality Management Defined

Management strategies that emphasize innovation and quality have been discussed extensively in the literature. There is a voluminous management literature on the subject, some of it academic. There is also a strand in the political economy literature that deals with the subject and, in this body of work, the implications of these strategies for workers and wages are a point of considerable interest. Piore and Sabel were among the earliest to theorize on this new mode of production, coining the term *flexible specialization* to describe it.¹⁰ According to Mahon, in the flexible specialization mode of production, "new techniques are applied in ways that demand intelligent human intervention...to turn out a range of innovative products destined to fill new niches in an increasingly differentiated market".¹¹ An alternative model is found in Streeck, where it is labelled "diversified quality production".¹²

10. M. J. Piore and C. Sabel, *The Second Industrial Divide: Possibilities for Prosperity* (New York: Basic Books, 1985).

11. Mahon, "From Fordism to ?" 15.

12. W. Streeck, "On the Institutional Conditions for Diversified Quality Production," in *Social Institutions and Economic Performance: Studies of Industrial Relations in Advanced Capitalist Economies*, ed. W. Streeck (Newbury Park, Ca.: Sage Publications, 1992).

These strategies are part of a larger set of management practices, which can be understood as a series of choices made by organizations along four key dimensions: strategy, technology, structure and human resources.¹³ A number of practices can be defined under each of these headings.¹⁴ Choices made in one dimension tend to condition choices made in the other three so that practices tend to coalesce in typical clusters.¹⁵ For example, a strategic choice to compete on high volume/low price would be accompanied by the use of mass production technology, which requires a particular organizational structure, which in turn implies a particular set of human resource management practices. The history of management science has been a series of prescriptions concerning the "one best way" to articulate these choices. The contemporary synthesis of these prescriptions is a set of practices variously labelled "total quality management", "continuous improvement" or, in the language of the Japanese birthplace of this movement, *kaizen*. This configuration, or clustering, of practices emphasizes unconditional customer satisfaction, achieved through the continuous improvement of production processes, requiring extensive involvement and empowerment of workers.

These attributes define the four building blocks of the conceptual model that I have developed to analyse QM and that form the basis for the remainder of this chapter: customer focus, process improvement, employee involvement and leadership (Figure 1).

13. E. Kast and J. E. Rosenzweig, *Organization and Management: A Systems Approach* (New York: McGraw-Hill, 1970).

14. P. Johanis, "The Managerial Determinants of Competitiveness" (master's thesis, École nationale d'administration publique, 1993).

15. D. Miller and P. H. Friesen, *Organizations: A Quantum View* (Englewood Cliffs, NJ: Prentice-Hill, 1984).

In this framework, customer focus is the driving preoccupation of the organization, with customer satisfaction its overriding objective. This is achieved through continual process improvement, which requires the active participation and commitment of employees. The employees are provided the proper tools and environment by the organizational leadership and by the signals as to customer wants and needs through a feedback loop from customers back to the organization. This framework will be used to identify and organize specific, measurable practices throughout this chapter.

Figure 1 Conceptual model of QM

Other definitions of QM found in the literature can be reduced to these basic elements.

For example, the Malcolm Baldrige Award framework comprises seven blocks, related to our four as shown in Table 2.2.

Table 2.2 Comparison of Baldrige QM criteria and dissertation QM model

<i>Dissertation QM model</i>	<i>Baldrige criteria</i>
Customer focus	Customer focus and satisfaction
Process improvement	Management of process quality
Employee involvement	Human resources management and development
Leadership	Leadership Strategic quality planning

The two Baldrige criteria that are not shown above are the "Information and analysis" criterion, which is incorporated in my framework as a set of practices in each of the four categories, while the Baldrige "Quality and Operational Results" category does not refer to principles or practices but rather to measures of outcomes for the purpose of the award.

A sampling of other definitions of QM consistently include similar elements, for example, Leslie Kossoff's definition:

"The unrelenting pursuit of continuous improvement throughout an organization which is realized by accessing and utilizing the concerted knowledge and experience of managers and employees at all levels in a data-driven, cooperative, coordinated and systematic approach."¹⁶

Process improvement, employee involvement and leadership are identifiable in this definition, though, curiously, not customer focus. In contrast, customer focus is the first

16. Leslie L. Kossoff, *Closing the Gap: The Handbook of Total Quality Implementation* (Newport Beach, Ca.: LK Associates, 1993): 42.

of Jablonski's six principles of QM, which also include focus on process as well as results, prevention versus inspection, mobilizing the expertise of the workforce, fact-based decision making and feedback.¹⁷ In the Conference Board's report "Customer Satisfaction Through Quality", the four principles of QM are to maximize employee potential, integrate the efforts of all players in the process leading up to the end user, improve continuously and manage by fact.¹⁸ The latter two definitions incorporate customer focus, process improvement and employee involvement but do not explicitly include leadership practices.

For the purpose of this dissertation, QM will be defined as an approach to managing an organization in which customer satisfaction is sought through the continuous improvement of processes, brought about by the active involvement of workers, who are enabled in their task by the organizational leadership.

This basic model can accommodate most contemporary management concepts and techniques, which appear under a multitude of labels and "buzzwords". Many of these will be described and related to the basic model (Table 2.3).

17. Joseph R. Jablonski, *Implementing TQM: Competing in the Nineties Through Total Quality Management* (New York: Pfeiffer and Company, 1991): 24.

18. Catherine Johnston and Mark Daniel, *Customer Satisfaction Through Quality: An International Perspective* (Ottawa: The Conference Board of Canada, Report 74-91-E, October 1991): vii-xix.

Table 2.3 QM and contemporary variants

	<i>Customer focus</i>	<i>Process improvement</i>	<i>Employee involvement</i>	<i>Leadership</i>
<i>Contemporary variants</i>	Anticipated wants and needs	Business process re-engineering Benchmarking Quality Function Deployment Just-in-time	Self-directed teams	Workplace democracy
	Accelerated market penetration	Concurrent engineering Flexible manufacturing		

Each of the four components of the basic model will now be described, along with the contemporary variants shown above. Under each category, a number of specific, observable practices will be defined, from which indicators of QM will be derived.

Customer focus

Under QM, the unequivocal purpose and mission of an organization is to serve its customers well. QM starts with customer wants, and at a minimum, the customer wants

defect-free products or services. In classical QM, this means producing to specifications.

This is the narrow definition of quality, as expressed by Crosby:

"Requirements must be clearly stated so that they cannot be misunderstood. Measurements are then taken continually to determine conformance to those requirements. The nonconformance detected is the absence of quality."¹⁹

Juran takes the notion of quality further with the concept of "fitness to use", having five dimensions: quality of design (for example, luxury product versus low end product), quality of conformance, availability to the customer (that is, durability and maintainability), safety and field use.²⁰ Another list of quality criteria is offered by Hall: form, fit, function, reliability, consistency.²¹

However, in the end, the customer is the final arbiter of quality. Therefore, rather than attempting to define quality in terms of the attributes of a product or service itself, it is more fruitful to define it in terms of customer satisfaction in relation to each of these attributes. Customer satisfaction exists where there is congruence between a customer's expectations concerning a product or service and his or her actual experience of the product. Expectations are formed in reference to other similar products, most often with price as the yardstick. In other words, for the same type of product, there is an expectation

19. Philip Crosby, *Quality is Free* (New York: Mentor Books, 1980): 15.

20. Artemis March, "A Note on Quality: The Views of Deming, Juran and Crosby," in *Readings in Total Quality Management*, ed. Harry Costin (New York: Harcourt Brace, 1994): 143.

21. Robert W. Hall, *Attaining Manufacturing Excellence* (Homewood, Illinois: Dow-Jones Irwin, 1992): 46.

that quality will vary with price. This price/quality ratio is the key theoretical summary variable that determines customer satisfaction.

This introduces the sometimes controversial question of the ultimate objective of quality management strategies: are they intended to reduce costs (lower prices) or to improve quality? Satisfying the customer is a basic survival strategy in an ever more competitive marketplace. As competition will be over the relative price/quality ratios of similar products, reducing costs and improving quality can, and must, be pursued simultaneously. This is a fundamental insight of the quality movement. As the title of Philip Crosby's book states, *Quality is Free*, or, more accurately, the costs of non-quality are higher than the costs of quality improvement.²²

Customer focus under contemporary QM expands the notion of customer satisfaction to a greater number of dimensions of quality. For example, Garvin's definition of quality has eight dimensions: performance, features, reliability, conformance, durability, serviceability, aesthetics and perceived quality.²³ However, perhaps the most significant new dimension of quality is time.

22. Crosby, *Quality is Free*.

23. Harry Costin, "Exploring the Concepts Underlying Total Quality Management," in *Readings in TQM*, 12.

"Looking more closely at the question of user value, we find the following characteristics:

- Quality: expressed in terms of features of products and services that are consistently valued by users;
- Cost: the sacrifice required of the user (in terms of money, time, risk, or self-esteem)
- Schedule: the delivery of user-valued features in the correct quantity, time, and place."²⁴

As process capabilities increase, the expectations of customers evolve from getting the desired quality at the right price, to getting exactly what they want at the right price but in six weeks, to getting exactly what they want at the right price tomorrow. The level of customer service that is now being pursued is the mass provision of customized products, "while U wait".²⁵

Another development in customer expectations concerns the distinction between products and services. Customer satisfaction is not the outcome only of the customer's experience with the core product, it is also the result of the customer's perception of how the core product is packaged, sold, distributed, delivered, promoted, installed, repaired, field-supported, upgraded and more.²⁶

24. William A. Band, *Creating Value for Customers: Designing and Implementing a Total Corporate Strategy* (New York: John Wiley and Sons Inc., 1991): 20.

25. According to the *Globe and Mail* (July 25, 1994, p.A18), Itami Knitwear of Japan offers a product service whereby customers can design their own fashions, the specifications of which are transmitted to an automatic loom, which produces a personalized outfit within hours.

26. Theodore Levitt, "Thinking about Management," quoted in Jim Clemmer, *Firing on All Cylinders: The Service Quality System for High Powered Corporate Performance* (Toronto: Macmillan Canada, 1992): 29.

Clemmer speaks of the "three rings of perceived value":

- the basic product or service;
- support;
- enhanced service.

The latter is a front line activity where the objective is to exceed customer expectations.

That the basis for future competition would be this total experience of product/service quality was also postulated by Chase and Garvin. "The manufacturers that thrive into the next generation, then, will compete by bundling services with products, anticipating, and responding, to a truly comprehensive range of customer needs."²⁷

This leads to the next aspect of the evolution of customer focus. The state of the art is no longer simply to *respond* to customer wants and needs, no matter how customized with respect to features, comprehensive with respect to services and demanding with respect to time, but to *anticipate* them. Market research techniques have become more and more sophisticated, with almost infinite market segmentation possibilities. Marketers have access to more data, for ever smaller areas, and have greater data processing capacities at their disposal than ever before. Such assets can be applied to market forecasting and the quest for anticipating customer needs. However, there is a view that product development through market research results mainly in incremental changes to existing products rather than in radically new product ideas. True innovation would result from more intuitive

27. Richard B. Chase and David A. Garvin, "The Service Factory," Harvard Business Review (July-August 1989): 62.

approaches, which call upon the creative genius of original thinkers. The creation of work environments that foster this kind of activity, whether in formal research and development departments or in informal special projects ("skunk works") anywhere in the organization, is an important new customer focus attribute.

For the purposes of this dissertation, specific, measurable customer focus practices will include the collection of information concerning customer satisfaction through surveys, focus groups or other forms of interaction; the canvassing of customer input into the design of new products; the establishment of customer service standards; the presence of an effective complaint resolution system; and the provision of information or assistance to customers through numerous means.

Process improvement

An insight of the quality movement is that everyone in an organization is a customer and a supplier at the same time. Customer satisfaction is not therefore the concern only of front line workers, those in contact with the end users of an organization's product, but of everyone in the process with respect to his or her immediate customer. This stems from the view of the organization as a set of interconnected processes, which introduces the next category of practices, process improvement.

According to the quality approach, a large proportion of defects (85% according to Deming) in output are the result of dysfunctional systems and processes rather than worker error.²⁸ Therefore, to achieve defect-free output, it is necessary to identify and correct the defect producing elements in the production processes. This first requires understanding the processes, both in general terms (i.e. understanding the organization as a collection of processes) and in their detailed operation. A large collection of practices has been developed to help analyse processes and identify dysfunctions. These include the so-called seven quality control tools: flow charts, cause-and-effect diagrams, control charts, histograms, check sheets, Pareto charts and scatter diagrams, most of which are methods of graphical presentation of statistical data. The use of simple statistical techniques, sometimes referred to as Statistical Process Control, is an important aspect of analysing production processes in a mass production context.

One consequence of viewing all organizational activities as part of a process is the realization that parts of the process lie upstream from the organization, that is in supplier organizations. As the quality of the organization's output is dependent on the quality of inputs provided by suppliers, an important element of QM is the nature of relationships with suppliers. These should be based on cooperation and trust, with quality as the prime focus, rather than on cost-based competition. Quality standards that must be met by suppliers before getting any business from a firm have become an integral part of the

28. Edward Deming, "On Some Statistical Aids toward Economic Production," in *Readings in TQM*, 96.

business landscape. The proliferation of company specific standards has led to the establishment of broad national and international quality assurance standards such as the International Standards Organization (ISO) 9000 series. Registration to such a quality assurance system is a basic requirement for doing business in many industries.

Improvement is sought at every stage of a process, including at the supplier end.

Continuous process improvement is an incremental activity, which applies the PDCA methodology, the Plan-Do-Check-Act cycle, sometimes called the Shewhart cycle or the Deming cycle. It is basically the application of the experimental model to production processes and is at the heart of Japanese process improvement.

"In the PDCA cycle, "plan" means to plan improvements in present practices by using statistical tools such as the seven tools of QC. "Do" means the application of that plan; "check" means seeing if it has brought about the desired improvement, and "action" means preventing recurrence and institutionalizing the improvement as a new practice to improve upon. The PDCA cycle goes round and round. No sooner is an improvement made than it becomes the standard to be challenged with new plans for further improvement. The KAIZEN process has been realized at its maximum."²⁹

The full power of this methodology would however not be realized if it was applied independently at each stage of a production process. Changes made at one stage would ripple across several downstream stages, creating a need for adjustment, for which they were unprepared. This kind of mutual adjustment can be achieved, however, through the

29. Masaaki Imai, *Kaizen* (New York: McGraw-Hill, 1986): 62-63.

use of cross-functional teams. In such teams, participants involved in different stages of a production process can work together to identify problems and develop solutions simultaneously rather than in a serial fashion.

Contemporary variants of QM include a whole range of additional approaches to designing and improving organizational processes. At the highest level, we speak of the transformation of whole manufacturing plants into "service factories."³⁰ At a middle level, we see the introduction of flexible manufacturing and manufacturing cells, self-contained modules capable of being assembled and re-assembled in a variety of production processes. Many terms that have found their way into the current lexicon can be understood as process improvement innovations: business process reengineering, quality function deployment, just-in-time, concurrent engineering and a whole variety of other time compression strategies. A number of such major innovations will be briefly reviewed in this section. The innovations discussed are business process reengineering, benchmarking, quality function deployment, just-in-time, concurrent engineering, flexible manufacturing and accelerated market penetration.

30. Chase and Garvin, "The Service Factory".

Business Process Reengineering

One of the buzzwords associated with QM is business process reengineering, originating in the 1980s with Michael Hammer.³¹ Continuous process improvement is essentially an incremental approach. A large number of small, doable improvement projects, requiring detailed knowledge of production processes and their outcomes, are conducted over time, leading to an ever growing reduction in defect rates. In pursuing the continuous process improvement objectives of QM, it became apparent to some organizations that their processes were or had become so misaligned with their customer service objectives that a clean slate approach was preferable to an incremental approach. Starting with a clean slate to redesign a process based on customer service objectives came to be known as business process reengineering. A reengineered process then becomes a suitable candidate for ongoing incremental improvement. (It is almost certain that a process which has gone through the wrenching trauma of reengineering, however necessary, will be in need of incremental improvement over a more or less extended breaking-in period.)

31. Michael Hammer, "Reengineering Work: Don't Automate, Obliterate," *Harvard Business Review* (July-August 1990).

Benchmarking

Another non-incremental way of gaining insight into process improvement possibilities is through benchmarking. Benchmarking is defined as "the search for industry best practices that lead to superior performance."³² In other words, it means learning from the experience of others, discovering what is possible from the observation of the practices of industry leaders. There are echoes here of Deming's observation that "workers know all there is to know about their work except how to improve it. Help toward improvement can only come from some other kind of knowledge", and such help may come from outside the company.³³ Benchmarking can be oriented to practices or to metrics, that is to measurements or quantifiable goals. For example, a benchmarking study conducted by Company X can determine Company Y's unit cost for a certain item, which is set as a goal. This is known as benchmarking metrics. The difference between Company X and Company Y's unit cost is the benchmark gap. How to close the gap is revealed by benchmarking practices, that is finding out why Company Y can achieve a lower unit cost. This is where opportunities for radical process improvement arise.

32. Robert C. Camp, *Benchmarking: The Search for Industry Practices that Lead to Superior Performance* (Milwaukee: Quality Press, ASQC, 1992): 12.

33. Edward Deming, "On some Statistical Aids toward Economic Production," in *Readings in TQM*, 95.

Quality Function Deployment

Quality Function Deployment (QFD) is a method of ensuring that customer expectations are communicated effectively through all stages of product or service design, development and implementation. With the emphasis shifting to quick response to customer expectations, such techniques have become instrumental in maintaining a competitive edge. Through QFD, all production processes, from design through manufacturing, are aligned on explicit statements of customer expectations. As Hauser and Clausing put it, it is a way for marketing and engineering to talk to each other.³⁴ The technique relies on the use of a series of matrices, starting with one that relates individual customer wants with respect to a product or component to specific design characteristics. Additional information concerning the relative importance of customer expectations, costs of engineering characteristics and comparisons with competitors enable members of cross-functional teams to make trade-offs and reach consensus on design parameters. A similar exercise can then be carried out downstream in the production process, first with agreed upon engineering characteristics and parts characteristics as the axes of the matrix, then with parts and key process operations, then with key process operations and production requirements, thus taking the voice of the customer right through from design, to parts deployment to process planning to production planning. As a process improvement practice, the main benefit of QFD is the improvement of cross-functional

34. John R. Hauser and Don Clausing, "The House of Quality," *Harvard Business Review* (May-June 1988): 63-71.

communications, leading to better designs, fewer product changes and decreased start-up problems. QFD is essentially a support to the effective operation of cross-functional teams, a basic element of QM.

Just-in-time

Another recent set of process improvement innovations can be included under the umbrella of "just-in-time". Originally thought of in North America as an inventory management technique aimed at saving storage space, it is also presented as a broader set of practices, based on a philosophy of trust and cooperation.³⁵ Some in fact consider JIT as a complete system of management, with the same scope as QM.³⁶ Applied originally to the manufacturing stages only, JIT principles can be adapted to other parts of the value chain: new product development, engineering, customer service, logistics and distribution. JIT deals with workplace organization and stresses simplicity and the elimination of waste. Implementing JIT means clearing the workplace of all unnecessary materials, simplifying the workflow, relocating operations and materials in such a way as to support the streamlined workflow and keeping the work environment clean. A major objective of these activities is visibility, a basic principle of JIT. The workplace should offer visual clues of exactly what is going on and what needs to be done.

35. Joseph D. Blackburn, "Just-in-time: The Genesis of Time Compression," in *Time Based Competition: The Next Battleground in American Manufacturing*, ed. Joseph D. Blackburn (Homewood, Illinois: Business One Irwin, 1991): 25-27.

36. Helene S. Fine, "Just-in-Time: A Production System Built on a Code of Ethics," in *Readings in TQM*, 269-275.

"Visibility is a minimum-cost database made up of the real thing. Its major purpose is instant response from anyone who should take action. Visibility is akin to immediate feedback."³⁷

Visibility is achieved through the layout of production operations, posted schedules, signal lights and other visual clues such as the cards used in the production control system known as *Kanban*. In such a workplace, production is "pulled" through the system, rather than "pushed". Basic rules of such systems are to provide simple, visible means of limiting the inventory of each item, make only what is necessary and locate each part in only one place.³⁸ However, the radical innovation of JIT is its focus on time: set up time, cycle time, throughput time. Reducing set-up time or changeover time (the time required to install the proper tooling for a production run) is considered a fundamental step in JIT implementation. "Ideal Just-In-Time production is only a dream unless setup time is reduced."³⁹ Achievement of reduced setup times, through a PDCA process improvement strategy, opens the door to shorter production runs and flexible manufacturing, making possible mass customization.⁴⁰ It also leads the way to the full panoply of time compression techniques, that is techniques that aim to radically reduce the time required to complete production processes. These include concurrent engineering, flexible manufacturing and accelerated market penetration.

37. Hall, *Attaining Manufacturing Excellence*, 88.

38. *ibid.*, 95.

39. Taiichi Ohno, quoted in Blackburn, *Time-based competition*, 43.

40. Shigeo Shingo, *A Revolution in Manufacturing The SMED System* (Cambridge, Mass.: Productivity Inc., 1985). SMED stands for "single minute exchange of die".

Concurrent engineering

Concurrent engineering basically results from the application of JIT to the new product development (NPD) process. One of the initial processes in the value chain, NPD can be thought of as comprising the following stages: concept generation, product planning, product design, product engineering, process engineering, pilot tests and production ramp up.⁴¹ One of the principal causes of wasted time in this process is excessive design changes due to inadequate or incomplete manufacturing information available to product designers and engineers. This is where "design for manufacturing" fits in, ensuring that manufacturing input is received at the front-end rather than later in the process. QFD and other similar cross-functional processes can be used to this end. However, another source of time wasting in this process is its execution in a sequential order rather than in an overlapping, concurrent fashion. This is where JIT concepts can be applied. The NPD process is essentially an information flow, punctuated by problem resolution nodes. If the process can be cleared, simplified and made visual, it may be possible to reduce information "batch sizes" and start on the next step in the process before the previous step is 100% complete. For example, it is possible to start the product engineering step before the product design is complete by breaking the product down into components. This is the essence of concurrent engineering and it can achieve remarkable reductions in new product development cycle times. However, it also calls upon improved cross-functional

41. Joseph D. Blackburn, "New Product Development: The New Time Wars," in *Time-based Competition*, 128.

communication and cooperation and multi-skilled and flexible employees, capable of operating under conditions of some ambiguity.⁴²

Flexible manufacturing

In the manufacturing stage, the most common expression of time compression is flexible manufacturing, that is the ability to produce short runs of a variety of product lines with the same physical plant. As we have seen in the discussion of JIT, the key to achieving flexible production is the reduction in setup time. The adoption of fast changeover time processes, such as Single Minute Exchange of Die (SMED), speeds up the throughput of the manufacturing phase.

Accelerated market penetration

In a recent article in the Sloan Management Review, Robertson extends time compression principles beyond product development and manufacturing to distribution and marketing.

"Everyone is speeding products to market these days. But reducing product development time is only half of the equation: the other half is penetrating the market quickly".⁴³

42. Ellen B. Domb, Robert C. Culver and Richard H. Rawcliffe, "Organizational Impact of Introducing Concurrent Engineering," in *Readings in TQM*, 351-359.

43. Thomas S. Robertson, "How to Reduce Market Penetration Cycle Times," *Sloan Management Review* (Fall 1993): 87-96.

Achieving reduction in "time to market acceptance" is seen as a source of competitive advantage that remains to be exploited. In a truly "pull" system, with individual customization and instant delivery, this is not an issue. Market acceptance is acquired before production begins. However, even in small batches, there remains a role for traditional marketing: distribution, pricing and promotion strategies affect the speed at which new products achieve their maximum sales potential. Gradual market penetration, with test markets followed by product launches by region is a strategy of the past. Imitation and rapid NPD by competitors could easily capture the market first. Robertson offers five basic guidelines for reducing market penetration time: reach the market first: preannounce the product before market availability: innovate constantly: occupy the market - multiple brands, positioning, segments and alliances: track market penetration by stage of the purchase decision process. Explicit application of JIT principles could perhaps elicit more insights in terms achieving time reduction in this area as well.

Summary of process improvement measures

From this review of process improvement approaches and techniques, the following practices will be retained as part of the QM indicator for this dissertation: using statistical process control; requiring suppliers to meet quality standards: being registered to a quality assurance system such as ISO 9000: benchmarking: performing self-assessment against quality criteria such as the Baldrige Award criteria: and, using the PDCA cycle in cross-functional teams to develop process improvements.

Employee involvement

The third building block in the model of quality management presented in this dissertation is employee involvement. The analytical activities required to identify and correct defect producing elements in production processes have in common the need for an intimate knowledge of these processes, a level of detailed knowledge only attainable by actually doing the work. Only production workers possess this level of knowledge, hence the importance of employee involvement. The human relations component in QM is not invoked out of altruism or any particular moral conviction. Rather, it is to deal with this information gap, essentially a principal-agent problem. To achieve continuous improvement in processes, and therefore to better serve customers, it is essential that workers bring to bear their detailed knowledge of the processes.

In the earlier stages of QM, employee involvement was limited to providing information. Action was to be taken by management. This is clear in two of Deming's 14 points. Point 7, "Institute modern methods of supervision", requires that foremen be empowered to inform upper management about conditions that need attention and that once informed, management take action. Point 8, "Drive out fear" calls for the cultivation of a climate in which workers are not afraid to report problems and offer suggestions. As management styles evolved over time, more and more action potential was devolved to foremen and production workers, especially in the context of cross-functional teams.

In some cases, for example the Baldrige criteria, recognition and reward systems are included as QM best practice, which raises an important debate on the role of reward systems in QM. If employee involvement is essential, what incentives are there for workers to participate in what, in the end, is management's job? If information is power, and the workers, consciously or not, have the information, what would compel them to surrender it, and with it, power?

The terms of the debate are well stated by Peter Senge:

"Intrinsic motivation lies at the heart of Deming's management philosophy. By contrast, extrinsic motivation is the bread and butter of Western management. The holiest of the holy for the American manager, "People do what they are rewarded for", is actually antithetical to the spirit of quality management."⁴⁴

Clearly, exhortation alone, in the form of slogans, encouragement or special events, as advocated in the zero defect approach, is not enough in that it provides no incentive.⁴⁵

Extrinsic motivational factors, such as prizes, bonuses and rewards for specific actions, tend to lose their effectiveness over time and create competition and resentment among co-workers rather than cooperation. Intrinsic motivational factors seem to have more power but also seem to vary widely across individuals, complicating the task of structuring incentives appropriately. For example, Deming puts his faith in the worker's pride in a job well done. Appropriate incentives therefore involve "removing barriers that

44. Peter Senge, "Building Learning Organizations," in *Readings in TQM*, 61.

45. Crosby, *Quality is Free*.

hinder the hourly workers", his Point 12. These barriers include lack of feedback on the quality of the work done, numerical quotas, defective parts and materials and inadequate maintenance. For Maslow, self-actualization or realizing one's full potential is the ultimate motivating factor. Incentives built upon this foundation would involve providing opportunities for self-improvement and promotions. For Senge, learning is a natural instinct of humankind.

"If left to their own devices, people will naturally look for ways to do things better. What they need is adequate information and appropriate tools. From the intrinsic perspective, people's innate curiosity and desire to experiment, if unleashed, creates an engine for improvement that can never be matched by external rewards."⁴⁶

The incentive structure in this case involves building a learning organization, a milieu that fosters and encourages learning in all its forms.

On a less idealistic level, a powerful source of motivation for employee involvement in process improvement is organizational survival. If an organization is threatened with extinction as the result of competition, employees can be galvanized into action.

However, such duress can also motivate workers (usually the best, most employable) to leave the organization for one with a more promising future. Such situations can also lead to the paradoxical case where workers are asked to participate in a streamlining activity that will eventually eliminate their own jobs, a very ill-conceived incentive structure.

46. Senge, "Building Learning Organizations," 62.

Finally, a more modest theory can be based on the issue of frustration in the workplace. For most workers, it is bad enough that they must work for a living, the situation is made much worse if their experience at work is frustrating due to confusion, dysfunctional systems and processes or customer dissatisfaction. Workers might be motivated to participate in improving the quality of their work life through the elimination of irritants caused by such dysfunctions.

This issue of incentives for employee participation in process improvement is fundamental to QM and the absence of an appropriate incentive structure is likely at the root of the difficulties reported with sustaining a quality transformation over time.⁴⁷

Almost all contemporary QM process improvement innovations have in common an increased role for employees. Their participation in complex interpersonal interactions with other workers from the far-flung corners of the enterprise is essential in QFD, JIT and the various time compression strategies. This may have implications for the human resource management practices and policies of organizations that seek to implement these innovations. Contemporary QM variants call upon a new approach to employee involvement, self-directed teams. We will also examine the ultimate employee involvement strategy, which may be on the horizon, workplace democracy.

⁴⁷ Clemmer, *Firing on All Cylinders*, 41; Hall, *Attaining Manufacturing Excellence*, 48; Kossoff, *Closing the Gap*, 33.

Self directed teams

One human resources management response to the requirement for more involvement, initiative and creativity on the part of workers is the establishment of self-directed teams. These differ from the process improvement cross-functional teams discussed above by the fact that the latter are permanent and constitute the fundamental building block for their organizations whereas the former are temporary, disbanding once their initial purpose is achieved.⁴⁸ The self-directed team is a formal organizational entity that performs all the activities required to complete the value-adding transformation process for which it is responsible.

"Work teams plan, set priorities, organize, coordinate with others, measure, and take corrective action - all once considered the exclusive province of supervisors and managers. They solve problems, schedule and assign work, and in many cases handle personnel issues like absenteeism or even team member selection and evaluation."⁴⁹

In order to be effective, self-directed teams need to be empowered. This means that decision-making authority must be delegated to teams, that teams must be held accountable, that they must align themselves to organizational objectives and must also develop their "ableness".⁵⁰ Such a workforce organization reflects a whole new organizational paradigm. Rather than being organized according to vertical, functional

48. Michael J. Brower, "Implementing TQM with Self-Directed Teams," in *Readings in TQM*, 405.

49. Zenger, Musselwhite, Moran and Orsburn, quoted in Clemmer, *Firing on All Cylinders*, 80.

50. Brower, "Implementing TQM," 407.

specialization, the organizing logic for these organizations is based on horizontal, multi-functional work processes: for each process, a multi-disciplinary team. The result is a much flattened hierarchy, but a hierarchy nonetheless. The self-directed team approach does not necessarily do away with hierarchy. Browner speaks of a team leader, a middle manager to whom the team is accountable and of executive leadership. Gerwin and Moffat report that the development of large technologically complex products requires hierarchies of teams operating at different levels.⁵¹

Workplace democracy

The ultimate expression of employee involvement is the self-organizing workplace comprised of nothing but workers. The most famous example of such an approach is Semco, the employee run company owned by Ricardo Semler, who wrote about this experiment in "Managing without Managers".⁵² The phenomenon of self-organization in social groups is also of interest to so-called chaos theorists, some of whom see a link between creativity and innovation and this anarchic form of organization.

"New patterns of behaviour emerge without prior shared intention when a system is pushed far from equilibrium to the edge of chaos... When organizations show innovative and creative changes, when they are renewed, it will be as a result of the spontaneous self organization of people within an informal system that

51. Donald Gerwin and Linda Moffat, "Authorizing and De-authorizing Processes for New Product Development Teams" (School of Business, Carleton University, 1994).

52. Ricardo Semler, "Managing without Managers," *Harvard Business Review* (September-October 1989).

shadows the formal one. The processes they employ will be those of competitive and cooperative political interaction."⁵³

This innovation is for the time being more theoretical than actual and would occur rarely in any business population. For the purposes of this dissertation, more traditional employee involvement practices will be considered such as the provision of quality training for employees; the participation of employees in the development of quality improvement plans; the dissemination by various means of information concerning such plans to all employees; the presence of employee suggestion systems, the use of recognition and reward systems; and, the conduct of surveys on employee satisfaction.

Leadership

Leadership issues are closely intertwined with the employee involvement issues discussed above. It is the role of the organizational leaders to put in place the incentive structure that will secure the employee involvement essential to continuous improvement. This will most often mean "making space" for innovation, risk-taking and open communications to occur. Management also exercises leadership by establishing and maintaining management systems that align the company's structures, policies and resources with the objective of client satisfaction.

53. Ralph Stacey, "The Role of Chaos and Self-Organization in the Development of Creative Organizations" (paper presented at the Chaos and Society Conference, Hull, Quebec, June 1-2, 1994).

"They create, monitor and continuously improve the management systems that enable employees to satisfy customers. In the companies visited, senior management recognized the need for change, built the organizational consensus on the direction of change, and became actively involved in ensuring that resources remain focussed on achieving the four management principles."⁵⁴

The active and visible involvement of senior management is reported in many sources as an essential feature of a successful transition to QM. For example, in the 1993 Baldrige examination, the Senior executive leadership criterion includes the following areas to address:

"a) senior executives' leadership, personal involvement, and visibility in quality related activities in the company. Include: (1) reinforcing a customer focus; (2) creating quality values and setting expectations; (3) planning and reviewing progress toward quality and operational performance objectives; (4) recognizing employee contributions; and (5) communicating quality values outside the company".⁵⁵

The implications of self-directed teams for leadership approaches and practices are substantial. Managers must make themselves more and more scarce in their "leader" role, more and more available in their assistance, teaching and support role. In such organizations, everyone works for the front line worker, who is a surrogate for the customer. This involves the development of new skills for managers: the ability to develop self-motivating people, to get diverse groups to carry out their own ideas, to build teams that manage more of their own work, to champion new improvement ideas

54. Johnston and Daniel, *Customer Satisfaction Through Quality*, ix.

55. 1993 Malcolm Baldrige examination criteria, Leadership category, Areas to address.

and to sponsor innovation.⁵⁶ Alternatively, Brower sees the middle manager becoming a leader-coach.

"The leader-coach creates with others a compelling mission and vision, operates from principle rather than from self-interest of whim, delegates, listens and asks questions a great deal, invests time and effort in evoking and enabling the development of others, and is constantly observing and managing his/her own thoughts, actions and state."⁵⁷

To senior executives, he leaves the role of initiating the transition to this mode of organization, and not killing it once it gets started! The implications of the self organized workplace on leadership practices are even more dramatic: the organization operates effectively without extrinsic leadership, that is without managers.

Such a radical transformation of the workplace may not be very prevalent at this time, nor may it ever achieve a dominant position. It is nevertheless the logical extension of the current trend toward greater employee empowerment. No less an authority than Peter Drucker writes, in *The New Realities*:

"The typical large organization, such as a large business or a government agency, 20 years hence will have no more than half the levels of management of its counterpart today, and no more than a third the number of 'managers'." ⁵⁸

56. Clemmer, *Firing on All Cylinders*, 88.

57. Brower, "Implementing TQM," 416-417.

58. Peter Drucker, *The New Realities: in government and politics, in economics and business, in society and world view* (New York: Harper, 1989).

For the purposes of this dissertation, leadership practices used to derive indicators of QM will include integrated quality improvement planning, also known as *Hoshin* planning; personal involvement in the development and regular updating of these plans; the conduct of regular meetings on quality; training for managers on quality issues; and, skills development programs in team-building and coaching.

Conclusion

Quality is no longer the exclusive concern of quality control departments. It now permeates the strategy and structure of private and public organizations, at least in rhetoric if not in action. What I have referred to as QM represents the latest synthesis of decades of management theory and is born of the convergence of what was once the quality movement and mainstream management theory. The depth of its genealogy suggests that it is no mere passing fad. Tried and tested over decades in the real-life laboratory of Japan, the principles and practices of QM provide a fully developed approach to management, which has something to offer for every kind of organization. That is not to say that it is universally adopted as the "one best way". Rather, various elements of QM are appropriated depending on the contingency factors facing organizations. This was true also of the management theories of the past. None were ever universally and uniformly applied. Rather, each represented a dominant paradigm, against which management practice was compared and adapted. So it is for QM today.

For the purposes of this dissertation, a set of measurable practices has been defined in each of the four categories of the conceptual model described above: customer focus, process improvement, employee involvement and leadership. Data on the extent of use of these practices have been collected and are at the heart of the analysis of the relationship between the adoption by firms of management strategies based on quality and the payment of higher wages. These data will be described in detail in the next chapter.

Chapter 3 - The data

The empirical data for this thesis have been drawn from several Statistics Canada surveys. The principal sources are two surveys of quality management (QM) practices conducted in the manufacturing sector in 1993 and in services in 1994 and the Prairie Provinces Wage and Salary Survey, 1996. Combined, these sources provide data on hourly wage rates for detailed occupational categories, by status, experience and firm size as well as data on management strategies.

The Quality Management Practices Surveys

The Quality Management Practices Surveys were conducted by Statistics Canada, on behalf of Industry Canada, in 1993 and 1994. The 1993 survey covered the manufacturing sector while the 1994 survey covered the services sector. Business services, telecommunications and wholesale and retail trade were targeted.

Respondents were asked in telephone interviews a set of questions on specific business practices. As Research Associate with the Small Business and Special Surveys Division of Statistics Canada, I developed the framework that guided the conversion of the survey responses to indicators on the use of 27 quality management practices in the manufacturing sector and 22 in the services industries, under the four headings, presented in the last chapter, of leadership, employee involvement, process improvement and customer focus (Table 3.1). The questionnaires and detailed rules for converting survey responses to QM practices are contained in Appendices 1 and 2.

Table 3.1 - Quality Management Practices

	<i>Manufacturing</i>	<i>Services</i>
Leadership		
Mission statement	x	x
Quality improvement plan	x	x
Management involvement	x	x
Meetings on quality	x	x
Quality training for managers	x	x
Assistance of consultant	x	
Quality support group	x	x
Employee involvement		
Employee input to plan	x	x
Communication of mission to employees	x	x
Assessment of training needs	x	
Quality training for employees	x	x
Employee suggestion system	x	x
Employee recognition and reward program	x	x
Measurement of employee satisfaction	x	x
Process improvement		
Registration to a QA system	x	x
Supplier standards	x	x
Statistical process control	x	
Problem solving teams	x	x
Benchmarking	x	x
Measurement of product quality	x	
Measurement of cycle times	x	
Measurement of waste scrap	x	
Process analysis		x
Customer focus		
Customer input into product design	x	x
Customer service standards	x	x
Market research	x	x
Customer satisfaction surveys	x	x
Complaint resolution system	x	x

The survey questions were not framed in QM terms, using QM jargon. Rather, they asked about specific workplace practices that could be objectively described and measured. The following response rates were obtained.

Manufacturing:¹

Sample:	1150
Contacted:	937
Completed:	787 (84%)

Business services:²

Sample:	1200
Contacted:	1033
Completed:	831 (80%)

Telecommunications:

Sample:	60
Contacted:	57
Completed:	51 (89%)

Wholesale and retail trade:

Contacted	479
Completed	405 (85%)

1. In the case of the manufacturing survey, the sample frame comprised all manufacturing establishments in Canada in 1993 with 20 or more workers, as recorded by the Annual Survey of Manufactures, a total of 16,032 establishments. A sample of 1150 cases was allocated across strata defined by industry (20 industries defined at the 2-digit Standard Industrial Classification, 1980), region (Atlantic, Quebec, Ontario, Prairies, British Columbia) and size (two groups: from 20 to 199 workers, and 200 and over).

2. In the case of the services survey, three separate samples were drawn. For business services, the stratification was based on industry and revenue size. In-scope industries included SIC 771 - Employment agencies and personnel suppliers, SIC 772 - Computer and related services, SIC 774 - Advertising services, SIC 775 - Architectural, engineering and scientific services and SIC 779 - Other business services. A sample size of 1200 companies was allocated among the strata, and an independent random sample drawn from each. For the telecommunications component, a census of the 60 telephone companies on the Annual Telephone Survey frame was conducted. Finally, in the case of the wholesale and retail trade sector, an experimental, non-scientific sample of 479 firms was selected, across 10 industries at the 3-digit level and three size groups. While not representative of the sector as a whole, the sample contained almost all large retailers (100 or more employees).

Even though respondents did not know exactly how their responses would be used to derive QM practices, one may suspect, however, that there may have been some over-reporting of certain "virtuous sounding" practices (for example, "does your company have customer service standards?"). There are several indications that any over-reporting may not have been important. For example, the survey estimate of the number of firms in the manufacturing sector that were registered under ISO 9000 is very close to the actual number (which can be compiled from a list of registered firms maintained at Industry Canada). Survey results were also consistent with other external evidence. Firms that were known to be active practitioners of QM (for example, winners of the Canadian Award for Business Excellence - now known as the Canadian Excellence Awards), reported using a high number of practices in the QM survey.³

The four surveys combined represent 2074 completed questionnaires, of which 288 were from firms located in the Prairie provinces.

3. In later surveys, using the same QM questionnaires and conducted in the federal Public Service, the samples were divided between management and employee panels. The estimated proportions of organizational units reporting the use of QM practices derived from either panel were not statistically different for almost all the practices. I therefore have confidence that responses in the earlier surveys were valid. See P. Johanis, *1995 Survey of Practices in Support of Quality Services in the Federal Public Service* (Ottawa: Statistics Canada, Cat. No.57-495MPE, 1995) and P. Johanis and S. Bourret, *1997 Survey of Practices in Support of Quality Services in the Federal Public Service* (Ottawa: Statistics Canada, Cat. No.57-495MPE, 1997).

The Prairie Province Wage and Salary Survey

The Prairie Provinces Wage and Salary Survey (PPWSS). 1996 was conducted by Statistics Canada on behalf of the Workers' Compensation Board of Alberta, Human Resources Development Canada and the Saskatchewan Department of Education. The objective of the survey was to obtain new information on wages paid by employers in different regions of Manitoba, Saskatchewan and Alberta, by detailed industry and occupation categories.

A pretest was conducted in May 1996, with the actual survey occurring in late 1996 and survey results released in September 1997. For reasons discussed below, this pretest will play an important role in the empirical work reported here. The survey was conducted as a sample survey, using a mail-out mail-back methodology with telephone follow-up for non-response.

The PPWSS followed a design previously used by Statistics Canada to collect information by detailed occupation (see the Survey on the Characteristics of Labour Demand in Quebec, 1995). This existing questionnaire was adapted for the collection of wage rate information.

Respondents were asked to provide the following information for each of up to 12 occupations in their establishments:

- Occupational title
- Union status
- Seasonality
- Start and end date of season
- Number of part-time workers
- Usual weekly hours of work of part-time workers
- Pay period reference for wage reported
- Six part-time wage rates, from starting level to maximum
- Number of full-time workers
- Usual weekly hours of work of full-time workers
- Pay period reference for wage reported
- Six full-time wage rates, from starting level to maximum
- Other cash compensation (average weekly amount)
- Basis of payment
- Expected vacancies over the next 12 months
- Planned new hires over the next 12 months

For the pretest, questionnaires were mailed out to the 288 employers in the Prairie provinces who had previously responded to the QM surveys described above. *Because data both on QM practices and on wage rates are available for these respondents, data*

collected in this pretest, linked with the data obtained earlier in the quality management practices surveys, form the principal data source for this dissertation⁴.

Data from the full survey will also be used, but only to validate the results obtained from the pretest sample. Field collection for the pretest occurred in May 1996. After the initial mail-out, there were no telephone follow-ups for non-response. The following response rates were obtained:

Manufacturing

Mailed out	102
Completed	52

Business services

Mailed out	117
Completed	36

Wholesale and retail

Mailed out	65
Completed	32

Telecommunications

Mailed out	4
Completed	2

4. As Research Associate with the Small Business and Special Surveys Division of Statistics Canada, I had the opportunity to perform this record linkage.

Of the 288 mailed out, 122 completed questionnaires were received. For each of these firms, then, the data contain the information collected in the two earlier surveys on their use of quality management practices, supplemented by detailed information on their wage rates, collected in the PPWSS pretest.⁵

Definition of variables

To facilitate processing and analysis, individual records were created for each occupation reported by a firm. In this way, the 122 questionnaires received produced 578 records, or an average of 4.7 occupations for each firm that responded. After edit and imputation, the clean data file contained 561 complete records, each representing an occupation-establishment pair. Each of these establishment-occupation pairs can contain as many as 12 wage rates, one for each of the 6 levels of experience, for both part-time and full-time jobs. As a result, 3892 wage rate records can be generated, an average of 6.9 wage rate observations per occupation.

The variables available for each of these wage rate records include:

- the hourly wage rate;
- the experience level associated with that rate;

5. It should be noted that there is a 2 to 3 year lag between the collection of data on QM practices and the data on wage rates. As a result, any lagged effect of QM implementation on wage rates should be apparent in the wage survey data. The relevance of this time difference will be apparent in Chapter 4.

- the occupation, full or part-time status and the union status associated with the job for which this wage rate is paid;
- the employment size, industry and extent of use of QM of the establishment in which the job is found.

The definition of each of these variables and basic descriptive statistics will be presented in this section.

Hourly wage rate

Hourly wage rates were calculated for all observations. Note that the wage rates in these data are associated with jobs, not individual workers. They are the wage rates employers have stated they pay or would pay for workers in particular occupations, with a particular level of experience. In the case of jobs covered by collective agreements, these data represent actual wage rates. For non-unionized jobs, there may be dispersion in actual wage rates around the reported wage rate.⁶

Wage rates were provided by firms according to the time period of their choice: hourly, daily, weekly, monthly or annually. Wages reported on an other than hourly basis were

6. For example, an employer may have reported that the hourly wage rate for workers after 2 years in a full-time, unionized job in a given occupation is \$10.00. This may be an actual wage rate, in the case where there are one or more workers in jobs fitting that description receiving only that rate. It might also be an estimate in the case where workers in jobs that fit that description are paid slightly different rates.

converted to hourly rates by using information on usual weekly hours of work, which was also collected in the questionnaire in reference to each declared occupation. As the usual hours of work per week were used to convert non-hourly to hourly rates, overtime is not accounted for in the survey results. Full-time daily rates were simply divided by 8.

Weekly rates were divided by the usual number of hours per week reported for the referenced occupation. Monthly rates were first multiplied by 12, to give an annual salary: total annual hours were calculated by multiplying the reported hours of work per week by 52. The ratio of annual salary to annual hours is then the hourly wage rate for these observations. For example, 40 hours per week translates to 2080 hours per year. Salaries reported on an annual basis were divided by 52 times the usual hours of work per week.

Converting all wage information to hourly wage rates eliminates the “hours” problem, in which differences in observed weekly or annual wages are caused by differences in hours worked. This is especially important as the polarization of hours worked may account for up to half the observed polarization of earnings, as reported in chapter 1. The conversion of all wage information to hourly wage rates will permit the identification of any polarization in wages, net of hours worked.

As just discussed, the information required to calculate an hourly wage rate for responses given on an other than hourly basis includes the unit of time used by the respondent and the usual hours of work per week. As there was item non-response for both variables, it

was necessary to impute for missing values (in less than 5% of the cases). Missing wage rates were also imputed when firms did not report a wage rate associated with a particular level of experience.⁷

After imputation, hourly wage rates were calculated and reviewed for anomalies. The first test was to examine any case where the calculated hourly wage rate was below \$4.00 or over \$40.00. The second test was to examine cases where the wage rates for higher levels of experience in a given occupation were lower than wage rates for lower levels of experience. Most of the errors identified were the result of manual or scanning capture errors and were corrected by obtaining the correct values obtained from the hardcopy questionnaires.

7. In the case of question 4 and 7 (hours of work, part-time and full-time) and questions 5 and 8 (time units of reporting, part-time and full-time), missing values were replaced by the most frequently reported value by the respondent. For example, if a respondent had reported information for five occupations, in three of which q7=40, one q7=35 and one was missing, then the missing value would be replaced by 40. Where usual hours of work were not stated for any of the reported occupations, the value "40" was assigned, for full-time wage rates, "20" for part-time wage rates.

In the case of questions 5ai to 5e and 8ai to 8e (starting wage up to maximum wage, part-time and full-time), a different imputation strategy was adopted. Where only one wage rate was reported, that rate was assigned across all questions. Where more than one wage rate was reported, the lower rate was imputed for missing values. The following table gives an example:

	Before	After
Starting wage, no experience	Value 1	Value 1
Starting wage, with experience	Missing	Value 1
Wage after 1 year	Missing	Value 1
Wage after 2 years	Value 2	Value 2
Wage after 3 years	Missing	Value 2
Maximum wage	Missing	Value 2

Only reported wages were used to impute missing wage rates and only for higher levels of experience. For example, a wage rate after 1 year would not be used to impute a missing starting wage but it would be used to impute a missing wage rate after 2 years.

Table 3.2 Descriptive statistics: Hourly wage rate

N=	3892
Mean=	\$12.84
Standard deviation=	\$6.07
Minimum	\$4.20
Median	\$11.54
Maximum	\$50.00
Mode	\$6.00

Level of experience:

Firms were asked to specify the level of experience associated with each wage rate they reported. The levels included starting level with less than six months prior experience, starting level with more than six months prior experience, after one year, after two years, after three years and the maximum level. This allows me to control for the effect of experience on wage rates within occupations. Every wage rate for an occupation within a firm is included in the data as a separate observation, with the experience variable defined with a value from 0 to 4 depending on whether the wage rate refers to a starting wage

(regardless of prior experience), a rate after one year on the job, after two years, after three years or a maximum wage rate.⁸

Table 3.3 Descriptive statistics: Experience level

<i>Experience level</i>	<i>Frequency</i>	<i>Percentage</i>
Starting level	1262	32.4
After 1 year	650	16.7
After 2 years	654	16.8
After 3 years	663	17.0
Maximum	663	17.0
Total	3892	100.0

The value "Starting level" is twice as frequent as the others because both the starting wage with at least 6 months experience and without experience were coded to this value. The wage rates associated with higher levels of experience are slightly more frequent because the imputation rules for partial non-response only permitted "upwards" imputation (see footnote 4). There remains therefore more partial non-response for wage rates associated with lower levels of experience.

8. It should be noted that the six wage rate observations for the same job in a given establishment are not independent as the wage rates associated with higher levels of experience are never less than those associated with lower levels of experience.

Occupation

Firms were asked to describe the jobs for which they reported wage rates by providing a job title and a brief description. These written responses were coded by Statistics Canada according the National Occupational Classification.⁹ This classification structure contains four levels: twelve major occupational groups are divided and subdivided into several hundred detailed occupations at the 4-digit level. Occupational wage rate data have been coded to this level of detail although, for the purpose of this research, only the 2-digit level detail was used. This increases the number of observations in each occupation, but increases the range of occupations that are coded in the same way. For the purposes of this dissertation, dummy variables were created for each of the 10 most frequent 2-digit occupations and for an "Other" category representing all others.

9. Human Resources Development Canada, *National Occupational Classification* (Ottawa: Supply and Services Canada, 1993)

Table 3.4 Frequency distribution of the Occupation variable

<i>Occupation</i>	<i>Frequency</i>	<i>Percentage</i>
Clerical	673	17.3
Professional, natural and applied science	155	4.0
Technical, natural and applied science	204	5.2
Intermediate sales and service	388	10.0
Elemental sales and service	149	3.8
Skilled trades	315	8.1
Skilled transport and equipment operators	270	5.9
Intermediate transport equipment operators	379	9.7
Processing and manufacturing machine operator	513	13.2
Labourers, processing, manufacturing, utilities	162	4.2
All others	684	17.6
Total	3892	100.0

Union status

Firms were asked if the occupations for which they were providing wage rate information were unionized. A dummy variable was defined, with value 0 for non-union and 1 for unionized occupations. Only 8 establishments reported wage information for both unionized and non-unionized occupations. In the other cases, all wage information reported was for either unionized or non-unionized occupations only.

Table 3.5 Frequency distribution of union status

<i>Union status</i>	<i>Frequency</i>	<i>Percentage</i>
Unionized	1189	30.5
Non-unionized	2703	69.5
Total	3892	100.0

Full or part-time status

Each wage rate is associated with either a full-time or a part-time job. Full-time hourly wage rates are paid for jobs that have usual hours of work of 30 or more hours per week while part-time hourly wage rates are paid for jobs with fewer than 30 hours of work per week. A dummy variable was defined, with values of 0 for part-time, 1 for full-time.

Table 3.6 Frequency distribution of full- or part-time status

<i>Full- or part-time status</i>	<i>Frequency</i>	<i>Percentage</i>
Full-time	3016	77.5
Part-time	876	22.5
Total	3892	100.0

Size

Previous research has suggested that workers in small firms are paid less than equivalent workers in large firms.¹⁰ It is therefore necessary to control for this variable. Firm size can be defined in terms of employment size classes (categorical) or as the number of workers in the firm (continuous). Both specifications were retained in the dataset. In the case of the categorical specification, two classes were defined, with value 0 for firms with less than 100 employees, 1 for those with 100 or more employees.

Table 3.7 Frequency distribution of the employment size variable

<i>Employment size</i>	<i>Frequency</i>	<i>Percentage</i>
Less than 100 employees	3293	84.6
100 or more employees	599	15.4
Total	3892	100.0

The descriptive statistics for the specification of this variable as the actual number of employees follow.

10. Morissette, *Do Small Firms Pay Less?*

Table 3.8 Descriptive statistics: Employment

N=	3892
Mean=	219.2
Standard deviation=	779.2
Minimum	1
1st quartile	2
Median	5
3rd quartile	70
Maximum	4500

Industry

The principal activity of the establishment is defined according to the Standard Industrial Classification (SIC 80), at the 2-digit, or Major Group level. For the purposes of this dissertation, 28 industry dummies were created, one for each industry listed below.

Table 3.9 Frequency distribution of the Industry variable

<i>Industry</i>	<i>Frequency</i>	<i>Percentage</i>
Food	237	6.1
Beverage	54	1.4
Rubber products	60	1.5
Plastic products	170	4.4
Primary textiles	12	0.3
Textile products	6	0.2
Clothing	36	0.9
Wood products	17	0.4
Furniture	96	2.5
Pulp and paper	18	0.5
Printing	270	6.9
Primary metals	299	7.7
Fabricated metal products	36	0.9
Machinery	138	3.5
Transportation equipment	197	5.1
Electrical and electronic products	12	0.3
Non-metallic mineral products	153	3.9
Refined petroleum and coal products	24	0.6
Chemical products	24	0.6
Other manufacturing	24	0.6
Telecommunications	210	5.4
Wholesale trade	192	5.0
Retail trade	812	20.9
Employment agencies and personnel suppliers	100	2.6
Computer and related services	126	3.2
Advertising agencies	60	1.5
Architectural, engineering and scientific services	449	11.5
Other business services	60	1.5
Total	3892	100.0

Quality Management practices

A summary measure was created to describe the extent and pattern of use of QM practices in these establishments. This is a particularly important variable as it will be used in Chapter 4 to explore the hypothesis that firms that have adopted QM practices pay higher wages.

A clustering procedure was used to group together firms that adopted a similar number of practices in each of the four categories of leadership, employee involvement, process improvement and customer focus. To achieve this, I defined four variables that expressed the number of practices used by a firm in each of the four categories of practices. For example, if a firm used 3 of the 5 practices in the Customer focus category, then the value for the "number of customer focus practices used" variable was 3. The cluster analysis procedure, through an iterative process, grouped together firms that were most alike in terms of these four variables. In the manufacturing industry, six clusters were found.

For illustrative purposes, results for this sector are shown below. As the total number of practices in each category varies (from 5 in the Customer focus category to 8 in the Process improvement category), the results are shown in percentage terms to facilitate the comparison across categories. For example, firms in Cluster 1 use on average a little over 4 of the 5 leadership practices (81%).

Table 3.10 Average number of QM practices used in each category, by cluster
(expressed as % of the total number of practices in the category)

<i>Cluster</i>	<i>Leadership</i>	<i>Employee involvement</i>	<i>Process improvement</i>	<i>Customer focus</i>
High balanced	81	81	81	86
High L-E	76	63	59	45
High P-C	43	51	73	72
Moderate use	47	41	32	59
Low P-C	20	24	52	49
Low use	13	18	15	29

The clusters were fairly evenly distributed, with no one cluster accounting for more than 21% of the firms. Each cluster has a unique profile, which is described below.

"High balanced" cluster (21% of firms):

The firms in this cluster make use of a high number of practices in each of the four categories (hence, the name "high balanced"). For this group, it is more instructive to examine what they do not do, rather than what they do. In the leadership practices, even though only 55% of these firms used an outside consultant to help them develop their quality improvement strategies, this is still highest amongst all firms. In the employee involvement category, the least used practice is measuring employee satisfaction, with 62% of the firms, still much more than in any other cluster. In the process improvement

category, 35% of the firms are registered to a quality assurance system. Finally, in the customer focus category, the least used practice is measuring client satisfaction relative to competitors, which 77% of firms do, more than in any other cluster.

"High leadership and employee involvement (L-E) " cluster (10% of firms):

Almost equal to the "High balanced" cluster in leadership practices, these firms are a little weaker in employee participation and significantly lower in process and customer focus practices. As these categories are more action and measurement oriented, one might question the commitment to QM of these firms.

Even though the strength of the firms in this cluster is in leadership practices, only 58% of the firms do extensive management quality training compared to 85% of the "High balanced" firms. In the employee involvement category, 26% of these firms measure employee satisfaction, less than the "High balanced" and the "High process and customer focus" cluster. No one process improvement practice stands out, all contributing about equally to a fairly low score of 59% in this category. As for customer focus, 20% and 29% of these firms measure customer satisfaction relative to competitors and conduct customer satisfaction surveys respectively, lower than all but the "Low use" cluster.

"High process improvement and customer focus (P-C)" cluster (18% of firms):

These are the opposite of cluster 2: low on leadership practices but significantly higher in process and customer focus practices. These firms seem to prefer action to exhortation.

For example, senior management plays an active role in the development and implementation of quality improvement plans in 19% of these firms and only 10% used an outside consultant to assist them. However, 90% have a quality support group and 75% provide quality training for their employees. These firms are especially active in the process improvement practices: 39% are registered with a quality assurance system, 95% have supplier standards and 96% measure product quality and delivery times, in all cases the highest of any cluster. Their average in the customer focus practices is brought down by the relatively infrequent use of customer satisfaction surveys, with 49% of the firms using this practice, compared to 78% of the "High balanced" cluster.

"Moderate use" cluster (12% of firms):

These firms are "middle of the road" QM practitioners, using about half of the practices in the leadership, employee involvement and customer focus categories, and fewer than half of the process improvement practices. The most frequently used practices by firms in the "Moderate use" cluster are quality support groups, employee quality training, measuring cycle times and using customer input in product design. As evidence of their lack of

commitment to process improvement practices, only 3% of these firms are registered with a quality assurance system, lower than even the "Low use" cluster.

"Low process and customer focus" cluster (19% of firms):

The Low P-C firms are similar to the "High process and customer focus" group in that they do not apply many leadership and employee involvement practices but are fairly active, but at a lower level of intensity, in the other categories. They apply about half the process improvement practices, more than the "Moderate use" cluster, and more customer improvement practices than the "Moderate use" and the "High leadership and employee involvement" clusters.

"Low use" cluster (20% of firms):

These firms make little use of QM practices. For 13 of the 27 practices, the proportion of firms responding positively was under 10%.

A similar analysis was conducted for the three service industries surveys. While there were differences in the patterns of moderate use, each group of sampled firms had "High balanced" and "Low use" groups, as in the manufacturing industries.

A cluster membership variable was defined based on these analyses and added to the records in the final data file for these surveys. In addition, a dummy variable was defined using this cluster membership variable such that a value of 1 was assigned for members of the High balanced cluster, and 0 for all others. The High balanced cluster was chosen to define the QM dummy variable because it, along with the Low use cluster, are the only patterns that are common to all surveyed sectors. It is also, along with the Low use cluster, an extreme pattern. Any effect that QM may have on wages would therefore be more likely to appear in association with these extreme patterns. However, detecting a wage premium or penalty associated with the presence of QM is a more compelling and understandable analytic result than with the absence of QM, so I chose the High balanced pattern over the Low use pattern to define the QM dummy variable.

Table 3.11 Frequency distribution of the quality management practices variable

<i>Quality management cluster</i>	<i>Frequency</i>	<i>Percentage</i>
High balanced	1010	26.0
All others	2882	74.0
Total	3892	100.0

Conclusion

The data described in this chapter contain information on wage rates, management practices and a variety of other variables that are found in the literature to be related to wages (including size, industry, occupation, unionization, experience and status). As a result, these data can provide an answer to the central empirical question of this dissertation. Do firms that adopt more quality management practices pay higher wages, holding other relevant factors constant? The answer to that question will then help us to examine the broader question of whether the adoption of QM practices has affected the polarization of earnings over time. The next challenge is to specify a model that will shed light on the associations between QM practices and wages, while taking into account the unique characteristics of the data. This is the subject of the next chapter.

Chapter 4 - The model

Introduction

The broad hypothesis that motivates this dissertation is that an increase over time in the share of firms having adopted quality management practices is a factor in the increased polarization of earnings observed in Canada. As noted in previous chapters, this broad hypothesis cannot be addressed empirically because of the lack of time series data that contain both wage rates and information about management practices. In this chapter, I will show how the narrower but related hypothesis that firms that make extensive use of QM practices pay higher wages *can* be addressed empirically, given the data described in Chapter 3.

In the first section of this chapter, I will describe what can be done with the available data, which is limited to the estimation of a point-in-time wage premium associated with QM, *ceteris paribus*. I will then discuss the implications of these limitations for

addressing the broad hypothesis mentioned above. If no wage premium is identified, I will argue that QM can then be discarded as a potential factor in the observed polarization of earnings. If, however, a QM wage premium is identified, I will argue that QM *might* be a factor, even though this cannot be demonstrated directly given the absence of time series data. I will close the first section of this chapter with a discussion of what would be required to address the thesis in a more satisfactory way. In the second section, the econometric model that I will use to determine if a QM wage premium exists will be described.

Scope of what can be demonstrated empirically

The data assembled for this dissertation are the only source of information on wage rates, QM practices and other correlates for a single group of firms, for a single period in the mid-1990s. As such, it can be used to determine if there *is* a difference, at a point in time, in the wages paid by employers who have adopted these practices compared to those who have not, *ceteris paribus*. A wage model can be specified that postulates that hourly wages are a function of industry, occupation, unionization, experience, full-time or part-time status, size of business and, most importantly, firm-level management practices.

$$W = f(I, o, u, s, e, fs, m)$$

where W = hourly wages, I = industry, o = occupation, u =unionization, s = full-time or part-time status, e = experience, fs = firm size and m = management practices.

If there are no differences observed in the wages paid by these two groups of employers, then changes over time in the share of employers having adopted quality management practices are unlikely to play any role in the polarization of earnings.

One can imagine some scenarios where this conclusion would not hold. For example, one might argue that there is a lag between QM adoption and its effect on wages. If so, no effect of QM on wages would have been observed at this time, although effects could be expected in the future. The construction of the data used for this dissertation should guard against this eventuality, however. Data on QM practices were collected in 1993 and 1994, while data on wage rates were collected in 1996. This two to three year lag should have provided sufficient time for QM adoption to have affected wages. In addition, it is known that most of the firms exhibiting a High Balanced pattern of QM implementation at the time of the survey had in fact started adopting these practices many years before, some as early as 1989. Any lagged effect should therefore have become apparent by the time the wage data were collected.

Another possibility is that QM adoption may increase the dispersion of wages paid within an establishment for any particular job category, without affecting the average wage for that job category, thus not affecting "between establishment" dispersion. In particular, the

range between entry level and maximum wage rates may increase as a result of QM.

Comparing average wage rates between QM adopters and other firms would not detect this potential polarizing effect. This hypothesis might explain some of the residual variation in models that examine differences in average wages between establishments.

However, as described in chapter 3, the data on wage rates assembled for this dissertation permit the comparison between establishments of actual, or nearly actual, wage rates for various occupations and levels of experience. The model will therefore be specified in such a way that any increased dispersion of this type is detected. This will be done by comparing reported wage rates, for all levels of experience, from starting wage to maximum wage, between establishments, not average wages.¹

There may be another, very unlikely, scenario in which a finding that QM adoption does not affect wage rates would nevertheless not mean the rejection of the hypothesis that is a factor in increased polarization. If, for unknown reasons, there was a wage gap in the past between firms that subsequently adopted QM practices and those that did not, and QM adoption closed that gap, then the observed present day equality in wages would be a

1. As pointed out in Chapter 3, for non-unionized jobs, the wage rates reported in the Prairie Provinces Wage and Salary Survey for specific levels of experience may be estimates rather than actual wages. To the extent that reported wages represent a measure of central tendency of wages for each category defined by the independent variables, QM implementation might increase the dispersion around that measure of central tendency, which would not be observed in these data. However, most of the reported wages are in fact actual wages around which there is no dispersion. In addition, based on the raw average wage rate for the two groups, average wages are less dispersed in the QM adopters (coefficient of variation of 37%) than in the other firms (c.v. of 50%). This comparison does not take into account, however, distributional differences between the two groups in terms of industry, occupation, etc.

fortuitous coincidence. In effect, we would have observed the precise moment where the upwards trajectory of wages in QM firms crossed the wage trajectory of non-QM firms.

Despite the possibilities inherent in each of the scenarios just described, a much more likely interpretation of an empirical finding that the extensive use of QM practices is uncorrelated, *ceteris paribus*, with wages is that adoption of QM has no impact on wages. If, therefore, no differences are observed in the wages paid between these two groups of employers, I will reject the hypothesis that the adoption of this particular set of management practices is a potential causal factor of the increased polarization of earnings observed in Canada.

If, however, there is a statistically significant difference in the wages paid, at a point in time, between firms that have adopted QM and firms that have not, *ceteris paribus*, then changes over time in the share of firms having adopted these practices could play a role in increasing the polarization of earnings. However, this finding does not imply that such a premium is necessarily polarizing. This depends on the initial distribution, as I will demonstrate below.

To do so, I will present a microsimulation that will show that a QM wage premium may or may not be polarizing, depending on the initial distribution. The first chart shows a hypothetical distribution of wage rates at time t (Chart 1). It is a symmetric distribution, showing 8 groups of wage rates ranging from \$8 to \$16, with a mean of \$12 and a

standard deviation of 2.02 ($n=50$). Taken together, the 8 groups can be thought of as representing the total economy, while each group can be thought of as representing all the wage rate observations for a given combination of industry, size, occupation, union status, full or part-time status and experience level. Note that this assumes that all jobs within these narrowly defined groups have the same wage.

At time $t+1$, some observations from each group (roughly 25% in every group) receive a premium of \$1 (Chart 2). This simulates the adoption of QM practices by a subset of firms, across many industries and size classes. By definition, within-group dispersion increases. In terms of the overall distribution, the mean wage is now \$12.24, with a standard deviation of 2.09. The wage rate distribution at time $t+2$ (Chart 3) was then simulated by adding the same premium to a further 20% sample, across all wage levels. As a result, the mean wage increases to \$12.44, but the standard deviation remains about the same at 2.08. The effect that these shifts have had on the distribution of wages can now be examined.

Chart 1 **Chart 2** **Chart 3**

Figure 2 - Microsimulation of the impact of QM wage premium on the distribution of wages

Visually, it is apparent that the distribution tends to flatten out from Chart 1 to Chart 2 as more wage rates shift to a higher level while others remain affected. Does this mean that the distribution becomes more polarized? According to the measurement of polarization adopted by Beach and Slotsve, there is polarization if there is an increase in the number of observations in the tails of a distribution, the tails usually being defined in terms of multiples of the standard deviation from the mean.² In our case, there are 6 observations in each of the tails of the normal distribution at time t , defined as one standard deviation from the mean ($12-2.02=9.98$; $12+2.02=14.02$, therefore the number of observations under 9.98 and over 14.02). At time $t+1$, there are 11 observations in the lower tail, and 8 in the right-hand tail (observations under 10.15 and over 14.33). At time $t+2$, there are 9 observations in each tail (observations under 10.36 and over 14.53). Accordingly, the distribution is more polarized at times $t-1$ and $t-2$ than at time t . However, it is less polarized at time $t-2$ than at time $t-1$.

This simple case illustrates the dynamics of how a distribution of wages can become more polarized as the result of a premium affecting a cross-cutting subset of a population, leaving the other behind. The basic intuition is that as the distribution flattens, there is an increase in the number of observations beyond a given relative distance from the mean, even though the mean itself may be higher. This case also illustrates how this

2. Beach and Slotsve, *Are We Becoming*

dynamic is sensitive to the initial distribution. For example, if the point of reference is time $t+1$, then the further 20% shift at time $t+2$ actually reduces polarization.

The point is that a wage premium that affects a subset of a population, across groups, can have a polarizing effect. A QM wage premium, which affects all wage rates in certain establishments only, establishments that might be in any industry and size class, is an example of such a premium.

While this establishes the possibility that a QM wage premium might be a factor in the observed increased polarization, the absence of time series data precludes addressing empirically whether it actually has been a factor over the last 15 years. The data and techniques that would be required to do so are described in what follows. Three methods are discussed:

- (1) a macroeconometric model;
- (2) the "share-shift" analysis;
- (3) simulation.

Macroeconometric model

One method of measuring the effect of the spread of QM practices on changes in the polarization of earnings would be to regress a time series of polarization summary measures against a time series of the shares of firms having adopted QM practices and

other correlates in a multivariate time series analysis. In this way, the independent effect on the polarization of earnings of changes in the share of firms having adopted these practices could be estimated.

There are many difficulties, however, making this approach impractical. First, there is no widely accepted summary measure of polarization, although one has been proposed by Wolfson, which could be used for this purpose.³ The biggest difficulty, however, lies in the absence of time series data on management practices. This dissertation makes use of one of the only data sources in Canada on quality management practices, and it is cross-sectional. As regards the other variables, time series of aggregate statistics could be cobbled together from various sources (for example, polarization measures based on earnings data from the Survey of Consumer Finances, industry and size data from the Survey of Employment, Payroll and Hours, occupational data from the Labour Force Survey), but ideally, one would want to collect these data from the same firms over time in a longitudinal design. There are no such data in Canada at this time.⁴

3. Wolfson, 1992.

4. The Workplace and Employee Survey, which will be launched by Statistics Canada in 1999, is a longitudinal survey that is intended to collect this type of data.

Share-shift analysis

A second approach adopted by researchers in this field is the “share shift analysis”, in which differences between distributions at two points in time resulting from simultaneous changes along two dimensions (for instance, earnings class and industry share) are decomposed into “within-group”, “between-group” and an interaction term.⁵ For example, if the distribution of QM were the same at the two points in time, then any changes in the shares of observations in earnings classes would necessarily be attributed to “within-group” change. If the distribution of QM had changed, however, part of the change in earnings classes could be due to “between-group” change. The greater the percentage of the change in the distribution of earnings ascribed to “between-group” change, the greater the role of QM in explaining increased polarization of earnings.

Simulation

As the data used for this research concerns the adoption of quality management practices and wage rates at a single point in time, neither technique described above can be applied here. Such an analysis could perhaps be conducted, however, in a simulation. For this purpose, it would be necessary to obtain coefficients that would enable the construction of projections of wage rates, management practices and other correlates into the future so

5. Wannell, 1991.

as to produce reasonable distributions of these variables at time $t+1$. In addition, the wage rate data collected in the survey, and projected into the future, for a population of employers would need to be transferred into earnings data for a population of workers.⁶

This conversion can only be partially implemented in the data used for this dissertation. While the number of workers and the hours worked are known for each wage rate, which permits the construction of distributions of earnings, the coverage of the data is not comprehensive. As the QM surveys were administered only in selected service industries, certain large industries are not covered. For example, health, education and government industries are not included.

Within the covered industries, the research data can support the production of distributions of earnings, but with large sampling errors. This is because the samples for the QM surveys were designed to be representative of the population of firms in terms of their QM behaviour, not in terms of total employment. This is particularly true for large firms as there is a great deal of variability in the large firm size class.⁷ Therefore, while

6. The data used for this dissertation concerns firms and wages, not workers. The distributions that can be constructed from it are of hourly wage rates (i.e. the incidence of every hourly wage rate). To convert these to distributions of earnings of workers, it would be necessary to create an individual record for each worker associated with a particular wage rate, in a given occupation, in a given establishment. If the survey data covers the universe of interest comprehensively (that is, firms from all sectors are included and data are collected from all occupations within the selected firms), then distributions of earnings can be constructed that are comparable to those that are produced from household surveys or other sources where the worker is the unit of analysis.

7. With the size cutoff set at 100 employees, a firm of 150 employees could very well be selected to represent a firm of 2000 employees and vice-versa. When the goal is to estimate total employment, there is usually a "take-all" stratum, that is, a census of the largest firms, to deal with this variability. This was not the necessary for the QM surveys.

distributions of earnings could be constructed for time t and time $t+1$, their coverage and quality would be suspect. For this reason, I decided that undertaking a simulation would not be worthwhile.

Summary

In summary, this dissertation can establish empirically whether or not there was a QM wage premium in 1996. If no such premium exists, then QM can be rejected as a factor in the observed polarization of earnings. If a QM premium is identified, then it is possible, though not necessary, that it has played a role in the polarization of earnings. Whether or not it actually has cannot be addressed empirically with the data at hand. In Chapter 5, however, I will argue that, when other evidence is considered, the plausibility of a scenario in which the adoption of QM practices is a factor increases.

From a econometric point of view, then, the only task that will be performed is to determine if a QM wage premium existed at the time the survey data were collected. In the rest of this chapter, I will present the econometric model that I have adopted to perform this task.

Characteristics of the required model

The techniques used must uncover any relationship that may exist between the use of quality management practices and wage rates, while controlling for other factors that are assumed to affect wages. One of the features of the data used for this dissertation is detailed occupational information associated with the wage rates and the model must take advantage of the availability of this information. The model must also take into account the hierarchical nature of the data.

The manner in which the dataset was constructed made evident its hierarchical nature: from 122 establishments, to 561 establishment-occupation pairs, to 3892 establishment-occupation-wage rate triads. The resulting data, even though organized around the wage rate entity, are comprised of a mix of entities, each with their own attributes. This is not unusual as a careful examination of many analytical data would reveal that hierarchical structures are common.⁸ As lower level entities inherit the attributes of higher level ones, this means that attributes of the highest level entity, in our case the establishment, will be repeated many times for lower level entities. For example, every wage rate record from the same establishment will have the same values for size, industry and QM practices.

8. A. S. Bryk and S. W. Raudenbush, *Hierarchical Linear Models: Applications and Data Analysis Methods* (Newbury Park, Ca.: Sage Publications, 1992):1-2.

Table 4.1 Hierarchical structure of the data

<i>Entity</i>	<i>Attributes</i>
Establishment	Size
	Industry
	QM practices
Occupation	NOC code
	Union status
Wage rate	Hourly dollar amount
	Experience level required
	Full- or part-time

Each wage rate record may not be independent, therefore, as there may be “within establishment” effects as well as “between establishment” effects. Traditional analytical techniques, for example ordinary least squares regression analysis, seek to quantify the latter, assuming that the former are not present. As the data are known to be hierarchical in nature, it behooves us to determine whether “within establishment” effects are important. A technique known as hierarchical linear modelling (HLM) has been developed to address this issue.⁹

This techniques uses a “slopes as outcomes” approach, that is in which regression coefficients are themselves used as dependent variables in further regressions. In the case of HLM, ordinary least square regressions are run for each of a number of groups and the

9. Bryk and Raudensbush, *Hierarchical Linear Models*.

resulting coefficients are used in empirical Bayes estimation procedures to produce between groups parameters. In our case, this means regressing wage rates against the within-establishment variables (the attributes of the wage rate and occupation entities in Table 4.1) in each of the 122 establishments in the data and using the resulting coefficients as outcome variables to be explained by the establishment level characteristics (industry, size and QM).

In performing this procedure, HLM retains only the number of cases for which there is sufficient data to produce OLS coefficients within groups. In our data, many of the within-group variables are 0-1 dummy variables. In this case, sufficient data means that there must be instances of both values 0 and 1 for a given variable within a given establishment. For example, to compute the effect of full-time status on wage rates within an establishment, there must be instances of both full-time and "non-full-time" wage rates in the establishment. For many variables in our data, this is not the case. As a result, when all within-group variables are specified, the HLM procedure reduces the number of useable firms from 122 to 8. This is the number of observations where there are instances of both values 0 and 1 for all the dummy variables. The most limiting variable is unionization as there are only 8 establishments that have both union and non-union wage rates. Most of the occupation dummies also seriously reduce the number of useable cases as many occupations do not exist at all in certain establishments (therefore, all values are 0).

Because of this limitation, only a very incomplete model could be specified in HLM, with experience as the only within-group variable. As a result, it was decided not to use this approach and to search the literature for wage determination models that could be used to analyze nested or hierarchical data.

While none of the wage models found in the literature are exactly suited for the purposes of this dissertation, they nevertheless provide the rationale for using occupational data, suggest different methods of including occupational characteristics and give examples of models that take into account individual, occupation and establishment characteristics.

A type of model that one frequently encounters in the literature is based on the theory of human capital. In these models, the earnings of individuals, usually defined as hourly wage rates, are a function of education and other training, which are considered as investments upon which a return can be expected in the form of higher wages. These kinds of models have been used extensively to explore the causes of wage differentials between groups of persons defined by individual characteristics such as gender.¹⁰ A feature of the human capital model that makes it attractive for this dissertation is that it is sometimes extended to take into account occupational characteristics.

10. Morley Gunderson, "Male-Female Wage Differentials and Policy Responses," *Journal of Economic Literature* 27 (1992): 46-72.

Although there is no consensus among labour economists regarding the inclusion of controls for occupation in earnings equations, convincing arguments can be marshalled in support. De Beyer and Knight¹¹ suggest four reasons:

"First, occupational wage differences compensate for non-pecuniary characteristics of different jobs. Second, occupational wage differences can arise from barriers to movement and institutional factors that hinder market equalization of wages. Third, occupational wage differences arise because of different skill requirements across occupations. Fourth, the value of natural ability and training may interact differently across occupations."¹²

On the strength of these arguments, the model selected for this dissertation will include occupation as a variable.¹³ The introduction of occupation as a variable in an empirical model, however, raises a problem of aggregation. At the most detailed level, there are several thousand categories of occupations, enough to use up the degrees of freedom of any but the largest data sets. This problem can be addressed by aggregating the data into broader categories. The more occupational data are aggregated, however, the wider is the range of occupations included in each group. As a result of the increased variability

11. J. De Beyer and J.B. Knight, "The Role of Occupation in the Determination of Wages," *Oxford Economic Papers* 41 no.3 (1989): 595-615.

12. Eric Solberg and Teresa Laughlin, "The Gender Pay Gap, Fringe Benefits and Occupational Crowding," *Industrial and Labour Relations Review* 48 no.4 (1995): 694.

13. It is recognized, as a result, that the most prevalent type of wage model found in the purely economic literature, which seeks to test the proposition that wages are a function of the value of the marginal product of labour, will not serve as a reference for this dissertation. These wage equations take a production function as a starting point and derive an equation for wages in a partial equilibrium context. Occupation is endogenous in this approach, and is excluded to avoid the resulting bias.

within groups at higher levels of aggregation, the explanatory power of occupation is dampened or lost.

Researchers have addressed this problem in different ways, which vary along two basic dimensions: the level of aggregation and the degree of pooling. The degree of aggregation refers to the number of classes used to define occupational characteristics, while the degree of pooling refers to whether wage rates are analysed within these occupational groupings in separate regressions or whether they are analysed across occupations. I will present several examples of each type that I have found in a search of recent articles on the role of occupation in wage determination.

The search for an appropriate model

An example of a very high level of aggregation of occupation combined with separate analyses is found in Rosholm and Smith.¹⁴ In this article, separate regressions are run for salaried workers and unskilled (manual) workers, in the public and private sectors. In the private sector samples, dummy variables are created to further specify industry: manufacturing, construction, trade and communications and other services. The samples are further sub-divided by gender so that, in the end, 8 sets of coefficients are produced

14. Michael Rosholm and Nina Smith, "The Danish Gender Wage Gap in the 1980s: A Panel Data Study," *Oxford Economic Papers* 48 (1996): 254-279.

and compared. The occupation variable has only two classes in this model, which are not exhaustive as skilled manual workers are excluded.

Another aggregation approach found in the literature is the transformation of occupational information into scales based on characteristics that are common across all occupations. An example of this approach can be found in Elliott and Parcel.¹⁵ An O.L.S. model is specified with hourly wages as the dependant variable and which includes as explanatory variables, in addition to human capital variables, four dimensions of occupational skill and content: substantive complexity, physical dexterity, physical activities and unpleasant work conditions. The gender and race composition (black, Hispanic or Asian) of occupations, defined according to the 1970 detailed U.S. Census occupational classification, is also included. Their rationale for including occupational characteristics is that labour markets are fragmented along occupational lines and that occupational characteristics have an effect on wages, net of individual characteristics. They find that the coefficients of the substantive complexity and physical activities variables are significant and positive, while physical dexterity has a negative effect on wages and unpleasant working conditions have no significant effect.

15. Marta Elliott and Toby L. Parcel, "The Determinants of Young Women's Wages: Comparing the Effects of Individual and Occupational Labour Market Characteristics," *Social Science Research* 25 (1996): 240.

A similar approach is taken by Kilbourne, England and Beron.¹⁶ In this case, the log of hourly earnings is regressed against individual characteristics (experience, education, marital status), occupational characteristics and a dummy variable indicating the "core" or "periphery" nature of the industry, for each of four sub-samples defined by race and gender. The occupational characteristics in this model are a set of scales measuring cognitive skill, physical skill, authoritative skill and nurturant skill, as well as three physical disamenities (hazards, hot and wet, cold). The same set of scales is used in Kilbourne, England, Beron, Farkas and Weir.¹⁷ However, in this case, a single regression is run with the pooled sample, with gender entered as a dummy variable. Industry detail is also expanded by including 12 dummy variables for broad industry sectors.

Rather than building scales that are applied across all occupations, some authors have retained occupational categories in a more disaggregated form. In Solberg and Laughlin, a wage model is specified that includes the usual education and experience variables, geography, ethnicity and family variables, a tenure variable (number of weeks with current employer), union status, industry (government, services or industrial) and occupation.¹⁸ Occupation in this model is classified in seven broad categories: clerical, craft, operatives, sales, managers, service and professional and technical. Earnings

16. Barbara Kilbourne, Paula England and Kurt Beron, "Effect of Individual, Occupational, and Industrial Characteristics on Earnings: Intersections of Race and Gender," *Social Forces* 73 no.1 (1994): 1149-1176.

17. Barbara Kilbourne, Paula England, Kurt Beron, George Farkas and Dorothea Weir, "Returns to Skill, Compensating Differentials, and Gender Bias: Effects of Occupational Characteristics on the Wages of White Women and Men," *American Journal of Sociology* 100 no.3 (1994): 689-719.

18. Solberg and Laughlin, "The Gender Pay Gap," 702.

equations were estimated on the total data set using 6 dummy variables for occupation (clerical is the omitted variable) and by occupation separately. They find that the education variables largely lose their explanatory power in the occupation-specific regressions while experience and tenure remain significant, as does the union variable. This would indicate that education influences wages largely through assignment to specific occupations and that occupation, therefore, acts somewhat as a proxy for education.

In a paper that seeks specifically to isolate the independent effects of industry and occupation on wages, Lucifora specifies a model in which personal characteristics, occupation, industry and working conditions are regressed against annual earnings in 1985. Occupation is entered as a set of 7 dummy variables: management/admin, technical, clerical, sales, skilled, semi-skilled and unskilled.¹⁹ Industry was represented by 7 dummies, which correspond to the Major Group (2-digit) level of the Standard Industrial Classification. In addition to education, experience and gender, the personal characteristics variables include tenure, defined as the number of years with the current employer while the working conditions variables include three classes of firm size, measured by the number of employees. Lucifora uses a fixed-effects approach to fix the unchanging effect of industry across occupations, basically a method of dealing with the hierarchical nature of his data. This is achieved by running regressions including personal

19. Claudio Lucifora, "Inter-industry and Occupational Wage Differentials in Italy," *Applied Economics* 25 (1993): 1113-1124.

characteristics only within each industry-occupation cell (49 cells) and considering the resulting intercept as the industry-occupation fixed effect.

The research design that most closely parallels the requirements of this dissertation is found in a study by Petersen and Morgan.²⁰ This is one of many studies that investigate the wage differences between men and women, with the difference that in this study, cross-sectional (that is, single year) data on the wages of men and women in the same detailed occupations, in the same establishments are used. From this data, the authors can ascertain whether the wage gap observed in aggregate between men and women is attributable to discrimination within establishments or whether it stems from allocative discrimination, defined as the clustering of women in lower paid occupations and/or establishments.

The log of the hourly wage rate is regressed against establishment and individual characteristics, in each of 16 industries. The establishment level characteristics include size, region, an urban indicator, union status, major products, the number of employees remunerated by each of 10 different pay schemes and fringe benefits. The individual level characteristics include sex, occupation and method of payment (incentive or time-rated). Occupation is represented by detailed, industry-specific codes so that there are on average

20. Trond Petersen and Laurie A. Morgan, "Separate and Unequal: Occupation-Establishment Sex Segregation and the Gender Wage Gap," *American Journal of Sociology* 101 no.2 (1995): 329-365.

42 occupational classes in each industry. This specification produces a large number of parameters, as many as 70 for several of the industry regressions.

In Petersen and Morgan, a regression model that treats occupation as a fixed effect is used. The two generic equations are

$$\ln w_{ice} = \beta_o + \beta x_{ice} + \gamma S_{ice} + \varepsilon_{ice} \quad (1)$$

$$\ln w_{ice} = \beta_o + \beta x_{ice} + \gamma S_{ice} + \eta_{ic} + \varepsilon_{ice} \quad (2)$$

where

$$\sum_{o=1}^O \sum_{c=1}^C \eta_{ic} = 0$$

In both models, the dependent variable is the natural log of the wage rate for individual i in occupation o in establishment e . The x term represents all the variables from the establishment level characteristics and the method of pay variable from the individual characteristics, while S is the employee's sex, with values 1 = women; 0 = men.

The first equation is labelled the "total estimator" according to the analysis of covariance terminology and provides an estimate of the effect of sex on wage rates without

occupational or establishment controls. The second equation is the "within estimator", which takes into account membership in sub-groups defined by occupation and establishment through the term η_{oe} . Different regressions are run, with the term η_{oe} assuming different values:

- 1) $\eta_{oe} = \eta_o$, occupational controls only: Dummy variables are entered for each occupation (as many as 83 occupations in the "Hospitals" industry);
- 2) $\eta_{oe} = \eta_e$, establishment controls only: Dummy variables entered for each establishment (as many as 796 in the Machinery industry);
- 3) $\eta_{oe} = \eta_o + \eta_e$, occupation and establishment controls: The two sets of dummy variables described above are entered;
- 4) $\eta_{oe} = \eta_{oe}$, an interaction term between occupation and establishment: Dummies are entered for each establishment-occupation pair (as many as 8451 in the Hospitals industry. Note that there are 151,187 records in this industry so that there are sufficient degrees of freedom to enter such a high number of variables).

By comparing the results of the total estimator to the various within estimators, it is possible to ascertain the share of the total wage differential that is attributable to each. For example, in the Men's and Boy's Shirts industry, the following results were obtained.

Total estimator	Occupation	Establishment	Occupation + establishment	Occupation * establishment
-.178	-.032	-.185	-.045	-.00

The total estimator coefficient for the gender variable was $-.178$ or a 17.8% raw wage penalty for women. However, when controls for occupation and establishment were included, the differential was not significantly different from 0, meaning that men and women in the same occupations in the same establishments were paid the same. These results led the authors to conclude that most of the wage gap was due to occupational segregation, that is the clustering of women in lower paid occupations.

The model specified

The principal difference between these examples and the model specified for this dissertation is that the unit of observation in the latter is jobs, not individuals. There are therefore no personal characteristics such as gender and race to be included. Other human capital variables such as education and experience are also not directly applicable, although they are in some way represented. Instead of education, the data include occupation, which, as seen earlier, can act as a proxy for this characteristic. Instead of experience defined as the total years of work experience of individuals, there is a variable, which I have called experience, that represents the number of years required on the job to qualify for a wage rate (for example, starting wage, wage after one year on the job, wage after two years on the job, etc.). The research data set also includes a full-time and part-time indicator, which is not found in any of the papers described above. The

other variables in the model specified for this dissertation that refer to establishment characteristics (industry, union and size) are similar to those found in the articles presented above.

While most of the papers reviewed above dealt with wage differentials between groups of workers defined by gender, the approaches used can be applied to the issues being addressed in this dissertation, which concern wage differentials between groups of jobs defined by whether or not quality management practices are used in the establishments in which the jobs are found.

Based on this review, the test of association between hourly wage rates and the use of quality management practices will be conducted using Ordinary Least Squares regression analysis, according to this specification, which essentially replicates equations (1) and (2) in Petersen and Morgan:

$$w_{ioe} = \beta_0 + \beta x_{ioe} + \gamma Q_{ioe} + \varepsilon_{ioe}$$

$$w'_{ioe} = \beta_0 + \beta x_{ioe} + \gamma Q_{ioe} + \eta_{oe} + \varepsilon_{ioe}$$

where

$$\sum_{o=1}^{N_o} \sum_{e=1}^{N_e} \varepsilon_{ioe} = 0$$

in which w = the hourly wage rate for job i in occupation o in establishment e , x = the characteristics of the job and of the establishment in which the job is found (size, union status, full or part-time status and experience), Q is the use of management practices and η represents the fixed industry and occupation effects. This term will take the following values:

- 1) $\eta_{oe} = \eta_o$, occupational controls only: Dummy variables are entered for each occupation:
- 2) $\eta_{oe} = \eta_o + \eta_e$, occupation and industry controls: Two sets of dummy variables are entered, one for industry, the other for occupation:
- 3) $\eta_{oe} = \eta_{oe}$, an interaction term between occupation and industry: Dummies are entered for each industry-occupation pair.

The results of these procedures are presented in the next chapter.

Chapter 5 - Analysis

Introduction

In this chapter, I will present two strands of analysis leading to the conclusion that changes over time in the share of firms having adopted competitive strategies based on quality management practices have contributed to the increased polarization of earnings observed in Canada. In the first section, I will present evidence that firms that have adopted quality management practices pay higher wages for similar jobs than firms that have not. This section is the centerpiece of the dissertation, in which the results of the regression model described and developed in previous chapters are presented. In the second section, I will link these findings to increased polarization of earnings by presenting evidence that the share of firms having adopted quality management practices has increased over time. While the evidence, presented in the first section, that a QM wage premium exists is quite strong, the evidence concerning the link with increased polarization can only be suggestive at this point.

To demonstrate that firms that have adopted quality management pay higher wages. I will rely on survey data, discussed in Chapter 3, for a sample of firms in manufacturing and selected service industries.¹ These data include information on the wages paid for various jobs and the extent of use of quality management practices.

A review of relevant wage models in Chapter 4 has led me to use ordinary least squares to estimate the following equation:

$$W_i = \beta_0 + \beta_1 QM + \beta_2 Exp + \beta_3 Status + \beta_4 Union + \beta_5 Size + \beta_6 Ind_i + \beta_7 Occ_i + \varepsilon_i$$

$$i = 1, \dots, 3892$$

The definition of the variables and their mode of measurement are shown in Table 5.1 while the descriptive statistics are shown in Table 5.2.

1. Throughout chapters 5 and 6, phrases such as “firms that have adopted quality management practices” or other such labels refer to those firms that make extensive use of these practices, in all categories, as described in the High Balanced cluster profile in chapter 3.

Table 5.1 Measurement of the variables included in regressions

<i>Mnemonic</i>	<i>Name</i>	<i>Mode of measurement</i>
W	Hourly wage rate for job	Dollar amount
QM	Intensive use of Quality Management practices	1 if yes, 0 otherwise
Exp	Number of years with same employer required to qualify for wage rate	0 to 4, 4 meaning 4 or more years
Status	Full-time status of job	1 if yes, 0 otherwise
Union	Union status of job	1 if yes, 0 otherwise
Size	Establishments with 100 or more employees	1 if yes, 0 otherwise
Ind	Industry of establishment (28 dummies).	1 if yes, 0 otherwise
Occ	Occupation of job (11 dummies)	1 if yes, 0 otherwise

The 11 occupation dummies are classified according to the National Occupational Classification while the 28 industry variables are classified according to the 1980 Standard Industrial Classification (Table 5.2).

Table 5.2 Descriptive statistics of variables included in regressions

<i>Variable</i>	<i>Mean</i>	<i>Standard deviation</i>
QM	0.21	0.40
Experience	1.70	1.49
Full-time	0.77	0.42
Size	0.15	0.36
Union	0.31	0.46
Food industries	0.06	0.24
Beverage industries	0.01	0.12
Rubber products	0.02	0.12
Plastic products	0.04	0.20
Primary textiles	0.01	0.06
Textile products	0.01	0.04
Clothing industry	0.01	0.10
Wood industries	0.01	0.07
Furniture and fixtures industry	0.02	0.16
Pulp and paper	0.01	0.07
Printing	0.07	0.25
Primary metals	0.08	0.27
Fabricated metal products	0.01	0.10
Machinery	0.04	0.18
Transportation equipment	0.05	0.22
Electrical and electronic products	0.01	0.06
Non-metallic mineral products	0.04	0.19
Petroleum products	0.01	0.08
Chemical products	0.01	0.08
Other manufacturing	0.01	0.08
Personnel agencies	0.03	0.16
Computer and related services	0.03	0.18
Advertising agencies	0.02	0.12
Offices of architects and engineers	0.12	0.32
Other business services	0.02	0.12
Wholesale trade	0.05	0.22
Retail trade	0.20	0.41
Telecommunications	0.05	0.23
Clerical occupations	0.17	0.38
Professional occupations in natural and applied sciences	0.04	0.20
Technical occupations in natural and applied sciences	0.05	0.22
Intermediate sales occupations	0.10	0.30
Elemental sales occupations	0.04	0.19
Skilled trades	0.08	0.27
Skilled transport and equipment operators	0.07	0.25
Intermediate transport and equipment operators	0.10	0.30
Processing and manufacturing machine operators	0.13	0.34
Labourers in processing, manufacturing and utilities	0.04	0.20
Other occupations	0.18	0.18

Association between QM and higher wages

The mean hourly wage rate for firms that make use of quality management practices (n=1010) is \$14.40 while for the rest of the businesses it is \$12.29. A t-test shows that this raw difference of \$2.11 per hour is significantly different from zero.

When controls for experience, full-time status, size and union are included, the coefficient for QM is \$1.23 per hour and significant (Table 5.3). In other words, holding experience, status, size and union constant, employers that have adopted QM practices pay their workers hourly wage rates that are on average \$1.23 higher than those that have not. Note that this is analogous to the total estimator in Peterson and Morgan.² However, the occupation and industry of employment of workers can also contribute to differences in their wage rates and controls must be included for these variables. The strategy used by Peterson and Morgan will be followed here. First, only controls for occupation (11 dummies) will be added. Then, dummies for occupation and for industry will be included (37 dummies in all, 11 for occupation and 28 for industry). Finally, the combined effect of industry and occupation will be introduced by creating dummies for each industry-occupation pair for which data for both QM and non-QM firms exist (36 industry-occupation pairs, see Appendix 3 for details). In the latter case, the number of useable

2. Peterson and Morgan, "Separate and Unequal", 341.

observations is reduced to 2663 as only industry-occupation pairs that contain both QM and non-QM firms are retained.

Table 5.3 Effects of quality management practices on hourly wage rates

<i>Variable</i>	<i>Total (1)</i>	<i>Occupation (2)</i>	<i>Occupation- industry (3)</i>	<i>Occupation * industry (4)</i>
QM	1.23 (5.72)	0.58 (3.09)	0.55 (2.50)	0.65 (2.65)
Experience	0.96 (16.06)	0.93 (17.96)	0.92 (19.18)	0.88 (14.02)
Full-time	2.30 (10.47)	1.21 (6.15)	0.83 (4.30)	0.89 (3.61)
Size	-0.5 (2.26)	0.01 (0.02)	-0.05 (0.18)	1.18 (3.57)
Union	2.89 (14.01)	3.76 (19.44)	2.43 (9.96)	2.51 (7.90)
R ²	0.16	0.37	0.46	0.45

Note: T-statistics are shown in brackets underneath the associated coefficient. For a description of the data see chapter 3. For a description of the model, see Chapter 4. Column 1 gives the total estimator for the effect of QM on hourly wages, with no occupation or industry controls (n=3892). Column 2 gives the effect with the inclusion of occupational dummies. Column 3 gives the estimators when both occupation and industry dummies are included. Column 4 shows the effect with controls for industry-occupation pairs, by means of one dummy variable for every industry-occupation pair. Only observations in industry-occupation pairs that contained both QM and non-QM firms were retained so that n=2663. Detailed results showing coefficients for all dummies can be found in Appendix 3. Source: Calculations by the author from a data file combining data from the Prairie Provinces Wage Rate Survey and the 1993 and 1994 Quality Management Practices Surveys of Statistics Canada.

When occupation controls are added, the effect of QM on hourly wage rates is reduced, from \$1.23 per hour to \$0.58 per hour, but it is still statistically significant. Part of the difference in wages between QM and non-QM establishments is due, therefore, to different occupational mixes in these firms. High wage occupations are more likely to be found in establishments that have implemented QM. Nevertheless, even within occupations, QM has an independent effect. In other words, even if only jobs in a given

occupation are considered, say clerical occupations, hourly wage rates in QM establishments are on average \$0.58 higher than in non-QM establishments, holding constant the other control variables (size, union, status and experience).

Occupational controls also reduce the effect of full-time status on hourly wage rates, for much the same reason: full-time jobs are clustered in establishments that have high wage occupations. In contrast, the effect of unionization on wage rates is increased when occupational controls are introduced. The effect of unionization is greater within occupations (+\$3.76) than across occupations (+\$2.89). In other words, there is on average more difference between the wages of unionized and non-unionized jobs in the same occupation than between jobs in different occupations.

The introduction of controls for industry makes little difference in the effect of QM on hourly wage rates, which are on average \$0.55 per hour higher in QM establishments than in non-QM establishments, when controlling for industry and occupation, compared to \$0.58 with occupation controls only. Also, the coefficient for experience required remains stable regardless of the specification of the model, hourly wage rates increasing by \$0.92 for every additional year on the job. However, the effect of unionization (\$2.43) and of full-time status (\$0.83) is reduced after controlling for industry. This would indicate that unionization and full-time status vary by sector, with certain industries more likely to contain full-time, unionized jobs than others and this effect is now captured in the industry dummies.

In the last specification shown in column 4 of Table 5.3, controls are introduced for industry-occupation pairs (such as clerical operations in the retail trade industry). This is a multiplicative interaction term between industry and occupation, produced by multiplying one term by the other. Where both the industry and occupation dummies have a value of 1, the resulting interaction term is set to 1. Otherwise, the value is 0. Not all resulting industry-occupation pairs contain QM and non-QM observations. For example, in the Metal Fabrication industry (SIC 30), there are 18 wage rate observations for skilled trades. All of them, however, are found in non-QM establishments. By only retaining "integrated" pairs (QM and non-QM), the number of useable observations is reduced to 2663 from 3892. If all firms in the industry-occupation pair were either QM or non-QM, a regression coefficient could not be calculated for the QM variable.

With this specification, there is little change in the sign, magnitude and significance of the QM, experience, full-time and union coefficients. The coefficient for QM increases slightly to \$0.65, compared to \$0.55 when industry and occupation are included additively. In other words, even within given occupations within given industries, QM firms pay higher wages than non-QM firms, holding constant the other control variables. The introduction of controls for industry-occupation pairs has a large effect on the coefficient for size, however, which becomes positive and significant, as expected based on previous research.³

3. Morissette, *ibid.*

A model was then specified to explore how these variables may interact. This was done by entering multiplicative interaction terms between union and QM (QM_u), size and QM (QM_s) and size and union (size_u). Whether QM acts alone or in concert with other variables is shown in Table 5.4.

In columns 1 and 2, results are reported with occupation and industry controls ($\eta_{oc} = \eta_o + \eta_c$) while results with controls for industry-occupation pairs ($\eta_{oc} = \eta_o * \eta_c$) are shown in columns 3 and 4. In the latter case, only the QM_union interaction term was included.

Table 5.4 - Effects of QM on hourly wage rates, in interaction with union status and firm size

<i>Variable</i>	<i>With interaction terms</i> <i>($\eta_{ix} = \eta_o + \eta_u$)</i>	<i>Without interaction terms</i> <i>($\eta_{ix} = \eta_o + \eta_u$)</i>	<i>With interaction terms</i> <i>($\eta_{ix} = \eta_o * \eta_u$)</i>	<i>Without interaction terms</i> <i>($\eta_{ix} = \eta_o * \eta_u$)</i>
QM	-0.29 (1.08)	0.55 (2.50)	-0.31 (1.04)	0.65 (2.65)
QM_u	2.30 (5.60)	n.a.	2.68 (5.28)	n.a.
QM_s	0.90 (1.10)	n.a.	n.a.	n.a.
Size_u	1.71 (2.50)	n.a.	n.a.	n.a.
Exp	0.92 (19.24)	0.92 (19.17)	0.88 (14.1)	0.88 (14.02)
Status	0.75 (3.89)	0.83 (4.30)	0.83 (3.39)	0.89 (3.61)
Union	1.52 (5.16)	2.43 (9.96)	1.87 (5.53)	2.51 (7.90)
Empsize	-0.30 (0.97)	-0.05 (0.18)	1.16 (3.51)	1.18 (3.57)

Note: T-statistics are shown in brackets underneath the associated coefficient. For a description of the data, see chapter 3. For a description of the model, see Chapter 4. Column 1 gives the estimators for the effect on hourly wages of the independent variables used previously, plus interaction terms between QM, size and union, with controls for both occupation and industry ($n=3892$). Column 2 gives the results of the same model, but without the interaction terms between QM, size and union (same as column 3 in Table 5.3). Column 3 gives the estimators when only the QM and union interaction term is included, in addition to the usual independent variables, with controls for industry-occupation pairs, by means of one dummy variable for every industry-occupation pair ($\eta_{ix} = \eta_o$, $n=2663$). Column 4 shows the results of the same model, but without the QM and union interaction term (same as column 4 of Table 5.3). Detailed results showing coefficients for all dummies can be found in Appendix 3. Source: Calculations by the author from a data file combining data from the Prairie Provinces Wage Rate Survey and the 1993 and 1994 Quality Management Practices Surveys of Statistics Canada.

The striking finding from this model is the interaction between QM and unionization. By including the interaction term QM_u, QM is no longer significant on its own, regardless of whether industry and occupation are included additively or multiplicatively (coefficients -\$0.29 and -\$0.31 and t-scores of 1.08 and 1.04, respectively). In non-

unionized jobs, therefore, there is no QM premium. In unionized jobs, however, there is a statistically significant QM premium of \$2.37 (the sum of the coefficients on QM and on the QM-union interaction). Compared to jobs that are not unionized and in firms that have not adopted QM, the premium is \$4.23 per hour (the sum of the coefficients on QM, union and the QM-union interaction). This interesting finding will be further discussed in Chapter 6.

Validation procedures

Two procedures were conducted to validate the results of the regression. First, a model like the one reported in column 3 of Table 5.3, but without the QM variable, was rerun against the entire survey file of the Prairie Provinces Wage Rate Survey, which contains 82,224 observations, and the pretest file used for the dissertation.⁴ Results obtained from this much larger file can be used to do a rough check on the representativeness of the subsample used for this dissertation.

4. The QM variable, included in Table 5.3, could not be included in the model using the whole survey because it only exists for firms included in the pretest. In addition, the data in the full survey for major group 77 are not disaggregated to three digit industries. The data in the pretest for SICs 771, 772, 774, 775 and 779 were therefore aggregated to major group 77. The other difference is that Ind50 represents an "Other manufacturing category" in the pretest data, which includes SICs 12, 17 and 39 only, whereas Ind99 in the survey data contains all other SICs covered by the survey not elsewhere shown in the variable list.

Table 5.5 - Comparison of regression results, pretest and full survey data

	<i>Survey data</i> (n=83452)	<i>Pretest data</i> (n=3892)
Experience	0.72 (66.8)	0.92 (19.1)
Union	2.32 (50.9)	2.53 (10.4)
Status	1.67 (42.2)	0.96 (5.0)
Size	1.91 (42.9)	-0.11 (-0.41)

Note: T-statistics are shown in brackets underneath the associated coefficient. For a description of the data, see chapter 3. For a description of the model, see Chapter 4. Column 1 gives the coefficients for the effect on wages of the usual independent variables, except QM, for the full survey file (n=83,452), with both occupation and industry dummies included. Column 2 shows the results of the same model, but for the pretest file only (n=3892). Detailed results showing coefficients for all industry and occupation dummies can be found in Appendix 3. Source: Calculations by the author from a data file combining data from the Prairie Provinces Wage Rate Survey and the 1993 and 1994 Quality Management Practices Surveys of Statistics Canada.

The regression results using the data for the full survey are broadly consistent with the results reported earlier and therefore validate the regression model. The size and sign of the coefficients for experience, union and full-time status in this regression are comparable to the results obtained using the pretest data only. The results for employment size, however, are different. In the pretest data, the coefficient for size is negative and not significant. In the full survey data, the coefficient for size is significant and positive, at \$1.91 per hour. A similar result is obtained from the pretest data only when controls for industry-occupation pairs are included. One could conclude, therefore, that this is the most appropriate specification for analyzing the smaller pretest data file.

Another validation procedure involved evaluating the strength of any correlation between independent variables. Previous research had identified a relationship between firm size

and the adoption of quality management practices.⁵ If these are highly correlated, one may act as a proxy for the other. The same could be said of the unionization variable.

Table 5.6 - Correlation matrix, QM, union status and firm size

	<i>QM</i>	<i>Union</i>	<i>Size</i>
QM	1.0	0.29	0.16
Union	0.29	1.0	0.14
Size	0.16	0.14	1.0

The correlation coefficients between these variables are significantly different from 0 but not so large as to suggest that multicollinearity is a problem.

The link to increased polarization of earnings

As discussed in Chapter 4, the data used for this dissertation cannot provide direct empirical evidence of a link between the QM wage premium observed in 1996 and the increased polarization of the earnings of full-time full-year workers over the period 1981 to 1996. Therefore, I will rely on the qualitative interpretation of ancillary data sources that are suggestive of such a link. These are the stylized facts to this point.

5. Johanis, *Striving for Quality*

The distribution of earnings of full-time full year workers was less polarized 15 years ago. Since then, it has become more polarized, mostly as a result of changes in labour demand (see literature review in chapter 1). It is known that some, perhaps half, of the polarization in earnings is attributable to a polarization in hours worked. The rest is due to a polarization of hourly wage rates.⁶ Changes over this period in the shares of employers by sector, or in the occupational composition of employment, or in the age, experience or skill mix of the workforce have been found to be relatively minor contributors. The identification of the determinants of this polarization has proved elusive, leading some authors to suggest that changes in the share of employers having adopted certain management practices may have played a role. Against this backdrop, this dissertation presents evidence that there existed a QM premium in 1996. As described in Chapter 4, if the share of employers having adopted these practices has increased over the last 15 years, this can have had a polarizing effect on the distribution of earnings. Here is evidence that this is the case.

In 1993, 21% of manufacturing establishments in Canada had adopted a high balanced pattern of quality management implementation.⁷ In 1994, 12% of firms in the business services industries, 39 % in telecommunications and 22% in wholesale and retail trade had done the same.⁸ Although firms in some industries were more likely to adopt these

6. Morissette, Myles and Picot, *What is happening to earnings inequality?*

7. Johanis, *Striving for Quality*.

8. Johanis, *Striving for Quality II*

practices, their implementation was distributed throughout industries and size classes.

There are number of sources that can provide clues as to whether this distribution of QM firms is a long-standing pattern or something of more recent origin.

In the 1994 Survey of Quality Management Practices in Services Industries, respondents were asked if they had a written quality improvement plan and, if so, for how long it had been in place. Of the 505 firms that had such a plan, 33% reported that it had been in place for 5 or more years. The quality improvement plan was from 3 to 5 years old in 27% of the firms, 2 years old in 17% while in the other 23% of firms, it was 1 year old or less. There is therefore a gradual increase over the years in the proportion of firms developing a written quality improvement plan. It should be noted that the adoption of such a plan was found to be the single most significant indicator of whether or not other QM practices would also be adopted, with a strong correlation between the number and pattern of use of QM practices and the age of the plan. The older the plan, the more likely firms made extensive use of QM practices.⁹

Another indication that the adoption of QM practices is an emerging phenomenon can be found the 1995 Survey of the Characteristics of Labour Demand in Quebec. This is a large survey conducted by Statistics Canada and the Bureau de la statistique du Québec in

9. For example, in Business Services industries, only 1% of the firms that had no plan were in the High Balanced group, whereas among firms whose plans were from 3 to 5 years old, 54% were in the High Balanced group, and over 90% were in the three clusters that made more extensive use of QM practices. See Johanis, *Striving for Quality II*

the summer of 1995, which obtained information on labour demand from a little over 11,000 establishments from every part of the Quebec economy.¹⁰ Overall, 17% of firms indicated that they had adopted a "quality management system" and another 17% said they planned to do so within 2 years of the survey reference period. This varied widely by industry, ranging from a low of 9% actual and 10% planned in the Amusement and Leisure Services industry to a high of 45% actual and 36% planned in the Primary Metals industry. Once again, it seems that the adoption of QM is a broad-based emerging phenomenon, with as many firms planning to adopt QM practices as already have, across all industries, but with a large proportion still on the sidelines. Overall, 66% of firms indicated that the question was not applicable to them, with over 50% in almost all industries.

Conclusion

These two sources are consistent in portraying an upward trend in the share of firms adopting QM practices. As there is a wage premium associated with QM adoption, the increase in the share of employers having adopted QM could very well have contributed

10. Société québécoise de développement de la main-d'oeuvre and Human Resources Development Canada. *Enquête sur les caractéristiques de la demande de main-d'oeuvre au Québec. Résultats globaux* (September 1996). For a detailed description of survey methodology, see Bureau de la statistique du Québec and Statistics Canada. *Rapport méthodologique de l'Enquête sur les caractéristiques de la demande de main-d'oeuvre au Québec* (Québec: Gouvernement du Québec, December 1996).

to the increased polarization of earnings over the last 15 years, through the dynamics described in Chapter 4.

While the link between an increase in the share of firms having adopted QM and increased polarization is not fully grounded in empirical results, it is more than merely speculative. It is a plausible interpretation of the data that gives meaning to the clearly established finding that a QM wage premium exists. Management practices therefore make a difference, not only as regards the competitiveness of firms, but in terms of the wages paid to their workers, which in turn has implications for the distribution of earnings. The implications of these findings for public policy are discussed in the next chapter.

Chapter 6 - Implications

The conclusion that I have drawn from the research presented in this dissertation is that changes in the distribution of firms that make extensive use of quality management practices may have contributed to the increased polarization of earnings observed in Canada. This conclusion is based on the finding that firms that have adopted a comprehensive set of quality management practices pay higher wages, if they are also unionized, holding other relevant factors constant, and the observation that the share of firms having adopted these practices has increased, from a fairly small base, over the same time period as the increase in the polarization of earnings.

Whether or not the spread of QM practices is actually a factor in the increased polarization has yet to be demonstrated empirically. I am sufficiently convinced of the plausibility of the argument, however, to assume its truth as I discuss broader theoretical issues in this chapter.

Empirical contribution

Over the last 10 years, there has been a steady flow of research on the causes of the polarization of earnings in Canada, stemming mostly from the work of a group of researchers at Statistics Canada. This research effort has for the most part systematically investigated potential causes of the polarization of earnings, each new study building on the results of the last. Examining shifts in the industrial and occupational structure of the economy, skills polarization as measured through age and experience, polarization of working hours and the effect of firm size, this research has established one by one the validity and magnitude of the role played by each of these factors. While they explained part of the observed polarization of earnings, there nevertheless remained a significant unexplained component, which could not be addressed with available data.

This dissertation is based on a new, firm-level dataset that contains information on both human resources practices and wages. It represents therefore a first attempt at filling this gap.

Policy implications

On the broader theoretical front, the finding that a wage premium is associated with the adoption of quality management practices, but only in unionized workplaces,

corroborates two hypotheses found in the literature, each of which will be discussed in this section: (1) the introduction of adjustment strategies based on quality holds the potential for increased polarization, and (2) unions make a difference.

In this context, the adoption of quality management practices can be understood as part of a larger adjustment strategy adopted by firms in response to the globalization of markets.

The globalization of markets itself can be seen as a reaction to the crisis of Fordism - the inability of Western economies to sustain domestic economic growth through a regime of mass production and mass consumption, conciliated and made possible through collective bargaining. The nature and implications of alternative adjustment strategies have been discussed in the political economy literature.

In general, the theorized strategies take as their starting point the introduction of micro-electronic or information technologies. The alternative scenarios that are proposed involve the deployment and use of these technologies in ways that make possible the flexible production of high quality products rather than the mass production of standardized products. Perez speaks of the emergence of a new technological paradigm.

defined as “an ‘ideal type’ of productive organization, which defines the contours of the most efficient and ‘least cost’ combinations for a given period”. organized around a “key factor”, in this case low cost electronics.¹ The diffusion of this paradigm “entails a shift from economies of scale based on homogeneity (mass production) to economies of scope or of specialisation based on flexibility.”² Piore and Sabel introduce the concept of “flexible specialization”, in which the new technologies are combined with a traditional “craft” approach in the small batch production of customized goods.³ A competing concept, diversified quality production, is proposed by Streeck, which can be situated in relation to craft production and mass production as shown in Table 6.1.⁴

Table 6.1 - Theoretical models of the organization of production

	<i>Small batch</i>	<i>Large batch</i>
<i>Custom products</i>	Flexible specialization	Diversified quality production
<i>Standard products</i>		Mass production

If higher wages are associated with their introduction, each of these approaches carries within it the potential for increased polarization of earnings as they spread through the economy.

1. Carlotta Perez, “Microelectronics, Long Waves and World Structural Changes: New Perspectives for Developing Countries,” *World Development* 13, no.3 (1985):443.

2. Mahon, “From Fordism to ?” 10-11.

3. Piore and Sabel, *The Second Industrial Divide*.

4. Streeck, “On the Institutional Conditions of Diversified Quality Production”.

There is recent empirical evidence that the introduction of advanced manufacturing technology in Canada may be associated with the polarization of wages.⁵ Using 1981 and 1989 data on the number and type of technologies used in a sample of manufacturing plants, Baldwin *et al.* conclude that wages are an increasing function of the number of certain types of technologies used, in particular what they term labour-enhancing technologies. It may be, however, that part of what is being observed is the effect of the underlying management practices, which are not included in model. An indication that this may be the case is that the technologies most associated with wage premia are inspection and communications technologies which "monitor production via diagnostics and quality control".⁶ The implication is that it is not necessarily the technology, but the management practices that accompany their deployment that make the difference.

Although the strategies described in the literature are premised on the flexibility made possible by the emergence of microelectronic technologies, they are also understood to incorporate changes in shop floor organization and practices so that the effect on productivity and wages is the result of both factors.

"It would be wrong, however, to conclude that it is technological change itself which is producing these signs of polarization. Technology *per se* has no predetermined socio-economic impact; rather, its impact is shaped by the way that

5. J. Baldwin, T. Gray and J. Johnson, *Technology-Induced Wage Premia in Canadian Manufacturing Plants in the 1980s*, Statistics Canada, Research Paper Series no.92, Cat.11F0019MPE (January 1997).

6. *ibid.*, 4.

it is put to use...This is especially true of microelectronics which *can* be used to deskill office, shop and factory work - or it can be used to *enhance* skills."⁷

Similarly, Streeck recognizes the role of management choices in the course that is adopted: that course is conditioned, but not determined, by technology.⁸

In fact, one could go one step further by hypothesizing that, even in the absence of new technologies, it would be possible to improve productivity and wages strictly through the introduction of new workplace practices. A striking example was provided by the NUMMI experiment in the auto industry in the mid-1980s.

"The significance of NUMMI stems from the direct comparison that is made to the former GM-Fremont plant that had stood on the same site. With essentially the same plant, technology, workers, wage rates, union and union leaders, NUMMI organized a production system that far exceeded in productivity and quality not only the former GM-Fremont plant but also every other GM assembly plant in the United States. NUMMI demonstrated that Japanese auto production management practices were transferable to North America."⁹

The key to the NUMMI success was the implementation of the "team concept", an approach that bears many similarities to the model of quality management presented in

7. Mahon, "From Fordism to ?" 8.

8. Streeck, "On the Institutional Conditions for Diversified Quality Production", 32.

9. John Holmes and Pradeep Kumar, "Labour Movement Strategies in the Era of Free Trade: The Uneven Transformation of Industrial Relations in the North American Automobile Industry," in *Production, Space, Identity: Political Economy for the 21st Century*, ed. J. Jenson, R. Mahon and M. Bienefeld (Toronto: Canadian Scholars' Press, 1993): 206.

this dissertation.¹⁰ By adopting these kinds of approaches, flexibility without automation is a realistic alternative in many industries.

The role of unions

As seen in the last chapter, firms that have implemented a “high balanced” pattern of use of quality management practices pay higher wages, if they are also unionized. The fact that the adoption of these practices is associated with higher wages for unionized jobs but not for non-unionized jobs raises many questions. In which direction does causality run? Is higher productivity the result of the practices alone, with unions simply ensuring that labour gets its share of the increased value-added? Or is higher productivity, and higher wages, the result of unions being “on-side” to assist and support the implementation of this management approach? In other words, is union participation a prerequisite to the successful implementation of QM?

To understand why higher wages are associated with QM for unionized jobs only, I will first describe the mechanisms through which implementation of QM can lead to higher wages, a topic that has not been broached before. Three possible mechanisms are presented. In a first scenario, higher wages may result from a shortage of workers with the specific skills required to operate in a quality management environment. Employers

10. *ibid.*, 207.

would thus be willing to pay a premium to attract and retain such workers. In a second scenario, higher wages may be paid because employers provide more training in a quality management environment, which increases the value of their employees and which, in a human capital model, results in a higher wage. Some evidence has been reported that QM and training are complementary.¹¹ Finally, higher wages may be paid to reflect the higher marginal product of workers in a QM environment, not because of any additional skills and knowledge that they do not already possess, but because the full potential of workers is tapped in such an environment. In other words, these firms achieve greater efficiency as a result of QM implementation.

As either the labour shortage or increased training mechanisms described above would affect wages in both unionized and non-unionized jobs equally and as higher wages are associated with QM for unionized jobs only, these causes can be rejected as mechanisms for increasing wages in QM workplaces. I will therefore retain the hypothesis that QM is associated with higher wages because firms that adopt these practices become more efficient.¹²

11. Edward Lawler, Susan Mohrman and Gerald Ledford, *Employee Involvement and Total Quality Management: Practices and Results in Fortune 1000 Companies* (San Francisco: Jossey-Bass, 1992); Paul Osterman, "How Common is Workplace Transformation and Who Adopts It?" *Industrial and Labor Relations Review* 47 no. 2 (January 1997):173-187.

12. This assumes that unions do not facilitate the flow of workers to firms or induce employers to provide more training. While they might have a role in these two areas, I believe their impact on wages is greatest through their ability to influence productivity and their bargaining power.

With that assumption in place, I can now examine what role the presence of unions may play. One possible explanation is that QM implementation only succeeds in raising productivity, and wages, where there are unions, that somehow the existence of unions is a pre-requisite to successful implementation. Another scenario is that QM implementation can raise productivity in any kind of workplace, unionized or non-unionized, but that higher wages result only where there are unions to fight for the workers' share of the increased value-added. The latter is a highly plausible scenario but the former should also be considered.

In non-union workplaces, workers may be less inclined to surrender their detailed knowledge of the production process, upon which continuous improvement depends, to management, without enforceable guarantees of sharing in the benefits through higher wages. This knowledge is often informal and cannot be extracted from the workers without destroying the very trust and spirit of cooperation essential to the successful prosecution of this course of action.

"As we have seen, this inherited labour process is no longer effective and has instead given way to the development of a new form of work organization. This is one that stresses cooperation on the shopfloor, draws on the creativity of the labour force, reduces polarization between skills (encouraging multi-skilling), moves away from the fragmentation of tasks, and promotes long-term employment (which is crucial if labour is to be treated as resource rather than a cost)."¹³

13. R. Kaplinski, "Post-Fordist Industrial Restructuring: Some Policy Implications," in *Production, Space, Identity: Political Economy for the 21st Century*, ed. J. Jenson, R. Mahon and M. Bienefeld (Toronto: Canadian Scholars' Press, 1993): 44.

It is possible that the presence of unions is essential to provide the necessary framework within which this type of cooperation can evolve.

If this assumption is correct, then higher wages are the result the greater realization of potential productivity, but only in unionized workplaces, where unions both provide a framework for cooperation and supply the bargaining power to obtain the workers' share of the increased value-added. If, however, QM implementation can succeed in raising productivity in any workplace, union or non-union, then higher wages are the result of the greater realization of potential productivity, but the role of unions is limited to providing the bargaining power required to extract this surplus.

In addition to this firm level or sector level role, unions can also play a role on a societal level. The empirical result from the last chapter shows that the polarizing effect of the adoption of these strategies is layered over the already large wage premium associated with unionization alone. It also renders the polarizing effect more permanent by essentially capping the proportion of firms that can be both QM practitioners and unionized.

Twenty-three percent of the firms in the research data were QM practitioners - that is, in the "high balanced category" - while 31% were unionized. However, only 8% were both. As the proportion of firms that are unionized has remained stable for many years, the polarizing dynamics are more likely to be supplied by the adoption of QM by unionized

firms than by QM firms becoming unionized or by firms that are neither become both simultaneously. This means that the degree of unionization places a ceiling on the proportion of firms that can be both QM and unionized. If all firms were unionized, the polarizing effect of the adoption of QM would at first increase, as the distribution of earnings became more flattened, then decline, eventually disappearing when 100% of the firms adopted this management approach. But if the degree of unionization remains constant, the polarizing effect becomes "stuck", so that even if 100% of firms adopted QM, it would result in increased wages in only 30% of them. Although theoretically, the polarizing effect of the adoption of this strategy could eventually be eliminated if all firms were unionized, in practice this is not a realistic scenario. It is realistic, however, to expect that unions could play a role in influencing the state to adopt policies that, at a minimum, do not exacerbate the polarizing effect and that perhaps promote a high wage strategy throughout the economy.

"A crucial condition for such an outcome is the existence of a national industrial relations system which encourages and enables unions to play a positive part, both in pressing for modes of work organization which maximize worker opportunity to acquire and develop skills and in ensuring that high wage levels are maintained across the economy."¹⁴

14. Mahon, "From Fordism to ?" 20.

The role of the state

The nature of any action the state may take depends on whether the increasing polarization of earnings is seen as a temporary self-correcting phenomenon or something of a more permanent nature. If the spread of QM practices is a factor, does this represent a disequilibrium which will eventually be resolved through competitive forces or does it represent a dual equilibrium model, with a permanent polarizing effect? Levy and Murnane clearly recognize the importance of these issues for public policy:

"The variation in competitive strategies among firms in particular industries may reflect a disequilibrium situation. Eventually, competition may determine the most profitable technology/wage combination, and employer- and plant-specific variation in earnings will decrease. Alternatively, the variation may reflect a stable approach to an increasingly segmented product market. Whatever the situation, the standard of living of large numbers of workers is riding on the outcome. For this reason, it is particularly important to investigate the circumstances under which low wage strategies or high wage strategies emerge as more profitable, and the factors that influence firms' choice of strategies. It is possible that these choices depend on factors that can be influenced by public policy, such as regulatory framework, the tax structure, and the quality of public education."¹⁵

In the disequilibrium scenario, the polarizing effect of the spread of quality management practices would be corrected through market forces if all firms eventually abandoned this management approach or, alternatively, if all of them adopted it. As discussed above, however, even if all firms were to adopt QM, it is not likely that they would also all

15. Levy and Murnane, "U.S. Earnings Level and Earnings Inequality," 1369.

become unionized. The possible roles of the state in this scenario include reactive actions to mitigate the temporary effects of the earnings polarization and proactive actions to speed the workings of the market along. Reactive action deals with the consequences of polarization and involves transfers and other forms of assistance for workers whose relative earnings have fallen. It can also mean taxation to dampen the gains of those whose relative earnings have risen. Proactive action deals with the behaviour of firms and either encourages or discourages firms from engaging in polarizing behaviour, in this case the adoption of QM and unionization. With respect to the latter, the choice of what specific actions should be taken depends on whether the state supports low-wage, cost-cutting strategies or high-wage strategies based on quality.

In the dual equilibrium scenario, the state is faced with long term polarization and a set of dilemmas: first, can reactive transfers and assistance be supported in the long-term, fiscally and politically? and second, if there are truly stable equilibria so that both types of strategies are profit-maximizing, can the state legitimately promote one over the other because of its implications for wage levels? The judgement made as to the transitory or permanent nature of the polarizing phenomenon has important ramifications for public policy, as does the choice of which competitive strategy to promote.

This choice can take the form of a two-by-two matrix, with each quadrant associated with a set of reactive and/or proactive state actions.

Table 6.2 Policy options regarding the polarizing effect of adoption of QM

	<i>Price-based strategy</i>	<i>Quality-based strategy</i>
Transitory	1 Impose taxes on gainers	2 Provide transfers to losers
Permanent	3 Actively discourage adoption of QM Discourage unionization	4 Actively encourage adoption of QM Encourage unionization and other institutional supports

In Quadrants 1 and 2, emphasis is placed on reactive actions, using taxes and transfers to mitigate the temporary polarizing effects of QM adoption. In Quadrant 1, the earnings of gainers are taxed so as to bring them closer to the lower long-term mean earnings that are expected to arise under a price-based competitive strategy. In Quadrant 2, income transfers are made to the losers to bring their incomes up to the higher long-term mean expected under a quality-based regime.

Whether or not proactive action is taken depends on how long the transition period is expected to be. In Quadrants 3 and 4, no reactive actions are proposed as they are not considered sustainable in the long term. Rather, the emphasis is placed on vigorous proactive action that deals with the root causes of the polarization instead of its effects.

In Quadrant 4, state action involves the establishment and maintenance of institutional mechanisms that facilitate employer and worker commitment to QM. According to

Streeck, this approach requires an economy that is "in a particular way regulated and supported by thick, non-economic social institutions."¹⁶ These institutions provide incentives and constraints that lead firms to engage in behaviour that would not emerge under market incentives alone. These behaviours are in three categories: the need for a congenial organizational ecology; the need for redundant capacities; and, the need for collective production inputs (Streeck's wording).¹⁷

The first category, a congenial organizational ecology, closely resembles the third angle in Porter's diamond, "Related and Supporting Firms".¹⁸ According to the latter, an environment fostering competitiveness is one in which firms can associate, exchange, network and share, even while competing. For Streeck, diversified quality production puts a premium on strategic alliances and joint ventures.

"High product diversity and quality sometimes seem to go together with an attenuation of the distinction between firms and their competitors, as well as a blurring of the boundaries between firms and their suppliers. To the extent that diversified quality production is enhanced by a fluid, quasi-consortial pattern of industrial organization - with joint ventures being set up, like building sites, for special projects, to be dismantled after their completion - firms in a given industry are at the same time competitors and potential allies."¹⁹

16. Streeck, "On the Institutional Conditions of Diversified Quality Production," 31.

17. This implies that QM practices are not likely to become more widespread or cannot be sustained in the long term without state intervention. There may be some validity to this view. However, it is clear that, to date, QM practices have been adopted under market incentives, with very little state intervention.

18. Michael Porter, *The Competitive Advantage of Nations* (New York: Basic Books, 1990).

19. Streeck, "On the Institutional Conditions of Diversified Quality Production," 34.

Mechanisms that promote, and protect participants in such cooperative ventures, are not likely to arise from market forces alone and this is where the state can provide appropriate institutional supports.

In the second category, Streeck argues that diversified quality production requires the development and maintenance of polyvalent skills and organizational and decision structures that exceed, in quantity and quality, levels that would be justified through rational calculation. These redundant capacities are required to take advantage of rapidly shifting demand conditions and production methods and technologies. Short-term market orientation and "hierarchy failure" (a species of principal-agent problem) mitigate against the development of these redundancies, which are essential to longer term success. These arguments closely parallel the debate on "the cost of quality". In this polemic, the position taken by some North American writers is that investment in continuous quality improvement can reach a point of diminishing returns, beyond which benefits are not worth the costs. The Japanese position in this debate is that there are no limits to the amount of quality improvement that can or should be made as there are unintended positive externalities, which cannot be quantified in a decision calculus, stemming from the improvement efforts themselves.²⁰ In either case, institutional mechanisms are required to promote the adoption of what in the short-term seem to be unprofitable courses of action.

20. Crosby, "Quality is Free".

In the last category, Streeck argues that diversified quality production requires "a range of factor inputs that have significant collective-good properties".²¹ These include social peace, knowledge and skills. While each of these is an essential requisite for this mode of production, each is also imperfectly appropriable. Faced with the prospect of losing investments made in the production of these goods, employers are likely to under-invest, resulting in a suboptimal production, unless mechanisms can be instituted to compensate employers or otherwise ensure that they will reap the benefit of their investments.

Regardless of the specific measures, Streeck sees in all cases the opportunity and the need for multi-party discussion and negotiation in the development of the most appropriate mix for a given workplace in a given society. He gives as example the West German case as to the types of institutional mechanisms that foster a QM approach.

"Among the most conspicuous examples of institutional rigidities in the West German political economy that oblige economically rational firms and managements to contribute to collective goods needed for diversified quality production, prevent them from consuming such goods without replacement, and make them invest in a congenial organizational ecology, in redundant capacities, and in non-appropriable inputs, are:

1. A system of rigid wage determination, operated by strong and well-established trade unions and employer associations...
2. A policy of employment protection that compels employers to keep more employees on their payroll for a longer time than they might be inclined on their own...

21. Streeck, "On the Institutional Conditions of Diversified Quality Production," 42.

3. A set of binding rules that obliges employers to consult with their workforces and seek their consent above and beyond what many or most would on their own find expedient...
4. A training regime that is capable of obliging employers to train more workers and afford them broader skills than required for immediate product or labour market pressures...
5. A system of rules regarding the organization of work, created by government or trade union intervention and obliging employers to design jobs more broadly than many of them would find necessary..."²²

An alternative view is provided by the OECD in an analysis of the policy implications of competition in a globalized economy. The OECD identifies three areas of domestic policy that require examination and re-orientation to "obtain the gains and address the problems arising from globalization".²³ In the first category are policies that promote a favourable business environment, which includes technological, business services and physical infrastructures, access to capital and efficient financial markets. The second category of policies involve expanded investment in education and training to increase the availability of skilled labour, while the third category contains policies aimed at small firms. These include measures to encourage the diffusion of best practices and technology to enhance the competitiveness of firms in this sector, including, presumably, QM practices.

22. *ibid.*, 53-55.

23. Organization for Economic Cooperation and Development, *Globalization of Industry: Overview and Sector Reports* (Paris: OECD, 1996):11.

These policy implications are premised on a definition of globalisation that is driven, in part, by firm behaviour that includes the "adoption of 'lean' production methods and more horizontal internal and external organizational structures"²⁴, which corresponds roughly to the adjustment strategy based on quality mentioned above. Notably absent, therefore, from this list of policy implications are policies that deal with the polarizing effect of the differential adoption of these strategies, including the role of unions.

These issues have a resonance in the Canadian context. By the late 1980s, the policy discourse dealing with how Canadian business should adjust to the competitive pressures of a globalized economy had coalesced around the ideas of innovative, high quality, knowledge-based, high value-added production. This policy position, which was put forth in the government documents "Adjusting to Win" and "Success in the Works"²⁵ can be summarized as follows:

"In a high valued-added economy, new technology and modes of organization are deployed to produce high quality goods and services. Competition is thus focussed on areas of activity where quality, not low costs, is the main concern. In manufacturing, high value-added production involves the adoption of programmable automation, new methods of work organization (from statistical process control to teamwork) and new relations with suppliers (cooperation on new product development and the creation of supplier processes essential to the functioning of new "just-in-time" agreements)."²⁶

24. Streeck, 20.

25. *Adjusting to Win*, Advisory Council on Adjustment (Ottawa: Supply and Services Canada, 1989); *Success in the works - a labour force development strategy for Canada*, Human Resources Development Canada. (Ottawa: Supply and Services Canada, 1989).

26. Rianne Mahon, "Adjusting to Win? The New Tory Training Initiative," in *How Ottawa Spends, 1990-91*, (Ottawa: Carleton University Press, 1991): 76.

This describes a mode of adjustment based on quality, with many of the practices described in chapter 2 finding their way into the strategy. This policy thrust was continued in the Prosperity Initiative, a set of consultations that spawned a large number of discussion and position papers, culminating in the production of an action plan in October 1992.²⁷ Quality figures prominently among the many recommendations made by the Steering Group on Prosperity, a high profile group of experts drawn from academia, business and labour circles. For example, the Steering Group states that innovative action must be taken to "make quality the goal of all our endeavours so that Canada becomes a symbol of excellence around the world".²⁸ The first entry in a table of key recommendations reads: "Stimulate a coordinated approach to quality in all sectors"²⁹ and the first section of the action plan is entitled "Focussing on Customer Needs: Making Canada a Leader in Quality".³⁰

Not only public bodies promoted the adoption of an approach based on quality. Industry organizations followed suit. The Canadian Manufacturing Association published "The Aggressive Economy: Competing to Win", also in 1992, in which it explicitly recommends the adoption of quality management practices.

27. Steering Group on Prosperity, *Inventing our Future: An Action Plan for Canada's Prosperity*, Cat. No. C2-206/1992E, Ottawa, October 1992.

28. *ibid.*, 5.

29. *ibid.*, 8.

30. *ibid.*, 12.

"Canadian manufacturers must compete to win. They must:

- Secure open and equal access to domestic and import markets;
- Adopt Total Quality Management practices and cost effective technologies;
- Develop cooperative relationships with labour, research groups, education and training institutions;
- Upgrade the skills and talents of their employees."³¹

There were some dissonant notes, however, from the labour movement, for whom the kind of shop floor co-operation required under this approach is seen as a threat to its independence from management.³² Yet, even in rejecting formal recognition of this approach, the Canadian Auto Workers adopted the discourse: "(The CAW)...supports efforts to involve and empower workers, to increase worker dignity, to produce quality products with pride, to make jobs more rewarding and workplaces more democratic".³³

31. Canadian Manufacturers' Association, *The Aggressive Economy Competing to Win* (1992): 8.

32. Holmes and Kumar, "Labour Movement Strategies," 211.

33. Canadian Auto Workers, "Drawing lines on the team concept," 1989.

Conclusion

It seems we have come to the confluence of many interrelated events and trends: the collapse of fordist organization of production, the emergence of information technology, the globalization of markets and the convergence of quality management and mainstream management practice and theory. From this nexus emerges a menu of adjustment strategies, some of which carry within them the possibility of contributing to the polarization of earnings.

In this dissertation, I have set out to explore the relationship between the adoption by firms of quality management practices and the polarization of earnings observed in Canada over the last 15 years. In so doing, I have made three specific contributions that may prove useful for future research in this area.

First contribution

The first contribution is methodological and involves the development of concepts and measures in respect of management practices. The intellectual history of the relationship between quality management and mainstream management theory presented in Chapter 2, an original contribution in its own right, provided a conceptual framework for the operationalization of quality management as a set of measurable practices about which data can be collected and analyzed. This is a valuable contribution as “management practices” can be a particularly nebulous and intractable topic to define and measure.

Second contribution

The second contribution is empirical and concerns the presentation of statistical evidence for the existence of a wage premium associated with the adoption of quality management practices. I then argued that the existence of a QM wage premium is probably a necessary, but not sufficient, condition for changes in the share of firms having adopted these practices to have contributed to the polarization of earnings. What was not anticipated, however, was the finding that this relationship holds true for unionized jobs only. These empirical results contribute to the ongoing research on the determinants of earnings polarization and provide new candidates - the variables measuring QM practices - as possible explanatory variables.

Third contribution

The third contribution situates these findings in the context of current political economy literature. In this respect, a useful contribution is the discussion of the polarizing dynamics of a wage premium paid by a subset of employers only. Another element associated with this dynamic is the interaction with unionization. Either because their operation is a necessary condition to successful adoption of these practices or because their bargaining power is required to extract the benefits of this approach for workers, unions paradoxically can at once exacerbate the polarizing effect of QM adoption and provide an avenue for its eventual attenuation. Finally, new questions are raised for policy makers to consider and for future research.

Future research

The main direction for future research lies in the strengthening of the empirical link between QM adoption and earnings polarization. While the evidence presented in this dissertation for the existence of a QM wage premium is quite strong, the hypothesis that changes over time in the share of firms having adopted these practices have contributed to increased polarization is supported only by ancillary data at this time. Data on wage rates and QM practices are required for at least one more time period to empirically establish

or refute the existence of such a link. This can be done through modelling and simulation or through new survey data.

Another direction for future research is the exploration of the nature of the interaction between QM adoption, unionization and wage rates. It would be interesting to examine whether firms that have adopted QM achieve higher productivity than those that have not, *ceteris paribus*, or whether this is true of unionized firms only. If QM adoption does raise productivity, then the question of the disposition of this increased value-added as between capital and labour could also be addressed.

Whatever direction the evolution of these trends takes, the values and assumptions underlying the quality movement as propounded by Edward Deming must be protected and maintained. These are founded on the recognition of, and respect for, the dignity, know-how and abilities of working men and women. In this view, what is missing is not within the workers, but within "the system"³⁴, the organizational strategies, rules and structures that regulate the workplace. If this organizational context can be modified in certain ways, then the hitherto unused knowledge and abilities of workers can be unleashed.

34. Deming's own words.

Bibliography

- Advisory Council on Adjustment. *Ajusting to Win*. Ottawa: Supply and Services Canada. 1989.
- Babbage, Charles. *On the Economy of Machinery and Manufactures*. 1832. Reprint. New York: n.p., 1963.
- Baldwin, J., T. Gray and J. Johnson. *Technology-Induced Wage Premia in Canadian Manufacturing Plants in the 1980s*. Statistics Canada, Research Paper Series no.92. Cat.11F0019MPE. Ottawa, January 1997.
- Band, William A. *Creating Value for Customers: Designing and Implementing a Total Corporate Strategy*. New York: John Wiley and Sons Inc., 1991.
- Beach, C. and G. Slotsve. *Are We Becoming Two Societies? Income Polarization and the Myth of the Declining Middle Class in Canada*. Toronto: C.D. Howe Institute, 1996.
- Beck, Nuala. *Shifting Gears: Thriving in the New Economy*. Toronto: Harper-Collins. 1991.
- Bell, Daniel. *The Coming of Post-Industrial Society*. New York: Basic Books. 1973.
- Berger, M. "The Effect of Cohort Size on Earnings Growth: A Reexamination of the Evidence." *Journal of Political Economy* 93 (1985):561-573.
- Betcherman, G. and R. Morissette. *Recent Youth Market Experience in Canada*. Statistics Canada, Research Paper Series no.63. Cat. 11F-0019E. Ottawa. 1994.
- Blackaby, F. ed. *Deindustrialization*. London: Heinemann and National Institute for Economic and Social Research. 1979.
- Blackburn, Joseph D. "New Product Development: The New Time Wars." In *Time Based Competition: The Next Battleground in American Manufacturing*, edited by Joseph D. Blackburn. Homewood, Illinois:Business One Irwin, 1991.
- Blackburn, Joseph D. "Just-in-time: The Genesis of Time Compression." In *Time Based Competition: The Next Battleground in American Manufacturing*, edited by Joseph D. Blackburn. Homewood, Illinois:Business One Irwin, 1991.

- Bloom, D. and R. Freeman. *The Youth Problem: Age or Generational Crowding?* National Bureau of Economic Research Working Paper no.1829. Washington, D.C., 1986.
- Bluestone, H. and B. Harrison. *The Great U-Turn: Corporate Restructuting and the Polarizing of America*. New York: Basic Books, 1988.
- Bluestone, H. and B. Harrison. *The Deindustrialization of America?* (New York: Basic Books, 1982.
- Boulding, Kenneth E. "General Systems Theory - The Skeleton of Science." *Management Science* 2 (April 1956):197-208.
- Braverman, H. "Labour and Monopoly Capital." In *Classes, Power and Conflict*, edited by A. Giddens and D. Held. Berkeley: University of California Press, 1974.
- Brower, Michael J. "Implementing TQM with Self-Directed Teams." In *Readings in Total Quality Management*, edited by Harry Costin. New York: Harcourt Brace, 1994.
- Bryk, A. S. and S. W. Raudenbush. *Hierarchical Linear Models: Applications and Data Analysis Methods*. Newbury Park, Ca.: Sage Publications, 1992.
- Bureau de la statistique du Québec and Statistics Canada. *Rapport méthodologique de l'Enquête sur les caractéristiques de la demande de main-d'oeuvre au Québec*. Québec: Gouvernement du Québec, December 1996.
- Camp, Robert C. *Benchmarking: The Search for Industry Practices that Lead to Superior Performance*. Milwaukee: Quality Press, ASQC, 1992.
- Canadian Auto Workers. "Drawing lines on the team concept." 1989.
- Canadian Manufacturers' Association. *The Aggressive Economy: Competing to Win*. 1992.
- Chase, Richard B. and David A. Garvin. "The Service Factory." *Harvard Business Review* (July-August 1989).
- Clark, Colin. *The Conditions of Economic Progress*. 3rd edition. London: Macmillan, 1957.
- Clemmer, Jim. *Firing on All Cylinders: The Service/Quality System for High Powered Corporate Performance*. Toronto: Macmillan Canada, 1992.

- Cohen, S. and J. Zysman. *Manufacturing Matters*. New York: Basic Books, 1987.
- Costin, Harry. "Exploring the Concepts Underlying Total Quality Management." In *Readings in Total Quality Management*, edited by Harry Costin. New York: Harcourt Brace, 1994.
- Crosby, Philip. *Quality is Free*. New York: Mentor Books, 1980.
- Daft, Richard and Patricia Fitzgerald. *Management*. Toronto: Holt, Rinehart and Winston of Canada Ltd., 1992.
- Davis, S. J. and J. Haltiwanger. "Wage Dispersion between and within U.S. Manufacturing Firms, 1963-86." *Brookings Pap. Econ. Act.*, Special Issue (1991):115-180.
- Davis, S. J. *Cross-Country: Patterns of Changes in Relative Wages*. National Bureau of Economic Research Working Paper no.4085. Washington, D.C., 1992.
- De Beyer, J. and J.B. Knight. "The Role of Occupation in the Determination of Wages." *Oxford Economic Papers* 41 no.3 (1989): 595-615.
- Deming, Edward. Introduction to *The Fifth Discipline: The Art and Practice of the Learning Organization* by Peter Senge. New York: Doubleday Currency, 1990.
- Deming, Edward. "On Some Statistical Aids toward Economic Production." In *Readings in Total Quality Management*, edited by Harry Costin. New York: Harcourt Brace, 1994.
- Domb, Ellen B., Robert C. Culver and Richard H. Rawcliffe. "Organizational Impact of Introducing Concurrent Engineering." In *Readings in Total Quality Management*, edited by Harry Costin. New York: Harcourt Brace, 1994.
- Dooley, M. D. "The Over-Educated Canadian? Changes in the Relationship Among Earnings, Education and Age for Canadian Men: 1971-1981." *Canadian Journal of Economics* 19, no.1 (1986):142-159.
- Drache, D. *The De-industrialization of Canada and its Implications for Labour*. Canadian Centre for Policy Alternatives, 1989.
- Drucker, Peter. *The New Realities: in government and politics, in economics and business, in society and world view*. New York: Harper, 1989.

- Economic Council of Canada. *Good Jobs, Bad Jobs: Employment in the Service Economy. A Statement by the Economic Council of Canada*. Ottawa: Minister of Supply and Services, 1990.
- Elliott, Marta and Toby L. Parcel. "The Determinants of Young Women's Wages: Comparing the Effects of Individual and Occupational Labour Market Characteristics." *Social Science Research* 25 (1996).
- Esping-Andersen, G. *The Three Worlds of Welfare Capitalism*. Princeton, New Jersey: Princeton University Press, 1990.
- Feigenbaum, Armand V. "Total Quality Control." *Harvard Business Review* (Nov-Dec 1956): 94-98.
- Fine, Helene S. "Just-in-Time: A Production System Built on a Code of Ethics." In *Readings in Total Quality Management*, edited by Harry Costin. New York: Harcourt Brace, 1994.
- Foot, D. K. and J.C. Li. "Youth Unemployment: A Reply." *Canadian Public Policy* 14, no.1 (1988): 109-111.
- Foot, D. K., and J.C. Li. "Youth Unemployment in Canada: A Misplaced Priority?" *Canadian Public Policy* 12, no.3 (1986): 499-506.
- Garvin, David A. "History and Evolution of the Quality Movement." In *Readings in Total Quality Management*, edited by Harry Costin. New York: Harcourt Brace, 1994.
- Gerwin, Donald and Linda Moffat. "Authorizing and De-authorizing Processes for New Product Development Teams." School of Business, Carleton University, 1994.
- Gottschalk, P. and T. M. Smeeding. "Cross National Comparisons of Earnings and Income Inequality." photocopy of draft manuscript, March 1996.
- Groshen, E.L. "Employers, Occupations and Wage Inequality in Three Cities, 1957-89: Another Piece of the Puzzle." Federal Reserve Bank of Cleveland, working paper, (October 1990)
- Gunderson, Morley. "Male-Female Wage Differentials and Policy Responses." *Journal of Economic Literature* 27 (1992): 46-72.
- Hall, Robert W. *Attaining Manufacturing Excellence*. Homewood, Illinois: Dow-Jones Irwin, 1992.

- Hammer, Michael. "Reengineering Work: Don't Automate, Obliterate." *Harvard Business Review* (July- August 1990).
- Hammermesh, D. *Labour Demand*. Princeton, New Jersey: Princeton University Press, 1993.
- Harvey, D. *The Condition of Post-Modernity*. London: Basil Blackwell, 1989.
- Hauser, John R. and Don Clausing. "The House of Quality." *Harvard Business Review* (May-June 1988): 63-71.
- Helwege, A. "Sectoral Shifts and Inter-industry Wage Differentials." *Journal of Labour Economics* 10, no.1 (1992):55-84.
- Holmes, John and Pradeep Kumar. "Labour Movement Strategies in the Era of Free Trade: The Uneven Transformation of Industrial Relations in the North American Automobile Industry." In *Production, Space, Identity: Political Economy for the 21st Century*, edited by J. Jenson, R. Mahon and M. Bienefeld. Toronto: Canadian Scholars' Press, 1993.
- Holzer, H.J. "The Determinants of Employee Productivity: Some New Evidence." *Industrial Relations* (1990).
- Howell, D. R. and E.M. Wolff. "Trends in the Growth and Distribution of Skills in the U.S. Workplace, 1960-1985." *Industrial and Labour Relations Review* 44, no.3 (April 1991):486-502.
- Human Resources Development Canada. *National Occupational Classification*. Ottawa: Supply and Services Canada, 1993.
- Human Resources Development Canada. *Success in the works: a labour force development strategy for Canada*. Ottawa: Supply and Services Canada, 1989.
- Imai, Masaaki. *Kaizen*. New York: McGraw-Hill, 1986.
- Jablonski, Joseph R. *Implementing TQM: Competing in the Nineties Through Total Quality Management*. New York: Pfeiffer and Company, 1991.
- Johanis, Paul. *Striving for Quality II: 1994 Survey of Quality Management Practices in Canadian Service Industries*. Ottawa: Industry Canada, 1994.
- Johanis, Paul. *1995 Survey of Practices in Support of Quality Services in the Federal Public Service*. Ottawa: Statistics Canada, Cat. No.57-495MPE, 1995.

- Johanis, Paul. *Striving for Quality: 1993 Survey of Quality Management Practices in Canadian Manufacturing*. Ottawa: Industry Canada, 1993.
- Johanis, Paul. "The Managerial Determinants of Competitiveness." Master's thesis. École nationale d'administration publique, 1993.
- Johnston, Catherine and Mark Daniel. *Customer Satisfaction Through Quality: An International Perspective*. Ottawa: The Conference Board of Canada. Report 74-91-E. October 1991.
- Juhn, C. K., K. M. Murphy and B. Pierce. "Wage Inequality and the Rise in Returns to Skills." *Journal of Political Economy* 101, no.3 (1991):410-442
- Kaplinski, R. "Post-Fordist Industrial Restructuring: Some Policy Implications." In *Production, Space, Identity: Political Economy for the 21st Century*, edited by J. Jenson, R. Mahon and M. Bienefeld. Toronto: Canadian Scholars' Press, 1993.
- Kast E. and J. E. Rosenzweig. *Organization and Management: A Systems Approach*. New York: McGraw-Hill, 1970.
- Katz, L. F. and K.M. Murphy. "Changes in Relative Wages, 1962-1987: Supply and Demand Factors." *Quarterly Journal of Economics* 107, no.1 (1992):107-115.
- Kilbourne, Barbara, Paula England and Kurt Beron. "Effect of Individual, Occupational, and Industrial Characteristics on Earnings: Intersections of Race and Gender." *Social Forces* 73 no.1 (1994): 1149-1176.
- Kilbourne, Barbara, Paula England, Kurt Beron, George Farkas and Dorothea Weir. "Returns to Skill, Compensating Differentials, and Gender Bias: Effects of Occupational Characteristics on the Wages of White Women and Men." *American Journal of Sociology* 100 no.3 (1994): 689-719.
- Kossoff, Leslie L. *Closing the Gap: The Handbook of Total Quality Implementation*. Newport Beach, Ca.: LLK Associates, 1993.
- Lawler, Edward, Susan Mohrman and Gerald Ledford. *Employee Involvement and Total Quality Management: Practices and Results in Fortune 1000 Companies*. San Francisco: Jossey-Bass, 1992.
- Levy, F. and R. J. Murnane. "U.S. Earnings Levels and Earnings Inequality: A Review of Recent Trends and Proposed Explanations." *Journal of Economic Literature* 30 (1992):1333-1381

- Lucifora, Claudio. "Inter-industry and Occupational Wage Differentials in Italy." *Applied Economics* 25 (1993): 1113-1124.
- Luthans, Fred. "The Contingency Theory of Management: A Path out of the Jungle." *Business Horizons* 16 (June 1973): 62-72.
- Mahon, Rianne. "From Fordism to ?: New Technology, Labour Markets and Unions." *Economic and Industrial Democracy* 8 (1987) 5-20.
- Mahon, Rianne. "Adjusting to Win? The New Tory Training Initiative." in *How Ottawa Spends, 1990-91*. Ottawa: Carleton University Press, 1991.
- March, Artemis. "A Note on Quality: The Views of Deming, Juran and Crosby." In *Readings in Total Quality Management*, edited by Harry Costin. New York: Harcourt Brace, 1994.
- Maslow, Abraham F. "A Theory of Human Motivation." *Psychological Review* 50 (1946): 370-396.
- McGregor, Douglas. *The Human Side of Enterprise*. New York: McGraw-Hill, 1960.
- McLaughlin, M., "Employability Skills Profile: What Are Employers Looking For?" Ottawa: Conference Board in Canada, 1992.
- Medoff, J. J. and K. G. Abraham. "Are Those Paid More Really More Productive? The Case of Experience." *Journal of Human Resources* 16, no.2 (spring 1981):186-216
- Miller, D. and P. H. Friesen. *Organizations: A Quantum View*. Englewood Cliffs, N.J.: Prentice-Hill, 1984.
- Morissette, R. *Canadian Jobs and Firm Size: Do Smaller Firms Pay Less?* Statistics Canada, Research Paper Series no.35, Cat. 11F0019E. Ottawa,1991.
- Morissette, R. J., J. Myles and G. Picot. *What is Happening to Earnings Inequality in Canada?* Statistics Canada, Research Paper Series no. 60, Cat. 11F0019E. Ottawa, 1993.
- Morissette, R. *Why Has Inequality in Weekly Earnings Increased in Canada?* Statistics Canada, Research Paper Series no.80, Cat. 11F0019E. Ottawa, 1995.
- Myles, John. *The Expanding Middle: Some Canadian Evidence on the Deskilling Debate*. Statistics Canada, Research Paper Series no.9, Cat.11F0019E. Ottawa,1991.

- Offe, Claus. *Disorganized Capitalism*. Massachussets Institute of Technology Press. 1985.
- Organization for Economic Cooperation and Development. *Economic Outlook 1986*. Paris:1986, Chapter V.
- Organization for Economic Cooperation and Development. *Globalization of Industry: Overview and Sector Reports*. Paris: OECD. 1996.
- Osberg, Lars, E.N. Wolff, and W.J. Baumol. *The Information Economy: The Implications of Unbalanced Growth*. Halifax: Institute for Research in Public Policy. 1989.
- Osterman, Paul. "How Common is Workplace Transformation and Who Adopts It?" *Industrial and Labor Relations Review* 47 no. 2 (January 1997):173-187.
- Perez, Carlotta. "Microelectronics, Long Waves and World Structural Changes: New Perspectives for Developing Countries." *World Development* 13, no.3 (1985).
- Peters, Thomas J. and Robert H. Waterman. *In Search of Excellence: Lessons from America's Best-run Companies*. New York: Harper & Row. 1982.
- Petersen, Trond and Laurie A. Morgan. "Separate and Unequal: Occupation-Establishment Sex Segregation and the Gender Wage Gap." *American Journal of Sociology* 101 no.2 (1995): 329-365.
- Picot, G., J. Baldwin and R. Dupuy. *Have Small Firms Created a Disproportionate Share of New Jobs in Canada? A Reassessment of the Facts*. Statistics Canada, Research Paper Series no. 71, Cat. 11F0019E. Ottawa. 1994.
- Picot, G., J. Myles and T. Wannell. *Good Jobs/Bad Jobs and the Declining Middle 1967-1986*. Statistics Canada, Research Paper Series no.28, Cat. 11F0019E. Ottawa. 1990.
- Piore, M. J. and C. Sabel. *The Second Industrial Divide: Possibilities for Prosperity*. New York: Basic Books. 1985.
- Piore, M. J. and P. B. Doeringer. *Internal Labour Markets and Manpower Analysis*. Lexington, Mass: Heath. 1971.
- Porter, Michael E. *Competitive Strategy*. New York: The Free Press. 1980.
- Porter, Michael E. *The Competitive Advantage of Nations*. New York: Basic Books.1990.
- Reich, Robert. *The Work of Nations*. New York: Simon and Schuster. 1991.

- Riddell, W. "Unionization in Canada and the United States: A Tale of Two Countries." In *Small Differences that Matter: Labour Markets and Income Maintenance in Canada and the United States*, edited by D. Card and R. Freeman. Ann Arbor: University of Chicago Press, 1993.
- Robertson, Thomas S. "How to Reduce Market Penetration Cycle Times." *Sloan Management Review* (Fall 1993): 87-96.
- Rosholm, Michael and Nina Smith. "The Danish Gender Wage Gap in the 1980s: A Panel Data Study." *Oxford Economic Papers* 48 (1996): 254-279.
- Semler, Ricardo. "Managing without Managers." *Harvard Business Review* (September-October 1989).
- Senge, Peter. "Building Learning Organizations." In *Readings in Total Quality Management*, edited by Harry Costin. New York: Harcourt Brace, 1994.
- Shewhart, W. A. *Economic Control of Quality of Manufactured Product*. New York: D. Van Nostrand Company, 1931.
- Shingo, Shigeo. *A Revolution in Manufacturing: The SMED System*. Cambridge, Mass.: Productivity Inc., 1985.
- Société québécoise de développement de la main-d'oeuvre and Human Resources Development Canada. *Enquête sur les caractéristiques de la demande de main-d'oeuvre au Québec. Résultats globaux*. September 1996.
- Solberg, Eric and Teresa Laughlin. "The Gender Pay Gap, Fringe Benefits and Occupational Crowding." *Industrial and Labour Relations Review* 48 no.4 (1995).
- Stacey, Ralph. "The Role of Chaos and Self-Organization in the Development of Creative Organizations." Paper presented at the Chaos and Society Conference, Hull, Quebec, June 1-2, 1994.
- Statistics Canada. *Income After Tax. Distributions by size in Canada*. Cat. 13-210, March 1994.
- Statistics Canada. *Historical Labour Force Statistics*. Cat. 71-201, February 1995. Cansim matrix D767289.
- Statistics Canada. *Characteristics of Dual Earner Families*. Cat. 13-215, 1992, Table 1.

Statistics Canada. *Historical Labour Force Statistics*. Cat. 71-201. February 1995.
Cansim matrix D769813.

Steering Group on Prosperity. *Inventing our Future: An Action Plan for Canada's Prosperity*. Cat. No. C2-206/1992E. Ottawa, October 1992.

Streeck, W. "On the Institutional Conditions for Diversified Quality Production." In *Social Institutions and Economic Performance: Studies of Industrial Relations in Advanced Capitalist Economies*, edited by W. Streeck. Newbury Park, Ca.: Sage Publications, 1992.

Wannell, T. *Trends in the Distribution of Employment by Employer Size: Recent Canadian Evidence*. Statistics Canada, Research Paper Series no.39, Cat. 11F0019E Ottawa, 1991.

Welch, F. "Effects of Cohort Size on Earnings: The Baby Boom Babies' Financial Bust." *Journal of Political Economy* 87 (summer 1979):65-98

Wolfson, M. C. *Divergent Inequalities - Theory, Empirical Results and Prescriptions*. Statistics Canada, Research Paper Series no.66, Cat. 11F0019E. Ottawa, 1995.

Zuboff, S. *In the Age of the Smart Machine*. New York: Basic Books, 1988.

Appendix 1**Questionnaire for the Survey on Quality Management Practices in Service Industries****Introduction**

Hello Mr. or Ms. [fill respname]. This is [fill iname] from Statistics Canada.

We are conducting a survey about quality management practices in cooperation with the federal department of Industry. The information will give us a better understanding of the use of quality management in the services sector and help Industry Canada to develop focused programs to address the needs of Canadian companies.

We assure you that the data you provide will be held in strict confidence and used only for statistical purposes. In fact, Statistics Canada is prohibited by law from publishing statistics from this survey which would reveal information relating to any identifiable business.

This is a voluntary survey, however, your cooperation is essential to the accuracy of the information collected. The interview should only take about ten minutes of your time.

Qtitle

Could you give me your job title please?

Title:

====> _____

Qemp

Currently how many permanent employees are there in [fill company name]? Please include both full-time and part-time but not seasonal employees.

Number of Employees:

====> _____

Qmgt

Does the management group in your company consist of just one senior manager, or are there several senior managers or partners?

- <1> Only one senior manager or owner
- <2> More than one senior manager or partner
- <D> Don't know
- <R> Refused

Q1.1

Does your company have a **written** plan to improve quality?

- <1> Yes
- <2> No [go to Q2.1]
- <D> Don't know [go to Q2.1]
- <R> Refused [go to Q2.1]

==> _

Q1.2

For how many years has your company had a written quality improvement plan?

[*** Fit respondent's answer into these categories ***]

- <1> 1 year or less
- <2> 2 years
- <3> 3 to 5 years
- <4> more than 5 years
- <D> Don't know
- <R> Refused

==> _

Q1.3

What is the **main** reason you developed a quality plan?

[*** Don't read out the categories. However if the respondent needs help, the categories could be read as examples. Fit the respondent's answer into these categories ***]

- <1> To enter a new market
- <2> To maintain competitive edge
- <3> To export
- <4> To improve sales
- <5> To improve market share
- <6> New management
- <7> To reduce costs
- <8> To improve quality of service
- <9> To meet new standards
- <0> Other reason [specify]
- <D> Don't know
- <R> Refused

==> _

Q1.4

Is the quality plan part of your overall business plan?

- <1> Yes
- <2> No
- <D> Don't know
- <R> Refused

==> _

Q1.5

Which of the following people were involved in the **development** of the quality plan?

- <1> Yes
- <2> No
- <D> Don't know
- <R> Refused

a) **just one** senior manager?

==> _

b) several senior managers?

==> _

c) an outside consultant?

==> _

d) non-management employees?

==> _

e) your customers?

==> _

f) your suppliers?

==> _

Q1.5g)

Anyone else?

- <1> Yes [specify]
- <2> No
- <D> Don't know
- <R> Refused

==> _

Q1.6

Within your company, who is primarily **accountable** for **implementing** the quality plan?

[*** Read out the categories to the respondent. Choose only one ***]

- <1> **One** senior manager?
- <2> Several senior managers?
- <3> The whole management group?

- <D> Don't know
- <R> Refused

==> _

Q1.7

Have ALL employees been informed of this plan?

<1> Yes
 <2> No [go to Q1.9]
 <D> Don't know [go to Q1.9]
 <R> Refused [go to Q1.9]

==> _

Q1.8

How is the quality plan communicated throughout the company?

<1> Yes
 <2> No
 <D> Don't know
 <R> Refused

a) by newsletters including electronic mail?

==> _

b) by meetings?

==> _

c) by senior management example?

==> _

d) by links between quality plan and performance appraisal?

==> _

Q1.9

Is progress toward quality goals monitored?

<1> Yes
 <2> No
 <D> Don't know
 <R> Refused

==> _

Q2.1a)

In 1993, did the management group meet to discuss **improved service quality**?

<1> Yes
 <2> No [go to Q2.1b]
 <D> Don't know [go to Q2.1b]
 <R> Refused [go to Q2.1b]

==> _

And how frequently were these meetings held?

[*** Don't read out the categories unless the respondent needs help. Fit the respondent's answer into these categories ***]

<1> Weekly (or more frequently)

- <2> Twice per month
- <3> Monthly
- <4> Quarterly
- <5> Less frequently than quarterly
- <D> Don't know
- <R> Refused

==> _

Q2.1b)

And in 1993 did the management group meet to discuss **improved internal processes** (for example, sending out invoices faster)?

- <1> Yes
- <2> No [go to Q2.1c)
- <D> Don't know [go to Q2.1c)
- <R> Refused [go to Q2.1c)

==> _

And how frequently were these meetings held?

[*** Don't read the categories unless the respondent needs help. Fit the respondent's answer into these categories ***]

- <1> Weekly (or more frequently)
- <2> Twice per month
- <3> Monthly
- <4> Quarterly
- <5> Less frequently than quarterly
- <D> Don't know
- <R> Refused

==> _

Q2.1c)

Did the management group meet to discuss **improved employee training** in 1993?

- <1> Yes
- <2> No [go to Q2.1d)
- <D> Don't know [go to Q2.1d)
- <R> Refused [go to Q2.1d)

==> _

And how frequently were these meetings held?

[*** Don't read out the categories unless the respondent needs help. Fit the respondent's answer into these categories ***]

- <1> Weekly (or more frequently)
- <2> Twice per month
- <3> Monthly

- <4> Quarterly
- <5> Less frequently than quarterly
- <D> Don't know
- <R> Refused

==> _

Q2.1d)

And did the management group meet to discuss **greater customer satisfaction** in 1993?

- <1> Yes
- <2> No [go to Q2.2]
- <D> Don't know [go to Q2.2]
- <R> Refused [go to Q2.2]

==> _

And how frequently were these meetings held?

[*** Don't read the categories unless the respondent needs help. Fit the respondent's answer into these categories ***]

- <1> Weekly (or more frequently)
- <2> Twice per month
- <3> Monthly
- <4> Quarterly
- <5> Less frequently than quarterly
- <D> Don't know
- <R> Refused

==> _

Q2.2

Do senior managers at your firm learn about quality management practices using any of the following methods:

- <1> Yes
- <2> No
- <D> Don't know
- <R> Refused

a) By attending courses or conferences?

==> _

b) By participating in management meetings?

==> _

c) By reading articles or books on quality management practices?

==> _

d) Through customers?

==> _

e) Through suppliers?

==> _

Q2.2f) By any other methods?

<1> Yes [specify]

<2> No

<D> Don't know

<R> Refused

==> _

Q2.3a)

Is there a person or group of people in your company that is responsible for coordinating quality activities?

<1> Yes

<2> No [go to Q3.1]

<D> Don't know [go to Q3.1]

<R> Refused [go to Q3.1]

==> _

Q2.3b)

Are they responsible for monitoring quality through inspection?

<1> Yes

<2> No

<D> Don't know

<R> Refused

==> _

Q2.3c)

And are they responsible for providing support for quality improvement activities (for example, providing training)?

<1> Yes

<2> No

<D> Don't know

<R> Refused

==> _

Q3.1

Does [fill company name] have a written mission or vision statement? A mission statement is a company's declaration of its fundamental purpose while a vision statement is a declaration of what it wants to become in the future.

<1> Yes

<2> No [go to Q3.3]

<D> Don't know [go to Q3.3]

<R> Refused [go to Q3.3]

==> _

Q3.2

Have **all** employees been informed of the mission or vision statement?

- <1> Yes
- <2> No
- <D> Don't know
- <R> Refused

====> _

Q3.3

Does your company use any of the following to improve quality:

- <1> Yes
- <2> No
- <D> Don't know
- <R> Refused

a) problem-solving teams?

====> _

b) process analysis?

====> _

c) benchmarking?

[*** defined as systematic comparison of elements of the processes used by an organization against that of other organizations, with the aim of mutual improvement ***]

====> _

Q3.3d)

self-assessment using guidelines such as CAGE, the Canada Awards for Business Excellence, or Baldrige?

- <1> Yes
- <2> No [go to Q3.3e)]
- <D> Don't know [go to Q3.3e)]
- <R> Refused [go to Q3.3e)]

====> _

Which ones?

ENTER GUIDELINES USED:

====> _____

3.3e)

Anything else?

- <1> Yes [specify]
- <2> No

<D> Don't know
<R> Refused

===> _

Q3.4a)

Is [fill company name] registered to the quality assurance system CSA Z299?

<1> Yes [go to Q3.5a)
<2> No
<D> Don't know
<R> Refused

===> _

Q3.4b)

Are you **working towards** registration to CSA Z299?

<1> Yes
<2> No
<D> Don't know
<R> Refused

===> _

Q3.5a)

Is your company registered to any of the ISO 9000 series standards?

[*** ISO 9000 series: ISO 9001, 9002, 9003 ***]

<1> Yes
<2> No [go to Q3.5b)]
<D> Don't know [go to Q3.5b)]
<R> Refused [go to Q3.5b)]

===> _

Which ones?

ENTER 9000 series: [*** example, 9001 & 9003 ***]

===> _____

Q3.5b)

Is your company **working towards** registration to any of the ISO 9000 series standards?

<1> Yes
<2> No [go to Q3.6a)]
<D> Don't know [go to Q3.6a)]
<R> Refused [go to Q3.6a)]

Which ones?

ENTER 9000 series: [*** example, 9001 & 9003 ***]

==> _____

Q3.6a)

Is your company registered to **any other** quality assurance systems?

<1> Yes [specify]

<2> No

<D> Don't know

<R> Refused

==> _

Q3.6b)

Are you **working towards** registration to **any other** quality assurance systems?

<1> Yes [specify]

<2> No

<D> Don't know

<R> Refused

==> _

Q3.7

Does [fill company name] ask that its suppliers meet any of the following quality standards?

<1> Yes

<2> No

<D> Don't know

<R> Refused

a) CSA Z299?

==> _

b) ISO 9000 series?

==> _

Q3.7c)

Any others?

<1> Yes [specify]

<2> No

<D> Don't know

<R> Refused

==> _

Q3.8

Which of the following are used to determine customer **needs** *before a new service is developed*?

<1> Yes

<2> No

<D> Don't know

<R> Refused

a) conversations with your customers?

==> _

b) surveys?

==> _

c) focus groups?

==> _

Q3.8d)

Anything else?

<1> Yes [specify]

<2> No

<D> Don't know

<R> Refused

==> _

Q3.9

Which of the following do you use to determine the level of customer **satisfaction** after the service is provided?

<1> Yes

<2> No

<D> Don't know

<R> Refused

a) conversations with your customers?

==> _

b) surveys?

==> _

c) focus groups?

==> _

d) complaints?

==> _

e) return cards?

==> _

Q3.9f)

Anything else?

<1> Yes [specify]

<2> No

<D> Don't know

<R> Refused

==> _

Q3.10

Does your company keep data on any of the following:

- <1> Yes
- <2> No
- <D> Don't know
- <R> Refused

a) percent of customers who are satisfied overall with your service?

==> _

b) percent of customers who are satisfied with the reliability of your service (for example meeting deadlines)?

==> _

c) percent of customers who are satisfied with the courtesy of your staff?

==> _

d) percent of repeat customers?

==> _

e) number of complaints?

==> _

f) number of returns?

==> _

g) your market share?

==> _

Q3.11

Does [fill company name] have customer service standards (for example, resolving complaints within 10 days, or a maximum of 15 minutes waiting in line at a bank)?

- <1> Yes
- <2> No
- <D> Don't know
- <R> Refused

==> _

Q3.12

Which of the following do you use to provide clients with easier access to your services?

- <1> Yes
- <2> No
- <D> Don't know
- <R> Refused

a) a customer complaint telephone line?

==> _

b) a customer service department?

==> _

c) field service representatives?

==> _

d) a 1-800 line for clients?

==> _

Q3.12e)

Anything else?

<1> Yes [specify]

<2> No

<D> Don't know

<R> Refused

==> _

Q3.13

Does your company assess employees' training needs?

<1> Yes

<2> No [go to Q3.15]

<D> Don't know [go to Q3.15]

<R> Refused [go to Q3.15]

==> _

Q3.14

Is training provided in response to these needs?

<1> Yes

<2> No

<D> Don't know

<R> Refused

==> _

Q3.15

Does employee quality training include any of the following:

<1> Yes

<2> No

<D> Don't know

<R> Refused

a) Basic quality awareness?

==> _

b) Problem-solving techniques, for example process flowcharting?

==> _

c) Statistical tools such as control charts or histograms?

==> _

d) Training customer-contact employees to deal with clients?

==> _

Q3.15e)

Anything else?

<1> Yes [specify]

<2> No

<D> Don't know

<R> Refused

==> _

Q3.16

Do you evaluate the effectiveness of training courses?

<1> Yes

<2> No

<D> Don't know

<R> Refused

==> _

Q3.17

In [fill company name], do managers attend training sessions on either team building or coaching skills?

<1> Yes

<2> No

<D> Don't know

<R> Refused

==> _

Q3.18

Does your company use any of the following?

<1> Yes

<2> No

<D> Don't know

<R> Refused

a) Processes for employees to make suggestions?

==> _

b) Employee opinion surveys?

==> _

c) Employee recognition or reward systems?

==> _

Q3.19

Does your company track any of the following:

- <1> Yes
- <2> No
- <D> Don't know
- <R> Refused

a) level of employee satisfaction?

====> _

b) percent of employees making suggestions?

====> _

c) Savings made by quality improvement teams or problem solving teams?

====> _

d) Employee turnover rates?

====> _

e) Absenteeism rates?

====> _

We have now completed the survey questions.
Thank you very much for your cooperation

Appendix 2

Quality management practices in selected Canadian service industries

Definition of 22 practices:

A firm was considered to use a quality management practice if it responded yes to the question(s) listed under each practice below (question # as it appears on the questionnaire is shown).

Leadership

Senior management's personal leadership in developing quality values in all areas of the company, incorporating them into the planning process and ensuring that they become an integral part of the company's operations.

1. Mission statement

3.1 Does your company have a written mission or vision statement?

2. Quality improvement plan

1.1 Does your company have a written plan to improve quality?

3. Regular meetings on quality

2.1a During 1993, did the management group meet to discuss improved service quality? And how frequently were these meetings held?

- a) weekly*
- b) twice per month*
- c) monthly*
- d) quarterly*
- e) less frequently than quarterly*

2.1b During 1993, did the management group meet to discuss improved internal processes? And how frequently were these meetings held?

- a) weekly*
- b) twice per month*
- c) monthly*
- d) quarterly*
- e) less frequently than quarterly*

2.1c During 1993, did the management group meet to discuss improved employee training? And how frequently were these meetings held?

- a) weekly*
- b) twice per month*
- c) monthly*
- d) quarterly*
- e) less frequently than quarterly*

- 2.1d *During 1993, did the management group meet to discuss greater customer satisfaction? And how frequently were these meetings held?*
- a) *weekly*
 - b) *twice per month*
 - c) *monthly*
 - d) *quarterly*
 - e) *less frequently than quarterly*

Firms that met monthly or more frequently on any two of these four topics were considered to hold regular meetings on quality.

4. Quality support group

- 2.3c *And are they responsible for providing support for quality improvement activities (for example, providing training)?*

5. Management involvement

- qmgt *Does the management group in your company consist of just one senior manager, or are there several senior managers or partners?*
- 1.5 *Which of the following people were involved in the development of the quality plan?*
- a) *just one senior manager*
 - b) *several senior managers*
 - c) *an outside consultant*
 - d) *non-management employees*
 - e) *your customers*
 - f) *your suppliers*
- 1.6 *Within your company, who is primarily accountable for implementing the quality plan?*
- 1) *one senior managers*
 - 2) *several senior managers*
 - 3) *the whole management group*

If the response to qmgt was one senior manager only, management involvement was considered present if a "Yes" response was provided to questions 1.5a or 1.5b. If the response to qmgt was more than one senior manager, management involvement was considered present if a "yes" response was provided to question 1.5b and the response to question 1.6 was 2 or 3.

6. Quality training for managers

- 2.2a *Do senior managers at your firm learn about quality management practices using any of the following methods:*
- a) *by attending courses and seminars?*
- 3.17 *In your company, do managers attend training sessions on team building or coaching skills?*

This practice was defined as positive responses to question 2.2a and question 3.17.

Employee involvement

The means by which the company prepares its employees to carry out its quality objectives and provides mechanisms for all employees to contribute to meeting these objectives.

1. Employee input into quality plan

- 1.5d Which of the following people were involved in the development of the quality plan?
d) non-management employees?*

2. Communication of mission and plan

- 1.7 Have all employees been informed of this plan?*
3.2 Have all employees been informed of the mission or vision statement?

Affirmative answers to both these questions was required for this practice to be considered present.

3. Quality training for employees

- 3.15 Does employee quality training include any of the following:
a) Basic quality awareness
b) Problem solving techniques, for example flow charting
c) Statistical tools such as control charts and histograms
d) Training customer-contact employees to deal with clients*

This practice was considered present if firms responded "Yes" to a) and either b), c) or d), or if they responded positively to any two of b), c) or d), regardless of a).

4. Tracking employee satisfaction

- 3.19 Does your company track any of the following:
a) level of employee satisfaction?*

5. Recognition and reward schemes

- 3.18 Does your company use any of the following:
c) employee recognition or reward systems?*

6. Suggestion systems

- 3.18 Does your company use any of the following:
a) processes for employees to make suggestions?*

Process improvement

Measures by which the company brings about systematic and continuous improvements in its internal processes.

1. Registration to a quality assurance system

3.4a *Is your company registered to the quality assurance system CSA Z299?*

3.5a *Is your company registered to any of the ISO 9000 series standards?*

3.6a *Is your company registered to any other quality assurance systems?*

This practice was considered present if the response was yes to any one of these questions.

2. Supplier standards

3.7 *Does your company ask that its suppliers meet any of the following quality standards?*

a) CSA Z299

b) ISO 9000 series

c) any others

This practice was considered present if the response was yes to any one of these questions.

3. Problem-solving teams

3.3a *Does your company use any of the following to improve quality?*
a) *problem solving teams?*

4. Process Analysis

3.3b *Does your company use any of the following to improve quality?*
b) *process analysis?*

5. Benchmarking

3.3c *Does your company use any of the following to improve quality?*
c) *benchmarking*

Customer focus

The means by which the company makes the customer the final arbiter of product quality.

1. Customer input into product design

3.8 Which of the following are used to determine customer needs before a new service is developed?

- a) conversations with customers
- b) surveys
- c) focus groups
- d) anything else

This practice was considered present if any two of a) to d) was answered yes.

2. Customer service standards

3.11 Does your company have customer service standards?

3. Complaint resolution system

3.10 Does your company keep data on any of the following:
e) number of complaints

3.12 Which of the following do you use to provide clients with easier access to your services?
a) a customer complaint telephone line

Affirmative answers to either of these questions was required for this practice to be considered present.

4. Customer satisfaction surveys

3.9 Which of the following are used to determine customer satisfaction after the service is provided?
b) surveys.

5. Market intelligence

3.10 Does your company keep data on any of the following:

- a) percent of customers who are satisfied overall with your service?
- b) percent of customers who are satisfied with the reliability of your service?
- c) percent of customers who are satisfied with the courtesy of your staff?
- d) percent of repeat customers
- g) your market share

If the response is yes to any two of these, the practice was considered to be used.

Detailed regression tables

**Effects of QM on wage rates - dummies for industry and occupation shown
(Table 5.3)**

<i>Variable</i>	<i>No controls</i>	<i>No occupation and industry controls</i>	<i>With occupation controls</i>	<i>With industry and occupation controls</i>
TQM	2.11 (9.64)	1.23 (5.72)	0.58 (3.09)	0.55 (2.50)
Experience		0.96 (16.06)	0.93 (17.96)	0.92 (19.18)
Full-time		2.30 (10.47)	1.21 (6.15)	0.83 (4.30)
Size		-0.57 (2.26)	0.01 (0.02)	-0.05 (0.18)
Union		2.89 (14.01)	3.76 (19.44)	2.43 (9.96)
Food				reference variable
Beverage				4.92 (7.08)
Rubber products				4.24 (6.09)
Plastic products				0.65 (1.38)
Primary textiles				6.04 (4.44)
Textile products				-1.50 (0.80)
Clothing				-1.22 (1.48)
Wood products				-0.82 (0.71)
Furniture				-1.88 (3.35)
Pulp and paper				8.67 (7.69)
Printing				-0.75 (1.81)
Primary metals				4.66 (10.67)
Fabricated metal products				-1.06 (1.28)
Machinery				-1.05 (2.04)
Transportation equipment				1.30 (2.83)
Electrical and electronic equipment				6.51 (4.85)
Non-metallic mineral products				0.36 (0.72)
Petroleum products				5.76 (5.95)
Chemical products				-2.50 (2.57)

Other manufacturing		2.23	
		(2.27)	
Personnel agencies		0.16	
		(0.28)	
Computer and related services		3.07	
		(5.44)	
Advertising services		2.10	
		(3.09)	
Engineering and architecture services		3.36	
		(8.16)	
Other business services		3.39	
		(5.07)	
Wholesale trade		0.26	
		(0.55)	
Retail trade		-0.57	
		(1.60)	
Telecommunications		2.50	
		(4.44)	
Clerical	1.08	0.47	
	(3.46)	(1.48)	
Professional, natural and applied sciences	11.85	8.66	
	(25.53)	(16.71)	
Technical, natural and applied sciences	6.46	3.63	
	(15.11)	(7.79)	
Intermediate sales and service	reference	reference	
	variable	variable	
Elemental sales and service	-1.18	-0.94	
	(2.53)	(2.15)	
Skilled trades	4.20	3.12	
	(10.92)	(7.84)	
Skilled transport and equipment operators	3.27	2.74	
	(8.26)	(7.02)	
Intermediate transport and equipment operators	0.36	0.04	
	(1.02)	(0.13)	
Processing and manufacturing machine operators	1.19	0.71	
	(3.42)	(1.92)	
Labourers, processing, manufacturing, utilities	1.20	-0.06	
	(2.55)	(0.14)	
Other	5.43	4.28	
	(17.46)	(13.40)	
R ²	0.02	0.16	0.37
			0.46

Note: T-statistics are shown in brackets underneath the associated coefficient. For a description of the data see chapter 3. For a description of the model, see Chapter 4. Column 1 gives the raw effect of QM on hourly wages, with no controls (n=3892). Column 2 gives the total estimator for the effect of QM on hourly wages, with no occupation or industry controls (n=3892). Column 3 gives the effect with the inclusion of occupational dummies ($\eta_{i,c} = \eta_{i,c}$). Column 4 gives the estimators when both occupation and industry dummies are included. Source: Calculations by the author from a data file combining data from the Prairie Provinces Wage Rate Survey and the 1993 and 1994 Quality Management Practices Surveys of Statistics Canada.

**Regression results using the full survey data, industry and occupation dummies shown
(Table 5.5)**

<i>Variable</i>	<i>Survey dataset</i>
	(n=83452)
TQM	n.a.
Experience	0.72 (66.79)
Full-time	1.67 (42.17)
Size	1.91 (42.85)
Union	2.32 (50.94)
Food	reference variable
Beverage	2.96 (13.48)
Rubber products	0.54 (1.20)
Plastic products	-0.08 (0.483)
Primary textiles	7.86 (15.85)
Textile products	-2.00 (8.90)
Clothing	-3.24 (13.71)
Wood products	0.68 (4.15)
Furniture	-2.08 (9.98)
Pulp and paper	2.63 (12.95)
Printing	-0.45 (3.26)
Primary metals	2.08 (12.57)
Fabricated metal products	-0.11 (0.75)
Machinery	-0.32 (2.28)
Transportation equipment	0.26 (1.22)
Electrical and electronic equipment	-0.04 (0.24)
Non-metallic mineral products	1.13 (6.28)
Petroleum products	3.15 (9.02)
Chemical products	4.44 (26.75)
Other manufacturing	n.a. (see Ind99)

Business services	0.56 (3.7)
Wholesale trade	1.48 (9.83)
Retail trade	-0.48 (4.14)
Telecommunications	0.71 (4.62)
Other industries	0.61 (5.95)
Clerical	1.66 (23.45)
Professional, natural and applied sciences	10.47 (69.33)
Technical, natural and applied sciences	6.52 (56.33)
Intermediate sales	reference variable
Elemental sales	-0.57 (8.01)
Skilled trades	5.31 (67.28)
Skilled transport and equipment operator	5.20 (60.04)
Intermediate transport and equipment operator	2.80 (38.21)
Processing and manufacturing machine operator	2.51 (28.79)
Labourers, processing, manufacturing, utilities	0.98 (8.28)
Other occupations	4.06 (69.38)
R ²	0.32

Note: T-statistics are shown in brackets underneath the associated coefficient. For a description of the data, see chapter 3. For a description of the model, see Chapter 4. Column 1 gives the coefficients for the effect on wages of the usual independent variables, except QM, for the full survey file ($n=83,452$), with both occupation and industry dummies included. Source: Calculations by the author from a data file combining data from the Prairie Provinces Wage Rate Survey and the 1993 and 1994 Quality Management Practices Surveys of Statistics Canada.

Effect of QM on wage rates, in interaction with union status and firm size, dummies for industry and occupation shown (Table 5.4, column 1)

<i>Variable</i>	<i>With industry and occupation controls</i>
TQM	-0.29 (1.08)
TQM_u	2.30 (5.60)
TQM_s	0.90 (1.10)
Size_u	1.71 (2.50)
Experience	0.92 (19.24)
Full-time	0.75 (3.89)
Size	-0.30 (0.97)
Union	1.52 (5.16)
Food	reference variable
Beverage	4.65 (6.70)
Rubber products	4.90 (6.94)
Plastic products	0.44 (0.93)
Primary textiles	5.25 (3.84)
Textile products	-1.79 (0.96)
Clothing	-1.47 (0.82)
Wood products	-1.15 (1.00)
Furniture	-1.50 (2.67)
Pulp and paper	9.35 (8.37)
Printing	-0.79 (1.92)
Primary metals	4.60 (10.67)
Fabricated metal products	-1.31 (1.59)
Machinery	-1.13 (2.19)
Transportation equipment	1.42 (3.10)
Electrical and electronic equipment	6.70 (5.02)
Non-metallic mineral products	0.55 (1.08)

Petroleum products	5.88
	(6.09)
Chemical products	-2.37
	(2.44)
Other manufacturing	2.84
	(2.88)
Personnel agencies	0.20
	(0.36)
Computer and related services	2.94
	(5.21)
Advertising services	1.83
	(2.70)
Engineering and architecture services	3.21
	(7.81)
Other business services	3.13
	(4.69)
Wholesale trade	-0.14
	(0.28)
Retail trade	-0.72
	(2.02)
Telecommunications	-0.59
	(0.54)
Clerical	0.49
	(1.55)
Professional, natural and applied sciences	8.85
	(17.06)
Technical, natural and applied sciences	3.67
	(7.90)
Intermediate sales	reference
	variable
Elemental sales	-0.92
	(2.10)
Skilled trades	3.14
	(7.87)
Skilled transport and equipment operators	2.81
	(7.20)
Intermediate transport and equipment operators	0.17
	(0.49)
Processing and manufacturing machine operators	0.74
	(2.00)
Labourers, processing, manufacturing and utilities	-0.57
	(0.12)
Other occupations	4.32
	(13.47)

Effect of QM on wage rates, with and without interaction with union status, dummies for industry-occupation pairs shown (Table 5.4, columns 3 and 4)

<i>Variable</i>	<i>Without TQM_u interaction term</i>	<i>With TQM_u interaction term</i>
TQM	0.65 (2.65)	-0.31 (1.04)
TQM_u	n.a.	2.68 (5.28)
Experience	0.88 (14.02)	0.88 (14.07)
Full-time	0.89 (3.61)	0.83 (3.39)
Size	1.18 (3.59)	1.16 (3.51)
Union	2.51 (7.90)	1.87 (5.53)
Retail, clerical	-5.04 (10.37)	-5.17 (10.68)
Retail, intermediate sales	-5.19 (13.70)	-5.33 (14.11)
Retail, elemental sales	-5.64 (10.23)	-5.75 (10.47)
Retail, other occupations	3.49 (7.65)	3.37 (7.42)
Food, clerical	-2.14 (2.74)	-2.33 (3.01)
Food, elemental sales	-3.87 (3.78)	-3.64 (3.56)
Food, skilled transport and equipment operator	-1.86 (1.32)	-2.61 (1.84)
Food, intermediate transport and equipment operator	-1.47 (1.76)	-1.66 (2.00)
Food, processing and manufacturing machine operators	-3.78 (4.95)	-3.33 (4.37)
Food, labourers	-3.82 (4.17)	-3.88 (4.26)
Food, other occupations	-4.95 (4.24)	-4.87 (4.19)
Plastic products, clerical	-2.68 (2.93)	-3.26 (3.49)
Plastic products, processing and manufacturing machine operators	-2.62 (4.60)	-3.04 (5.31)
Furniture, clerical	-2.73 (1.93)	-2.13 (1.51)
Furniture, processing and manufacturing machine operators	-4.15 (4.98)	-3.88 (4.66)
Primary metals, clerical	-4.87 (4.13)	-4.74 (4.03)
Primary metals, skilled trades	5.36 (7.09)	4.77 (6.27)
Primary metals, skilled transportation and equipment operator	3.22 (0.81)	2.92 (3.62)
Primary metals, intermediate transportation and equipment operator	4.46 (3.76)	3.75 (3.16)

Primary metals, processing and manufacturing machine operators	3.29 (4.87)	2.79 (4.10)
Primary metals, labourers	0.97 (1.39)	0.54 (0.78)
Primary metals, others	-1.45 (1.82)	-1.36 (1.71)
Transportation equipment, skilled trades	-0.41 (0.68)	-0.33 (0.55)
Non-metallic mineral products, clerical	-4.69 (3.97)	-4.83 (4.11)
Non-metallic mineral products, intermediate transportation and equipment operator	-3.14 (4.08)	-3.15 (4.11)
Non-metallic mineral products, processing and manufacturing machine operators	-2.95 (3.96)	-3.10 (4.19)
Chemical products, other occupations	-3.33 (2.35)	-3.08 (2.18)
Personnel agencies, clerical	-3.25 (3.47)	-2.96 (3.12)
Personnel agencies, other occupations	-0.23 (0.30)	0.48 (0.64)
Computer and related services, professional natural and applied sciences	7.94 (11.49)	8.01 (11.64)
Engineering and architecture services, clerical	1.11 (1.51)	1.02 (1.39)
Engineering and architecture services, professional natural and applied sciences	8.63 (15.43)	8.69 (15.61)
Engineering and architecture services, technical natural and applied sciences	3.81 (8.21)	3.63 (7.83)
Engineering and architecture services, skilled trades	-2.90 (2.05)	-2.63 (1.86)
Engineering and architecture services, skilled transportation and equipment operators	4.70 (4.73)	4.83 (4.80)
Engineering and architecture services, intermediate transportation and equipment operators	reference variable	reference variable

Note: T-statistics are shown in brackets underneath the associated coefficient. For a description of the data, see chapter 3. For a description of the model, see Chapter 4. Column 1 gives the estimators for the effect on hourly wages of the independent variables used previously, with controls for industry-occupation pairs, by means of one dummy variable for every industry-occupation pair ($n=2663$). Column 2 gives the estimators when the QM and union interaction term is included, in addition to the usual independent variables, with controls for industry-occupation pairs, by means of one dummy variable for every industry-occupation pair ($n=2663$). Source: Calculations by the author from a data file combining data from the Prairie Provinces Wage Rate Survey and the 1993 and 1994 Quality Management Practices Surveys of Statistics Canada.

IMAGE EVALUATION TEST TARGET (QA-3)

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