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Who gets Market Supplements? Gender Differences within a Large Canadian University

Christine Doucet and Claire Durand
Université de Montréal

Michael Smith
McGill University

ABSTRACT

This study examines the gender pay gap among university faculty by analyzing gender differences in one component of faculty members' salaries – "market premiums." The data were collected during the Fall of 2002 using a survey of faculty at a single Canadian research university. Correspondence analysis and logistic regression analysis were performed in order to identify the characteristics related to the award of market premiums and whether these characteristics account for gender differences. The correspondence analysis produces a two-factor solution in which the second axis clearly opposes faculty who receive market premiums to those who do not. Gender is strongly related to this factor, with the female category on the side of the axis associated with the absence of market premiums. The results of the logistic regression confirm that field of specialization, frequency of external research contracts, faculty members' values and attitudes towards remuneration and seniority within rank are all related to the award of market premiums, as hypothesized. However, women were still almost three times less likely than men to have been awarded market premiums after controlling for these relationships. Overall, the results suggest that within a collective bargaining context, reindividualization of the pay determination process – notably, the payment of market premiums to faculty – may reopen pay differences by gender.

RÉSUMÉ

Cette recherche examine les écarts salariaux selon le genre chez les professeurs d'université en procédant à l'analyse des écarts selon le genre sur une composante spécifique du salaire des professeurs, soit les primes dites "de marché". Les données proviennent d'un sondage effectué en 2002 auprès des professeurs d'une grande université canadienne. L'analyse des correspondances de même que la régression logistique sont utilisées dans le but d'identifier les caractéristiques liées à la présence de primes de marché et d'examiner si ces caractéristiques peuvent expliquer les différences selon le genre. L'analyse des correspondances donne une solution à deux facteurs dans laquelle le second facteur oppose clairement les professeurs qui ont reçu une prime à ceux qui n'en n'ont pas reçue. Le genre est fortement associé à ce facteur, la catégorie "femme" se retrouvant du côté de l'axe associé à l'absence de primes de marché. Les résultats de la régression logistique confirment que le secteur d'activité, la fréquence des contrats de recherche, la valorisation du salaire ainsi que le rang combiné à l'ancienneté sont reliés à la présence de primes de marché, tel que suggéré par les hypothèses. Toutefois, même après avoir contrôlé pour ces relations, les femmes sont toujours près de trois fois moins susceptibles d'avoir obtenu des primes de marché que leurs homologues masculins. Dans l'ensemble, les résultats suggèrent que dans un contexte où les salaires sont déterminés par convention collective, la réindividualisation du processus de détermination des salaires, en particulier par le versement de primes de marché aux professeurs d'université, peut favoriser la réapparition d'écarts de salaire selon le genre.

INTRODUCTION

On average, women faculty members in Canadian universities have been paid less than their male colleagues. Using Statistics Canada's *Survey of full-time university faculty in Canada*, Ornstein, Stewart, and Drakich (1998) found a 16.8% gender pay gap in 1994. There had been little change by 2002-2003: also using Statistics Canada data, Sussman and Yssaad (2005) reported a gap of 15%. What explains this difference in pay by gender? Ornstein et al. (1998) found that after controls for age, degree, field of specialization, and institutional affiliation, the gender pay gap fell from 16.8% to 8.1%. When rank was added, the difference fell to 3.9%. Sussman and Yssaad (2005) also found a gender pay gap within rank, ranging from 4% to 6%, depending on rank. An unexplained gap thus remains and did not seem to decrease substantially during the period between the two studies.

Clearly, further research on the gender pay gap among academics is warranted. There should be, and no doubt will be, continued efforts to refine the

methods and diversify the data sources used to estimate the coefficients of the sort of earnings equation tested by Ornstein et al. (1998). In this paper, however, a *complementary* analytic approach is proposed. Generally speaking, earnings of faculty members in Canadian universities reflect some combination of the following components: (a) pay at the point of hire; (b) seniority, often summarized in a detailed pay scale by years of service; (c) promotion through the ranks; (d) merit increments based on judgments of performance; (e) stipends to compensate for administrative responsibilities; and (f) market supplements paid to attract new faculty members and retain those likely to leave. Scale increases with years of service are mechanical and cannot lead to an unexplained gender gap. However, the other four sources of pay increase, as well as pay at the point of hire, might do so because they may or do involve discretion.

This paper focuses on one of these discretionary forms of pay increase – market premiums. The rationale for market premiums is to cope either with distinctly robust demand for faculty in various disciplines or with the (sometimes potential) robust demand for individuals because of the excellence of their academic records. These appear to have become an increasingly important component of the earnings determination process in Canadian universities. At least, this has been claimed by several Quebec faculty unions (Pelletier, 2004; SGPUM, 2001, 2002; SPPUS, 2002; SPUL, 2003).

How pervasive is the use of market supplements among Canadian universities? According to the Canadian Association of University Teachers (CAUT), in 2001 most universities either used market supplements or were considering doing so (Fraser & Newark, 2001). Our review of the collective agreements and other salary agreements of the 90 member universities of the Association of Universities and Colleges of Canada (AUCC) shows that 39% (35/90) of universities openly use this practice. This proportion is an underestimate because not all institutions that use market supplements provide public documentation of the fact. For example, the only mention of market premiums in the collective agreement of the university where this research was conducted states that global remuneration comprises a base salary and, if the case arises, an individual premium. According to the agreements reviewed, most institutions allocate supplements on an individual basis (27 institutions). Seven other institutions allocate supplements to specified fields, and one does not provide information on the allocation method. The specified fields include engineering, business administration, law, dentistry, economics, and computer science. In some cases, supplements are part of a faculty member's base salary (11 institutions) while in others, they are distinct from it (23 institutions).

In this paper we examine differences by gender in the assignment of market premiums within one major Canadian university. There are interesting features to the process of assigning market premiums at this university. Base salary is fixed by collective agreement while market premiums are discretionary. Premiums may be assigned at the point of hire or at any subsequent point in a person's career. There has been a considerable amount of secrecy surrounding

their award (provoking an article by a department chair in the newsletter of the faculty union in April 2000 that expressed outrage at the secrecy surrounding market supplements). No written trace of the criteria used to allocate such supplements can be found in the organization's documents. In principle, they exist to respond to the market demand for individuals and for academic fields. In practice they seem often to be awarded in response to requests.

Until about 1998-2000, market premiums were normally used as a temporary adjustment to the basic salary. They were seen as the difference between the basic salary that was prescribed by the collective agreement and a target salary. As the basic salary increased with seniority and negotiated raises, the premiums diminished until the basic and target salary matched. Since 2001, premiums have been negotiated for a period of five years and the amount remains the same for the duration of the agreement. After five years, the agreement may be extended after a performance assessment.

Administrative data from the institution indicate that premiums represented 1.8% of the total payroll in 1997 (the earliest data available) and 4.6% in 2002 (the year of the survey used for the present research). They had reached 6.1% by 2006. The proportion of faculty receiving premiums grew from 22.6% in 1997 to 31.9% in 2002 and 38.6% in 2006 (including premiums to Canada Research Chair holders). The average amount of these awards has more than doubled over the years, from about $5,600 in 1997 to $11,800 in 2002 and $15,000 in 2006. Thus, they represent a growing proportion of the total earnings of faculty employed at this university and an even more significant component of those to whom they have been awarded: in 1997 they represented 7.5% of the salary of the recipients, in 2002, 11.8%, and in 2006, 12.8%.

We begin our analysis of gender and market premiums with a discussion of the broader literature on pay differences by gender, since that is a source of hypotheses most closely relevant to the subject.

THE PAY GAP: POTENTIAL EXPLANATIONS

Part of the gender pay gap is known to be due to gender differences in various characteristics related to pay. Previous research has shown that work experience and education help explain the gap. Unionization and work preferences resulting from different socialization are also possible explanatory factors. Another part of the gap however may be due to employers' discriminatory attitudes towards women. In Canada, the gender pay gap tended to fall over the 1970s and 1980s. Using data from Canadian censuses and the Survey of Consumer Finances, Baker et al. (1995) found that the gender pay gap among full-year, full-time workers fell from 40% in 1970 to 36% in 1980, to 33% in 1990. This decline is attributed to two factors. First, there was a decline in the portion of the gap that is due to gender differences in characteristics related to pay. The average amount of experience and education of women rose during that period. Increasing numbers of women entered better paid occupations and the proportion unionized increased (Baker et al., 1995; Kidd & Shannon, 1997).

Second, the unexplained part of the gap was also decreasing, which may have resulted from a decline in discrimination towards women and/or the convergence of women's and men's unobserved characteristics (Baker et al., 1995; Kidd & Shannon, 1997). Both explanations are plausible. A parallel decrease in the gender pay gap has been observed among university faculty (Ornstein et al., 1998). However, data from the 1996 and 2001 Canadian censuses suggest that the gap tended to remain relatively stable over the 1990s in the general population, at approximately 29% (Statistics Canada, 2003).

The gender pay gap among faculty tends to be higher in the United States. Using data from 1999, Barbezat and Hughes (2005) found a 20.7% unadjusted gender pay gap among American faculty, a figure closer to the 1970s Canadian gender pay gap than to the one observed in the early 2000s. Unionization almost certainly partly explains this difference. It tends to be associated with a smaller gap (Baker & Fortin, 1999; Doiron & Riddell, 1994) and Canadian faculty are more highly unionized than their U.S. counterparts. One mechanism through which unionization may reduce the gender pay gap is by promoting transparency and limiting discretion in pay determination processes. In general, transparent pay determination systems are associated with greater equality in pay (Rubery et al., 1998).

Factors accounting for the pay gap between male and female faculty members have been explained by two models: the difference model and the deficit model (Sonnert & Holton, 1995). The difference model refers to aspects of biography and preferences that may distinguish men and women. The deficit model refers to formal and informal processes that exclude women. As Sonnert (1999) explains, the difference model focuses on factors at the individual level. The deficit model refers to the way women are treated; it focuses on structural, organizational and social factors. Empirically, the boundary between the two models is not clear-cut. Nonetheless, the factors associated with the deficit model approximately coincide with those that might be considered discrimination.

Five potential explanations of the gender pay gap among faculty are relevant for our purposes. First, fields within which women tend to be underrepresented command higher salaries. Data compiled by the Canadian Association of University Teachers (2004) show that in 2001-2002, 29.8% of all Canadian full-time faculty members were female but they were underrepresented in two of the four highest paid sectors. The percent of female faculty in engineering and applied sciences was 9.9%, and in mathematics and the physical sciences, 13.3% (their presence in the other two – agricultural/biological sciences and social sciences approximately coincides with their presence in the profession as a whole). Conversely, they were over-represented in all four sectors offering the lowest average salaries – 36.9% in health professions and occupations,[1] 38.3% in fine and applied arts, 38% in humanities and related sciences, and 45% in education.

Second, the average research activity of women could be lower than that of men. Over 50 American studies (Cole & Zuckerman, 1984, in Cole & Singer,

1992), as well as one Canadian study (Nakhaie, 2002), have detected a gender gap in publication rates. Using survey data from 1987, Nakhaie (2002) has shown that when no adjustments were made for factors commonly associated with publication, male faculty members published roughly twice as much in their lifetime as females. Most of this gap was associated with gender differences in rank, field of specialization, seniority, type of institution, and time devoted to research. However, as noted by the author, the causal relationship implied by these associations was unclear[2] and the data used for this research were collected in 1987. The situation of women faculty members has significantly changed since then, and gender differences in publication rates may no longer exist (Nakhaie, 2002). A recent study on American faculty revealed very little, if any, gender difference in publication rates in recent cohorts (Xie & Shauman, 2003).

Of course, gender differences in publication rates – if present – could themselves reflect less integration by women into the academic culture (O'Leary & Mitchell, 1990, Sonnert & Holton, 1995) and their limited access to resources that promote research productivity. In 1999, a highly-publicized report from the Massachusetts Institute of Technology concluded that its women faculty members had limited access to space and to research grants and were excluded from positions of power. The report concluded that "differences resulted in women having less or in their being excluded from important professional opportunities" (MIT, 1999, p. 13). In Canada, there has been concern expressed about poor female representation among Canada Research Chair holders, which led to a human-rights complaint (PAR-L Electronic Network, 2005) that was recently settled by an agreement on equity in the nomination process for chair holders. The Fifth-Year Evaluation of the Canada Research Chairs Program showed that although the proportion of new female chair recipients had increased from 14.1% to 32% between 2000 to 2004, only 19.8% of chair holders were women in 2004 (R.A. Malatest & Associates Ltd, 2004) and 22% in 2006 (Canada Research Chairs Program Website).

Publication rates are likely to indirectly influence salary in two ways: (a) they may generate a track record that increases the likelihood of better salary offers from other institutions (that may be either accepted or used to bargain with the current employer); (b) they may affect salary through their impact on rank progression. A study conducted by Ornstein and Stewart (1996) suggested a negligible effect of publication record on salary. But the study used data from 1986. For the reasons given earlier, in many universities the relation between track record and salary has probably strengthened since then.

Third, women and men may differ in terms of values and attitudes towards work and pay. One form of this argument suggests that gender role socialization may have made males more competitive, aggressive, and disposed to dominate in one way or another and women more inclined to prize sensitivity and to be somewhat submissive (Blau, Ferber & Winkler, 2006). Were these characterizations correct, the gender gap in salaries might be a result of men's greater ag-

gressiveness when it comes to negotiating salaries or playing the game of seeking better offers from other institutions in order to force the current employer to match them (Blackaby et al., 2005; Svarstad et al., 2004). However, the evidence on differences in attitudes to work by gender is mixed. A meta-analysis of 21 studies, 19 of which were laboratory-based, revealed only small gender differences in the outcomes from salary negotiations (Stuhlmacher & Walters, 1999). A recent study based on a survey investigating the actual experiences of salary negotiation by university graduates in business, psychology, sociology, and history found no gender difference in the incidence of negotiation or in the relative success of negotiation (O'Shea & Bush, 2002). Finally, to our knowledge, no research has examined whether women and men academics differ in their attitudes towards salary negotiation.

Another form of the argument that there are gender differences in attitudes to work and pay is based on the idea of compensating differentials (Shirazi, Biel & Fransson, 2002). According to this model, there are gender differences in preferences with respect to job attributes. The results of recent studies on this topic are mixed. Using different data sources and studying different occupations, Tolbert and Moen (1998), Browne (1997), and Shirazi et al. (2002) all report no differences between men and women in the job attributes they most value. In contrast, Barbezat (1992) found significant gender differences in the job attributes preferred by Ph.D. graduates entering the academic job market. Men displayed a greater tendency to prioritize salary than women. Women were more likely to prioritize student quality, collegiality, and opportunities for collaborative work (Barbezat, 1992). However, this research is by no means definitive since it was limited to economists who were at the beginning of their careers.

Fourth, men on average have more seniority than their female counterparts (Ornstein & Stewart, 1996) and occupy higher academic ranks (Ornstein & Stewart, 1996; Ornstein et al., 1998; Sussman & Yssaad, 2005). There are several possible reasons for this. The presence of women in the academic profession in large numbers is relatively recent. Because of family constraints or for other reasons including discrimination, it is more likely that their careers were interrupted or that they delayed the start of their careers (Ornstein & Stewart, 1996; Ornstein et al., 1998; Sussman & Yssaad, 2005).

Finally, the academic career is said to have been shaped to match a life pattern more typical of males in that it hardly tolerates interruptions, requires working long hours as well as a willingness to travel, and large pay increases may require a willingness to be mobile. According to several studies reviewed in an American Sociological Association report (2004), "mothers often bear the primary family obligations that conflict with the demands and rhythms of academic life" (p. 5). The years concentrated with child-bearing and the care of young children often coincide with the critical time when an academic must work relentlessly to obtain tenure. Child care may limit the capacity of women to build their reputations and networks through conference participation. Also,

broader family commitments may limit the willingness of women to take jobs that require geographic mobility. Within couples, the fact that women are on average younger than men may play a role. The age differential may imply that women's spouses have been on the labour market for a longer time than the women themselves and are more likely to have established careers. This simple fact may hamper women's choices. In short, women faculty are more likely to be part of dual-career couples.

The research on child-rearing and promotion has yielded inconsistent results. Ginther and Hayes (2001) and studies reviewed by Bentley and Adamson (2003) suggest that child-rearing slows promotion. Long (2001) and Perna (2003), however, found no effect. In a study of four Australian universities, many women faculty members expressed a reluctance to participate in conferences while their children were young (Deane et al., 1996). In their research on fellowship recipients of the *National Science Foundation* and the *National Research Council*, Sonnert and Holton (1995) found that mothers were more likely to say that they had accepted post-doctoral fellowships in order to be with their partner. Men, on the other hand, displayed the opposite tendency; the ones who were childless were more likely than the ones who had children to say that they had accepted post-doctoral fellowships in order to be with their partner.

There has been some interesting and relatively recent work on the issue of geographic mobility. In a study of academic economists in the United Kingdom, Blackaby, Booth, and Frank (2005) found that women were less likely than men to have received an outside offer in the five previous years. They argue that this finding is consistent with what Booth, Francesconi, and Frank (2003) call the "loyal servant" hypothesis (p. 304). This suggests that family commitments more often limit female rather than male mobility and that prospective employers know this, meaning that those employers are less likely to make offers to women. Current employers exploit the opportunity this provides by paying their female employees less. Note, however, that the fact that women had received fewer outside offers over the five previous years was the only evidence provided. The article contained no direct evidence bearing on the loyal servant hypothesis.

Since market supplements have not been addressed specifically by previous research, this study derives its hypotheses from the literature reviewed above, which deals with pay differentials by gender. Some of the hypotheses reviewed below have not been supported in previous research. We retain them here because access to market premiums may provide a more precise way to test these hypotheses than is the case for aggregate pay. Transposing the possible explanations proposed for gender differences in pay to gender differences in market premiums generates the following research questions and related hypotheses.

A first question asks whether female faculty members are disadvantaged in their access to market premiums as well as in their overall salary. This leads to our first hypothesis.

Hypothesis 1 – Women are less likely to receive market premiums than men.

Our second question is whether this difference – if present – can be understood as an outcome of gender differences in the presence of characteristics that increase the likelihood of having received a market premium. There are four hypotheses related to this question.

Market premiums are aimed at compensating individual or collective differences in the market situation of faculty members. The most common indicators of market situation are field of specialization and faculty members' research activity. So,

Hypothesis 2 – The receipt of market premiums is related to research activity and field of specialization.

The three remaining hypotheses deal with characteristics that are less clearly related to the reasons for which systems of market premiums are introduced. Suppose that market premiums are more likely to be awarded to those inclined to negotiate for them. It is possible that those who rank pay highest in their list of desirable job attributes negotiate with more determination, therefore:

Hypothesis 3 – Those who most value pay raises are more likely to have received market premiums.

Late starts, career disruptions and academic career characteristics are frequently used to account for lower female pay. We would expect, then, that career characteristics of this sort play some role in the process through which market premiums are secured.

Hypothesis 4 – Career characteristics are related to the reception of market premiums.

Finally, in the literature there is much speculation – and not much data – on the consequences of family constraints for the career of faculty members. Therefore:

Hypothesis 5 - Family constraints reduce the likelihood that someone will have received a market premium.

Our core question is, as follows: after controlling for all the characteristics related to the presence of market premiums, does a gender difference in the receipt of them persist?

RESEARCH DESIGN

This is a case study of a single university. This particular university provides an interesting context for an examination of the operation of a system for awarding market premiums. The university is unionized, but the system for

awarding market premiums falls outside the collective agreement. The university's administration has not made available to the broader university community information on the operation of the system. In this context, then, market premiums are an area where administrators can exercise complete discretion and have a strong incentive to do so because they cannot exercise discretion in basic pay, which is governed by a collective agreement. We are interested in whether exercising discretion produces equivalent outcomes for male and female faculty members.

Data

The data come from a survey conducted in the Fall of 2002, sponsored by the university's faculty union. Questionnaires were sent to all 1249 tenure-track faculty, researchers, lecturers and research associates who were members of the union[3]. The response rate was 51.6%. For the objectives of this research it is a suitable data source since it includes information related to all of the factors discussed above. There are, however, two possible weaknesses. Non-response might be a source of bias. There might also be bias because the data are self-reported.

To check for possible bias the demographic and occupational results from the survey were compared with available administrative data from the university. It is important to note that in the administrative records market supplements and administrative stipends are combined. In the survey data, these are disaggregated. For comparative purposes, we combined them. Data presented in Appendix A show that there is little difference in the distributions of characteristics between the two data sets.

Measures

The indicator of presence of market premiums available in this analysis is whether one had been received since appointment to a tenure-track position. This creates a methodological problem that is addressed in the next section. There are five sets of variables, each set corresponding with the content of Hypotheses 1 to 5. Descriptive information on these variables can be found in Appendix B. In addition, Appendix C presents the distribution of these variables by gender.

For Hypothesis 1, gender is the only variable; it takes a value of 0 if the respondent is male and 1 if female. For Hypothesis 2, academic sector of employment (reflecting the general market value of various fields of specialization) provides a collective measure of faculty market value. Indicators of individual value included the following: how often faculty members have accepted a private research contract in the last year, being a member of a research team, currently receiving research grants, being the recipient of a Canada Research Chair, being the recipient of any other kind of research chair, and the presence of research assistants, research professionals and post-doctoral fellows.

For Hypothesis 3, attitudes to remuneration are measured by a question on the priority given to increases in salary as opposed to other aspects of employment. For Hypothesis 4, indicators of career stage are seniority within rank, age at appointment, number of years of professional experience prior to appointment, type of previous work experience as well as presence of administrative stipends since appointment.[4] Finally, for Hypothesis 5 there are four indicators of family constraints: presence of children under 12, main occupation of spouse, perceived level of difficulty associated with combining professional and family obligations, and presence of demanding family responsibilities over the previous two years.

A Measurement Gap

Our measure of the salary component under study allows respondents to report receipt of a premium at any point during their appointment at the university under study. Before 1998, the university's practice was to diminish the amounts of the premiums until extinction. So some respondents may have received a premium in the past that had been terminated by the time of the survey. This is a problem: the data available means that we are obliged to examine the relationship between information on respondents' attitudes and research output from 2002, on the one hand, and the receipt of a market premium that may have occurred several years earlier, and may have disappeared, several years earlier.

We have explored this issue carefully. Administrative data from the institution show that, of those who had received premiums between 1997 and 2002, only 9.1% lost them at some point over this period. Moreover, as discussed earlier, only since 1998 have market premiums been widely used. Overall, it seems safe to assume that most market premiums to which faculty referred in their answers were awarded fairly recently and that most faculty continued to receive them at the time of the survey. This information is unfortunately not available in the survey data, however.

Another problem arises because we are looking for associations between 2002 responses to questions and a market premium award that in some cases would have taken place several years previously. What is at issue here is the relative stability of our measures. Many are (almost) completely stable – this would be true of age at appointment, gender and, for the most part, academic sector.

There is a set of variables related to research performance that may not be stable. For example, a person may have received a market premium in, say, 1998 at a time when he or she was not supervising a post-doctoral fellow, but have been supervising one in 2002, when the survey was conducted. We can assume with relative assurance that there is much continuity over time in research performance. It is, for example, the nature of the Canada Research Chair program that someone holding such a position in 2002 normally had stronger than average research performance five or 10 years earlier. Measures of family responsibilities – actual and perceived – may be problematic. A professor with a

child under 12 in 2002 may not have had one in 1998, when he or she received a market premium. But since the range of ages spanned is birth to 12 and since there was a marked growth of market premium awards at the end of the 1990s, it is likely that in most cases the added family responsibility would have coincided with the period during which the award was made. Moreover, responses to the question on the perceived difficulty in combining professional and family responsibilities are likely to have been shaped over some time. Finally, those who have used different valuations of the importance of pay to explain differences in pay by gender must assume that those valuations are relatively stable. Were they not, it would be difficult to determine how pay disadvantages by women could be produced by a (relative) disinterest in pay.

These caveats suggest that the use of responses to questions in 2002 to predict awards that in some cases were made several years earlier pose some problems. However, the seriousness of the problem should not be exaggerated. In the conclusion, we return to the issue in the interpretation of our results.

Analyses

Two procedures are used to analyze the data. They differ in the extent to which they assume causal sequencing. First, a correspondence analysis using SPAD v6 is used in order to describe the relationships between variables without an assumption of causal sequence. The procedure is a special case of principal components analysis in which variables are measured at the nominal or ordinal level. Consequently, chi-square instead of correlation is used to assess distances. It is a technique used to visualize data. It projects on a single geometric plane all the relationships among variables so that categories chosen by the same respondents are close to each other on the plane (Lebart, Morineau & Piron, 2002)

In correspondence analysis, variables may either be used as active or supplementary elements. Active variables and their interrelations determine a map – or maps if more than two factors are retained. For the results to be interpretable, active variables must all relate to the same theme (Morineau, 1993). Supplementary variables do not contribute to the computation of the factors. Their relationship with the active map determines their projection on the bidimensional space defined by the factors.

In the present research, the active variables retained are all those that should be related to the receipt of market supplements because they are the prime factors used to justify their presence (i.e., sector of activity, frequency of research contracts, and the indicators of research activity), as well as the receipt of market supplements. Therefore, the active plane provides information on the relationships among market value, research activity, and market premiums. This plane is related to Hypothesis 2 which states that there is a relationship between the market value of faculty and receipt of market premiums.

The supplementary variables projected on to this plane are those that might be expected not to be related to market supplements, if market premiums were

only a reflection of market value and, of particular interest for our purposes, gender. They are related to hypotheses 1, 3, 4, and 5. If the supplementary variables are related to market premiums, they will load significantly on the same factor that includes the presence of market premiums. This is a first test of our hypotheses.

A limit to correspondence analysis is that it is difficult to compare its results with those of studies published elsewhere. Also, it does not generate an estimate of the extent of gender differences that are unaccounted for by other variables. This sort of residual difference is a major focus of interest in most of the relevant research. To supplement the correspondence analysis, we also present analyses using logistic regression, which tends to assume a causal sequence. As observed before, we return to the plausibility and implications of this assumption in the conclusion.

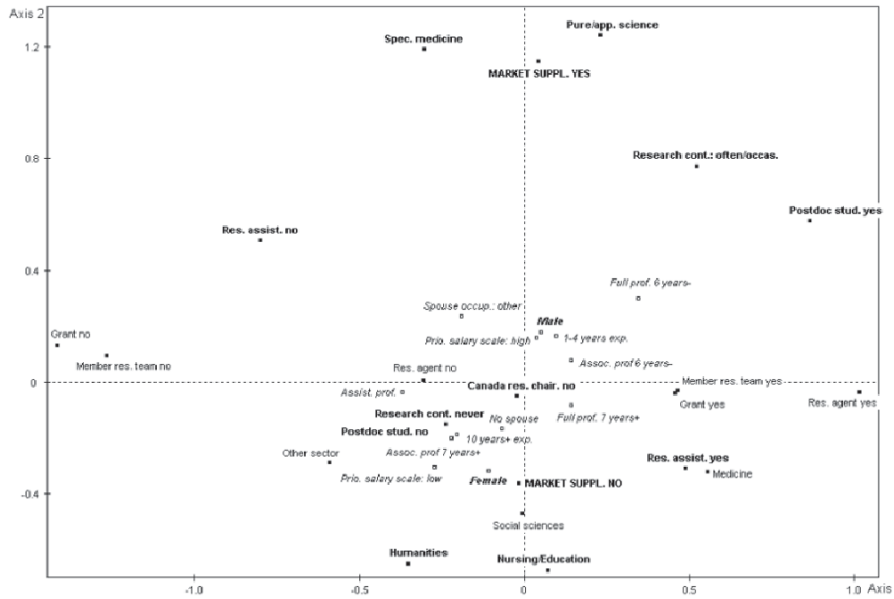
Hierarchical logistic regressions are used in order to assess the impact of adding explanatory variables on the relationship between gender and the receipt of market premiums. The gender variable is entered first, followed by the variables found to be related to the presence of market premiums in the correspondence analysis. These variables were entered in blocks in order to estimate their added contribution and to check for possible interactions. Finally, we present the most parsimonious model which retains only the variables that have a significant or substantial relationship with the receipt of market premiums.[5]

RESULTS

Correspondence Analysis

The Cattell Scree test yielded two factors. The first accounts for 15.6% of the total variance, the second for 10.0%, for a fairly substantial 25.6% of the total variance. There is little difference between the eigenvalues of the factors beyond 1 and 2, which suggests that the second factor is the threshold for retaining factors to be considered.

Figure 1 describes the results of the analysis.[6] Significant t-test scores of the factor loadings are presented in Appendix D. The first factor is clearly and almost solely defined by research activities, opposing the more active researchers to the less active. The t-tests of the significance of the factor loadings of the different categories vary from 5.1 to 19.9. The variables contributing most to this axis are, in descending order of importance as follows: research grants, being a member of a research team, presence of research assistants, research agents and post-doctoral fellows, frequency of research contracts, and sector of activity. On the more active researcher side of the axis, characteristics that reflect the presence of human and financial resources for research tend to be present while on the less active researcher side, they are absent. Academic sector is also related to this factor. Those in the Faculty of Medicine are most active, those in "other faculties" (Architecture, Law, Theology and Kinesiology) less active. Receipt of a market premium is not related to this axis.



Note: In order to make the results more readable, the central area of the graph produced by Spad is magnified. Since the "yes" category of the variable "award of a Canada research chair" lies outside of this area (coordinates: 1.26 on axis 1 and 3.41 on axis 2), it does not appear in the graph. Italics indicate supplementary variables. Characters in bold indicate both active and supplementary variables that load the most significantly on axis 2.

Figure 1 Graphical representation of the first two factors – correspondence analysis

The presence of market supplements is by far the largest contributor to the second factor, as indicated by the high t-test associated with the "yes" category of this variable (15.9). This factor clearly opposes faculty who receive market supplements to those who do not and is orthogonal to the first factor. The remaining variables contributing to this axis may all be thought of as being more or less directly related to the market value of faculty. Receipt of a market premium is on the same side of the axis as working in the pure and applied sciences or in specialized medicine (Dentistry, Optometry, Pharmacy, Veterinary Medicine), holding a Canada Research Chair, post-doctoral supervision, and at least occasional research contracts. On the absence of market supplements side of the axis are the Humanities, Literature, Nursing, and Education. This shows that research activity of a particular kind was related to the award of market supplements – the sort of activity that leads to a Canada Research Chair and involves post-doctoral fellows – both of which have been more common in the natural and biological sciences.

The contribution of the supplementary variables is consistent with the interpretation of the first factor as more/less active researcher. The variables that are most related to this factor are seniority within rank and type of prior profession-

al experience. Full professors with six years or less of seniority within rank and faculty who had prior research experience tend to be found on the more active researcher side of the axis, while assistant professors and those who had teaching experience and a substantial work history prior to their appointment at the university under study tend to be found on the less active researcher side of the axis. The relationship between this factor and the remaining categories is fairly weak (t-test <2.5). They include, on the more active researcher side, some characteristics that are related to age such as the presence of children under the age of 12 and having a spouse who has another type of professional occupation.

The supplementary variables of particular interest in this analysis are those related to the factor dominated by the award of market supplements. The variable most related to this factor is gender. Women are clearly on the side of the axis where those not receiving market supplements cluster. In order of importance, on the side of the axis where those who received market supplements cluster, we find those who attributed the most importance to salary, were recently appointed to the rank of full professor, were appointed to the university under the age of 30, and had entered directly into an academic position. These are all consistent with a portrait of a faculty star.

This correspondence analysis is informative in that it shows that gender is associated with the receipt of market supplements. The limit to this analysis is that it does not allow us to determine whether market supplements are related to differences between men and women on various other characteristics related to the award of a supplement. This issue is addressed in the next section.

Logistic Regression Analysis

The variables in the correspondence analysis related to the factor determined by the presence of market supplements are retained for this new analysis. They are entered in five sets – as defined in the literature review and in the hypotheses. This allows us to estimate the relationship between each set and the award of a market supplement as well as the impact of their inclusion on variables already present in the analysis. The order of entry is the same as the order of the hypotheses. Gender is entered first, followed by the variables that, most obviously, should be related to market supplements. Next, variables related to attitude, career, and family constraints are entered. Thus, at each step, it is possible to estimate whether the inclusion of the variables has an impact on the relationship between gender and the presence of market supplements. Finally, we fit a parsimonious model that includes only the variables that are related to the odds of receiving market supplements.

The results of the hierarchical logistic regression are displayed in Table 1. The first column shows that the likelihood of receiving a market supplement is associated with gender, with women being 2.4 times[7] less likely than their male counterparts to receive market supplements. In fact, 3.9% of the variance in market supplement awards is related to gender.[8] This result is consistent with those obtained using correspondence analysis.

Table 1. Hierarchical logistic regression of the presence of market supplements.

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Gender	W: 11.77 p=0.001		W: 6.82 p=0.009		W:6.50 p=0.011		W: 10.20 p=0.001		W: 10.88 p=0.001		W: 12.41 p=0.000	
Women	-0.88**	0.42	-0.74**	0.48	-0.73*	0.48	-1.00**	0.37	-1.08**	0.34	-1.05***	0.35
Sector (ref. : humanities)			W: 52.34 p=0.000		W: 49.13 p=0.000		W: 44.31 p=0.000		W : 45.46 p=0.000		W: 54.91 p=0.000	
Pure and applied science			2.63***	13.88	2.57***	13.08	2.82***	16.73	2.92***	18.48	2.41***	11.18
Social science/psychology			1.82**	6.15	1.74**	5.70	1.77**	5.88	1.83**	6.21	1.36*	3.89
Medicine			0.83	2.28	0..77	2.15	0.82	2.28	0.91	2.49	0.10	1.10
Specialized medicine			3.25***	25.73	3.14***	23.08	3.13***	22.76	3.27***	26.41	2.67***	14.49
Nursing/education			1.48*	4.41	1.47*	4.34	1.33	3.80	1.46	4.30	0.98	2.65
Other sector			1.78**	5.91	1.82**	6.14	1.81**	6.09	1.89**	6.59	1.45**	4.27
Frequency of research contracts (ref. : never)			W: 8.38 p=0.015		W: 6.58 p=0.037		W: 5.96 p=0.051		W: 5.72 p=0.057		W: 8.02 p=0.018	
Often or occasionally			0.82**	2.28	0.74*	2.10	0.77*	2.16	0.76*	2.14	0.84**	2.31
Rarely			0.49	1.64	0.43	1.54	0.39	1.48	0.43	1.54	0.35	1.41
Award of Canada Research Chair			W: 3.82 p=0.051		W: 3.68 p=0.055		W: 3.10 p=0.078		W: 2.97 p=.085			
Yes			2.07+	7.93	2.21+	9.10	2.05+	7.73	2.04+	7.68		
Research assistants			W: 0.93 p=0.335		W: 0.89 p=0.34		W: 2.926 p=0.087		W: 3.37 p=.066		W: 2.28 p=0.131	
Yes			0.25	1.28	0.25	1.28	0.48+	1.62	0.53+	1.70	0.40	1.49
Post-doctoral fellows			W: 1.38 p=0.240		W: 1.58 p=0.208		W: 0.54 p=0.464		W: 0.40 p=0.526			
Yes			-0.35	0.71	-0.38	0.69	-0.25	0.78	-0.22	0.80		
Priority: improvement of salary scale (ref.: low/not at all a priority)					W: 7.28 p=0.026		W: 7.20 p=0.027		W: 7.50 p=0.023		W: 7.62 p=0.022	

	Model 1	Model 2	Model 3		Model 4		Model 5		Model 6	
High priority			1.03*	2.80	1.00*	2.71	1.03*	2.80	0.87*	2.38
Medium priority			0.53	1.71	0.42	1.53	0.43	1.54	0.27	1.31
Seniority within rank (ref.: assistant professor)					W: 17.14 p=0.002		W: 18.00 p=0.001		W: 19.79 p=0.001	
Associate professor 6 years -					-0.28	0.76	-0.28	0.76	-0.20	0.82
Associate professor 7 years +					-0.90*	0.41	-1.01*	0.36	-0.97*	0.38
Full professor 6 years -					-1.28**	0.28	-1.33**	0.27	-1.10**	0.33
Full professor 7 years +					-1.48***	0.23	-1.63***	0.20	-1.52***	0.22
Age at appointment (ref.: under 30 years old)					W: 2.35 p=0.504		W: 2.13 p=0.546			
31-35 years old					0.07	1.07	0.07	1.07		
36-40 years old					-0.40	0.67	-0.40	0.67		
41 years old +					0.19	1.21	0.14	1.16		
Number of years of prior experience (ref.: None)					W: 2.28 p=0.516		W: 2.30 p=0.513			
1-4 years					0.69	1.99	0.68	1.97		
5-9 years					0.58	1.79	0.57	1.77		
10 years+					0.70	2.10	0.73	2.07		
Type of experience (ref.: teaching)					W:0.19 p=0.91		W:0.21 p=0.90			
Research					-0.05	0.95	-0.05	0.95		
Other					0.12	1.13	0.13	1.14		
Receipt of administrative stipends					W: 2.77 p=0.096		W: 2.82 p=0.093		W=3.13 p=0.077	

Continued on next page.

	Model 1	Model 2	Model 3	Model 4		Model 5		Model 6	
Yes				0.61+	1.83	0.62+	1.85	0.60+	1.82
Presence of children						W: 0.88 p=0.349			
Yes						-0.28	0.76		
Main occupation of spouse (ref.: university professor)						W: 1.16 p=0.762			
Other professional occupation						-0.34	0.71		
Other occupation						-0.10	0.91		
No spouse						-0.05	0.95		
Nagelkerke R2	0.039	0.261	0.281	0.339		0.345		0.317	
-2Log likelihood	528.290	446.217	438.452	414.132		411.512		458.003	
df	1	12	14	27		31		17	

+p < 0.10 *p < 0.05 **p < 0.01 ***p < 0.000

Five indicators of market value were components of the second factor identified in the correspondence analysis – academic sector, frequency of research contracts, holding a Canada Research Chair, having research assistants, and post-doctoral fellows. Of these, academic sector and research contracts are related to market supplements in the logistic regression analysis. Holding a Canada Research Chair does not have a significant effect at the conventional 0.05 level, but it does at the less stringent, but sometimes used, 0.1 level (p=0.051). When compared to faculty members in the Humanities, members in all other sectors – except the Faculty of Medicine[9] – were more likely to have received market supplements. The odds range from 4.4 in Nursing and Education to more than 25 in specialized medicine. Faculty members who had often or occasionally accepted private research contracts were 2.3 times more likely to have received market supplements than those who had never accepted such contracts.[10] Canada Research Chair holders were almost eight times more likely than others to have been awarded a market supplement. The remaining market value indicators – the presence of post-doctoral fellows and of research assistants – are unrelated to the receipt of market supplements, net of the presence of the other indicators. Their relationship with market supplements reflects differences among academic sectors.[11]

With these indicators of market value the variance explained by the model rises to 26.1%. Hypothesis 2 is supported. It is noteworthy that the coefficient for gender falls somewhat: the odds ratio goes from 2.4 to 2.1, but this change is not statistically significant.

The third column shows that those who most value salary scale improvements were more likely to have received market supplements – 2.7 times more likely than those who saw it as a low priority. Adding this indicator has a negligible effect on the coefficients of the other predictors and increases the variance explained by 2 percentage points. Hypothesis 3 is supported, but there is no evidence that differences in this attitude explain the women's lower probability of being awarded market supplements. In this sample, the relationship between gender and priority given to salary scale improvement is weak (see Appendix C).

Of the five available indicators of career characteristics, only seniority within rank is clearly related to receipt of a market premium. The broad pattern is that assistant professors were most likely to have been awarded a market premium. In comparison, full professors in the rank for seven or more years were four times less likely to have received supplements, full professors with less than seven years seniority 3.6 times less likely, and associate professors with seven or more years seniority 2.4 times less likely.[12] This result differs from what we found using correspondence analysis which located full professors with less than seven years of seniority on the "presence of market supplements" side of axis 2. This discrepancy may be explained by the relationship between variables already in the analysis, in particular academic sector.

Faculty members who had previously received administrative stipends were almost twice as likely to have obtained market supplements than those who

never received such stipends. Age at appointment, number of years of work experience prior to academic appointment, and type of prior experience are unrelated to the probability of receiving a market supplement in this analysis.

Adding career characteristics to the model increases the explained variance from 28.1% to 33.9%. Hypothesis 4 is also supported. However, most important for our purposes, adding seniority in rank and administrative stipends does not significantly change the gender coefficient.

Finally, neither of the indicators of family constraints (children under 12, spouse employed or not) is significantly related to the award of market supplements and the coefficients of the indicators already in the model remain roughly the same when these new variables are introduced. Their presence in the correspondence analysis is likely due to their relationship with career variables, which are related to age. The fifth hypothesis is thus rejected.

To construct a final parsimonious model we initially only included the indicators related to the award of market supplements at a p-value of 0.1 or less in the complete model. Subsequent tests were performed to examine whether the variables with a p-value greater than 0.05 in this more parsimonious model might also be excluded. The conclusion drawn from these tests was that the award of a Canada Research Chair could be left out. Doing so did not substantially change any of the coefficients and the model fit remained about the same. However, receipt of administrative stipends and the presence of research assistants were retained because their inclusion did improve model fit. The fit provided by the final parsimonious model presented in the last column of Table 1 is as good as that of the complete model. We compared the two models using the difference in deviance and degrees of freedom which is distributed as chi-square. A common criterion of significance is a chi-square divided by the degrees of freedom that exceeds 4. In this case, the difference between the models is not significant (chi-square = 46.5 with 14 degrees of freedom, criterion=3.3).

The results displayed in the last column of Table 1 show that the direction of the effects is the same as in the complete model. Taken together, the predictors included in the final model account for 31.7% of the variance in the receipt of market supplements which constitutes a substantial proportion for this type of research.

The central question addressed in this article is whether gender differences in the receipt of market premiums are fully accounted for by the other characteristics associated with market premiums. The results of this analysis indicate that they are not. On the contrary, after controlling for the effects of market value, attitude toward remuneration, and career characteristics, disadvantage of women in accessing a market premium is not modified. They remained almost three times (2.85) less likely than men to be awarded one.

DISCUSSION AND CONCLUSION

Our results are consistent with all but one of our hypotheses. Market premiums were more likely to have been awarded to faculty members likely to have a higher market value, to those who most stressed pay as a job attribute, and to those at the beginning of the career. Most importantly for our purposes, however, women were less likely to have received market premiums than men and that disadvantage persisted even after the significant number of controls we added. Our results provide substantial support for Hypothesis 1. Interestingly, Hypothesis 5 was not supported. There was no evidence that family constraints influenced the likelihood that someone would be awarded a market premium, whether that person was a man or a woman.

Clearly, one should not exaggerate the importance of the results of an analysis of an aspect of salary policy in a single university. Nor, we would argue, should the importance of these results be underestimated. Pay differences by gender increasingly originate within occupations rather than between them (Fortin & Huberman, 2002). We also know that the magnitude of the pay difference by gender varies by occupation. For example, Robson and Wallace (2001) found no gender pay gap among Canadian lawyers in 1994, after suitable controls. For a similar period, Tanner (1999), in contrast, did find a pay disadvantage for women among pharmacists. There is good reason to think that the largest pay-offs to the study of pay differences by gender will emerge from studies that, implicitly, control for a wide range of effects by focusing on a single occupation. This study, of course, is within a single occupation within a single organization. This means that we have controlled more effectively for a wider range of effects than is the case in the bulk of the research on pay differences by gender. What do the results suggest?

First, in this university context family constraints had no effect on the likelihood of receipt of a market premium. How is this possible? It is important to note first that there is little direct evidence in the existing research of a family constraint effect. Furthermore, universities may provide more flexibility in work hours than most employers. Family obligations may make it difficult for a faculty member to devote the amount of time to research that he or she would wish to, given the performance requirement built into the tenure process. On the other hand, the limited number of student contact hours in a research university do allow many faculty members to move between work, in particular research, and family obligations in a way that is less likely to be possible in many other highly paid professions. Consistent with the sort of argument found in Esping-Andersen (2004), our results may suggest the importance of family-friendly work arrangements for gender equity in pay (though, in a comparison of the rates of access to senior management positions in the U.S. and Sweden, Milgrom and Petersen (2006) raise the possibility that family-friendly policies of the Swedish sort damage women's careers by facilitating choices that reduce the amount of career-enhancing experience acquired by women).

Second, it remains the case that, after the inclusion of a wide range of controls in the estimation of the various equations discussed above, women were less likely to receive market premiums than men. A likely explanation could be that relevant factors were not sufficiently controlled. Academic fields may have been too aggregate. For example, the market demand for social scientists may on average be greater than is the case for those in the humanities, but the market demand within the social sciences is greater for economists than for anthropologists. The measures used are not sufficiently refined to allow us to control for that. Clearly, we would prefer to have had more direct measures of research productivity – say, the number and quality of publications. The indirect controls that were included in the analysis to cover various aspects of research activity are likely to have accounted for most of the effect of the individual market value of faculty members as researchers. Still, they may not entirely account for this effect. Nor do we adequately control for differences in values and attitudes. We did not have an direct measures of attitudes towards salary negotiation, a characteristic that was hypothesized to differentiate women from men and to contribute to explaining the gender gap in pay (Blackaby et al., 2005; Svarstad et al., 2004). Finally, we may not have adequately controlled for relevant factors because of the lag between our measurements of faculty characteristics and the fact of having been awarded market supplements.

These are limitations to draw conclusions from the research described above. But a reasonable case can be made that the measurement limitations in this work are no greater, and are probably less, than are those in most of the other relevant work. In some cases, our measures are distinctly superior to those used in the bulk of the relevant literature. This is the case, in particular, for our measures of career and of family constraints. In addition, we do have attitudinal controls that are not present in the research on the pay of university professors described earlier. Moreover, with a survey from a single university, we implicitly control for differences across universities in the characteristics of faculty members and in the policies through which salaries are determined. That, in our view, is a substantial advantage. In other words, a conservative interpretation of our results would still allow the conclusion that women are disadvantaged in the pay-determination process, even within the highly meritocratic context of a modern Canadian research university.

The occupation of university faculty members has some interesting characteristics that are relevant to the understanding of the pay determination process. Where pay is determined by a collective agreement with rates set by rank and seniority, it is very difficult for gender differences to emerge. The introduction of discretionary components does allow gender differences to emerge. The introduction of market premiums by universities – as noted earlier, a recently common phenomenon – has the effect of individualizing compensation. In this case study, at least, individualized compensation appears to have operated, on average, to the disadvantage of women. Why that should be so remains an important question for future research.

A reasonable position is that unexplained gender differences in pay – for example, those produced by differences in the awarding of market premiums – ought to be explained or eliminated. The results presented here suggest a plausible line of research and, perhaps, policy concern. In this study women proved to be disadvantaged within a system of discretionary awards of market premiums, a system probably introduced precisely because of the limits on discretion imposed by the collective agreement that sets the basic rates of pay. The development of a program of market premiums moved the pay determining process at this university in an individualizing direction. There may be much to be said for a more individualized pay determination process. But such a policy comes with the risk that particular groups may be disadvantaged – groups that are less likely to be disadvantaged within a pay system governed by a collective agreement. The conclusion to be drawn from the analyses is that market premiums require care when implemented.

There is, of course, the more fundamental problem of the relative roles of structure and individual choice in the production of pay differences by gender. This distinction underlies the difference between the deficit and difference models that we discussed earlier, two models that organize much of the discussion in the literature on differential labor market outcomes by gender. These issues are more complicated than would be implied by the mechanical application of these two models. Consider the effect of academic sector. Suppose that the pay disadvantage of women was substantially explained by their sector of employment. That might indicate an effect of personal choice on pay differences. It also might reflect a process through which pay is lower in the sectors in which women are employed because women are employed in them rather than because of a neutral market process. This research, alas, does not do much to advance our capacity to answer that question. More studies of individual universities, such as the one reported here, are more likely to provide the institutional detail that makes it possible to tease out these more complicated issues. Further insight is likely to be gained from longitudinal studies. Administrative records, when available, will often provide such data.

NOTES

1. This sector includes the following fields: basic sciences/medicine, dental specialities, dentistry, medical specialization, medical technology, medicine, nursing, optometry, paraclinical science, pharmacy, public health, rehabilitation medicine, surgery and other health occupations. There is wide variability of salaries by field within this sector, and women are greatly over-represented in the fields that command the lowest salaries (i.e., rehabilitation medicine and nursing, where women comprise respectively 74.2% and 93.6% of faculty).

2. Women tend to hold lower ranks than their male counterparts. Publishing is crucial to rank progression, but it could also be that holding a higher rank leads to publishing more – that faculty members in higher ranks benefit from a process of accumulation of advantages such as better access to resources for research, a wider professional network, and the recognition that leads to invited publications (Nakhaie, 2002). At least two other reasons could account for the higher publication rate of senior faculty. First, in universities with substantial tenure requirements in terms of publication, junior faculty who do not publish may not receive tenure, leaving only more productive faculty at higher ranks. Second, senior faculty may be more productive as a result of their experience in publication and teaching: experience in publishing may lead to a reduction in the time needed to write publications; experience in teaching, which implies an accumulation of lecture notes, may free up time for publication.
3. Detailed methodological information, including the questionnaire, is available from the authors.
4. Faculty members who have received administrative premiums have been part of the administration at one point, which is an indicator of their career. However, having been part of the administration also means that they have been normally informed of the availability of market premiums, which is not necessarily the case for other faculty members. Thus, they may be more likely to request – and receive – market supplements than faculty members who were never part of the administration. This consideration is particularly relevant in the context of the institution at which this research was conducted, where the presence of a market supplements policy is kept relatively secret.
5. This study uses the entire population of union members as opposed to a sample of this population. For this reason, the statistical tests that are used do not apply in a strict sense. The term "significant" should thus be understood as an indication of substantial differences.
6. In examining the graph, the reader has to be conscious that the position of the various categories of variables on the map is not uniquely determined by the importance of the relationship between a given variable and its categories and the factors as illustrated by the axes. It is the structure of relationships that determines the plan. Hence, a category with very few cases may be positioned further on a given axis but it may not be a significant contributor to the axis if there are not enough cases to warrant signification. The interpretation uses the statistical contribution of the different categories, not their positioning on the axes.
7. To make the description of the results more readily understandable, the negative odds (exp of less than 1) are presented as 1/exp β. A value of 0.42 for exp gives a value of 2.4 for 1/exp β, which means that women are 2.4 times *less* likely than men to receive such supplements.
8. Values of Nagelkerke R^2 can be interpreted in the same way as Pearson's R^2.

9. Professors at the Faculty of Medicine in this sample are the non clinicians who teach in the Faculty. They may be, for example, professors/researchers in physical and occupational therapy, public health, health administration. They benefit from a different and higher basic pay scale.
10. The impact of research contracts on the market value of faculty may differ substantially by field. These contracts are highly valued in engineering and management, but less so in humanities and social sciences. However, our data do not include faculty from engineering and management because they are not members of the university's faculty union.
11. Research assistants are more likely to be used in Pure and Applied Sciences and in Specialized Medicine (Chi square=42.1, p=0.000). Post-doctoral fellows are more likely to be found in Pure and Applied Sciences and in the Faculty of Medicine (Chi square=62.1, p=0.000).
12. This may seem odd. However, market supplements have been attached substantially to hiring and faculty are generally hired at the assistant professor level and, as at other Canadian universities, standards have been increasing at this institution.

Appendix A: Comparison of survey data with administrative data

		Survey	Admin. data	Response rate
Total (N)		N = 645	N = 1249	51.6%
		%	%	%
Gender	Male	65.0	68.2	48.4
	Female	35.0	31.8	55.8
	Total	100.0 (637)	100.0 (1249)	
Field of specialization	Male – Humanities	9.8	7.3	68.1
	Female – Humanities	5.1	3.4	74.4
	Male – Social science and psychology	10.4	13.0	40.7
	Female – Social science and psychology	5.2	6.2	42.9
	Male – Pure and applied science	13.1	12.7	52.2
	Female – Pure and applied science	1.9	1.9	50.0
	Male – Medicine	13.6	14.3	48.0
	Female – Medicine	8.2	7.5	55.9
	Male – Specialized medicine (veterinary medicine, dentistry, pharmacy, optometry)	8.5	9.1	47.4
	Female – Specialized medicine	4.3	3.8	57.4
	Male – Nursing/education	2.5	2.6	48.5
	Female – Nursing/education	5.9	5.1	58.7
	Male – Other	6.8	9.2	37.4
	Female – Other	4.7	3.9	62.5
	Total	100.0 (633)	100.0 (1249)	
Seniority within rank	Male assistant professor	12.6	11.5	55.9
	Female assistant professor	13.1	9.5	70.3
	Male associate professor 6 years -	13.0	12.3	53.6
	Female associate professor 6 years -	7.4	7.3	51.6
	Male associate professor 7 years +	7.4	7.2	52.2
	Female associate professor 7 years +	4.6	3.6	64.4
	Male full professor 6 years -	10.7	12.0	45.3
	Female full professor 6 years -	4.1	5.3	39.4
	Male full professor 7 years +	21.0	24.0	44.3
	Female full professor 7 years +	6.0	5.1	59.4
	Male – other	n/a	1.4	n/a
	Female – other	n/a	0.9	n/a
	Total	100.0 (633)	100.0 (1249)	
Gender by receipt of market supplement or administrative stipend	Male – yes	26.7	24.9	54.7
	Male – no	38.3	43.4	45.0
	Female – yes	8.3	8.2	52.0
	Female – no	26.7	23.5	58.0
	Total	100.0 (637)	100.0 (1249)	

Appendix B: Descriptions of variables

Variable set	Variable	Description
Dependent variable	Receipt of market supplements	Having received market supplements since appointment: 0 = no; 1 = yes.
Gender	Gender	0 = male; 1 = female.
Market value / Research activities	Sector	Sector in which faculty is employed: 1 = humanities; 2 = social science and psychology; 3= pure and applied science; 4 = medicine; 5 = specialized medicine (veterinary medicine, dentistry, pharmacy, optometry); 6 = nursing/education; 7 = other (law, physical education, environmental design, music, theology.)
	Frequency of research contracts	Frequency at which faculty have accepted private research contracts over the last year: 1 = often/ occasionally; 2 = rarely; 3 = never.
	Member of a research team	Being a member of a research team within the institution or outside the institution: 0 = no; 1 = yes.
	Research grants	Currently receiving research grants: 0 = no; 1 = yes.
	Award of a Canada Research Chair	Being the recipient of a Canada Research Chair: 0 = no; 1 = yes.
	Award of other kind of research chair	Being the recipient of a research chair other than Canada Research Chair: 0 = no; 1 = yes.
	Research assistants	Presence of research assistant supervised over the last year: 0 = no; 1 = yes.
	Research agents	Presence of research agents supervised over the last year: 0 = no; 1 = yes.
	Post-doctoral fellows	Presence of post-doctoral fellows supervised over the last year: 0 = no; 1 = yes.
Values and attitudes towards remuneration	Prioritization of salary scale	Level of priority attributed to the improvement of the salary scale: 1 = high priority; 2 = medium priority; 3 = low priority/not a priority.

Continued on next page.

Variable set	Variable	Description
Career characteristics	Seniority within rank	Variable created by combining rank and seniority: 1 = assistant professor; 2 = associate professor six years and under; 3 = associate professor seven years and over; 4 = full professor six years and under; 5 = full professor seven years and over.
	Receipt of administrative stipends	Having received administrative stipends since appointment: 0 = no; 1 = yes.
	Number of years of prior experience	Number of years of professional experience prior to appointment, followed by categorization: 1= none; 2=1-4 years; 3=5-9 years; 4=10 years+.
	Type of experience	Type of previous work experience: 1 = none; 2 = teaching; 3 = research; 4 = management/other.
	Age at appointment	Variable created by subtracting year of birth from year of appointment, followed by categorization: 1=30 years old or less; 2=31-35 years old; 3=36-40 years old; 4=41 years old +.
Family constraints	Main occupation of spouse	1 = university professor; 2 = other professional occupation; 3 = other occupation; 4 = no spouse.
	Presence of children	Presence of children aged 12 years old and under living in the household at least half the time: 0 = no; 1 = yes.
	Difficulty of combining professional and family obligations	Perceived level of difficulty associated with combining professional and family obligations: 1 = often difficult; 2 = sometimes difficult; 3 = rarely difficult; 4 = never difficult.
	Demanding family responsibilities	Having fulfilled demanding family responsibilities over the previous two years: 0 = no; 1 = yes.

Appendix C: Differences between men and women faculty on the variables of interest

			Gender		Total
			Men	Women	N
Variable set	Indicator	Categories	%	%	
Market value/ research activities	Sector of activity (r^2= 50.84; p=0.000)	Humanities	15.1	14.3	95
		Social science and psychology	16.1	14.8	99
		Pure and applied science	20.2	5.4	94
		Medicine	21.0	23.3	138
		Specialized medicine	13.2	12.1	81
		Nursing/education	3.9	16.6	53
		Other	10.5	13.5	73
		Total	100.0	100.0	633
	Frequency of research contracts (χ^2=10.45; p=0.005)	Often or occasionally	23.8	13.7	119
		Rarely	13.8	11.3	76
		Never	62.4	75.0	392
		Total	100.0	100.0	587
	Member of a research team (χ^2=0.33; p=0.565)	Yes	26.6	28.7	174
		No	73.4	71.3	463
		Total	100.0	100.0	637
	Research grants (χ^2=1.26; p=0.261)	Yes	83.2	79.4	483
		No	16.8	20.6	106
		Total	100.0	100.0	589
	Award of a Canada Research Chair (χ^2=4.81; p=0.028)	Yes	2.3	0.0	9
		No	97.7	100.0	577
		Total	100.0	100.0	586
	Award of other kind of research chair (χ^2=0.09; p=0.767)	Yes	2.0	1.6	10
		No	98.0	98.4	519
		Total	100.0	100.0	529
	Presence of research assistants (χ^2=2.55; p=0.111)	Yes	60.5	67.0	391
		No	39.5	33.0	232
		Total	100.0	100.0	623
	Presence of research agents (χ^2=0.27; p=0.601)	Yes	23.7	21.8	145
		No	76.3	78.2	485
		Total	100.0	100.0	630
	Presence of post-doctoral fellows (χ^2=5.27; p=0.022)	Yes	28.4	20.0	160
		No	71.6	80.0	469
		Total	100.0	100.0	629
Values and attitudes towards remuneration	Prioritization of salary scale (χ^2=6.15; p=0.046)	High priority	54.8	45.5	315
		Medium priority	34.3	37.9	217
		Low priority or not a priority	11.0	16.6	79
		Total	100.0	100.0	611

Continued on next page.

			Gender		Total
			Men	Women	N
Variable set	Indicator	Categories	%	%	
Career characteristics	Seniority within rank (χ^2=32.99; p=0.000)	Assistant professor	19.5	37.2	163
		Associate professor 6 years -	20.0	21.1	129
		Associate professor 7 years +	11.5	13.0	76
		Full professor 6 years -	16.6	11.7	94
		Full professor 7 years +	32.4	17.0	171
		Total	100.0	100.0	633
	Receipt of administra-tive stipends (χ^2=8.43; p=0.006)	No	80.2	88.8	530
		Yes	19.8	11.2	107
		Total	100.0	100.0	637
	Number of years of prior experience (χ^2=1.34; p=0.720)	None	18.2	17.9	113
		1 - 4 years	35.6	32.1	215
		5 - 9.5 years	21.6	21.6	135
		10 years +	24.6	28.4	162
		Total	100.0	100.0	625
	Type of experience (χ^2=8.66; p=0.034)	None	18.4	17.9	113
		Teaching	18.9	22.0	124
		Research	50.2	40.4	290
		Management/other	12.4	19.7	93
		Total	100.0	100.0	620
	Age at appointment (χ^2=6.21; p=0.102)	30 years old or less	28.0	23.0	159
		31-35 years old	37.3	34.9	221
		36-40 years old	23.4	23.9	143
		41 years old +	11.3	18.2	83
		Total	100.0	100.0	606
Family constraints	Main occupation of spouse (χ^2=53.85; p=0.000)	University professor	5.8	18.4	64
		Other professional occupation	50.0	42.9	299
		Other occupation	28.2	10.6	139
		No spouse	16.0	28.1	127
		Total	100.0	100.0	629
	Presence of children ages 12 and under (χ^2=0.99; p=0.319)	Yes	36.2	32.3	222
		No	63.8	67.7	415
		Total	100.0	100.0	637
	Difficulty of combining professional and family obligations (χ^2=8.29; p=0.040)	Often difficult	25.6	31.7	162
		Sometimes difficult	39.1	41.7	234
		Rarely difficult	19.2	18.6	111
		Never difficult	16.1	8.0	78
		Total	100.0	100.0	585
	Demanding family responsibilities-previous year	Yes	25.1	31.4	170
		No	74.9	68.6	453
		Total	100.0	100.0	623

Appendix D: Correspondence analysis – t-tests of significant effects on the two factors

Factor 1 : Significant active categories in order of importance

Variable label	Category label	Test-Value	Weight
Research grants	No	-19.91	149
Member of a research team	No	-18.99	164
Research assistants	No	-14.94	221
Research agents	No	-13.29	457
Post-doctoral fellows	No	-12.00	445
Frequency of research contracts	Never	-8.91	423
Sector	Other	-5.11	67
CENTRAL AREA			
Frequency of research contracts	Often or occasionally	6.01	109
Sector	Medicine	7.09	128
Post-doctoral fellows	Yes	12.29	151
Research agents	Yes	13.70	140
Research assistants	Yes	15.09	370
Member of a research team	Yes	18.73	439
Research grants	Yes	19.62	454

Factor 1 : Significant supplementary categories in order of importance

Variable label	Category label	Test-Value	Weight
Seniority within rank	Assistant	-5.33	156
Type of experience	Teaching	-4.14	117
Number of years of prior experience	10 years +	-2.99	158
Prioritization of salary scale	Low priority or not a priority	-2.55	77
Main occupation of spouse	Other	-2.45	132
Presence of children ages 12 and under	No	-2.36	391
Type of experience	Other	-2.21	86
Seniority within rank	Associate professor 7 years +	-2.05	76
CENTRAL AREA			
Seniority within rank	Full professor 7 years +	2.12	163
Presence of children ages 12 and under	Yes	2.20	212
Main occupation of spouse	Other professional occupation	2.28	284
Seniority within rank	Full professor 6 years -	3.42	84
Type of experience	Research	5.01	278

Factor 2 : Significant active categories in order of importance

Variable label	Category label	Test-Value	Weight
Receipt of market supplements	No	-15.72	457
Award of a Canada Research Chair	No	-9.89	594
Research assistants	Yes	-9.53	370
Post-doctoral fellows	No	-8.24	445
Sector	Humanities	-6.73	91
Frequency of research contracts	Never	-5.66	423
Sector	Nursing/education	-5.10	52
CENTRAL AREA			
Post-doctoral fellows	Yes	8.19	151
Frequency of research contracts	Often or occasionally	8.88	109
Research assistants	No	9.45	221
Award of a Canada Research Chair	Yes	10.31	9
Sector	Specialized medicine	10.92	74
Sector	Pure and applied science	12.82	91
Receipt of market supplements	Yes	15.89	146

Factor 2 : Significant supplementary categories in order of importance

Variable label	Category label	Test-Value	Weight
Gender	Female	-5.63	206
Prioritization of salary scale	Low priority or not a priority	-2.88	77
Number of years of prior experience	10 years+	-2.78	158
Age at appointment	36-40 years old	-2.44	135
Receipt of administrative stipends	No	-2.41	492
Presence of children ages 12 and under	No	-2.29	391
Type of experience	Teaching	-2.22	117
Main occupation of spouse	No spouse	-2.06	119
CENTRAL AREA			
Presence of children ages 12 and under	Yes	2.40	212
Number of years of prior experience	1-4 years	2.79	198
Age at appointment	30 years or less	2.86	153
Seniority within rank	Full professor 6 years -	2.94	84
Main occupation of spouse	Other	3.03	132
Prioritization of salary scale	High priority	3.71	293
Gender	Male	5.91	393

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CONTACT INFORMATION

Christine Doucet
Sociology Department at the Université de Montréal
Université de Montréal
christine.doucet@umontreal.ca
Phone: (514) 343-6111 #3910

Christine Doucet is a Ph.D. candidate in the Sociology Department at the Université de Montréal. Her primary research interest is gender inequality. She is currently preparing a thesis on gender differences in access to market supplements among university faculty and the processes that make their occurrence possible.

Claire Durand is Professor of Sociology at the Université de Montréal. She is a specialist in quantitative methodology, in particular survey methodology, on which she has published extensively. Her recent publications deal, among other things, with the design and performance of telephone surveys, the effects of legislation regulating the publication of election poll results, and the sources of error in polling in the 2002 and 2007 French presidential elections as well as in Quebec elections since 1998. Her current research examines public attitudes towards polling.

Michael R. Smith is James McGill Professor of Sociology at McGill University. His research has examined issues in economic sociology, in general, and labour markets, in particular. Subjects covered in recent research include the earnings differentials between visible minority immigrants and other Canadians, the effects of globalization and technological change on inequality, and labour market flexibility in Canada and Sweden. Current research projects include examinations of income and behaviour after job loss in Canada and Australia, and of training expenditures and outcomes in Quebec and other Canadian provinces.