

# Determinants of Vacation Leave and Relations to Work Hours and Wages in Canadian Establishments

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## Abstract

Using a nationally representative sample of employees and workplaces from Statistics Canada's Workplace Employee Survey (WES) 1999-2005, we provide new evidence on the determinants of vacation leave and its relationship to hours worked and hourly wages. Although paid vacation leave is an important factor in explaining variations in the gross domestic product (GDP) per capita as it has an impact on the number of annual hours worked, the literature has rarely focused on it. Previous studies have revealed that annual hours of work fall by 45 hours for each additional week of vacation used, i.e. by more than one week of full-time work. Correcting for bias due to the fact that workers revealed different preferences in the use of vacation and that workplaces may have different leave policies, we find that annual hours of work fall by only 29 hours. Our results imply that reporting an extra week of vacation used translates less than one for one into a reduction in weeks worked. That is, failure to correct for unobserved effects leads to an overestimate by approximately 55% of the impact of paid vacation on hours worked. Our findings support the hypothesis that pressure at work may lead many employees to use vacation days more, but also causes them to work longer hours.

**Key Words:** Paid Vacation Leave, Vacation Leave Used, Work Hours, Wages, Mixed Model, Linked Employer-Employee Data.

**JEL Classification:** J22, M52.

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# 1 Introduction

In this paper, we successively address the following questions: What are the determinants of paid vacation<sup>1</sup> and vacation used<sup>2</sup>? How are annual work hours influenced by paid vacation and vacation used? What is the relationship between paid vacation and wages? How can changes to paid vacation influence vacation used?

Regarding the first question, it is interesting to examine the determinants of vacation leave<sup>3</sup> in the light of Canadian data, because Canadian labor legislation regarding paid vacation is distinctive: It is less generous than European but more advantageous than American legislation. Understanding the determinants of this workplace characteristic allow us to examine why certain employees have longer paid vacation than others and why some employees take advantage of them more than others do<sup>4</sup>.

The relationship between vacation leave and hours worked reflects the way the latter are determined in the labor market. Altonji and Oldham (2003)<sup>5</sup> argue that paid vacation are an important factor in explaining variations in the gross domestic product (GDP) per capita between the various jurisdictions, due to their impact on the number of annual working hours<sup>6</sup>. They

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<sup>1</sup>By "paid vacation" we mean the vacation days and weeks to which the employee is entitled in a year (i.e., the number of vacation days the employer grants its employees, including the minimum legal paid vacation). Accordingly, paid vacation arrangements are not rigid. The employer offers a minimum of two weeks paid vacation to all its entitled employees; this is the minimum legal paid vacation in Canada (HRSDC (2006)). Although the employer cannot offer less than two weeks paid vacation to all entitled employees, he may offer more than two weeks, as this is left to each employer's discretion. In other words, vacations are part of a social benefit program that varies from one employer to the other. For example, an employer may offer more vacation time to attract certain categories of employees.

<sup>2</sup>In the rest of the text, "vacation used" means vacation days and weeks that are actually used. Many employees do not use all the vacation days to which they are entitled annually (Ray and Schmitt (2007)), even though vacations are meant to improve the living conditions of employees. Here are some arguments that frequently limit vacation use: (1) work intensifies (lack of time), (2) financial reasons, (3) professional environment (e.g., competition between colleagues for a position), and (4) extension of professional responsibilities (e.g., answer email, contact clients).

<sup>3</sup>Firms also offer unpaid vacations, but in our paper, we only examine paid vacation. The latter are hours paid but not worked that may have an impact on other aspects of the workplace and on the standard of living.

<sup>4</sup>For example, in 2005, a third of American workers did not use all the vacation days they were entitled to (Ray and Schmitt (2007)). In that year, the corresponding percentage for their Canadian counterparts was 22% (according to Statistics Canada's WES).

<sup>5</sup>Several studies mention paid vacation in terms of the time allocated to work and leisure, notably in drawing a contrast between the United States and Europe (Altonji and Oldham (2003); Alesina and al. (2005); Aguiar and Hurst (2007)).

<sup>6</sup>Blanchard (2004) and Prescott (2004) show that the number of annual hours worked determines the standard of living in terms of the GDP per capita. In fact, several factors have been mentioned in the literature to explain the difference in capital intensity between countries. Among these factors are marginal taxation rates (Prescott (2004)); interest in leisure activities (Blanchard (2004)); organized labor regulations and union power (Alesina

find that an additional week of paid vacation reduces the number of annual working hours by approximately 26.8 hours in the United States. In controlling for countries, they find a significant difference between the United States and Europe, i.e., an annual reduction of approximately 51.9 hours worked in Europe for each additional week of paid vacation. In this context, a negative relationship between working hours and paid vacation is to be expected because vacation regulations can be a constraint for employees in their choice of working hours.

As to the third question, vacation leave is considered an important component of the employment contract; this is reflected in the relationship between vacations and social benefits (Altonji and Usui (2007)). This fact would lead us to the assumption that to get more paid vacation, in terms of social benefits, is an indicator of a higher salary. The positive relationship between vacation leave and salary is consistent with job search models (e.g. Hwang and al. (1998)). According to those models, the firms' heterogeneity in matching value implies that some establish high salaries and social benefits to attract employees on the job market or to reduce turnover rate. It should be noted that the relationship between paid vacation and wage may guide policy makers in their decision to attract employees with an adequate social benefits policy.

Finally, identifying the relationship between paid vacation and vacation used is of interest in its own right, as it shows how individuals use vacation days when paid vacation change. This would provide information on vacation trends. It is assumed that employees will use more vacation days when their paid vacation entitlement is higher. Economic theory predicts that leisure increases with extra weeks of paid vacation (Alesina and al. (2005); Aguiar and Hurst (2007)).

There are two important limitations on the data and methodology used in previous studies. In terms of data, previous studies are based on surveys collecting information on households that may include jobless respondents. This may increase errors in measuring the number of vacation days, as opposed to employee surveys, in which all respondents have a job. It is more likely that an employee will report the real number of vacation days. In our paper, we provide new evidence by using a nationally representative sample of employees and workplaces. We use data from the Workplace and Employee Survey (WES) conducted by Statistics Canada. WES is a linked longitudinal employer-employee data sample containing detailed information on private sector firms from 1999 to 2005. It should be noted that only such a data source yields results that are

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and al. (2005)); employee preferences and lifestyles (Osberg (2003)).

representative of Canadian employers and employees regarding paid vacation. Moreover, WES data allow us to differentiate between paid vacation and vacation used.

In addition, the existing literature does not deal with the unobserved heterogeneity of employers and employees that may influence the use of vacation leave; this factor could lead, for example, to an overestimation of the impact of paid vacation on hours worked. Thus, in this paper, we contribute to the literature by using a mixed effects model. This model allows us (1) to control for the unobserved effects specific to individuals and employers and (2) to deal with the problem of simultaneity between vacation leave and hours worked. That is, we rely on mixed effects model to correct for the biases due to the endogeneity problem, as well as biases associated with unobserved heterogeneity.

Using a mixed effects model to correct for unobserved heterogeneity at both the worker and workplace level, we find that annual hours of work fall by 29 hours for each additional week of vacation used. However, results with OLS model show that annual hours of work fall by 45 hours as previously found in the literature. That is, failure to correct for unobserved effects leads to overestimate by approximately 55% the impact of paid vacation on hours worked. These findings imply that reporting an extra week of vacation used translates less than one for one into reduction in weeks worked.

The remainder of the paper is organized as follows. Section 2 presents the existing literature. Section 3 discusses the implications of the legislation in terms of paid vacation. Section 4 presents the data used along with descriptive statistics. We continue in section 5 with the empirical specification used. The estimate results are discussed in section 6. Finally, we conclude briefly in section 7.

## 2 Literature

Although paid vacation is an important job characteristic, the literature has rarely focused on them. This can be explained either by the absence of adequate data on paid vacation or by the weakness of existing data.

In one of the first empirical studies on vacation leave, Buckley (1989) analyzes the determinants of paid vacation in various areas of the United States. He uses data from the Area Wage Survey (WES) of the U.S. Bureau of Labor Statistics from 1983 to 1986. He finds that workers

who benefit from more paid vacation time than the country's average live in areas with higher-than-average salaries. For blue collar workers, there is more paid vacation time in regions with large firms and in regions with highly unionized workers and substantial manufacturing activity. For example, in Detroit, workers benefit from approximately 20% more paid vacation time. By contrast, in San Antonio, an area with a lower rate of unionization, less manufacturing activity and smaller firms, paid vacation time is less than the average.

Maume (2006) studies the determinants of vacation leave for men and women in the United States. The data are taken from the National Study of the Changing Workforce (NSCW) for the year 1992. Controlling for family and employment characteristics, he finds that women are more likely to use their vacation days than men. A possible explanation is that women attach more importance to family life, whereas men are mainly interested in their work environment. Thus, the fact that women use more vacation time than men may affect their career progression. He also finds a negative relationship – only for men – between vacation used and annual hours worked. Finally, he finds that vacation time used has no effect on men and women's salaries.

In a more detailed study, Altonji and Usui (2007) examine the relationship between vacation leave and certain workplace characteristics in the United States. They use the Panel Study of Income Dynamics (PSID) from 1975 to 1991. They find i) vacation time used rises one-to-one with paid vacation and annual hours worked fall by about one full-time week with every week of paid vacation; ii) that there is a positive relation between paid vacation and hourly wages; iii) that paid vacation and vacation used are longer for women, married people, civil servants and unionized employees but shorter for black workers; and finally iv) that paid vacation seem to be determined by employer policy rather than through negotiation between workers and employers. In particular, paid vacation times are strongly correlated with seniority, but they depend very little on experience; and for job changers, it is only weakly related to vacation obtained in the previous job.

More recently, Wooden and Warren (2008) analyze the impact of weekly hours worked on vacation time used in Australia, with data from the 2005 Household, Income and Labour Dynamics (HILDA) survey. They find a positive but weak relationship between vacation used and weekly hours worked. In addition, their results depend on control variables. On the whole, the results do not suggest that workers who report long hours of work are compensated by taking extended period of vacation leave each year. The authors also note that the relationship between

vacation used and hours worked is difficult to predict. On the one hand, long working hours should increase the need and desire to use all one's vacation time, and on the other hand, long working hours are an obstacle to workers taking their leave entitlements.

### 3 Vacation leave legislation

Geographic variations exist in work legislations for paid vacation leave. In Canada, labor legislation requires a minimum of two weeks' vacation per year after a minimum length of service of about one year. This vacation time is extended to three weeks after five years of consecutive service. In Europe, employees are entitled to a longer annual vacation, i.e., a minimum of four to six weeks. By contrast, the U.S. is the only advanced economy where the employer is under no obligation to grant vacation leave to his employees (Ray and Schmitt (2007))<sup>7</sup>. According to these legislations, employees often benefit from three types of paid leave: annual leave (vacation), statutory holidays and sick leave, which are hours paid but not worked.

In the majority of countries, the government sets a minimum limit for vacation leave. Altonji and Oldham (2003) argue that government action could be a solution for determining the optimal amount of hours worked. Another argument that may prompt the government to act is the positive effect of vacations on employees' health. However, those regulations may also be a constraint for employees in their choice of hours worked (Altonji and Oldham (2003)). The regulations could then become an obstacle for individuals who prefer to work more. Several studies reveal that given a choice, some workers opt to increase the number of working hours in order to obtain higher compensation (e.g., Drolet and Morissette (1997)).

Employers determine the hours worked per year by first establishing vacation days and all other types of paid and unpaid vacation. The number of paid vacations is therefore determined by the employer rather than through negotiations between employers and employees, because employee preferences are heterogeneous and not observable by the employer (Altonji and Usui (2007))<sup>8</sup>. By contrast, being unionized increases paid vacation (Buckley (1989), Altonji and Usui (2007)), i.e., paid vacation could be determined through negotiation with employees via a union.

Finally, laws requiring minimum vacation leave could improve the well-being of employees.

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<sup>7</sup>In the United States, the employment contract determines the number of vacation days to which an employee is entitled.

<sup>8</sup>However, the authors mention that more-productive employees tend to negotiate to get more paid vacation time.

Wisniewski (1990) argues that the number of vacation days resulting from job loss reflects an economic loss for the employee<sup>9</sup>. Huffman (2006) concludes that employees should use their vacation days more. Among the arguments used is the fact that during the period following a vacation, employee productivity may be higher, therefore more beneficial to employees in that sense. Chikani and al. (2005) observe that women who often take vacations are less stressed and less tired. Accordingly, these women have more time to take care of their family, which is useful to society and is part of the quality of life.

## 4 Data

We use data from the Workplace and Employee Survey (WES) conducted annually by Statistics Canada<sup>10</sup>, from 1995 to 2005. WES is both longitudinal and linked<sup>11</sup> in that it documents the characteristics of workers and workplaces over time. This survey covers approximately 6,500 workplaces in sectors of activity, and links changes affecting employees (salaries, work stability, training, etc.) with changes in the firm (human resources management practices, innovation, use of technology, etc.). It should be noted that this survey covers neither firms located in Yukon, the Northwest Territories or Nunavut, nor public administration, livestock production, fisheries, hunting or trapping.

The target population for the workplace component of the survey is defined as the collection of all Canadian establishments who paid employees in March of the year of the survey. Those establishments are followed over time with the periodic addition of samples of new locations to maintain a representative sample<sup>12</sup>. For the employee component, the target population is the collection of employees working or on paid leave in the workplace target population. It covers approximately 24,000 employees sampled from lists provided by the selected workplaces. For every workplace, a maximum number of 24 employees is selected and for establishments with

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<sup>9</sup>For example, if two employers pay the same salary but the first employer offers more vacation time than the second, the first employer is more beneficial to the employee. This result is in line with the hedonic theory of wages. This theory implies that two jobs that differ in terms of their benefits (i.e. vacation) will offer different salaries.

<sup>10</sup>This is a micro-database with restricted access. The survey data are linked, i.e., information on firms is linked with information on their employees.

<sup>11</sup>The longitudinal and linked nature of this survey makes it possible to control the unobserved effects on employees (repeated observation of the same employee regarding his employment) and on employers (several employees in the same workplace).

<sup>12</sup>The survey consists of a follow-up of the initial sample chosen in 1999, to which Statistics Canada adds a sample of new firms every two years.

less than 4 employees, all employees are sampled. WES follows employees for two years only due to the difficulty in integrating new employers to the sample as workers change employers. New employee samples were collected every second survey cycle. The WES is therefore representative of employees only for the resampling years<sup>13</sup> (1999, 2001, 2003 and 2005).

## 4.1 Descriptive statistics

The WES allows us to differentiate between paid and used vacation. This survey also yields information on unused vacation, i.e., it makes it possible to create and define the unused vacation variable as the difference between paid and used vacation.

Figure 1 presents the distribution of paid and used vacation weeks for men in 2005. We find that 12.2% of men report no week of paid vacation<sup>14</sup>, only 2.6% report one week, 21.5% report two weeks, 43% report three weeks, 11.5% report four weeks, 7.5% report five weeks and 1.5% report six weeks or more. The distribution of used vacation weeks is similar to that of paid vacation weeks. Although a large percentage of employees had three weeks of paid vacation, the majority reported using less than three weeks per year. Figure 2 reveals that women's paid and used vacations are similar to men's.

Figure 3 shows the distribution of used vacation weeks less paid vacation weeks according to gender. The difference is zero for 56.8% of men and 58.2% of women. The distribution gap is -4 to 4 weeks skewed to the left indicating that in a given year, many workers use less vacation time than their paid vacation. For those who use less vacation time than their paid vacation, a plausible explanation is that some workers prefer to carry forward a portion of their vacation days to the following year or relinquish their right to use their vacation. By contrast, workers who used their paid vacation more had most probably carried them forward in previous years and were finally using them.

Table 1 presents the proportion of employees who reported unused vacations in the resampling year 2005. Those who confirmed having unused vacation time the most were the 35% of men and 46.3% of women whose level of education is either "Completed college or some university". It is interesting to note that only 29% of men and 24.2% of women who have flexible hours of work had unused vacation time, as opposed to 55.6% of men and 48.1% of women who work regularly

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<sup>13</sup>For example, in 2001, workers were resampled on the basis of the same 1999 workplaces.

<sup>14</sup>This high percentage is probably due to the employee category with less than a year of service with the employer.



from Monday to Friday. In terms of occupation, we find that the “Technician” category has the highest proportion of unused vacation time – 50.5% of men and 33% of women. Finally, the firms where people had the most unused vacation time is the 20-29 employees category, with 34.6% of men and 34.3% of women. Tables 2 and 3 present descriptive statistics for the variables used in our analysis. It should be noted that it is impossible to disclose the minimum and the maximum because of Statistics Canada’s confidentiality policy.

## 4.2 Independent variables

### 4.2.1 Employee characteristics

For variables specific to employees, we distinguish between socio-demographic characteristics and job characteristics.

**Socio-demographic characteristics** First, we consider the age of workers included in the model. Indeed, young employees are more likely to use less vacation time. It is assumed that vacation use increases according to the employees’ age. It is possible that older employees need to rest more. In addition, they do not have to prove their loyalty to their employers by working more. The number of children may also affect the use of vacation time. Having school-age children increases parents’ working days (remunerated and domestic) and demands more time. The economic theory suggests that parents with school-age children work more in order to provide them with a better education. By the same token, marital status may also influence paid vacation. Intuitively, employees with no children are expected to take more vacation time because they have no family responsibilities. However, at the same time, these employees may possibly take more vacation to enjoy more leisure time before bearing marital responsibilities. It is interesting to test the impact of single parenthood on paid vacation leave because on the one hand, most families are managed by women and, on the other hand, because of the growing number of single-parent families.

Two other variables are included in the model to take into account the employee’s race (black or not) and whether he or she is an immigrant or born in Canada. Altonji and Usui (2007) argue that black employees have less vacation time than white employees. At the same time, the effect of being an immigrant is not clear. One can assume that there is no difference because these employees abide by the same conditions as employees born in Canada. It is also possible that

immigrants believe taking less vacation time is a visible sign of efforts and loyalty towards their employer.

Another variable that may influence paid vacation is the employee's health. Indeed, health is a dichotomous variable indicating whether or not a health problem reduces work activities. Maume (2006) notes that to have a health problem has no effect on paid and used vacation. By contrast, Altonji and Usui (2007) find that employees with a health problem use their vacation leave less. It is likely that those employees use their sick days more and consequently use their vacation days less. By the same token, annual income (employment and other sources) is included among the variables. A high annual income is often associated with more time on the job. This may motivate employees to take less vacation leave or not to take it at all. Income could possibly have an endogenous character. Given that the use of vacation leave depends on the employee's income, it is plausible that higher-income employees use less vacation leave. In our empirical specification, we assume that income is fixed over time.

An important factor that influences the use of vacation leave is the level of human capital accumulation, which is measured by seniority, labor market experience and education, as in the literature. Seniority demonstrates the employee's stability with the employer, and vacation days, which are considered a work benefit, will logically increase with seniority. The employee's cumulated experience has no significant effect on vacation leave (Altonji and Usui (2007)). It should be noted that in the WES questionnaire, seniority (length of a worker's employment within a firm) is measured in months, whereas experience (number of years of full time work) is measured in years.

Finally, previous studies reveal that education has a positive influence on paid vacation (Maume (2006); Altonji and Usui (2007)). In other words, workers who have cumulated more years of education enjoy more paid vacation time. The theory of human capital predicts that the level of education is inversely proportional to the time allotted to household tasks (Becker (1985)). The greater the education gap between employees, the more employees with less education will use more vacation time. WES only lists degrees held by each worker. Accordingly, we use this information to assess the number of years of education.

**Job characteristics** One aspect that attracted considerable attention in previous studies is work arrangement. Part time work is likely to have an impact on the use of vacation leave.

For example, more women than men work part time, and they have less working hours when working full time (Staines and Pleck (1986)). In our paper, working less than 30 hours per week is considered part time work. WES provides the opportunity to examine the impact of certain work arrangements. We are interested in comparing the regular schedule (Monday to Friday) to flextime (varying arrival and departure time). We also study the impact of a reduced work week (following a special agreement with the employer) and a compressed week (working more hours in a day to reduce the number of working days per week). There is evidence that employees who work according to flextime are less stressed by time constraints (Marshall (2006)). Flextime arrangements are increasingly popular because they allow employees to adjust their working time according to their family obligations. Those arrangements may have an impact on workers' decisions to use vacation days. These work arrangement variables are exogenous to employees, i.e., work schedule arrangements do not depend on the employee's decision to use more or less vacation time. In other words, the causality between work arrangement and vacation time is not reciprocal. We assume that these variables are fixed over time, i.e., that there are no changes in employees' work schedules.

Unionization and employee promotions are considered explanatory variables. Indeed, union membership has an impact on the use of vacation leave (Altjonji and Usui (2007)). Employees covered by a collective bargaining agreement are likely to have more paid vacation time (Maume (2006)). This suggests that when employees are unionized, they use their vacation leave more. Promotions may also have an influence on vacation leave. To have a promotion often motivates the employee to spend more time in his workplace, particularly if the promotion involves new responsibilities. The promotion is a dichotomic variable equal to one if the worker obtained this promotion since he started working for this employer.

Two variables related to the worker's tasks in the firm are included in the model. These variables are supervision tasks and the type of occupation. We assume that if an employee has a supervisory function, he would have less used vacation leave. The supervisor is often overburdened by responsibilities; this may lead him to spend more time at work. Maume (2006) finds that supervisors have more paid vacation time. Finally, in terms of occupation, WES provides information on the following employee categories: managers, professionals, technical personnel/trades, marketing or sales, clerical/administrative, and production workers.

### 4.2.2 Firm characteristics

A first variable consists of human resources management practices, particularly organizational changes. Previous studies did not pay attention to the effect of these changes on the use of vacation leave. Moreover, the availability of linked employer-employee data allows us to include it in our analysis. We assume that the firm's various organizational strategies impact the use of vacation leave. For example, if the firm has downsized during the year, employees may be required not to use all their vacation leave entitlement. We focus on variables related to (1) adoption of flextime (2), reduction in the number of employees (downsizing), (3) greater reliance on temporary workers (4), increased demand for part time workers (5), increase in overtime use (6), greater reliance on job rotation, and (7) increased demand for external suppliers of products and services (subcontracting ).

Firm size is another variable that may influence the use of vacation leave (Maume (2006)). Theoretically, large firms are likely to have more formal human resource management than smaller ones. Therefore, we should expect that they meet vacation entitlement provisions more than smaller firms. However, large firms demand more from employees, particularly when they face strong competition in the marketplace. This may prevent employees of using all their vacation leave. It is often observed that smaller firms have more difficulty organizing work and filling vacant positions during employee vacations. This has undoubtedly a repercussion on the use of their employees' vacation days. Firm size is measured in WES by the total number of employees. We define the following categories: small (less than 20 employees); medium (20 to 99); large (100 to 499); and very large (500 employees or more).

Lastly, it is important to consider the industry in which the firm operates. It is possible that employees use more vacation days in certain sectors than others. For example, employees in the finance and insurance sectors, who work for more competitive firms, use their vacation time less. Variables reflecting the North American Industry Classification System (NAICS) are available in WES.

## 5 Empirical specification

### 5.1 Determinants of vacation leave

Let  $V$  be the observed number of days of vacation leave for employee  $i \in (1, \dots, N)$  in firm  $j \in (1, \dots, J)$  at time  $t \in (1, \dots, T_i)$ . We assume that  $V$ , provided that the employee has or uses  $V_{ijt}$  paid vacation, is defined as follows:

$$V_{ijt}^k = X_{ijt}\beta^k + Z_{jt}\gamma^k + \theta_{ij}^k + \psi_j^k + \varepsilon_{ijt}^k \quad (1)$$

where  $V_{ijt}^k$  is a random variable denoting the number of vacation weeks of employee  $i$  in firm  $j$ ; with  $k = a$  (paid vacation),  $u$  (vacation used).  $X_{ijt}$  is a matrix containing the observable characteristics for employee  $i$  at time  $t$ ;  $Z_{jt}$  is a matrix of observable characteristics for workplace  $j$  to which the worker  $i$  is linked. We assume that  $X_{ijt}^k$  and  $Z_{jt}^k$  are not sufficient to capture all the differences between employees in the use of vacation and, therefore, we consider that unobserved characteristics may be represented by effects specific to individuals  $\theta_{ij}^k$  and firms  $\psi_j^k$ . Parameters  $\beta^k$  and  $\gamma^k$  are estimated for observable characteristics.  $\varepsilon_{ijt}^k$  is the statistical residual.

Worker effect can be interpreted as a measure of unobserved characteristics (e.g. different preferences, ability, motivation, ambition) that vary between employees and may affect the use of vacation leave. Workplace effect is a measure of firm-specific unobserved characteristics, common to all workers of the firm. For example, it can be interpreted as a measure of vacation leave policy paid to employees of the same firm.

Equation (1) is considered as a linear model. The choice of this model is justified for the following reasons: (1) the probability of having more than one unused vacation day during a period of time is small compared to the length of time interval (i.e. it is a decreasing probability), (2) the vacation days are dependent between them (from one year to another) conditional on observable characteristics and unobservable worker/firm effects, and (3) the instantaneous probability of having more paid vacation is constant over the period<sup>15</sup>. Therefore, we exclude the use of a nonlinear model (e.g. Poisson model).

We rewrite the model in matrix notation:

$$V = X\beta + Z\gamma + D\theta + F\psi + \varepsilon \quad (2)$$

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<sup>15</sup>If an employee is entitled to two weeks of paid vacation in a given year, he may have more than these two weeks the following year which depends on the choice of the firm.

where  $V$  is the  $N^* \times 1$  vector of vacation leave (for both paid vacation and vacation used);  $X$  is the  $N^* \times q$  matrix of observable worker characteristics;  $\beta$  is a  $q \times 1$  parameter vector;  $Z$  is the  $N^* \times p$  matrix of observable workplace characteristics;  $\gamma$  is a  $p \times 1$  parameter vector;  $D$  is the  $N^* \times N$  design matrix of the unobserved component for the worker effect;  $\theta$ , the  $N \times 1$  vector of worker effects;  $F$  is the  $N^* \times J$  design matrix of the unobserved component of the firm effect ( $J$  firms total);  $\psi$ , the  $J \times 1$  vector of firm effects;  $\varepsilon$  is the  $N^* \times 1$  vector of residuals; and  $N^* = \sum_{i=1}^N T_i$  is the total number of observations. It should be noted that  $N$  is the number of individuals;  $J$  is the number of firms;  $q$  and  $p$  are the number of time-varying variables, respectively;  $T_i$  is the number of observations on worker  $i$ .

### 5.1.1 Identification and estimation

The identification of the worker and firm effects is made possible through the longitudinal and linked aspects of the data. Identification of the firm effect is based on the repeated observations on workers from the same firm. However, including pure worker unobserved heterogeneity is not possible because we do not observe worker mobility between firms in our data. Therefore, the identification of the worker effect is possible through the employer-employee relationship ( $\theta_{ij}$ ) because we have repeated observations of the same worker over time.

Worker and firm effects can be identified under fixed or random effects assumptions about the unobserved heterogeneity components. The fixed effect model arises when we can distinguish between firm and individual fixed effects, i.e. we should have to observe the same worker in different firms. However, our database does not follow workers moving from firm to firm; therefore we cannot treat both firm and individual effects as fixed. In this paper, we employ a mixed model in which worker and firm effects are treated as random. The structure of the mixed model allow for some correlation between the matrix of the worker and firm effects and time-varying observable characteristics. In other words, mixed effects model imposes restrictions on the relationship between observable and unobservable variables. That is, this model is different from the random effect model. It should be noted that it is important to take into account both sources of heterogeneity in order to avoid the problem of spurious regressions due to multiple observations on the same worker over time and the same firm characteristics over its employees.

The mixed model specification treats  $\beta$  and  $\gamma$  as fixed, and  $\theta$  and  $\psi$  as random. Estimation for  $(\hat{\beta}, \hat{\gamma}, \hat{\theta}, \hat{\psi})$  involves two stages that are closely linked. In the first stage, we estimate the

variance components of the random effects,  $\sigma_\theta^2$ ,  $\sigma_\psi^2$  and the error covariance  $G$  using the Restricted Maximum Likelihood (REML). In the second stage, we compute estimates of the fixed effects and Best Linear Unbiased Predictors (BLUP) of the random effects in the full model (2).

The model is identified under the following stochastic assumptions:

$$\begin{bmatrix} \theta \\ \psi \\ \varepsilon \end{bmatrix} \Big| X, Z \sim N \left( \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \sigma_\theta^2 I_N & 0 & 0 \\ 0 & \sigma_\psi^2 I_J & 0 \\ 0 & 0 & G \end{bmatrix} \right) \quad (3)$$

where

$$G = \begin{bmatrix} V(\varepsilon_1) & 0 & \dots & 0 \\ \dots & \dots & \dots & \dots \\ 0 & \dots & V(\varepsilon_i) & \dots & 0 \\ \dots & \dots & \dots & \dots & \dots \\ 0 & \dots & 0 & V(\varepsilon_N) \end{bmatrix}$$

with

$$R = \begin{bmatrix} \sigma_\theta^2 I_N & \\ & \sigma_\psi^2 I_J \end{bmatrix} \quad (4)$$

is the matrix of variance components.  $\hat{G}$  and  $\hat{R}$  denote the REML estimates of  $G$  and  $R$ .

Four important points should be made about the estimates for  $(\hat{\beta}, \hat{\gamma}, \hat{\theta}, \hat{\psi})$ . First, mixed model solutions  $(\hat{\beta}, \hat{\gamma}, \hat{\theta}, \hat{\psi})$  converge to the least squares solutions as  $|\Omega| \rightarrow \infty$  with  $G = \sigma_\varepsilon^2 I_{N^*}$ . Hence the OLS estimator is a special case (Abowd and Kramarz (1999b)). Second, mixed effects model allows for some correlations between the random effects and observable characteristics,  $X_{ijt}$  and  $Z_{jt}$ , i.e. we do not assume that the design of the random effects ( $D$  and  $F$ ) is orthogonal to  $X$  and  $Z$  of the fixed effects  $\beta$  and  $\gamma$ . Third, Abowd and al. (2008) note that, since REML is based on the maximum likelihood principle, it inherits the consistency, efficiency, asymptotic normality, and invariance properties of maximum likelihood (ML). Finally, mixed effects specification allows to obtain unbiased estimators by assuming that the potential source of endogeneity is constant in time (i.e.  $\beta$  and  $\gamma$  are constant), and by controlling for both worker and firm unobserved heterogeneity.

## 5.2 Relationship between paid vacation and hours worked

In order to estimate the impact of paid vacation on hours worked, we consider the following specification:

$$H_{ijt} = V_{ijt}^k \alpha^k + X_{ijt} \beta^k + Z_{jt} \gamma^k + \theta_{ij}^k + \psi_j^k + u_{ijt}^k \quad (5)$$

where  $H_{ijt}$  is the number of annual hours worked for individual  $i$  at time  $t$ ;  $V_{ijt}^k$  is the number of paid vacation and vacation used;  $X_{ijt}$  and  $Z_{jt}$  are consecutively the matrixes of observable worker and firm characteristics. We assume that worker effect  $\theta_{ij}^k$ , firm effect  $\psi_j^k$ , and statistical residual  $u_{ijt}^k$  follow a normal distribution.

This specification is likely to be strongly biased because vacation leave are determined simultaneously with the hours worked. Thus, the assumption of exogeneity of the explanatory variable (paid vacation) may be violated. As the paid vacation is endogenous, the estimator obtained by OLS model is biased.

Unlike Altonji and Usui (2007) who use the least squares in two stages regression (2SLS), we use a mixed effects model that controls for unobserved heterogeneity in order to solve this problem of simultaneity. In our specification, we assume that paid vacation - the source of endogeneity - is constant over time. In fact, the variable used by Altonji and Usui (2007) as an instrument for paid vacation is the seniority. However, the latter may be correlated with the unobserved effect specific to the firm  $\psi_j$  which can influence the paid vacation. In other words, firm effect, which can be interpreted as a measure of vacation leave policies paid to employees of the firm, could be correlated with seniority. For example, a firm may pay to an employee more vacation days (i.e. more than the legal minimum of two weeks of vacation leave) which depends on the firm's paid vacation days policy. Thus, seniority is likely to be correlated with firm effect and probably with person effect. Solving the mixed equations simultaneously yield the Best Linear Unbiased Estimates (BLUE) of the fixed effects and Best Linear Unbiased Predictors (BLUP) of the random effects. That is,  $\hat{\beta}$  and  $\hat{\gamma}$  are consistent and unbiased. The estimation procedures used are the same as specified in the last section.

### 5.3 Wage equation

In this section, we examine the relationship between paid vacation and hourly wages:

$$W_{ijt} = V_{ijt}^a \delta^a + X_{ijt} \beta^a + Z_{jt} \gamma^a + \theta_{ij}^a + \psi_j^a + \nu_{ijt}^a \quad (6)$$

where  $W_{ijt}$  is the (log) wage rate observed for individual  $i$  at time  $t$ ;  $V_{ijt}^a$  is the number of weeks of paid vacation.  $X_{ijt}$  and  $Z_{jt}$  are consecutively the matrixes of observable worker and firm characteristics.  $\delta$ ,  $\beta$  and  $\gamma$  are vectors of parameters to estimate. Worker effect  $\theta_{ij}^a$ , firm effect  $\psi_j^a$  and statistical residual  $\nu_{ijt}^a$  are normally distributed.



As in the empirical specification of hours worked, the wage equation is likely to be biased because paid vacation are simultaneously determined with wages, and therefore the assumption of exogeneity of the explanatory variable  $V_{ijt}^a$  may be violated. We use a mixed effects model in the same way as specified in section (5.1).

## 6 Results

To analyze the results, we take into consideration various categories of independent variables. We start with the results of the determinants of paid vacation and vacation used. Then, we continue with the impact of paid vacation on vacation used. The relationship between vacation leave and hours worked follows. We conclude with an analysis of the impact of paid vacation on wages. However, it should be mentioned that tables of results include both the mixed effects model and the OLS model in order to compare the results of those two specifications.

### 6.1 Determinants of vacation leave

#### 6.1.1 Socio-demographic characteristics

The impacts of individual characteristics on paid and used vacation are presented in Table 4. The analysis shows that there is no difference between men and women in terms of paid vacation. Such a result is not surprising. In fact, women hold more positions of responsibility, and those positions are often more profitable in terms of social benefits (e.g. vacation), which reduces the gap with men in terms of paid vacation. Within this context, Marshall (2006) finds that, in Canada, couples share family responsibilities more equitably, which may explain the convergence of used vacation between men and women.

It is no surprise that married employees and single-parent families are more likely to have more paid vacation and vacation used. This result indicates that increased family responsibilities will increase the probability of using more vacation time and to spend more time with the family. As to the presence of children, contrary to our expectations, a negative and significant effect is observed in terms of paid vacation and vacation used. We think that children of school age will motivate parents to work more to ensure a better quality of education for them.

In terms of annual income, the effect is positive and significant. However, it is negligible for both paid and used vacation. We observe that income is not an important determinant,

even when taking unobserved heterogeneity into account. One would think that the prospect of a higher income would motivate employees to work more or better in order to improve their standard of living. In other words, the employee is financially motivated to spend more time at work. It is very probable that in our sample, a large percentage of employees did not obtain a salary raise.

With regard to health, one observes that being healthy has no effect on paid vacation. This confirms our expectations, although the health effect is less visible. However, we observe that this impact becomes positive and significant with used vacation, i.e., if the employee's health condition did not limit his work activities, the vacation leave increases significantly. This result is astonishing because we were expecting the opposite effect. It is probable that employees use their vacation more to relax even if they have no health problem. Age has a significantly positive effect on paid vacation and vacation used. This result is very logical because the number of vacation days to which an employee is entitled will increase with seniority. In addition, it is possible that older employees will use more vacation time. Lastly, to be an immigrant or black has no effect on paid vacation. These results match Maume's results. (2006).

Finally, human capital variables reveal that paid and used vacations increase with seniority. The more stable the individual within the firm, the more he uses and enjoys paid vacations. We think that with seniority, the employee is less worried about his job security with the employer and consequently is encouraged to use more vacation time. Professional experience is a factor that influences vacation leave. Our results demonstrate that paid and used vacations increase with experience. This result is different from Altonji and Usui's (2007) results, which point to a weak effect. This difference in results seems to indicate that, in Canada, vacations obtained with an employer are not lost when workers change employers. It is possible that employees in Canada have more unionized power than those in the United States, allowing them to negotiate vacation leave in their new job. With regard to the level of education, we find that categories such as "Completed college or some university" and "Bachelor or higher education completed" generate a positive and significant result. According to these findings, we can conclude that the higher the level of education, the more employees use and enjoy paid vacation. However, the effect is more substantial in the case of vacation used, particularly for the graduate studies category. Indeed, it is logical to believe that positions requiring a higher level of education are likely to include more paid vacation time, particularly since the impact of the category "Industrial training or other"

on paid vacation and vacation used is negative and significant.

### **6.1.2 Job and workforce characteristics**

The results of the impact of job and workforce characteristics on vacation leave are presented in Table 5. The results show that part time workers have less paid vacation time. The ratio of used vacation time reveals a negative and significant effect. Conversely, the effect of regular work schedules (Monday to Friday) has a positive and significant effect on paid and used vacations, i.e., the more an employee works according to a regular schedule, the more he will obtain and use paid vacations. This conclusion is not surprising. Part time work is often less favourable in terms of social benefits. In addition, part time workers can use their free time to seek another job. Surprisingly, work on a flexible schedule has a negative and significant impact on vacation used. This is unexpected because flextime work is more popular, as it allows employees to balance work and family obligations. It appears that, by contrast to those who work according to a regular schedule, flextime employees are less restricted by a lack of time and enjoy more free time, so that they don't feel the need to use more vacation leave.

Being promoted, holding a supervisory position or belonging to a union are positively related to paid vacation and vacation used. Thus, paid vacation is positively linked to tasks requiring more responsibilities. For example, the supervisor has more responsibilities and therefore has the opportunity to enjoy more paid vacation time. Similarly, employees covered by a collective agreement commonly have more social benefits (e.g., paid vacation).

With regard to workforce characteristics, we find that the greater the proportion of full time employees at an employer, the more paid and used vacations. Indeed, it is logical to assume that employers who have a higher proportion of full time employees offer more paid vacation time. We also find that unionization generally has a positive and significant impact on paid and used vacation weeks. It appears that employees have more paid vacation time when employers have a substantial proportion of unionized employees.

### **6.1.3 Firm characteristics**

Overall, the model reveals that the impact of organizational changes is significant only for some practices. The results show that "Greater reliance on temporary workers" has a negative effect on paid and used vacations. This result matches the one mentioned above with regard to part

time workers in terms of employment characteristics. Of course, a greater number of part time employees reduces used vacation time, because such employees are more likely to use less vacation time. On the other hand, when employers “Increase overtime use”, we find it has a positive impact on paid vacation. It is conceivable that employers tend to provide more vacation time to employees who are willing to work more.

The results regarding firm size confirm our expectation that all other categories (20 to 99 employees, 100 to 499 employees and 500 employees or more) are positive and significant compared to smaller firms (less than 20 employees). Indeed, employees of larger firms have more paid and used vacation weeks than workers of smaller firms. This shows that firm size is an important determinant of paid vacation leave. A plausible explanation is that large firms are more likely to have formal human resource management. Accordingly, large firms have more legal requirements regarding vacation leave.

## **6.2 Impact of paid vacation on used vacation time**

The results are presented in Table 7. The first line shows the estimates of OLS model. The results indicate that paid vacation have a positive impact on vacation used. The ratio is equal to 0.537 when independent variables are excluded. However, when we add a dichotomous variable indicating whether the worker has received paid vacation weeks or not, the ratio falls to 0.263. We think this reduction is linked to the difference between jobs that offer paid vacation leave and those that do not. Once socio-demographic characteristics are added, the ratio increases to 0.417.

A comparison between our results and those of Altonji and Usui (2007) shows a difference in the effect of paid vacation. According to Altonji and Usui (2007), an additional paid vacation week implies an increase of approximately one used vacation week. On the other hand, we find that an extra paid vacation week implies an increase of less than a week of vacation used. A possible explanation of this difference is that in certain firms, employees prefer to receive financial compensation by working the paid vacation days. This compensation is considered as additional income related to not using all one’s vacation days. Another possible explanation is intertemporal substitution in the use of paid vacation time, given that in some provinces, employees have the right to carry forward a portion of their vacation days to the following year.

In taking into account unobserved employee and firm heterogeneity according to the mixed

effects model, we observe that the impact of paid vacation on used vacation time diminishes in comparison with the OLS model (which yields lower ratios). This suggests that failure to correct for unobserved effects leads to an overestimation of the impact of paid vacation on vacation used.

### **6.3 Impact of vacation leave on hours worked**

The results of the impact of paid vacation and vacation used on hours worked are presented in Tables 8 and 9, respectively. We first consider the results with OLS model. In Table 8, we find that an extra week of vacation used leads to a decrease of approximately 44.970 (column 4, line 3) in annual hours worked, i.e., the average number of annual hours worked is reduced by more than a week of work. In Table 9, we find that an extra week of paid vacation reduces the annual hours worked by 30.470 hours (column 4, line 1). We also find that the dichotomous variable indicating that the worker has or has not received paid vacation has a negative impact on the annual hours worked. In a comparison with Altonji and Usui's (2007) findings, the effect of vacation used is similar (they find a ratio of -45.436). By contrast, there is a difference in the effect of paid vacation (the ratio is -60.501).

Controlling for the unobserved characteristics of firms and employees, according to mixed effects model, we find that this reduction is only 28.570 hours worked for every extra used vacation week, and 22.520 hours worked for every extra paid vacation week. In other words, the above results are weak when controlled for unobserved effects. These results suggest that (1) employees who state that they use more vacation time do not work more hours, (2) there is a negative difference in the number of hours worked between employees who have received paid vacation leave and those who have not, and (3) the absence of control for unobserved effects leads to an overestimation of the impact of paid vacation leave on hours worked.

### **6.4 Impact of paid vacation leave on wages**

In Table 10, we present separate results for the impact of paid vacation weeks on the hourly wages of full time and part time employees. The results show a positive relationship between paid vacation and wages for both categories of employees. The ratios are equal to 0.120 and 0.210 respectively for part time and full time employees with the mixed effects model. With the OLS model, the results are 0.221 and 0.334 respectively for part time and full time employees. This indicates that receiving more paid vacation time as a social benefit implies a higher salary.

The results of the model with a set of dichotomous variables, indicating the number of paid vacation weeks, are statistically negative for the category “0 and 1 week of paid vacation”. However, the relationship between paid vacation and wages is positive for the 3-weeks category, and it increases with the 5- to 6-weeks category. Notice that the 2-week category of paid vacation is the category of reference. It appears that jobs offering less paid vacation time provide lower wages.

Altonji and Usui (2007) find a similar result for the entire sample. They argue that if the worker must choose between a job that offers two weeks of paid vacation and no unpaid vacation leave, and another job offering one week of paid vacation with one week of unpaid vacation leave, the worker will find no difference between these two jobs if they offer the same annual salary. A possible explanation is the firms’ heterogeneity: some of the firms offer better salaries and benefits to attract employees on the job market or to reduce turnover rate.

## 7 Conclusion

In this paper, we provide new evidence on the determinants of vacation leave and its relationship to hours worked and wages. Our framework is similar to Altonji and Usui (2007). However, our methodology improves the previous work in two ways (1) we extend the standard linear model to correct for the unobserved heterogeneity at both the individual and firm level, and (2) we use linked longitudinal employee-employer data, a unique nationally representative sample of workers and workplaces. The data used come from Statistics Canada’s Workplace Employee Survey (WES) 1999-2005.

Using a mixed effects model we find that annual hours of work fall by 29 hours for each additional week of vacation used. Results with OLS model show that annual hours of work fall by 45 hours, i.e. more than one week of full-time work. Our results with OLS model are similar to those found by Altonji and Usui (2007). That is, failure to correct for unobserved effects leads to overestimate by approximately 55% the impact of paid vacation on hours worked. Our model implies that reporting an extra week of vacation used translates less than one for one into reduction in weeks worked.

Our results also indicate that hourly wage rates are positively related to paid vacation. This leads us to believe that receiving more paid vacation in terms of benefits, is an indication of

higher wage. A possible explanation is that the heterogeneity of firms implies that some of them adopt a high level of wages to attract employees on the job market or to reduce turnover rate.

We also find that vacation leave used is positively correlated with paid vacation. A comparison between our results and those of Altonji and Usui (2007) shows that there is a difference in the size of the effect of paid vacation. Altonji and Usui (2007) found that on average, vacation time used rises one-to-one with paid vacation. On the contrary, we find that an additional week of paid vacation implies an increase of less than a week of vacation used. A possible explanation for the difference in these results is the intertemporal substitution in the use of the amount of paid vacation in some Canadian provinces where employees are entitled to defer part of their vacation days for the following year.

The analysis shows that job stability has a significant impact. We find that seniority is positively correlated with paid vacation and vacation used, i.e. the more stable employment the more the paid vacation are used. We also find that experience and union membership is positively associated with paid vacation and vacation used. Altonji and Usui (2007) find a small effect regarding the experience. This difference in results suggests that, in Canada, vacation leave seems to be determined to some extent by negotiation between the worker and the firm.

In future work, it would be interesting to truncate the distribution of the days of vacation leave in order to see if the determinants of vacation leave differ according to the amount of vacation days. Also, it would be interesting to study the episode of vacation leave, but it needs an appropriate data structure.

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## Appendix I: Figures

Figure 1: Distribution of Vacation Weeks for Men in 2005

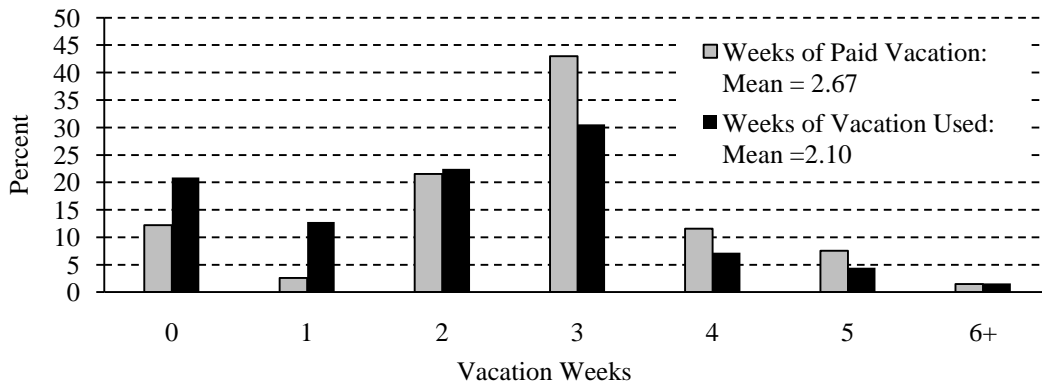


Figure 2: Distribution of Vacation Weeks for Women in 2005

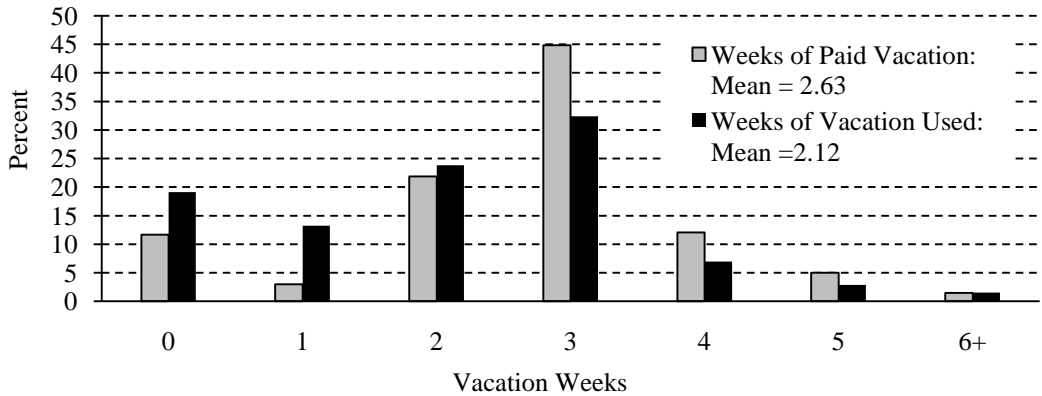
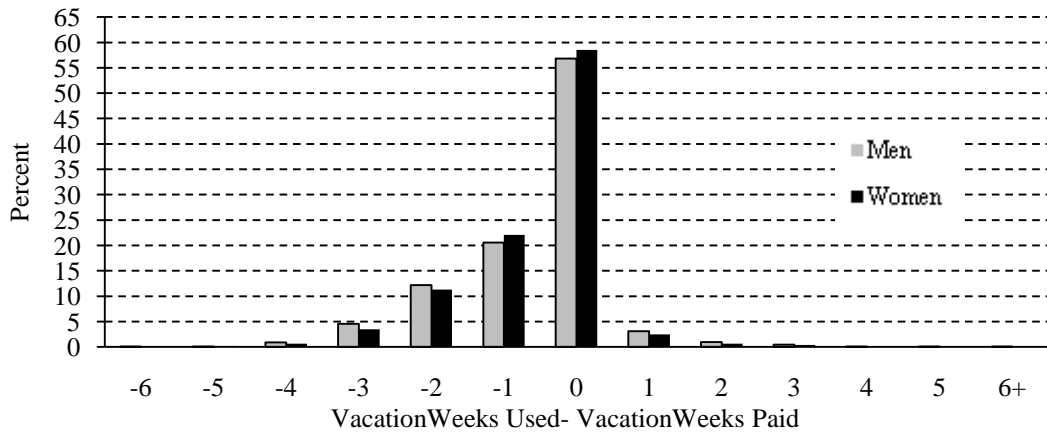


Figure 3: Distribution of Vacation Weeks used minus Vacation Weeks Paid in 2005



Sources: Statistics Canada, Workplace Employee Survey (WES).

Appendix II: Tables

Table 1: Proportion of employees who report unused vacation according to socio-demographic, employment and firm characteristics in 2005

Variable	Man	Woman
<b>Highest level of education</b>		
Vocational diploma some college	29.52	20.46
Completed college or some university	34.98	46.39
Bachelor or higher education completed	29.10	26.20
Industrial training or other	6.38	6.93
Total (%)	100	100
<b>Work arrangement</b>		
Work part-time	5.30	17.29
Work regular hours	55.64	48.15
Work flexible hours	29.40	24.25
Work on a reduced workweek	3.34	3.75
Work on compressed work week schedule	6.29	6.54
Total (%)	100	100
<b>Occupations</b>		
Manager	20.11	10.43
Professional	13.08	19.78
Technician	50.58	33.06
Marketing/sales	3.00	9.89
Clerical/administrative	6.37	20.93
Production w/o certificate	6.86	5.90
Total (%)	100	100
<b>Workplace size</b>		
19 employees and less	26.09	24.48
20-99 employees	34.62	34.35
100-499 employees	21.11	18.93
500 employees and more	18.18	22.23
Total (%)	100	100
Number of observations	13,470	10,727

Table 2: Summary statistics - Employees

Variable	1999		2005	
	Mean	Std. Dev.	Mean	Std. Dev.
<b>Socio-demographic characteristics</b>				
Women	0.521	0.499	0.522	0.499
Married	0.566	0.495	0.531	0.450
Black	0.011	0.105	0.010	0.102
Age	39.637	11.064	40.902	11.902
Immigrant	0.175	0.380	0.179	0.383
Number of children aged 0 to 18	0.779	1.040	0.680	0.987
Monoparental	0.127	0.333	0.118	0.323
Family Income	67993.080	55748.100	77033.62	54456.58
No activity limitation due to health issues	0.017	0.129	0.022	0.266
<b>Human Capital</b>				
Seniority	8.428	8.192	8.748	8.740
Experience	16.183	10.713	17.569	11.500
Vocational diploma some college	0.325	0.468	0.271	0.444
Completed college or some university	0.433	0.495	0.462	0.498
Bachelor or higher education completed	0.269	0.443	0.287	0.452
Industrial training or other	0.127	0.333	0.067	0.250
<b>Work arrangement</b>				
Work part-time	0.201	0.401	0.209	0.406
Work regular hours	0.709	0.453	0.683	0.465
Work flexible hours	0.393	0.488	0.366	0.481
Work on a reduced workweek	0.139	0.346	0.069	0.253
Work on compressed work week schedule	0.085	0.279	0.080	0.271
<b>Occupation</b>				
Manager	0.147	0.354	0.126	0.332
Professional	0.160	0.366	0.171	0.377
Technician	0.393	0.488	0.408	0.491
Marketing/sales	0.082	0.275	0.079	0.271
Clerical/administrative	0.141	0.348	0.147	0.354
Production w/o certificate	0.074	0.263	0.066	0.248
<b>Promotion received</b>	0.381	0.485	0.376	0.484
<b>Supervise the work of other employees</b>	0.379	0.480	0.387	0.487
<b>Covered by a collective bargaining agreement</b>	0.280	0.449	0.261	0.439
Number of observations	23,540		24,197	

Table 3: Summary statistics - Employers

Variable	1999	
	Mean	Std. Dev.
<b>Changes in organisational practices</b>		
Adopted flexible time	0.158	0.365
Downsizing	0.087	0.282
Greater reliance on temporary workers	0.045	0.209
Greater reliance on part-time workers	0.096	0.295
Use overtime	0.080	0.271
Greater reliance on job rotation	0.149	0.357
Greater reliance on external suppliers	0.120	0.325
<b>Workplace size</b>		
19 employees and less	0.874	0.331
20-99 employees	0.108	0.310
100-499 employees	0.015	0.122
500 employees and more	0.002	0.047
<b>Industry</b>		
Natural resources	0.018	0.135
Primary product manufacturing	0.010	0.100
Secondary product manufacturing	0.017	0.130
Labour intensive tertiary manufacturing	0.030	0.173
Capital intensive tertiary manufacturing	0.023	0.150
Construction	0.077	0.266
Transportation	0.121	0.326
Communication and other utilities	0.012	0.111
Retail trade and consumer service	0.317	0.465
Finance and insurance	0.052	0.222
Real estate	0.043	0.203
Business services	0.112	0.316
Education and health services	0.140	0.347
Information and cultural industries	0.022	0.146
Number of observations	6,271	

Table 4: The effect of individual characteristics on weeks of vacation leave

<i>Explanatory Variable</i>	<i>Dependent Variable</i>			
	<i>Vacation used</i>		<i>Paid vacation</i>	
	<i>(1)</i>	<i>(2)</i>	<i>(3)</i>	<i>(4)</i>
	<i>OLS</i>	<i>Mixed effects</i>	<i>OLS</i>	<i>Mixed effects</i>
<b>Socio-demographic characteristics</b>				
Women	0.052*** (0.015)	-0.019 (0.010)	0.024 (0.013)	-0.012 (0.009)
Married	0.066*** (0.021)	0.116*** (0.010)	0.004 (0.016)	0.016 (0.009)
Black	0.022 (0.063)	-0.080*** (0.041)	0.063 (0.057)	-0.04 (0.036)
Age	0.034*** (0.006)	0.034*** (0.003)	0.044*** (0.006)	0.040*** (0.003)
Age squared	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
Immigrant	-0.130*** (0.021)	-0.055*** (0.012)	-0.038** (0.015)	-0.008 (0.011)
Number of children aged 0 to 18	-0.037*** (0.008)	-0.041*** (0.004)	-0.037*** (0.007)	-0.022*** (0.004)
Monoparental	0.092*** (0.025)	0.094*** (0.014)	0.058*** (0.022)	0.036*** (0.012)
Family Income (000s)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
No activity limitation due to health issues	0.136*** (0.033)	0.098*** (0.012)	0.011 (0.027)	0.004 (0.011)
<b>Human Capital</b>				
Seniority	0.137*** (0.005)	0.135*** (0.002)	0.067*** (0.004)	0.050*** (0.002)
Seniority squared (/100)	-0.004*** (0.000)	-0.004*** (0.000)	-0.000** (0.000)	-0.000*** (0.000)
Experience	0.018*** (0.003)	0.019*** (0.001)	0.015*** (0.003)	0.016*** (0.001)
Experience squared (/100)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
Vocational diploma some college	0.063*** (0.016)	0.028*** (0.008)	0.058** (0.015)	0.018*** (0.007)
Completed college or some university	0.145*** (0.014)	0.057*** (0.008)	0.070*** (0.013)	0.032*** (0.007)
Bachelor or higher education completed	0.328*** (0.018)	0.137*** (0.010)	0.173*** (0.016)	0.099*** (0.008)
Industrial training or other	-0.110*** (0.022)	-0.048*** (0.011)	-0.037*** (0.018)	-0.032*** (0.010)
Number of observations	131,818	131,818	131,818	131,818
Statistical significance: *=10%; **=5%; ***=1%.				
Standard error in parantheses.				
<i>Note:</i> We control for occupation (6), industry (14) and year (7).				

Table 5: The effect of job and workforce characteristics on weeks of vacation leave

<i>Explanatory Variable</i>	<i>Dependent Variable</i>			
	<i>Vacation used</i>		<i>Paid vacation</i>	
	<i>(1)</i>	<i>(2)</i>	<i>(3)</i>	<i>(4)</i>
	<i>OLS</i>	<i>Mixed effects</i>	<i>OLS</i>	<i>Mixed effects</i>
<b>Work arrangement</b>				
Work part-time	-0.698*** (0.032)	-0.496*** (0.011)	-0.777*** (0.034)	-0.578*** (0.010)
Work regular hours	0.184*** (0.028)	0.146*** (0.009)	0.190*** (0.026)	0.111*** (0.008)
Work from Monday to Friday between 6am and 6pm	0.112*** (0.025)	0.055*** (0.009)	0.060*** (0.024)	0.020** (0.008)
Work flexible hours	-0.079*** (0.016)	-0.054*** (0.006)	-0.044*** (0.013)	-0.022*** (0.005)
Work done at home	0.043*** (0.020)	0.045*** (0.008)	0.121*** (0.016)	0.085*** (0.007)
Work on a reduced workweek	0.030 (0.031)	0.034 (0.011)	-0.054 (0.032)	-0.072*** (0.010)
Work on compressed work week schedule	-0.021 (0.029)	-0.048 (0.012)	-0.025 (0.025)	-0.019 (0.010)
Promotion received	0.247*** (0.018)	0.217*** (0.008)	0.193*** (0.013)	0.162*** (0.007)
Supervise the work of other employees	0.029 (0.017)	0.063*** (0.007)	0.065*** (0.016)	0.079*** (0.006)
Covered by a collective bargaining agreement	0.364*** (0.022)	0.141*** (0.011)	0.383*** (0.023)	0.166*** (0.010)
Proportion of the workforce female	0.001 (0.001)	0.001*** (0.000)	0.001 (0.000)	0.003*** (0.000)
Proportion of full-time permanent employees	0.561*** (0.051)	0.359*** (0.023)	0.574*** (0.048)	0.337*** (0.020)
Proportion of part time permanent employees	-0.269*** (0.051)	-0.112*** (0.020)	-0.370*** (0.056)	-0.220*** (0.017)
Proportion of employees participating in union	0.401*** (0.032)	0.220*** (0.014)	0.458*** (0.029)	0.286*** (0.012)
Proportion of managers	-0.085 (0.047)	-0.071*** (0.014)	-0.098 (0.055)	-0.067*** (0.017)
Turnover rate	-0.001*** (0.000)	-0.000*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
Number of observations	131,818	131,818	131,818	131,818

Statistical significance: \*=10%; \*\*=5%; \*\*\*=1%.

Standard error in parantheses.

*Note:* We control for socio-demographic characteristics, occupation (6), industry (14) and year (7).



Table 6: The effect of firm characteristics on weeks of vacation leave

<i>Explanatory Variable</i>	<i>Dependent Variable</i>			
	<i>Vacation used</i>		<i>Paid vacation</i>	
	<i>(1)</i>	<i>(2)</i>	<i>(3)</i>	<i>(4)</i>
	<i>OLS</i>	<i>Mixed effects</i>	<i>OLS</i>	<i>Mixed effects</i>
<b>Changes in organisational practices</b>				
Adopted flexible time	-0.023 (0.033)	0.010 (0.011)	0.011 (0.030)	0.030*** (0.009)
Downsizing	0.078*** (0.027)	0.006 (0.009)	0.057*** (0.021)	-0.023 (0.008)
Greater reliance on temporary workers	0.047 (0.026)	0.064*** (0.013)	0.025 (0.023)	0.001 (0.011)
Greater reliance on part-time workers	-0.085*** (0.031)	-0.070*** (0.012)	-0.101*** (0.031)	-0.052*** (0.010)
Use overtime	-0.014 (0.028)	-0.003 (0.010)	0.029 (0.024)	0.015 (0.009)
Greater reliance on job rotation	-0.076*** (0.021)	-0.038*** (0.009)	-0.046*** (0.022)	-0.013 (0.008)
Greater reliance on external suppliers	0.006 (0.025)	-0.003 (0.011)	0.010 (0.027)	0.026 (0.009)
<b>Workplace size</b>				
20-99 employees	0.166*** (0.024)	0.241*** (0.014)	0.167*** (0.019)	0.204*** (0.013)
100-499 employees	0.385*** (0.029)	0.480*** (0.018)	0.343*** (0.027)	0.431*** (0.016)
500 employees and more	0.440*** (0.044)	0.614*** (0.024)	0.379*** (0.036)	0.582*** (0.021)
<b>Difficulty filling vacancies</b>				
	0.011 (0.018)	-0.010 (0.008)	0.033 (0.016)	0.014 (0.007)
Number of observations	131,818	131,818	131,818	131,818

Statistical significance: \*=10%; \*\*=5%; \*\*\*=1%.  
Standard error in parantheses  
*Note:* The reference category is 19 employees and less. We control for socio-demographic characteristics, occupation (6), industry (14) and year (7).

Table 7: The effect of vacation weeks paid on vacation weeks used.

<i>Estimation Method</i>	<i>Explanatory Variable</i>	<i>Control Variables</i>			
		<i>None</i>	<i>Add Demographic Variables</i>	<i>Add Seniority and Union</i>	
		(1)	(2)	(3)	(4)
<i>OLS</i>	Paid vacation	0.537*** (0.005)	0.263*** (0.005)	0.417*** (0.006)	0.375*** (0.006)
	1(VP > 0)	1.978*** (0.013)	1.701*** (0.017)	1.742*** (0.014)	
<i>Mixed effects</i>	Paid vacation	0.314*** (0.001)	0.129*** (0.001)	0.321*** (0.002)	0.299*** (0.002)
	1(VP > 0)	2.085*** (0.007)	1.835*** (0.007)	1.852*** (0.001)	
Number of observations		131,818	131,818	131,818	131,818

Statistical significance: \* = 10%; \*\* = 5%; \*\*\* = 1%.  
Standard error in parantheses.  
*Note:* VP is an indicator equal to one if a worker receives paid vacation.  
We control for occupation (6), industry (14) and year (7) in columns (3) and (4).

Table 8: The effect of vacation weeks used on hours measures

<i>Control Variables</i>	<i>Dependent Variable</i>			
	<i>Hours worked per week (1)</i>	<i>Overtime hours (2)</i>	<i>Maximum hours worked per week (3)</i>	<i>Annual hours worked (4)</i>
	<i>OLS</i>			
None	-0.869*** (0.055)	0.005 (0.017)	-1.375*** (0.072)	-45.201*** (2.909)
Add demographic variables	-0.858*** (0.057)	-0.003 (0.017)	-1.340*** (0.072)	-44.640*** (2.976)
Add seniority and union	-0.8643*** (0.062)	-0.020 (0.018)	-1.375*** (0.080)	-44.970*** (3.260)
	<i>Mixed effects</i>			
None	-0.600*** (0.027)	-0.046*** (0.006)	-0.897*** (0.036)	-31.24*** (1.449)
Add demographic variables	-0.564*** (0.028)	-0.032*** (0.006)	-0.829*** (0.037)	-29.34*** (1.492)
Add seniority and union	-0.549*** (0.029)	-0.037*** (0.006)	-0.814*** (0.037)	-28.57*** (1.506)
Number of observations	131,818	131,818	131,818	131,818

Statistical significance: \* =10%; \*\* =5%; \*\*\* =1%.  
Standard error in parentheses.  
*Note:* We control for occupation (6), industry (14) and year (7).

Table 9: The effect of weeks of paid vacation on hours measures

<i>Explanatory Variable</i>	<i>Dependent Variable</i>			
	<i>Hours worked per week (1)</i>	<i>Overtime hours (2)</i>	<i>Maximum hours worked per week (3)</i>	<i>Annual hours worked (4)</i>
	<i>OLS</i>			
Paid vacation	-0.585*** (0.066)	0.067*** (0.023)	-0.917*** (1.122)	-30.470*** (5.176)
1(VP > 0)	-2.334*** (0.319)	-0.095 (0.077)	-3.392*** (0.386)	-121.373*** (16.604)
	<i>Mixed effects</i>			
Paid vacation	-4.332*** (0.037)	0.030*** (0.008)	-0.642*** (0.048)	-22.520*** (1.928)
1(VP > 0)	-1.682*** (0.111)	-0.069*** (0.026)	-2.569*** (0.144)	-87.45*** (5.776)
Number of observations	131,818	131,818	131,818	131,818

Statistical significance: \* = 10%; \*\* = 5%; \*\*\* = 1%.  
Standard error in parentheses.  
*Note:* VP is an indicator equal to one if a worker receives paid vacation.  
We control for socio-demographic characteristics, occupation (6), industry (14) and year (7).

Table 10: The effect of weeks of paid vacation on the log of the hourly wage

Explanatory Variable	Part time workers		Full time workers	
	(1)	(2)	(3)	(4)
	OLS	Mixed effects	OLS	Mixed effects
Paid vacation	0.221*** (0.039)	0.120*** (0.014)	0.334*** (0.019)	0.210*** (0.009)
1(VP>0)	0.145*** (0.110)	0.131*** (0.043)	0.641*** (0.066)	0.374*** (0.028)
VP=0	-0.188 (0.097)	-0.132*** (0.043)	-0.692*** (0.095)	-0.370*** (0.039)
VP=1	-0.021 (0.133)	0.043 (0.065)	-0.483*** (0.172)	-0.232*** (0.060)
VP=3	0.447*** (0.114)	0.180*** (0.047)	1.876*** (0.067)	0.563*** (0.026)
VP=4	0.368 (0.230)	0.376*** (0.088)	2.277*** (0.089)	0.679*** (0.038)
VP=5	1.369*** (0.384)	0.457*** (0.133)	1.908*** (0.114)	0.713*** (0.048)
VP=6+	3.398*** (0.180)	1.757*** (0.147)	2.800*** (0.102)	1.038*** (0.075)
Number of observations	16,563	16,563	93,672	93,672
Statistical significance: * =10%; ** =5%; *** =1%. Standard error in parentheses. Note: VP is an indicator equal to one if a worker receives paid vacation. Columns contain dummy variables for each number of weeks of paid vacation, with VP=2 as the reference category. We control for socio-demographic characteristics, occupation (6), industry (14) and year (7).				