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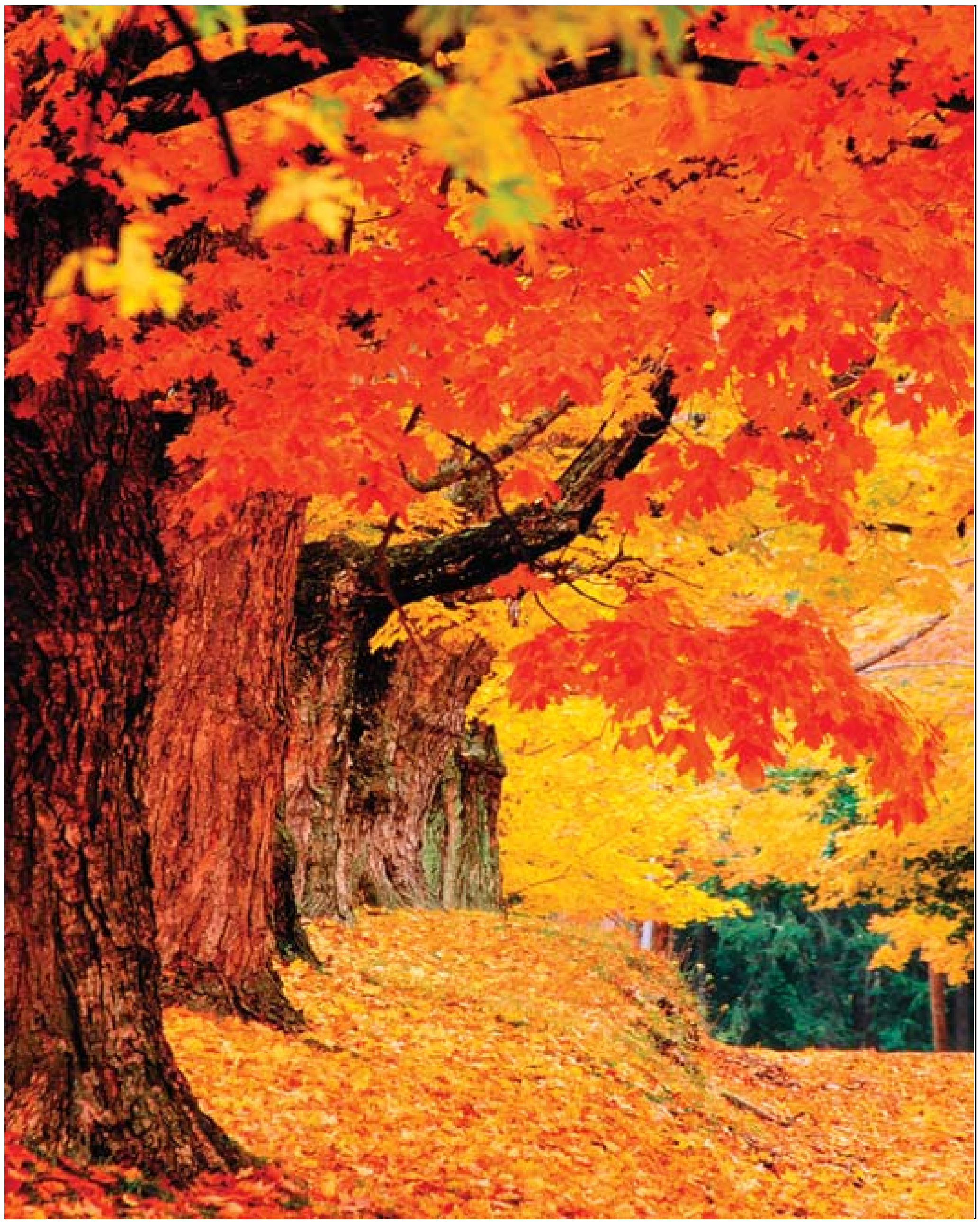
- WHO GAINS FROM COMPUTER USE?
- JOB STRAIN AND RETIREMENT
- FACT-SHEET ON GAMBLING



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- . not available for any reference period
- .. not available for a specific reference period
- ... not applicable
- p preliminary
- r revised
- x confidential
- E use with caution
- F too unreliable to be published

Highlights

In this issue

Who gains from computer use?

- Computers should increase the productivity of workers using them, or else employers would not invest in the technology. It is also implied that wages should be higher for workers who use computers. A model accounting for basic worker characteristics indicates a naïve computer wage premium of 17%. The term 'naïve' is used since many argue that workers with higher abilities (not directly measured) are generally those given computers. Correcting for the selection bias results in a much smaller premium of 4%.
- By broad occupational group, managers earned a computer wage premium of 7%, while professionals and trade and technical workers earned about 4%. No significant premium was found in other occupational groups (marketing and sales workers, clerical and administrative workers, and production workers with no trade or certification).
- The computer wage premium was quite high for workers with an advanced degree (18%) or a bachelor's degree (10%), still positive for those with college or vocational training (3%), and not statistically different from zero for those with a high school diploma or less.

Job strain and retirement

- Job strain, whether caused by a heavy workload, time constraints, or conflicting demands, may be an overlooked factor in the decision to retire.
- Older workers (aged 45 to 57) with high job strain in managerial, professional or technical jobs were much more likely to retire early than those with low job strain. For sales/services/clerical and blue-collar occupations, job strain was unrelated to retirement.
- If job strain can be mitigated by the ability to balance demands with the power to make decisions, older workers may be more inclined to continue working.

Perspectives

Who gains from computer use?

Cindy Zoghi and Sabrina Wulff Pabilonia

Since the 1980s, wage inequality between highly educated and less educated workers has grown substantially. One hypothesis is that the computerization of work allows workers to shift their focus from routine tasks to problem solving, and that this 'upskilling' increases productivity and wages (Attewell 1987). One study found that workers who used a computer on the job earned 17.6% higher wages than those who did not (Krueger 1993). This paper sparked debate as to whether the return is truly for using a computer or a result of being selected to use one. If workers with high ability or unobserved skills are those given computers on the job, then cross-sectional results could falsely attribute a wage premium to computer use—a conclusion supported by a study finding that workers who used other tools associated with white-collar type work, including a pencil and a hand calculator, received a similar return on these tools (DiNardo and Pischke 1997).

A few researchers have used panel data to control for unobserved individual differences. Most found small or insignificant returns on technology use, suggesting that firms are allocating information technologies to their highest skilled workers, who already earn more.

While proponents of upskilling argue that computerization can lead to productivity and wage increases, critics counter that computerization can be *de*skilling. That is, the increased mechanization reduces workers' control over the production process and simplifies jobs, leading to lower wages. In fact, the introduction of new technology may be upskilling for some workers (because it complements them in production) and deskilling for others (because it substitutes for them in production), even within a single firm. A case study of the introduction of digital cheque imaging in a bank, found that exceptions processors spent more time on problem solving and less on repetitive tasks while the staff of deposit processors with the same skill requirements was reduced (Autor, Levy, and Murnane 2002). In this case, computers substituted for some routine tasks and complemented problem-solving. These differences may be observable between occupational groups as computers change skill requirements. For example, word-processing programs may be deskilling for clerical workers because documents can be prepared more quickly and with fewer skills, but upskilling for managers because such programs allow them to take on a greater variety of tasks. Another reason for differential returns to technology across workers is that managers and professionals with high cognitive skills are especially important for the implementation of new technologies (Bresnahan, Brynjolfsson and Hitt 2002). They need to be able to transform organizations to take advantage of technology and new information so that they can learn about their customers. Similarly, since highly educated workers have a comparative advantage in adjusting to new technologies, the introduction of new technologies should shift demand away from less educated workers (Bartel and Lichtenberg 1987).

This study uses a panel of workers surveyed in the 1999 and 2000 Workplace and Employee Survey (WES) to re-examine wage premiums for using a computer at work (see *Data source*). It identifies the return to adopting a computer, as distinct from the negative return from ceasing to use a computer, and examines the returns for specific subgroups of workers by education, occupation, and computer application. It also measures the longer-term returns to continued computer use and the effects of previous computer experience and training to determine whether the difference between the small returns for adopters and the much larger returns for continued users can be attributed to learning costs.

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Wage differential for computer use

A 'naïve' wage equation was estimated by ordinary least squares with various personal characteristics and computer use (yes/no) as the explanatory variable of interest (see *Methodology*). The resulting wage premium for computer use is 16.9%, which does not account for selection effects or differing effects across subgroups of workers (Table 1).

Unobserved worker characteristics, such as ability, may also make computer users different from other workers. If these unobservables are correlated with wages,

Table 1 The wage effect of using a computer

	Pooled OLS model (naïve)	Individual fixed-effects model	First-differenced model
Dependent variable	ln(hourly $)	ln(hourly $)	Δln(hourly $)
Computer user	.1565***	.0160**	...
Both years (maintainers)	...	...	.0375***
1999 only (ceasers)	...	...	.0029
2000 only (adopters)	...	...	.0377***
R^2	0.4285	0.0879	
Adjusted R^2			0.0243

Source: Workplace and Employee Survey, 1999 and 2000
*Statistically significant at * = p<.10; ** = p<.05; *** = p<.01.*
Note: The OLS model includes a constant, years of education, potential experience (and its square), parents or grandparents from a non-European country, different language at work than at home, part-time status, marital status, sex, sex interacted with marital status, union coverage, regional indicators, five occupational indicators, tenure with the establishment, a year indicator, the natural log of establishment size, and the percentage of computer users in the establishment. The other models include the same variables except those that are constant over time and recent promotion in 2000.

Methodology

An economic model of wages that accounts for the production activities of firms, employee education, varying employee productivity, varying job complexity across occupations, declining computer costs and varying computer training costs results in four possible sources of wage dispersion relating to computer use and adoption (Zoghi and Pabilonia 2004).

1. Computer users might be more productive relative to non-users, regardless of computer use.
2. Computer users might be the type of employee firms protect by paying higher-than-market (or efficiency) wages.
3. Higher computing productivity might raise wages for computer users.
4. Lower costs of computerization might increase the computer wage premium.

Only the third source represents the 'true' computer wage premium. The others indicate that computer use probably coincides with other employee characteristics that employers value (selectivity effects). This study uses a number of different approaches to isolate the true computer wage premium from the selectivity effects.

Cross-sectional ordinary least squares (naïve)
This model estimates the gross wage differential between computer users and non-users that includes all four factors outlined above, controlling for years of education, potential experience, potential experience squared, parents or grandparents from a non-European country, different language spoken at work than at home, part-time status, marital status, sex, sex interacted with marital status, union coverage, regional indicators, five occupational indicators, tenure with the establishment, a year indicator, establishment size, and percentage of computer users in the establishment.

Controlling for unobserved qualities
If computer users have other unobserved qualities (such as ability or ambition) that are correlated to wages, then cross-sectional estimates of the computer wage premium, as above, are upward biased. However, an algebraic trick can be used with panel data to eliminate this bias. If wage changes are estimated as a function of the change in characteristics over time, then all characteristics that do not change (whether observed or unobserved) 'drop out' of the model. These are termed 'fixed-effects' models. Only those characteristics that can change over time are included: education, potential experience, marital status, work-home language differences, part-time status, union coverage, job promotion, number of employees, and the percentage of computer users within the establishment.

Since the returns to computer use can also vary according to changes in computer use patterns, the four possible computer use transitions a worker can experience over time can be separately identified, and returns to computer use allowed to vary between these groups of individuals and over time. The four transitions are those who never used a computer, those who used a computer in both periods, those who ceased using a computer in 2000, and those who adopted a computer between 1999 and 2000.

An alternative approach is to use past wages to capture the fixed effect. This enables the return to computer use of long-term users to be estimated, as opposed to focusing on changers.

Since the theoretical model also indicated that the computer-use premium could vary by type of worker and application, all the fixed-effects models were estimated separately by occupational groups, educational groups, and application used most frequently. Computer training variables were added to examine the interactions between training and the computer wage premium.

the previously reported wage premium would be incorrectly attributed to computer use. Indeed, many other researchers have found that the wage premium for computer use is greatly diminished or no longer exists when they control for unobserved individual heterogeneity.[1] Many demographic variables are time-invariant and consequently do not appear in the fixed-effects model. However, education did change for quite a few workers, possibly due to measurement error in one or both years. Additionally, marital status, work-home language differences, part-time status, and union coverage can change. For many of the establishments, both the number of employees and the percentage of computer users changed between 1999 and 2000. Also considered was recent promotion, a factor that may be correlated with changes in both computer use and wages.[2]

Confirming previous results, the fixed-effects estimate was only 1.6% (Table 1, column 2).[3] Identification in this specification comes from the 9% of workers who changed computer status—6% adopted and 3% ceased to use a computer in 2000.[4] The model assumes the absolute value of the return to computer use is the same for both adopters and ceasers—which may not be the case. In addition, it does not provide any information about the return to computer use for workers who used a computer in both 1999 and 2000 or even for many years prior to 1999 (Dolton and Makepeace 2004).

Therefore, the four possible computer-use transitions a worker can experience over time were separately identified, and returns to computer use were allowed to vary between these groups of individuals and over time. The four transitions are: those who never used a computer, those who used a computer in both periods, those who ceased using a computer in 2000, and those who adopted a computer between 1999 and 2000.

In a first-differenced model, the effect of computer use on wages for the average worker in the first year of computer adoption is a statistically significant 3.8% (Table 1, column 3). The coefficient on ceasing to use a computer is not statistically significantly different from zero, perhaps due to downward wage rigidity.

The small wage premium found does not necessarily indicate that returns to computer use are this small but merely that returns to the average worker in the first year of computer use are small. Returns might be small in the first year if employers passed along some or all of the costs of computer training to their employees. However, the return to long-run computer experience for continuing computer users may well differ.

Accounting for worker differences and technology use

So far, the implication has been that the average worker does not earn the high wage premiums initially associated with computers—at least in the short

Data source

The **Workplace and Employee Survey** was initially conducted in 1999. Establishments in the survey are followed annually, while employees are followed for only two years and then re-sampled. The analysis used a panel of employees with their matched employer information from 1999 and 2000—the most recent available. The panel aspect allows a control for unobserved individual characteristics that might affect the propensity for computer use as well as wages.

In 1999, more than 23,500 employees in almost 6,000 establishments were interviewed. Establishments were first selected from employers with paid employees in March of the survey year. Employers in the territories and those operating in crop and animal production; fishing, hunting, and trapping; private households; religious organizations; and public administration were excluded. At each establishment, a maximum of 24 employees were randomly sampled. All employees were selected in establishments with fewer than four employees. In 2000, just over 20,000 employees were re-interviewed. For some of the main econometric analysis, a restricted sample was used—the 19,000 employees who responded in both years, remained with the same employer in both years, and had non-missing observations on the dependent and independent variables. (No significant differences were apparent between the full sample and restricted sample employee characteristics.)

The dependent variable in the analysis is the natural logarithm of the hourly wage. Employee respondents reported wages or salaries before taxes and other deductions in any frequency they preferred (hourly, daily, weekly, annually). They were also asked about additional variable pay from tips, commissions, bonuses, overtime, profit-sharing, productivity bonuses, or piecework. Hourly compensation was derived by dividing total pay by total reported hours. (Managers may be more likely to work unreported hours than other workers. Thus, hourly wages for this occupational group would be overestimated.)

Table 2 Wage effects of adopting a computer by occupation and education

Occupation	
Managers	.0704*
Professionals	.0437
Technical/trade	.0389***
Marketing/sales	-.0026
Clerical/administrative	.0118
Production, no trade	.0214
Education	
Advanced degree	.1760**
Bachelor's degree	.1031***
College or vocational training	.0289**
High school graduate	.0310
Less than high school graduate	.0146

Source: Workplace and Employee Survey, 1999 and 2000
*Statistically significant at * = p<.10; ** = p<.05; *** = p<.01.*
Note: The sample is restricted to employees who responded to the survey in both years and remained with the same employer in the same occupation.

run—although the premium is still positive and economically significant. Nevertheless, certain workers may earn higher than average returns. Evidence for such differential effects was sought by re-estimating the first-differenced model for workers by occupational group, educational group, and type of application used most frequently.

Six broad occupational groups were examined: managers, professionals, technical and skilled production workers, marketing and sales workers, clerical and administrative workers, and unskilled production workers with no trade or certification. Group samples were restricted to those who were in the same occupation in both years (Table 2). Even controlling for individual heterogeneity, managers earned a statistically significant 7.0% higher wages in the first year of computer use, compared with 3.9% for technical/ trade workers. The remaining occupational groups, however, earned no statistically significant wage premium for adopting computers, and only the return to professionals using a computer was an economically significant 4.4%. These results coincide with expectations, since white-collar workers are likely to possess more problem-solving skills than other workers. If computers are a complement for high-skilled workers and a substitute for low-skilled workers, it makes sense that the adoption of computers would affect the wages of these groups differently. Estimations of the wage effect for the average worker obscure important differences between types of workers.

A second way to test for differential effects of computerization for particular types of workers is to estimate the models separately by education, dividing the sample into those with less than a high school diploma, only a high school diploma, college or vocational training, a bachelor's degree, or an advanced degree. Wage premiums are quite high for workers with an advanced degree (17.6%) or a bachelor's degree (10.3%), still positive for those with college or vocational training (2.9%), and not statistically different from zero for those with a high school diploma or less.

Another source of heterogeneity that may affect the returns to computer use stems from the different tasks performed. If technology complements a worker doing problem-solving tasks but substitutes for a worker doing repetitive tasks, then it may be important to look at more detailed questions of technology use. To do this, the adoption indicator was disaggregated into the primary software application used by the adopter (14 categories). In addition, two other types of technology—computer-aided tools (for example, industrial robots) and non-computer technologies (for example, cash registers and scanners)—were tested for (Table 3).

Table 3 The wage effect of adopting a specific application

	First-differenced model
Computer-aided technologies	-.0072
Other technologies	-.0034
Main application used (conditional on adopting a computer)	
Word processing	.0729***
Spreadsheet	.0189
Database	.0511**
Desktop publishing	.1996*
Management applications	.0246
Communications	.0694**
Programming	.0890
Specialized office	.0343*
Data analysis	.1091
Graphics	-.0152
Computer-assisted design	.0289
Computer-assisted engineering	.0171
Expert systems	.0866
Other	-.0173

Source: Workplace and Employee Survey, 1999 and 2000
*Statistically significant at * = p<.10; ** = p<.05; *** = p<.01.*
Note: The sample is restricted to employees who responded to the survey in both years and remained with the same employer.

The wage premium is largest for those adopting desktop publishing, data analysis, and programming (20%, 10.9%, and 8.9% respectively) compared with continued non-users. These applications tend to demand critical thinking or problem-solving skills. However, the variance for the coefficients in this model comes from individual workers who adopt a computer and this particular software. The number of workers in each group is quite small, resulting in large standard errors in most instances. Adopters who use word processing, database, communication, and specialized office applications earn significant, but smaller, wage premiums (7.3%, 5.1%, 6.9%, and 3.4% respectively). Thus while some of the estimates in the first-differenced model are quite noisy, some differences in the wage premium do appear to remain depending upon the primary application adopted. It does not seem that workers using technologies other than computers earn a wage premium for that usage. The three different groups of workers—by occupation, education, and type of software application used—seem to largely confirm that technology can affect workers differently.

Long-term results

One reason the traditional fixed-effects and flexible first-differenced models might yield small estimates of the return to computer use is that they measure the wage change within the first year of adopting or ceasing to use a computer. In order to estimate the return for maintaining computer use, the previous year's wage was used to try to capture the individual fixed effects. The average return to computer use for those who used computers in both periods was 8.3% in 2000 (Table 4). This large and significant return suggests that those with computer skills are earning higher wages than those who are first learning to use their new computers at an establishment. The return to adopting (4.2%) using the lagged wage approach was only slightly higher than that obtained using first-differences (3.8%), suggesting that lagged wages are good proxies for the individual fixed effects—at least for adopters.

Re-estimating the equation for the occupational and educational groups shows that most continued users earned a return to computer use. Even though workers in the marketing/sales and clerical/administrative occupations did not earn a return to adopting, workers in these occupations who continued their computer use earned economically significant returns of 10% and 8% respectively. Among the educational groups, continued users all earned an economically large return to computer use. High school graduates, one of the lower educational levels, earned one of the highest returns—10.6%. The coefficient on continued users in the advanced degree group was imprecise. These results suggest that previous fixed-effects models dramatically understate the 'true' returns to computer use, and in fact, only represent the much smaller average returns to adopting or ceasing to use a computer.

Not too surprisingly, the long-term returns are in most cases much larger than the short-term ones, since most workers will not immediately become more productive the instant a computer appears on their desk. Workers must learn to use a computer and incorporate it into their job.[5] In the first year of using a computer on the job, learning costs may be high for workers, especially those with no prior experience. These may be pecuniary costs of courses or on-the-job training, or opportunity costs of lost productivity

Table 4 The long-run wage effect of using a computer, value-added approach

	OLS	
	Maintainers	Adopters
All workers	**.0796*****	**.0410*****
Occupation		
Managers	.0664***	.0836**
Professionals	.0243	.0523
Technical/trade	.0862***	.0445***
Marketing/sales	.1043***	.0823
Clerical/administrative	.0771***	.0333
Production, no trade	.0563**	.0580*
Education		
Advanced degree	.0601	.1465**
Bachelor's degree	.0829***	.1018***
College or vocational training	.0831***	.0360***
High school graduate	.1008***	.0559***
Less than high school graduate	.0588***	.0175

Source: Workplace and Employee Survey, 1999 and 2000
*Statistically significant at * = p<.10; ** = p<.05; *** = p<.01.*
Note: The OLS model (using the 2000 sample) includes lagged wage, a constant, years of education, potential experience (and its square), parents or grandparents from a non-European country, different language at work than at home, part-time status, marital status, sex, sex interacted with marital status, union coverage, regional indicators, five occupational indicators, tenure with the establishment, the natural log of establishment size, the percentage of computer users in the establishment, and recent promotion. The other specifications exclude the occupational indicators.

while adapting their job to computer use. While some learning costs will be paid by the employer, workers may be expected to implicitly share them, since many of these applications add to their general transferable skills rather than firm-specific ones.

The data provide two ways to assess why returns are lower for adopters than for continued users. One is to compare the returns to adoption for those who received and did not receive computer training. Employees were asked if they participated in any on-the-job or classroom training on computer hardware or software related to their job and paid for by their employers. The 15% of adopters who received (and implicitly required) training would be expected to have lower wages while they paid their share of the training cost, resulting in lower returns in the presence of training. The second way is to compare the returns to adoption for workers with and without prior computer experience. Workers with prior computer experience may be able to reap higher productivity in their first year of computer use than those with no prior computer experience and thus earn a higher return.

Although results are imprecise for the interaction terms because of the small number of adopters with either prior experience or training,[6] the coefficients suggest that learning costs may affect the short-term returns to computer use (Table 5). A computer adopter not receiving training earns a return of around 4%, while one with training earns 3% (Model I). A worker without prior computer experience earns a return to adopting of 2.9%, while a worker with prior experience earns 5% in the year of adoption (Model II).

The theoretical model allows learning costs and the extent to which workers share them to vary across types of workers, showing that these variations can help explain the differential returns to computer adoption. For example, if low-skilled workers require more training than high-skilled workers to master a particular computer application, then it might take longer for any premium to be reflected in their wages. While separate estimations for the different occupational and educational subgroups are quite noisy, as the variance is derived from a one-year wage change, there is nevertheless some evidence that the sharing of these costs is especially high for particular groups of workers, although the pattern is not clearly related to skill level. The one significant result in the training interaction is for the marketing and sales occupations, which is consistent with the fairly large return to continued users for this group (Table 4). Other groups, such as professionals, clerical and administrative, and the highly educated incur economically large costs of training. While these are not all intuitive, the first-differencing method does not control for unobservable traits that might cause one worker to receive training in the second period and another worker not to receive the training. Thus, although the large negative effect on the interaction term for workers who hold a bachelor's or advanced degree is somewhat surprising (10.2% and 8.0% respectively), it is likely that many of these degree holders do not require formal training and that those who do are different in some important unobservable way. Alternatively, their training programs may be expensive because of the complexity of the applications they must master.

Table 5 Effects of training and previous computer experience on the computer adoption wage premium

	Model I		Model II	
Adopted in 2000	Overall	With training*	Overall	Prior experience*
All workers	**.0395*** **	**-.0101**	**.0289** **	**.0210**
Occupation				
Managers	.0630	.0544	.0451	.0590
Professionals	.0626	-.0663	.0189	.0673
Technical/trade	.0340**	.0322	.0379	.0026
Marketing/sales	.0459	-.2908**	-.0205	.0332
Clerical/administrative	.0305	-.0877	.0048	.0149
Production, no trade	.0178	.0541	.0048	.0433
Education				
Advanced degree	.1901***	-.0796	.1274	.1236
Bachelor's degree	.1210***	-.1018	.0834	.0339
College or vocational training	.0314**	-.0136	.0319**	-.0065
High school graduate	.0245	.0329	.0094	.0534
Less than high school graduate	.0129	.0156	.0152	-.0023

Source: Workplace and Employee Survey, 1999 and 2000
*Statistically significant at * = p<.10; ** = p<.05; *** = p<.01.*
Note: The sample is restricted to employees who responded to the survey in both years and remained with the same employer in the same occupation.

The size of the wage premium for those who do not receive formal training is larger for several of the low-skilled groups (for example, marketing/sales, clerical/administrative) than in the models that do not control for training. If workers were observed a few years after adopting computers, however, their wages might be higher than those of similar workers who did not adopt a computer between 1999 and 2000. In fact, the effect should be larger than was measured here, since much of the learning costs are not reflected in formal training but in on-the-job experience using a computer.

Most groups also demonstrated a larger return for experienced adopters, shown by the positive return on the interaction, even though the estimates are imprecise. The exceptions are workers with college or vocational training or no high school degree and those in technical and trades occupations, which may indicate that the applications used by these workers tend to be firm-specific and that prior general computer skills are not readily transferable.

Conclusion

A naïve wage regression indicates that workers who used a computer earned 16.9% more in 2000 than those who did not use a computer. Controlling for unobserved worker heterogeneity using a changing characteristics model, the wage growth for the first year of computer use was a statistically significant 3.8%. This model allows the separate identification of the return to adopting a computer from the wage loss associated with ceasing to use a computer, which is not statistically different from zero.

This panel estimate, however, obscures important differences between types of workers and returns from using different computer applications. While technical workers, professionals and managers earn higher wages in the first year of computer use, other occupational groups, whose skills may be substitutes for computer technologies, earn no statistically significant return. Similarly, workers with a bachelor's or advanced degree earn 10% to 17% more when adopting a computer, while those with college or vocational training earn around 3% and those with a high school diploma or less earn no return. Returns to using different software applications vary markedly, suggesting a return to computerizable tasks that allow creative or cognitive skills to be better utilized. Workers who use other machinery or computer-controlled technology do not earn a return. Computers seem to be a complement to high-skilled workers performing problem-solving tasks and a substitute for low-skilled workers performing repetitive tasks.

Small but significant returns accrue for some workers in the first year of computer use. Using lagged wages as an alternative means of controlling for individual fixed effects, which provides an estimate of returns to computer use for those who used a computer both years, shows that the average worker who used a computer in 1999 and 2000 earned an 8.3% wage premium, more than double the return for the average adopter. In addition, continued users in most skill groups earned more than a 5% return to computer use in 2000.

The result that continued users earn more than adopters may represent greater productivity. The penalty associated with receiving training on a new computer suggests either that workers pay for training in terms of slower wage growth or that workers who receive training differ from those who do not receive training. Controlling for computer training increases wages for many of the low-skilled groups whose premiums were small or zero in previous models. In addition, computer adopters with prior computer experience earned more in the first year than those lacking experience.

Perspectives

■ Notes

1 See, for example, Bell (1996); Entorf, Gollac and Kramarz (1999); and Entorf and Kramarz (1997).

2 The simple correlation between adopting a computer and a recent promotion is 0.0317, while the correlation between ceasing to use a computer and promotion is -0.0054.

3 A random-effects specification and an establishment fixed-effects specification were also tried. According to results of the Hausman test, the null hypothesis that the individual effects are uncorrelated with the other regressors in the model could be rejected. The return to computer use controlling for establishment heterogeneity, but not worker heterogeneity, was 7.7%.

4 Some may be concerned with the large number of ceasers in the data. Dolton and Makepeace (2004) suggest two possible reasons why workers stop using a computer. One is that they may do so as they move up the promotion ladder. However, in Canada, the simple correlation between ceasing to use a computer and promotion is -0.0054, and this specification and those that follow controlled for promotion. The other reason is that ceasers are not very good at using a computer. A fixed-effects regression using only non-computer users in 1999 found a 3.9% return.

5 Bresnahan (1999) discusses the importance of re-organizing the workplace for effective use of computers.

6 Only 1.2% of the sample both adopted a computer and received some type of training.

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Job strain and retirement

Martin Turcotte and Grant Schellenberg

The decision to retire early may be influenced by many factors, but financial considerations are usually central. Those who have saved enough throughout their working life and who are covered by a pension plan are likely to leave the labour force sooner than others. In contrast, the self-employed and individuals without pension coverage or sufficient savings may have to work until later in life.

An often overlooked factor may also influence the retirement decision: the intrinsic characteristics of one's job. Even after a long career, some individuals may delay retirement for the simple reason that they enjoy their work. On the other hand, many men and women who feel stressed and dissatisfied with their job may feel they can't retire too soon.

This study examines workers whose job may not fit their expectations, focusing on their level of stress. Using the National Population Health Survey (1994 to 2002), the article asks whether older workers (aged 45 to 57) who experience high job strain will be more likely to retire than those who do not feel the same pressure at work (see *Data source and definitions*). In particular, it examines whether individuals in certain occupations or with particular socio-demographic characteristics are likely to retire early because of job strain.

What is job strain?

Job strain, a concept that was developed more than 20 years ago (Karasek 1979), can be defined as "a measure of the balance between the psychological demands of a job and the amount of control or decision-making power it affords" (Wilkins and Beaudet 1998, 47). Psychological demands include a heavy workload, time constraints and conflicting demands. Control or decision-making power refers to the freedom to decide how to perform tasks and having a say about what happens in one's job. More broadly, it refers to the possibility of learning new things or performing diversified tasks.

Generally, jobs that are psychologically demanding are associated with high stress. However, the stress can be mitigated if individuals have control or decision-making power. In fact, high demands can even lead to increased well-being if workers have control over their tasks (Sargent and Terry 1998). In these 'active' jobs, demands are viewed as challenges that individuals can meet effectively since they are in a position to take autonomous decisions (Dwyer and Ganster 1991).

In contrast, individuals with high demands but little control—that is, in high-strain jobs—are most at risk for work stress. They are also most at risk of developing work-related health problems. Jobs with moderate demands are generally not very stressful, and even less so if control is high. (However, if demands are too low, negative consequences can result—for example, boredom.) In summary, autonomy level is as crucial as demand level in determining how a job will affect an individual's health or well-being.

The Canadian Centre for Occupational Health and Safety defines workplace stress as harmful physical and emotional responses that can happen when job demands conflict with the amount of control an employee has over meeting these demands. Several studies have documented this negative relationship (Wilkins and Beaudet 1998; Kalimo et al. 2003; Dwyer and Ganster 1991; Karasek et al. 1988).

Stress and the decision to retire

This article uses longitudinal data over a period of eight years starting in 1994-95 to examine whether retirement behaviours are related to job strain. Among individuals aged 45 to 57 and working full time in 1994-95, 17% had retired by 2002-03 (see retirement

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Data source and definitions

The **National Population Health Survey** (NPHS) collects health information from private household and institutional residents in the 10 provinces, except on Indian reserves and Armed Forces bases, and in some remote areas.

For each of the first three cycles (1994-95, 1996-97 and 1998-99), two cross-sectional files were produced: general and health. The general file has socio-demographic and some health information for each household member. The health file contains additional, in-depth information about one randomly selected household member. Starting in 2000-01, the NPHS became strictly longitudinal, and the two questionnaires were combined.

In addition to the cross-sectional information, a longitudinal file was produced. In 1994-95, a member from each participating household was randomly selected and the resulting panel of 17,276 was followed over time. Response rates were 92.8% in 1996-97, 88.2% in 1998-99, 84.8% in 2000-01 and 80.6% in 2002-03.

Analytical techniques and definition of retirement
All five cycles of the NPHS were used. For people aged 45 to 57 employed full time in 1994-95 (n=1,213), the relationship between job strain and the likelihood of retirement (the event of interest) was examined. Only individuals completing all five cycles and who either stayed in the workforce or retired in subsequent cycles were selected. Those leaving the workforce for other reasons, including health, were excluded (see Allison 1995, 227 for details on this method). The competing risks approach used allows a focus on events of interest only.

The proportional hazards model allows timing of events and their association with various characteristics to be studied. With this method, "each individual's survival history is broken down into a set of discrete time units that are treated as distinct observations. After pooling these observations, the next step is to estimate a binary regression model predicting whether an event did or did not occur in each time unit." (Allison 1995, 211-12).

Time elapsed since the first cycle (in terms of number of cycles) was included as a continuous variable to correct for the greater the likelihood of retirement with passing time. For each person-year, that variable ranged from 1 to 4.

Many but not all factors in the model were allowed to change over the period since it is more realistic, for example, to assume that the risk of retirement in 2002-03 was related to health status or income in 2000-01 rather than 1994-95. Specifically, three broad categories were created: those fixed at their 1994-95 values, those with two values (1994-95 and 2000-01), and those with four. Factors fixed at their 1994-95 values were sex, place of birth, and education. Variables with four values were self-rated health status, presence of children under 13 (yes/no), marital status (married/not married), income adequacy (see below), class of employment (self-employed/employee), industry, occupation, and province. Job strain was asked only in 1994-95 and 2000-01. In the model including interaction terms, occupation was used for the same periods.

Construction of the job strain variable

Seven questions measured demand and autonomy levels:

> Please tell me if you strongly agree (1), agree (2), neither agree nor disagree (3), disagree (4), or strongly disagree (5).
>
> *Psychological demands*
>
> 1. Your job is very hectic (reversed scores).
> 2. You are free from conflicting demands that others make.
>
> *Control*
>
> 3. Your job requires that you learn new things (reversed scores).
> 4. Your job requires a high level of skill (reversed scores).
> 5. Your job allows you freedom to decide how you do your job (reversed scores).
> 6. Your job requires that you do things over and over.
> 7. You have a lot to say about what happens in your job (reversed scores).

To estimate job strain, the demand items were averaged. The five measuring autonomy and latitude for decision making were also averaged. Average demand was then divided by average autonomy. Individuals whose jobs were not psychologically demanding and who had a high level of autonomy had the lowest scores for job strain (0.2). In contrast, those whose jobs were psychologically very demanding and who had little autonomy or latitude for decision making had the highest scores. In summary, the higher the score, the greater the level of job strain experienced.

The **adequacy of income** variable used in this study classifies the total household income into 3 categories based on total household income and the number of people living in the household.

Lowest and lower-middle income	Less than $30,000 (1 or 2 persons) Less than $40,000 (3 or 4 persons) Less than $60,000 (5 or more persons)
Upper-middle income	$30,000 to $59,999 (1 or 2 persons) $40,000 to $79,999 (3 or 4 persons) $60,000 to $79,999 (5 or more persons)
Highest income	$60,000 or more (1 or 2 persons) $80,000 or more (3 or more persons)

definition in *Data source and definitions*). Not surprisingly, the older people were at the beginning of the period, the greater the likelihood they would have been retired eight years later. For example, of those aged 55 to 57 in 1994-95, 38% had retired, compared with only 6% of those aged 45 to 47. However, age is only one determinant of retirement, and multivariate analysis allows an examination of the relative importance of various factors, including job strain.

Overall, individuals who experienced high job strain were not significantly more likely to retire than individuals who experienced low strain (Table, first column). While the propensity to retire for individuals experiencing high levels of job strain appears greater, it failed to be statistically significant (p=0.07).

Does this mean that job quality is not related to the decision to retire? Previous research has shown that the relationship between job characteristics (autonomy, use of skills, demands) and health outcomes was not the same for every occupation (Pousette and Johansson Hanse 2002). For example, lack of autonomy may have negative consequences for some types of job but not for others. Accordingly, a supplementary model was run (Table, column 2) and found support for this notion.

Individuals in managerial, professional or technical jobs who expressed high job strain were much more likely to retire than those who expressed low job strain (Chart). For workers in two other occupational groups (sales/services/clerical and blue-collar occupations), job strain was not related to retirement.

Why are managers, professionals and technicians more affected? Perhaps they have different expectations toward their job and their role within the workplace. Many individuals with higher levels of education expect their job to offer a fair amount of latitude and a chance to use their competencies and professional skills. Also, since managers, professionals and technicians generally have higher incomes and are more likely to be covered by a pension plan, those in high-pressure jobs may be less hesitant to retire.

Managers and professionals are also more likely to return to work after retirement (Schellenberg, Turcotte and Ram, forthcoming). With more options for future employment, they may be more willing to leave a job they find unsatisfactory.

In any case, managers, technicians and professionals were much more likely to retire from their job if they felt they had low autonomy, lacked the opportunity for professional development, and were in a hectic job with conflicting demands.

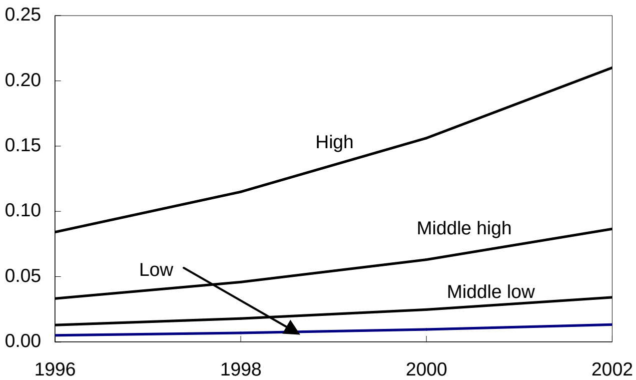
Certain well-known socio-economic variables are related to retirement. For example, the self-employed were about half as likely as employees to retire. The self-employed are not covered by pension plans,

Table Adjusted risk ratios for transition into retirement

	Overall	Interaction terms factored in
Sex		
Men	0.58**	0.58**
Women	1.00	1.00
Place of birth		
Outside Canada	0.56*	0.57*
Canada	1.00	1.00
Self-rated health		
Excellent	1.00	1.00
Very good	1.20	1.22
Good	1.31	1.28
Fair/poor	2.04	1.82
Highest level of schooling		
Less than high school	1.05	1.06
High school	1.17	1.19
College, trade/technical diploma	1.97*	2.07*
University degree	1.00	1.00
Presence of children		
At least one	1.28	1.27
None	1.00	1.00
Marital status		
Married	0.91	0.90
Not married	1.00	1.00
Household income adequacy		
Lowest and lower middle	0.63	0.62
Upper middle	0.78	0.79
Highest	1.00	1.00
Employment status		
Self employed	0.49*	0.50*
Employee	1.00	1.00
Industry		
Consumer services	1.23	1.32
Producer services	1.01	1.12
Public sector	1.50	1.44
Goods-producing	1.00	1.00
Province of residence		
Newfoundland and Labrador	2.43**	2.79*
Prince Edward Island	0.85	0.91
Nova Scotia	2.10*	2.23*
New Brunswick	1.49	1.56
Quebec	1.75*	1.97*
Ontario	1.00	1.00
Manitoba	0.96	1.07
Saskatchewan	1.03	0.99
Alberta	1.03	1.03
BC	1.54	1.64
Occupation		
Managerial, professional, technical	0.68	0.11**
Clerical, sales	0.70	0.78
Blue collar	1.00	1.00
Job strain		
All occupations	1.64	1.06
Managerial, professional, technical	-	6.79*
Clerical, sales, blue-collar	-	0.84
Age and control variable for cycle		
Cycle	1.37**	1.39**
Age	1.27**	1.27**

Source: National Population Health Survey, 1994 to 2002
** Significantly different from the reference group p<0.05, ** p<0.01.*
Reference category

Chart Predicted probabilities of retirement for managers, professionals and technicians by level of job strain



A low score for job strain is defined as 0.2, a middle-low score as 0.7, a middle-high score as 1.2, and a high score as 1.7.

making it difficult for them to retire unless they have accumulated considerable savings and wealth (Hayward, Friedman and Chen 1998). In addition, the self-employed generally have more control over their work schedule, allowing them the attractive option of easing into retirement by gradually reducing the number of hours they work. If such an option were offered to employees, many considering retirement might possibly also choose to continue working (Morissette, Schellenberg and Silver 2004).

Consistent with other research on retirement (Schellenberg 2004), immigrants were significantly less likely to retire than the Canadian-born. Among immigrants working full time in 1994-95, 13% had retired by 2002-03, compared with 19% of the Canadian-born. Even when other factors were taken into account, the association between immigration status and the likelihood of retirement remained significant (Table). Immigrants generally arrive in Canada at a later stage in their career, making it more difficult for them to accumulate sufficient years of work to consider early retirement.

Past studies indicate that the relationship between level of education and retirement is ambiguous. While a higher level of education usually favours a better economic outcome and hence the possibility of leaving the labour market earlier, it may also offer more non-economic rewards and opportunity for advancement, encouraging workers to remain in the labour market longer (Kosloski, Ekerdt and DeViney 2001). Overall, the present results are fairly consistent with previous findings and show that workers who had completed college were more likely to retire than those with a university degree. However, the latter did not differ from those whose highest level of schooling was elementary or high school.

Similar to what previous studies have found (Hayward and Hardy 1985), self-perceived fair or poor health was related to retirement. However, this result just failed to reach statistical significance ($p = 0.0501$). This is partly because those who did not work because of illness or disability, and who are sometimes considered retirees in other studies, were censored in the model (see *Data source and definitions*). A supplementary analysis in which illness/disability was the event of interest (versus staying in the labour market) supported the hypothesis that health is strongly related to leaving the labour market earlier among near-retirees. Those in fair or poor health were 13 times more likely to quit work because of illness or disability than those in excellent health (results not shown).[1]

Men were less likely to retire early than women (15% versus 22%), the association remaining significant when all other factors in the multivariate analysis were taken into account. Some authors have suggested that the effect of job strain on health may be different for men and women (Piltch et al. 1994), but supplementary models showed that the correlation between job strain and the likelihood of retirement is very similar for both sexes (results not shown).

Workers in Quebec, Newfoundland and Labrador, and Nova Scotia were more likely to retire early than those in Ontario. These three provinces had the highest unionization rates in Canada in 2003 (Akyeampong 2004). Being a member of a union, and therefore having pension coverage, significantly increases the possibility of taking early retirement.

Conclusion

Lack of control combined with too many job demands significantly increases the likelihood of early retirement for individuals in managerial, technical and professional occupations. Previous studies found that expected age of retirement was lower for individuals expressing dissatisfaction with their job (Kim and Hong 2001; Adams 1999). This study confirmed these findings by examining actual retirement behaviours as opposed to expectations.

With the retirement of the baby-boom generation imminent, increasing attention is being paid by employers and policy makers to strategies that could encourage older workers to remain in the workforce. While measures such as increasing salaries or reducing work hours have been proposed, the possibility of greater job autonomy has rarely been considered. Employers might find they could retain some older workers if they offered them more control over their daily tasks. If more autonomy were not possible, fewer demands might also encourage older workers to remain on the job.

Perspectives

Note

1 In the sample aged 45 to 57 and working full time in 1994-95, 7% had left the labour market because of illness or disability by 2002-03. These individuals are sometimes treated as retirees in other studies. In this study, a strict definition of retirement, limited to respondents who said that they were not working because they were retired, was used. A supplementary analysis that combined those who left the labour market for illness *or* for retirement as the event of interest was conducted. The conclusions about the relationship between job strain and retirement/illness remained the same: For managers, professionals and technicians, the greater the level of job strain, the greater the likelihood of leaving the labour market for retirement or illness/disability. Poor or fair health was also significantly related to leaving the labour market for illness or disability.

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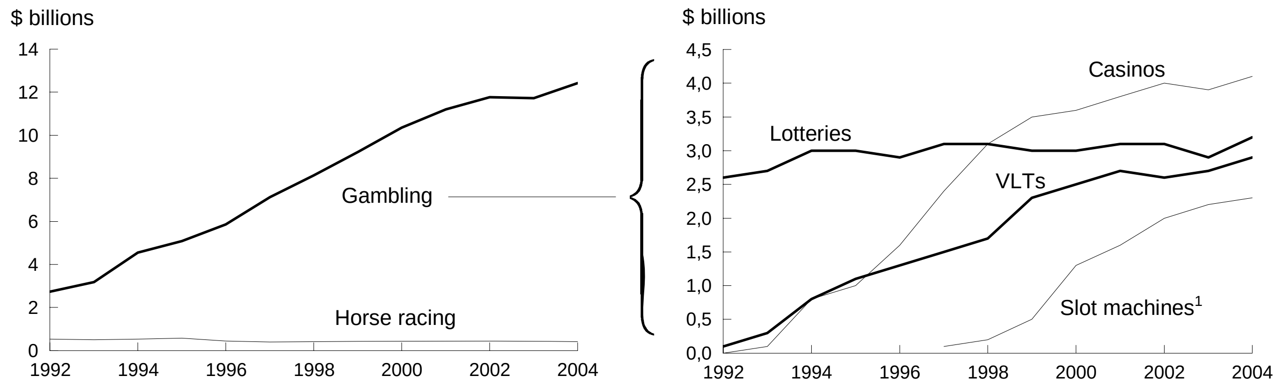
PERSPECTIVES
ON LABOUR AND INCOME

Fact-sheet on gambling

- Net revenue from government-run lotteries, video lottery terminals (VLTs), and casinos rose from $2.7 billion in 1992 to $12.4 billion in 2004.[1] Of this $12.4 billion, $5.0 billion was profit.
- Net revenue from pari-mutuel betting (horse racing) dropped from $532 million to $415 million over the same period (1992 to 2004).
- In 2004, lotteries accounted for 25% of all net non-charity gambling revenue, casinos 33%, VLTs 23%, and slot machines not in casinos 19%.
- Average gambling expenditure per person 18 and over in 2003 ranged from $101 in the three territories to $647 in Saskatchewan, with a national average of $477.[2]
- Compared with workers in non-gambling industries, those in gambling were more likely to be women (51% versus 47%), under 35 (47% versus 37%), paid by the hour (76% versus 64%), and paid less ($18 hourly versus $19).
- Employment in the gambling industry rose from 11,000 in 1992 to 54,000 in 2004.
- One in six women and men living alone reported spending money on casinos, slot machines or VLTs; however, the men spent more than twice as much as the women—$684 compared with $312.[3]
- Gambling participation and expenditure rates increased with household income. For example, 58% of households with incomes of less than $20,000 gambled in 2003 and spent an average of $312, while equivalent figures for those with incomes of $80,000 or more were 79% and $725.

Net revenue from government-run gambling has increased steadily.



Source: National Accounts

1 Refers to ones found outside government-run casinos.

Gambling revenues and profits

	Gambling revenue[1]		Gambling profit[2]		Share of total revenue[3]		Expenditure per capita (18 +)[4]	
	1992	2003	1992	2003	1992	2003	1992	2003
	$ millions (current)				%		$	
Canada	**2,734**	**11,724**	**1,680**	**6,510**	**1.9**	**5.6**	**128**	**477**
Newfoundland	80	202	42	107	2.3	5.2	189	490
Prince Edward Island	20	34	7	20	2.7	3.4	209	322
Nova Scotia	125	362	72	165	2.8	5.8	180	490
New Brunswick	117	205	49	124	2.7	3.7	209	345
Quebec	693	2,708	472	1,432	1.8	4.9	128	456
Ontario	853	4,583	529	2,080	1.9	6.4	106	484
Manitoba	153	475	105	304	2.5	5.0	186	542
Saskatchewan	62	483	39	311	1.1	6.5	86	647
Alberta	225	1,545	125	1,274	1.6	6.9	118	645
British Columbia	403	1,145	239	689	2.2	4.3	153	349
Yukon, Northwest Territories and Nunavut	5	7	1	4	0.3	0.4	82	101

Sources: National Accounts, Public Institutions (Financial management statistics) and post-censal population estimates.

1 Total revenue from wagers on government controlled lotteries, casinos and VLTs, minus prizes and winnings.

2 Net income of provincal governments from total gambling revenue, less operating and other expenses (see Data sources and definitions*).*

3 The 2003 share of total revenue calculation is based on 2003 gambling revenue and 2002 total provincial revenue. The 2003 provincial revenue will be available autumn 2005.

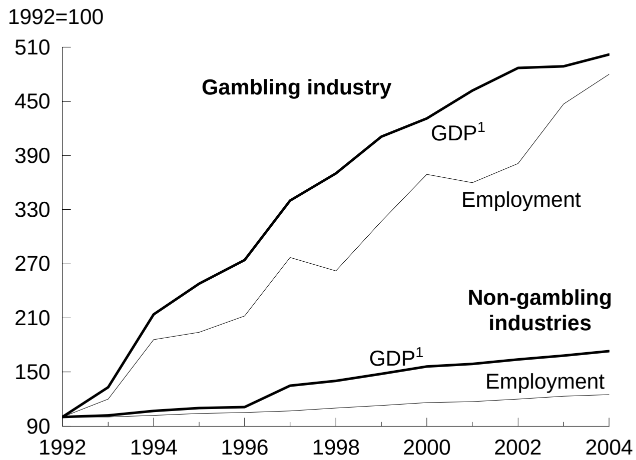
4 Net wagers; persons 18 and over were selected as this is the legal age of gambling in most provinces.

Characteristics of workers

	Gambling		Non-gambling	
	1992	2004	1992	2004
		'000		
Total employed	**11**	**54**	**12,708**	**15,896**
Sex		%		
Men 35	49		55	53
Women	65	51	45	47
Age				
15 to 34	58	47	45	37
35 and over	42	53	55	63
Education				
High school of less	67	46	57	45
Postsecondary certificate or diploma	21	37	27	34
University degree	F	17	16	21
Work status				
Full-time	59	86	81	81
Part-time	41	14	19	19
Provinces				
Atlantic provinces	8	4	7	7
Quebec	F	18	24	23
Ontario	28	46	39	40
Prairie provinces	30	19	17	18
British Columbia	25	14	13	13
Class of worker				
Employee	99	97	85	85
Self-employed	F	3	15	15

Source: Labour Force Survey

Gambling outpaced other industries.



Sources: Labour Force Survey; National Accounts

1 *The price, at basic prices, of the goods and services produced. The GDP figures for the gambling industry refer strictly to wagering activities, such as lottery ticket sales, VLT receipt sales, and bets at casinos. Other economic spinoffs, such as hotel and restaurant business, security services, or building and equipment maintenance are not included.*

Characteristics of jobs

	Gambling		Non-gambling	
	1997	2004	1997	2004
		'000		
Employees[1]	**30**	**52**	**11,293**	**13,446**
		%		
Unionized[2]	27	31	33	32
Non-unionized	73	69	67	68
Permanent job	90	93	89	87
Temporary job	10	7	11	13
Usually receive tips	27	26	7	7
No tips	73	74	93	93
Paid by the hour	80	76	61	64
Not paid hourly	20	24	39	36
Average hourly earnings[3]		$		
Men: full-time	13.34	20.22	17.80	21.10
Women: full-time	12.93	16.34	14.71	17.95

Source: Labour Force Survey

1 *More detailed questions on employees were introduced with the 1997 revision of the Labour Force Survey.*

2 *Includes persons who are not union members, but whose jobs are covered by collective agreements.*

3 *Includes tips and commissions.*

Household expenditures on gambling activities

	At least one gambling activity		Government lotteries		Other lotteries/raffles, etc.		Casinos, slot machines and VLTs		Bingos	
	$	%	$	%	$	%	$	%	$	%
All households										
1998	462	77	251	68	81	34	432	20	700	10
1999	499	76	246	67	76	32	631	20	655	10
2000	492	74	245	64	84	31	546	21	743	9
2001	513	72	257	62	98	30	554	20	815	9
2002	570	73	263	63	129	30	679	21	905	8
2003	506	74	243	66	96	29	670	19	799	8
One-person households[1]	367	64	195	55	90	18	491	16	521	7
Men	444	67	243	60	117	18	684	16	714	3
18 to 44	391	64	198	55	78	18	516	22	777	2
45 to 64	449	74	243	70	107	18	1,169	12	172	4
65 and over	558	60	346	54	230	16	518	9	1,527	4
Women	291	61	143	50	66	18	312	15	467	10
18 to 44	178	61	92	53	59	19	245	14	318	5
45 to 64	264	70	161	61	80	22	276	17	296	8
65 and over	353	56	149	42	57	16	356	15	550	13
All households										
Newfoundland	457	76	255	65	90	37	378	11	688	15
Prince Edward Island	403	73	199	59	82	47	557	10	700	12
Nova Scotia	515	75	277	63	65	43	433	20	836	11
New Brunswick	495	74	259	66	57	35	568	12	836	13
Quebec	380	79	236	75	49	18	456	16	536	8
Ontario	545	71	243	63	111	28	645	21	951	7
Manitoba	537	72	226	60	88	36	579	26	611	11
Saskatchewan	448	76	223	61	91	50	433	24	640	9
Alberta	762	70	252	57	126	36	1,361	18	1,367	7
British Columbia	503	71	246	64	104	32	855	16	578	5
Income after tax										
Less than $20,000	312	58	165	50	75	12	446	10	461	9
$20,000 to $39,999	407	72	224	65	69	24	395	16	843	8
$40,000 to $59,999	483	78	253	70	99	33	513	19	946	7
$60,000 to $79,999	665	83	263	75	101	39	1,024	26	674	7
$80,000 and over	725	79	307	68	123	42	917	27	1,209	5

Source: Survey of Household Spending

Note: Expenditures are per spending household. Unless otherwise indicated, figures are for 2003.

1 Using one-person households allows examination of individual characteristics. Persons 18 and over were selected as this is the legal age for gambling in most provinces.

Household expenditure on all gambling activities by income groups, 2003

	Average expenditure			Gaming as % of total income	
	All house-holds	Reporting house-holds	Per-centage reporting	All house-holds	Reporting house-holds
	$	$	%	%	%
Income after tax	**373**	**506**	**74**	**0.6**	**0.8**
Less than $20,000	180	312	58	1.3	2.2
$20,000 to 39,999	294	407	72	1.0	1.4
$40,000 to 59,999	377	483	78	0.8	1.0
$60,000 to 79,999	550	665	83	0.8	1.0
$80,000 and over	571	725	79	0.5	0.7

Source: Survey of Household Spending

■ Notes

1 Refers to total money wagered on non-charity lotteries, casinos and VLTs, minus prizes and winnings.

2 Survey of Household Spending (SHS) and National Accounts rankings of provincial expenditures differ, in part because the SHS includes both charity and non-charity gambling activity.

3 The expenditure figures are not adjusted for any winnings. As well, households consistently under-report the amount of money they spend on gambling. Comparisons with Lottery Corporation figures, for example, have shown that households under-report their government lottery purchases by more than 50%.

Data sources and definitions

Labour Force Survey: a monthly household survey that collects information on labour market activity, including detailed occupational and industrial classifications, from all persons 15 years and over.

National Accounts: The quarterly Income and Expenditure Accounts (IEA) is one of several programs constituting the System of National Accounts. The IEA produces detailed annual and quarterly income and expenditure accounts for all sectors of the Canadian economy, namely households, businesses, governments and non-residents.

Survey of Household Spending: an annual survey that began in 1997 and replaced the Family Expenditure Survey and the Household Facilities and Equipment Survey. It collects data on expenditures, income, household facilities and equipment, and other characteristics of families and individuals living in private households.

The **Canadian Community Health Survey** (CCHS) provides regular and timely cross-sectional estimates of health determinants, health status, and health system utilization. The initial year (2000) and every odd year thereafter (from 2001) collects generic health information from 130,000 respondents. During the even years, the survey sample is smaller (roughly 30,000) and addresses a specialized topic. Cycle 1.2, on Mental Health and Well-Being, was held in 2002. Its main objective was to provide national and provincial estimates of major mental disorders and problems, and to illuminate the issues associated with disabilities and the need for and provision of health care. The survey contained questions on a wide range of disorders and problems, including a section on 'pathological gambling'.

The target population of the CCHS 1.2 excludes those living in the three territories, individuals living on reserves or crown land, residents of institutions, full-time members of the Armed Forces, and residents of some remote regions.

Gambling industries: This industry group covers establishments primarily engaged in operating gambling facilities, such as casinos, bingo halls and video gaming terminals; or providing gambling services, such as lotteries and off-track betting. It excludes horse race tracks and hotels, bars and restaurants that have casinos or gambling machines on the premises.

Gambling profit: net income from provincial and territorial government-run lotteries, casinos and VLTs, after prizes and winnings, operating expenses (including wages and salaries), payments to the federal government and other overhead costs are deducted.

Gambling revenue: all money wagered on provincial and territorial government-run lotteries, casinos and VLTs, less prizes and winnings. Gambling revenue generated by and for charities and on Indian reserves is excluded.

Government casino: a government-regulated commercial casino. Permits, licences and regulations for casinos, both charity and government, vary by province. Government casinos, now permitted in several provinces, also vary by the degree of public and private involvement in their operations and management. Some government casinos are run entirely as crown corporations, while others contract some operations—for example, maintenance, management or services—to the private sector.

Video lottery terminal (VLT)**:** coin-operated, free-standing, electronic game of chance. Winnings are paid out through receipts that are turned in for cash, as opposed to cash payments from slot machines. Such terminals are regulated by provincial lottery corporations.

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