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## COMPUTER USE AMONG IMMIGRANTS IN THE WORKPLACE: HOW DOES IT VARY BY GENDER, EDUCATIONAL LEVEL, ETHNICITY, OCCUPATION AND TENURE?

By

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### KEY POINTS:

- In general, immigrants use computers at their current workplace less than the Canadian-born, though the difference between Canadian-born and established immigrants is small.

- Word processors, communications applications and spreadsheets are the most popular computer applications. Immigrants and the Canadian-born have similar probability of using these applications at their current workplace.

- For male employees, a larger proportion of immigrants use a computer in comparison to the Canadian-born. For female employees, a larger proportion of Canadian-born use computers in their current workplace in comparison to immigrants.

- More highly educated individuals have a higher probability of computer use at work.

- In general, the Canadian-born use a computer at work more than immigrants across all employment tenure categories.

- Managers and professionals have higher probability of computer use than non-managers and non-professionals. For non-managers and non-professionals, the Canadian-born have higher probability of computer use than immigrants. For managers and professionals, the findings are mixed.

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## *INTRODUCTION TO TIEDI*

The Toronto Immigrant Employment Data Initiative (TIEDI) seeks to assist organizations whose mandate includes the better integration of immigrants into Toronto's labour force. Such partner organizations include immigrant service agencies and advocacy groups, labour organizations, regulatory bodies, professional associations, training organizations, and credential assessment agencies.

The purpose of the project is to provide organizations with free access to statistical data and analysis on various aspects of immigrant labour market integration. The goal is to help organizations access the quantitative data they need in order to: identify priorities, develop programs and services, compose proposals and reports, and carrying out advocacy and public education endeavours.

TIEDI provides a unique service in which community organizations' data needs are met by a team of academic researchers and student analysts. Our partners define the data that they need - the project is thus driven by their agendas and not by academic research priorities.

TIEDI is based at York University, with a team of academic researchers drawn from York, the University of Toronto, and Ryerson University. Core members of the project team also include representatives of the Ontario Council of Agencies Serving Immigrants (OCASI), the Toronto Region Immigrant Employment Council (TRIEC) and World Education Services. The project is funded by the Social Sciences and Humanities Research Council of Canada under its Knowledge Impact in Society program, and by York University.

The datasets used by the project include a range of large-scale surveys such as the Census, the Longitudinal Survey of Immigrants to Canada, the Ethnic Diversity Survey, the Workplace and Employee Survey, the Survey of Labour and Income Dynamics, the Labour Force Survey and the Permanent Residents Data System.

TIEDI Analytical Reports provide tabulations of data, some brief analysis and contextualization, and some necessary caveats about the limitations of the data and analysis. Since the data presented have not been treated to detailed statistical analysis, any conclusions must be seen as preliminary and as starting points for further, more detailed, research.

For further information, contact the TIEDI Principal Investigator, Dr Philip Kelly (pfkelly@yorku.ca), or the TIEDI Project Coordinator, Stella Park (pstella@yorku.ca).

*While the research and analysis are based on data from Statistics Canada, the opinions expressed do not represent the views of Statistics Canada.*

## RESEARCH QUESTION

Are immigrants more likely to use a computer in the workplace compared to the Canadian-born? How does it vary by gender, educational level, ethnicity, occupation and employment tenure?

## BACKGROUND

The occupational attainment and mobility of immigrants in host countries are well discussed in the literature. In general, immigrants have an occupational disadvantage compared to Canadian-born workers, partly because immigrants have difficulty transferring their educational skills to their host country. Studies have shown that individual and structural factors affect the occupational mobility of Canadian immigrants (Basran and Li 1998; Reitz 2007). Four major individual factors include ability to meet occupational standards, lack of Canadian experience, proficiency in English and French and period of residence in Canada. Major structural factors include the recognition of the foreign credentials and experience by host country employers, and experiences of discrimination.

In order to assess the occupational integration of immigrants, this report asks whether immigrants and the Canadian-born have equal access to jobs that incorporate high levels of occupational skill. Since measuring access to upper-level occupations is difficult, in this study we measure computer-use in the work-place as a proxy measurement for high-skilled jobs. Literatures in work and technology have shown that workers benefit from computer use. Pabilonia and Zoghi (2005) conclude that wages for workers who use computers grow faster than those who do not use computers for different functions at work. In a subsequent paper, Pabilonia and Zoghi (2007) find that skill-biased technical change explains the increasing wage of computer users. They also found that highly skilled workers, such as college graduates, managers and professionals earned more from adoption of computers. Examining the relationship between computer ownership and entrepreneurship, Fairlie (2006) found that people who had access to a home computer are more likely to become entrepreneurs and create a variety of businesses beyond the IT industry.

Computer use has been found to benefit all workers, but also immigrants in particular. Using data from the 2001 Census of Population and Housing in Australia, Chiswick and Miller (2005) find that computer use is one way that immigrants can increase the transferability of their pre-migration skills. Ono and Zavodny (2008) investigated the relationship between computer use and English ability using U.S. data and found that computer competency appeared to be a key factor in the polarization of the U.S. labour market. Assessing inequality in computer use between immigrants and the native-born is thus important because of the influence of computer competency on the employment and educational opportunities of immigrants. Many new immigrants have an IT background, but they may not use it when they come to Canada, while a lack of IT access and skills may be a barrier to integration (Boyd and Thomas, 2001).

This report investigates whether immigrants have an equal probability of computer use when compared to the Canadian-born. Similar to the studies mentioned above, a computer includes a microcomputer, mini-computer, personal computer, mainframe computer or laptop that can be programmed to perform a variety of operations (Statistics Canada, 2003).

*THE DATA: WORKPLACE AND EMPLOYEE SURVEY (WES)*

The Workplace and Employee Survey (WES) 2005 is designed to explore a broad range of issues relating to employers and their employees. The survey is unique in that employers and employees are linked at the microdata level; employees are selected from within sampled workplaces. The WES 2005 collected data from 24,197 employees and 6,693 workplaces.

The WES offers potential users several unique innovations: chief among these is the link between events occurring in workplaces and the outcomes for workers. In addition, it is a longitudinal survey, which allows for a clearer understanding of changes over time. The WES permits the examination of the effect of workplace characteristics, in addition to industry and firm size effects (Statistics Canada, 2009).

This report uses survey data collected in 2005. The time period leading up to the WES data collection in 2005 was marked by economic growth, strong employment gains, and earnings growth in Canada (Lin, 2008: 5). Existing economic conditions (see Table 1 for basic economic data) and government policies may affect the trajectories of respondents. The outcomes of the respondents presented in this report may not therefore be comparable to the experiences of all employed immigrants.

*Table 1: Economic Performance Indicators, Canada, 2001-2005*

|  | **2001** | **2002** | **2003** | **2004** | **2005** | **Overall average** |
|---|---|---|---|---|---|---|
| Growth in Real GNP | 1.8 % | 2.9 % | 1.9 % | 3.1 % | 3.1 % | 2.6 % |
| Unemployment Rate | 7.2 % | 7.6 % | 7.6 % | 7.2 % | 6.8 % | 7.3 % |

*Source: Maslove, 2008: 228*

The WES sample design for workplaces is based on a fixed panel of workplaces, which means that the panel is subject to attrition over time. A second concern with the use of a fixed panel design is the deterioration in the efficiency of the stratification over time as the business universe changes. Also, as with any dataset, there are issues of outliers, imputation and estimation.

A further limitation of the WES data is that the sample size restricts the use of local data. When cases are selected to limit the data to respondents from Toronto, the cell counts become too small for meaningful results.

Table 2 shows the distribution of Canadian-born, established immigrants, and recent immigrants. Canadian-born constitute the largest single group in the sample at 82.1%, followed by established immigrants at 12.2%. Recent and very recent immigrants are the smallest group at 5.7%. Together, immigrants constitute 17.9% of the sample.

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*Table 2: Distribution of Canadian-born and Immigrants by Period of Arrival, Canada*

| | Canadian-born | Immigrants | |
|---|---|---|---|
| | | Before 1991 | 1991-2003 |
| **%** | 82.1 | 12.2 | 5.7 |
| N | 10, 027, 316 | 1, 490, 536 | 697, 457 |

*Note: The numbers in the table are weighted by employee weights*

**Definitions:**
**Canadian-born**: means employees who were born in Canada.
**Established Immigrants:** in this case refers to immigrants who landed before 1991. The data set covers immigrants who arrived in Canada in 1945 onwards.
**Recent Immigrants:** in this case refers to immigrants who landed between 1991 and 2003.

## RESULTS

### a) Computer Use

Table 3 displays the probability of computer-use by immigrant status. The Canadian-born have the highest probability of using a computer at their current workplace at 67.8%, followed by 66.8% of established immigrants and 63% of recent immigrants. Overall, then, there is very little difference in computer use at work, based on immigrant status and length of residency.

*Table 3: Probability of Computer use for Canadian-born and Immigrants*

| | Canadian-born | Immigrants | |
|---|---|---|---|
| | | Before 1991 | 1991-2003 |
| Use of Computer (%) | 67.8 | 66.8 | 63.0 |

### b) Use of Computer Applications

Table 4 shows the applications used by employees who use a computer at their workplace. There are 14 types of applications: word processors, spreadsheets, databases, desktop publishing and form design, general management applications, communications, programming languages and development tools, specialized office applications, data analysis, graphics and presentation, computer-aided design, computer-aided engineering, expert systems, and "other".

As would be expected, word processor, communications, spreadsheet, database and specialized office applications are the most commonly used computer applications in workplaces, and their usage is not significantly different between Canadian-born and immigrants.

*Table 4: Types of applications in computer use for Canadian-born and Immigrants*

| | Canadian-born | Immigrants | |
|---|---|---|---|
| | | Before 1991 | 1991-2003 |
| Word processors | 43.2% | 43.1% | 41.1% |
| Communications applications | 41.8% | 41.2% | 36.6% |
| Spreadsheets | 36.3% | 36.6% | 36.9% |
| Specialized office applications | 32.3% | 32.8% | 30.6% |
| Databases | 29.5% | 28.2% | 29.0% |
| Graphics and presentation | 16.0% | 17.1% | 14.6% |
| General management applications | 12.5% | 11.3% | 12.6% |
| Data analysis | 11.9% | 10.8% | 12.4% |
| Desktop publishing and form design | 9.4% | 8.9% | 9.1% |
| Programming languages and development tools | 5.5% | 5.5% | 7.9% |
| Computer-aided design | 4.8% | 5.4% | 4.0% |
| Computer-aided engineering | 1.8% | 3.0% | 1.6% |
| Expert systems | 2.8% | 2.8% | 2.1% |
| Other | 11.0% | 8.4% | 10.3% |

*Note: "Other" means types of computer applications other than those mentioned above.*

## c) Computer Use by Gender

Table 5 examines the probability of computer use by gender and immigration status. Among men, recent male immigrants have the highest probability of using computers at their current workplaces, followed by established male immigrants and Canadian-born male employees. Interestingly, the reverse is true in case of women, with Canadian-born women using computers most often at work, followed by established immigrants and recent immigrants.

*Table 5: Computer Use Probability by Gender for Canadian-born and Immigrants*

| | Sample Distribution of Gender | Computer Use Probability: Canadian-born | Computer Use Probability: Immigrants | |
|---|---|---|---|---|
| | | | Before 1991 | 1991-2003 |
| Male (%) | 47.8 | 44.0 | 47.3 | 52.8 |
| Female (%) | 52.2 | 54.9 | 51.8 | 45.4 |

## d) Computer Use by Education

Table 6 explores computer use at current workplaces according to the education level of employees. Among all sampled employees in the survey, 52.2% have some postsecondary education and 21.3 % have at least university education. Only about one quarter of sampled employees have only high school or less than high school education.

*Table 6: Computer Use Probability by Education for Canadian-born and Immigrants*

| | Sample Distribution of Education in WES | Computer Use Probability: Canadian-born | Computer Use Probability: Immigrants | |
| --- | --- | --- | --- | --- |
| | | | Before 1991 | 1991-2003 |
| Less Than High School (%) | 10.0 | 29.7 | 27.1 | 13.0 |
| High School (%) | 16.6 | 57.9 | 36.4 | 36.5 |
| Some Postsecondary | 52.2 | 70.1 | 69.8 | 58.4 |
| University | 21.3 | 91.8 | 88.4 | 80.8 |

Table 6 shows that the likelihood of using computers in the workplace is very strongly correlated with levels of education. For all groups (Canadian-born and immigrant), a large majority of university degree holders are using computers at work. At the same time, recent immigrants are consistently seen to be using computers less than established immigrants or the Canadian-born.

### e) Computer Use by Ethnic Group

Table 7 shows the probability of using computers at current workplaces, according to ethnic groupings. In the sample, White employees account for about 77.4% of all surveyed employees. The East Asian, Filipino and South East Asian groups make up 5.4% of the sample. Together, Arab, West Asian, North African, Black, East Indian and Latin American employees account for 5% of the sample. 'Other ethnic groups' make up the remaining 12.2% of the sample.

The pattern in Table 7 varies across groupings, but the most striking disparity is between Canadian-born and immigrants in the East Asian, Filipino and South East Asian group. In this group, the likelihood of using a computer is much higher among Canadian-born (88.1%) than among immigrants. There is also a clear disparity between Canadian-born Whites (at 65.3% computer use) and Canadian-born visible minorities whose computer use is generally higher.

*Table 7: Computer use Probability by Ethnic Group for Canadian-born and Immigrants*

| | Sample Distribution of Ethnic Groups | Computer Use Probability: Canadian-born | Computer Use Probability: Immigrants | |
| --- | --- | --- | --- | --- |
| | | | Before 1991 | 1991-2003 |
| Arab, West Asian or North African and Black (%) | 2.0 | 68.5 | 60.6 | 59.0 |
| East Asian, Filipino and South East Asian (%) | 5.4 | 88.1 | 54.6 | 59.1 |
| East Indian and Latin American (%) | 3.0 | 75.2 | 71.1 | 56.6 |
| White (%) | 77.4 | 65.3 | 70.2 | 65.1 |
| Other Ethnic Group (%) | 12.2 | 67.5 | 69.7 | 80.0 |

### f) Computer Use by Job Tenure

Table 8 examines the probability of respondents using computers at their current workplace according to employment tenure and immigrant status. Among all sampled employees, 27.9% have 2 years or

less tenure with their current employers, 16.1% have 3 or 4 years, 12.2% have 5 or 6 years, and 43.7% have more than 6 years.

*Table 8: Computer Use by Tenure for Canadian-Born and Immigrants*

| | Sample Distribution of Tenure | Computer Use Probability: Canadian-born | Computer Use Probability: Immigrants | |
|---|---|---|---|---|
| | | | Before 1991 | 1991-2003 |
| 0-2 Years With Current Employer (%) | 27.9 | 59.9 | 60.0 | 60.4 |
| 3-4 Years With Current Employer (%) | 16.1 | 68.2 | 64.1 | 66.9 |
| 5-6 Years With Current Employer (%) | 12.2 | 69.1 | 56.3 | 64.8 |
| More Than 6 years With Current Employer (%) | 43.7 | 72.2 | 72.9 | 61.6 |

Among Canadian-born, computer usage does appear to increase with length of tenure in a job, but the correlation is much less clear among immigrants. Across employees with similar periods of tenure, there is little correlation between computer use and immigration status or period of residency in Canada.

**g) Computer Use by Occupation**

Table 9 shows rate of computer use by occupation. Among all sampled employees, 29.8% of them are managers and professionals, while the remaining 70.2% of sampled employees are in technical fields/trades, marketing/sales, clerical/administrative work, production work with no trade/certification, or operation and maintenance.

*Table 9: Computer use by Occupation for the Canadian-Born and Immigrants*

| | Sample Distribution of Occupation | Computer Use Probability: Canadian-born | Computer Use Probability: Immigrants | |
|---|---|---|---|---|
| | | | Before 1991 | 1991-2003 |
| Managers and Professionals (%) | 29.8 | 92.0 | 87.9 | 95.3 |
| Technical Fields/Trades, Marketing/Sales, Clerical/Administrative Work, Production work with no trade/certification, Operation and Maintenance (%) | 70.2 | 57.9 | 55.8 | 47.0 |

As would be expected, managers and professionals have a very high probability of using computers at their current workplaces. Approximately 90% of Canadian-born and immigrant managers and professionals use computers at work. Employees who work in the other occupations listed have a much lower probability of computer use than professionals and managers.

*CONCLUSIONS*

It is important to note that this report has tabulated the relationship between computer use in the workplace alongside several other employee characteristics. A more complete analysis would require many of these variables to be combined in order to establish their relative importance. It is worth remembering that although many studies demonstrate a relationship between computer use and employee earnings, the use of a computer cannot in itself be assumed to imply better terms of employment. It should also be pointed out that the data used in this report is from 2005, and even in the last 7 years the nature of computer use and applications in workplaces has changed.

This report investigated computer use among immigrant and Canadian-born employees by types of computer application, gender, education, ethnic groups, tenure and occupation. The main findings are as follows.

- In general, immigrants use computers at their current workplace less than the Canadian-born, though the difference between Canadian-born and established immigrants is small.

- Word processors, communications applications and spreadsheets are the most popular computer applications. The Canadian-born do not have the highest probability of computer use across all types of applications.

- For male employees, immigrant groups have a higher probability of computer use in comparison to the Canadian-born. For female employees, the Canadian-born have a higher probability of computer use at their current workplace than immigrants.

- Higher education leads to a higher probability of computer use at workplaces. In all education sub-samples, the Canadian-born use computers at work the most, while established immigrants also have high probability. Employees with a university education are most likely to use computers.

- In general, the Canadian-born are more likely to use a computer than immigrants across all employment tenure sub-samples.

- Managers and professionals have much higher probability of computer use than non-managers and non-professionals. For non-managers and non-professionals, the Canadian-born have higher probability of computer use than immigrants. For managers and professionals, the findings are mixed.

*APPENDIX*

RELEVANT QUESTIONS FROM WES SURVEY QUESTIONNAIRE:

1. **46 –** Were you born in Canada?

2. **X4.1 (b)** When did you start working for this employer?

3. **46 (a)** – In what year did you immigrate to Canada?

4. **22-** Do you use a computer in your job? Please exclude sales terminals, scanners, machine monitors, etc., these are covered in another question.

5. **22 (a)** – How many hours a week do you normally spend using a computer at your job? (By this we mean using or developing computer applications, rather than just having the computer turned on.)

6. **22 (b)** – When you first started this job, how many hours a week did you normally spend using a computer?

7. **22 (c)** – What types of applications do you use? (Check all that apply.) Note: Here we are interested in what the application does, not its name

8. **44.** Gender.

9. **47.** What is the highest grade of elementary or high school (secondary school) that you have completed?

   Please report the highest grade, not the year when it was completed

10. **48.** Did you graduate from high school (secondary school)?

11. **49.** Have you received any other education?

12. **50.** What was that education?

13. **55.** Canadians come from many ethnic, cultural and racial backgrounds. From which groups did your parents or grandparents descend?

**Questionnaire** (wave 1): http://www.statcan.gc.ca/concepts/wes-emte1-eng.pdf
**Questionnaire** (wave 2): http://www.statcan.gc.ca/concepts/2000-wes-emte-1-eng.pdf
**Questionnaire** (wave 3): http://www.statcan.gc.ca/concepts/2001wes-elte1-eng.pdf
**Questionnaire** (wave 4): http://www.statcan.gc.ca/concepts/2002wes-elte-eng.pdf
**Questionnaire** (wave 5): http://www.statcan.gc.ca/concepts/2003wes-elte2-eng.pdf

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*BIBLIOGRAPHY*

Basran, Gurcharn and Li, Zong, 1998. "Devaluation of Foreign Credentials as Perceived by Visible Minority' Professional Immigrants", *Canadian Ethnic Studies/Etudes ethniques au Canada*. 30(2): 7-23.

Boyd, Monica and Thomas, Derrick, 2001. "Match or Mismatch? The Employment of Immigrant Engineers in Canada's Labor Force", *Population Research and Policy Review,* High-Skilled Migration (Apr.,2001), 20(1/2), pp:107-133.

Chiswick, Barry C, and Paul W. Miller. 2007. "Computer Skills, Destination Language Proficiency and the Earnings of Natives and Immigrants." *Review of Economics of the Household* 5(2): 129-57.

Evans, M. D. R., 1987. "Language usage and opportunity: Immigrants in the Australian Labor Market", *Sociology,* 21(2): 253-274.

Evans, M. D. R. and Kelley, Jonathan, 1986. "Immigrants's Work: Equality and Discrimination in the Australian Labour Market", *Journal of Sociology*, 22(2): 187-207.

Fairlie, Robert. 2006. "The Personal Computer and Entrepreneurship." *Management Science* 52(2):187-203.

Maslove, Allan M. ed. 2008. "Appendix B Fiscal Facts and Trends". How Ottawa Spends, 2008-2009 A More Orderly Federalism? (Montreal: McGill-Queen's University Press),pp. 211-228.

Krebs, Patak, Picot and Wannell. 2006. "The Development and Use of a Canadian Linked" Employer-Employee Survey", 2006, http://www.statcan.gc.ca/imdb-bmdi/document/2615_D2_T9_V1-eng.pdf

Lerner, Miri and Menahem, Gila, 2003. "Decredentialization and Recredentialization: The Role of Governmental Intervention in Enhancing Occupational Status of Russian Immigrants in Israel in the 1990s", *Work and Occupations,* 30(1): 3-29.

Ono, Hiroshi and Zavodny, Madeline, 2008. "Immigrants, English Ability and Digital Divide", *Social Forces,* 86(4): 1455-1479.

Reitz, Jeffrey. 2007. "Immigrant Employment Success in Canada, Part I: Individual and Contextual Causes", *International Migration & Integration*, 8, pp.11–36.

Statistics Canada, 2007. WES data dictionary, http://www.statcan.gc.ca/pub/71-221-x/4057951-eng.htm

Pabilonia, Wulff Sabrina and Zoghi, Cindy, 2005. "Returning to the Returns to Computer Use", *The American Economic Review, Papers and preceedings of the One Hundred Seventeenth Annual Meeting of the American Economic Association,* 95(2): 314-317.

Zoghi, Cindy and Pabilonia, Wulff Sabrina, 2007. "Which Workers Gain upon adopting a Computer?" *The Canadian Journal of Economics*, 40(2): 423-444.

Boyd, Monica and Thomas, Derrick, 2001. "Match or Mismatch? The Employment of Immigrant Engineers in Canada's Labor Force", *Population Research and Policy Review,* High-Skilled Migration (Apr.,2001), 20(1/2), pp:107-133.

*FURTHER READINGS:*

http://www.statcan.gc.ca/pub/88f0017m/88f0017m1996003-eng.pdf