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Abstract

This paper aims to identify the factors that may explain the effect of characteristics specific to Canadian business decision makers on technology adoption. The 2022 Survey of Advanced Technology and the National Accounts Longitudinal Microdata File are used to analyze the adoption rate of business decision makers who are women, racialized individuals and recent immigrants and compare them with the rate for decision makers who are men, non-racialized individuals and long-term residents of Canada. A Blinder–Oaxaca decomposition shows that the differences in observable characteristics between these groups of decision makers and their counterparts explain one-third of the difference in technology adoption. Certain characteristics—such as business size, industry and province—play a role in explaining the differences. Furthermore, reducing barriers to technology adoption could increase the adoption rate in the different groups of decision makers analyzed.

Keywords: technology adoption, diversity, advanced technologies

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Introduction

The adoption of advanced technologies is a strategic imperative for companies that want to succeed in competitive markets by reducing costs, expanding their product range and increasing productivity. Calculations based on the 2022 Survey of Advanced Technology (SAT) reveal that 60.6% of enterprises have adopted at least 1 of the 15 advanced technologies covered by the survey. Furthermore, of the enterprises that have adopted at least one advanced technology, 57.4% have been innovative by introducing a new or an improved product to the market or by implementing a new or an improved business process.

Technology adoption varies considerably between business decision makers based on their demographic characteristics, with notable differences according to immigrant status, ethnicity and gender.[1] The gap is widest between recent immigrants and long-term residents of Canada[2] (33.3% versus 63.2%, respectively), followed by the gap between racialized[3] and non-racialized decision makers (50.7% versus 63.5%, respectively), and that between decision makers who are women and those who are men (53.1% versus 63.3%, respectively).

The key question is whether these unconditional gaps in advanced technology adoption between different groups of business decision makers would hold once key factors affecting adoption—such as business, economic and financial characteristics, and other decision maker characteristics—are considered. Understanding the factors behind differences in advanced technology adoption can help identify targeted strategies or support mechanisms to promote more inclusive access to advanced technologies, ensuring that all businesses, regardless of their leadership's demographic profile, have the opportunity to benefit from innovation and improve their competitiveness.

A large body of literature has attempted to understand how different attributes of business decision makers can influence their propensity to adopt advanced technologies. Several papers have focused on explaining gender differences in adoption rates using behavioural models (Gefen and Straub, 1997; Venkatesh et al., 2000; Wang et al., 2009; Goswami and Dutta, 2015).[4] These models have been used in natural experiments conducted during an enterprise technology adoption process. The results suggest that businesses with a key decision maker who is a man are more likely to adopt advanced technologies than those with a key decision maker who is a woman. This gender gap in adoption rates can be attributed to a variety of factors, including the perception of attaining gains in job performance, the complexity of adopting a technology, social influence, and the organizational and technical infrastructure facilitating the adoption (MacGregor and Vrazalic, 2008; Orser and Riding, 2018). Finally, recent work by Liu and Faryaar (2024) has shown that certain firm characteristics, such as the proportion of women employees, liquidity conditions and labour productivity, also play a role in explaining differences in the use of emerging technologies between women- and men-owned firms.

To the authors' knowledge, there are no or few studies that have analyzed the effect of racialization and immigrant status in technology adoption or usage among business decision makers. In addition, most existing research focuses on small companies in limited sectors and on specific technologies, mainly related to information technology, while the present study covers companies of all sizes in a wide range of sectors and with various types of technologies. This study uses a Blinder–Oaxaca decomposition

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1. Other characteristics of the primary decision maker captured in the SAT are age, level of education, Indigenous identity, LGBTQ2+ status and disability status. Results for this paper by age and level of education are available upon request.
2. This group encompasses non-recent immigrants and Canadian-born individuals.
3. The concept of racialized individuals in this article is based on the visible minority variable in the SAT. Racialized groups exclude First Nations people, Métis and Inuit.
4. See Cai et al. (2017) for a recent meta-analysis on gender and attitudes toward technology use, covering empirical studies.

Research article
Technology adoption and diversity among Canadian business decision makers:
Evidence from the survey of advanced technology

(Blinder 1973; Oaxaca 1973) to identify the factors that may explain the effect of characteristics specific to Canadian business decision makers on technology adoption.

The paper is structured as follows. Section 2 provides an overview of the data, while Section 3 presents descriptive statistics. Section 4 describes the Blinder–Oaxaca regression model. Section 5 offers the results from the model, and Section 6 presents conclusions.

Data

The 2022 SAT collected information on the adoption of advanced technologies by Canadian businesses with more than 10 employees and sales of over $250,000 in all sectors of activity except construction.[5] Based on the SAT questionnaire, the person primarily responsible for making decisions about the business is the primary decision maker. This person could be the majority owner, chair of the board of directors or general manager.[6] In this study, recent immigrants are defined as people who have lived in Canada for five years or less.

The survey questions cover the following aspects explored in this study: the type of technology adopted, the various barriers to adoption, the measures taken to overcome barriers and the demographic characteristics of key decision makers. The SAT database is linked to the National Accounts Longitudinal Microdata File database to incorporate business financial characteristics, including the current ratio, the profit margin and labour productivity.[7]

Advanced technology as defined in the survey includes advanced material handling, supply chain and logistics technologies; advanced design and information control technologies; advanced processing and fabrication technologies; clean technologies; security or advanced authentication systems; and advanced business intelligence technologies. Emerging technology includes nanotechnologies; biotechnologies; geomatics or geospatial technologies; artificial intelligence (AI) technologies; virtual reality, augmented reality or mixed reality technologies; Internet-connected smart devices or systems; blockchain or distributed ledger technologies; robotics; advanced medical devices for human health; and additive manufacturing.

Descriptive analysis

Table 1 summarizes the differences in technology adoption rates by gender, racialization and immigrant status of business decision makers in the 15 advanced and emerging technology subgroups. The results suggest that adoption gaps are largest based on immigrant status (30.0 percentage points), followed by racialization (12.9 percentage points) and gender (10.4 percentage points). In other words, decision makers who are women, racialized individuals or recent immigrants to Canada adopt relatively less technology than their counterparts.

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5. The following industry sectors are in scope for this survey: agriculture, forestry, fishing and hunting; mining, quarrying, and oil and gas extraction; utilities; manufacturing; wholesale trade; retail trade; transportation and warehousing; information and cultural industries; finance and insurance; professional, scientific and technical services; health care and social assistance; arts, entertainment and recreation; accommodation and food services; and other services (except public administration).
6. For convenience, the study at times refers to groups based on ownership (e.g., women-owned businesses).
7. The linkage rate between the two datasets is 99.7%.

Research article

Technology adoption and diversity among Canadian business decision makers:
Evidence from the survey of advanced technology

When the technology groups are disaggregated further, it is evident that the gap in adoption rates varies by type of technology. The difference in adoption is greatest for advanced technologies such as advanced material handling, supply chain and logistics technologies; advanced design and information control technologies; clean technologies; advanced business intelligence technologies; and additional advanced technologies. For instance, the adoption gap based on racialization is 16.8 percentage points for advanced design and information control technologies.

On average, the adoption gap is largest and most significant for all three characteristics combined for advanced design and information control technologies.

Table 1

Weighted distribution of the advanced technology adoption gap by characteristics of key business decision makers

Type of advanced technology	Gender adoption gap (women)	Racialization adoption gap (racialized individuals)	Immigrant status adoption gap (recent immigrants)
	percentage points		
(AI) Artificial intelligence technologies	-0.6	3.0 ***	0.2
(AT) Additional advanced technologies	-10.3 ***	-6.8 *	-10.9 *
(BC) Blockchain or distributed ledger technologies	-0.5	0.3	1.6
(BI) Advanced business intelligence technologies	-8.2 ***	-7.5 **	-6.9
(BT) Biotechnologies	-0.6	0.4	1.2
(CT) Clean technologies	3.8	-10.0 **	-13.2 *
(DI) Advanced design and information control technologies	-9.8 ***	-16.8 ***	-18.6 ***
(GG) Geomatics or geospatial technologies	-2.3 ***	1.3	-0.8
(IT) Internet-connected smart devices or systems	1	-4.0 **	-2
(MD) Advanced medical devices for human health	0.3	3.2	0.9
(MH) Advanced material handling, supply chain and logistics technologies	-1.9	-6.1 ***	-0.3
(NA) Nanotechnologies	0.9	2.7	-0.6 *
(PF) Advanced processing and fabrication technologies	-1.6	-1.1	-1.3
(RB) Robotics	0.7	-0.6	0.8
(VR) Virtual reality, augmented reality or mixed reality technologies	-0.5	1	1.6

* significantly different from reference category (p < 0.10)

** significantly different from reference category (p < 0.05)

*** significantly different from reference category (p < 0.01)

Notes: Adoption gap values are in percentage points and are obtained by weighting businesses according to their probability of selection. The p-value is used to check whether technology adoption by key decision makers in enterprises with a targeted characteristic differs from that of counterparts. The adoption gap is the difference between the adoption rate of a select technology between decision makers who are women and men, racialized individuals and non-racialized individuals, and recent immigrants and long-term residents of Canada.

Source: Calculated by the authors using the 2022 Survey of Advanced Technology.

Of the 15 technologies listed in Table 1, women decision makers show significantly lower adoption rates than men in four technologies, with the largest gap observed in the additional advanced technologies category (10.3 percentage points). Additional advanced technologies include automated product and part identification, executive dashboards for analysis or decision making, software as a service, and inter-company computer networks. Women decision makers do not exhibit significantly higher adoption rates than men for any of the 15 technologies.

Racialized decision makers have significantly lower adoption rates for six technologies than non-racialized decision makers, particularly for advanced design and information control technologies (16.8 percentage points). Advanced design and information control technologies include virtual product development or modelling software, enterprise resource planning, customer relationship management software, transportation management systems, warehouse management systems, manufacturing execution system and resource planning, computer integrated manufacturing, and software for demand forecasting or demand planning. By contrast, for AI technologies, racialized decision makers have a significantly higher adoption rate than their non-racialized counterparts.

Decision makers who recently immigrated to Canada exhibit a significantly lower adoption rate than long-term residents for four technologies, particularly additional advanced technologies, where the gap was 18.6 percentage points. Decision makers who are recent immigrants to Canada do not have a significantly higher adoption rate than their long-term resident counterparts for any of these technologies.

The above findings highlight the disparities in technology adoption trends among different demographic segments of primary business decision makers.

Regression-based analysis: Blinder–Oaxaca decomposition

To identify the factors influencing the difference in advanced technology adoption rates between two distinct groups of business decision makers, a Blinder–Oaxaca decomposition is applied to the 2022 SAT data. It separately estimates the correlates of the probability of advanced technology adoption for each of the groups of business decision makers. Then, the difference in adoption rates between the two groups can be decomposed into the contribution of the difference in their respective characteristics (called the endowment effect) and the contribution of the unexplained effect.

Let i and j be two distinct groups: men and women, non-racialized people and racialized people, and recent immigrants and long-term residents of Canada. Let Y be the probability of adopting at least one advanced technology for groups i and j of business decision makers:

$$Y^i = X^i \beta^i + u^i \quad (1)$$

$$Y^j = X^j \beta^j + u^j \quad (2)$$

where X is composed of all other decision maker characteristics (other than i and j) and enterprise data such as industry, employment, certain financial data (the current ratio, the profit margin and labour productivity), province of operation and obstacles to innovation; β is the vector of returns to endowment; and u is the standard residual term.[8,9] Once the above two equations have been separately estimated for groups i and j using a linear[10] probability model for example, the adoption rate for each group can be given by the following formulas:

$$\bar{Y}^i = \bar{X}^i \hat{\beta}^i \quad (3)$$

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8. The current ratio, which is defined as current liability over current assets of a business, measures the liquidity of a business and can be used as a proxy for the credit constraint of the business. The higher the ratio is, the lower the liquidity is or the higher the credit constraint is. The profit margin is defined as the ratio of profit over the value added of a business, and labour productivity is defined as the ratio of value added over the hours worked by employees.
9. Binary variables, such as industry and province, are normalized.
10. Robustness checks were performed by using a probit model rather than a linear probability model. The results are very similar.

Research article

*Technology adoption and diversity among Canadian business decision makers:
Evidence from the survey of advanced technology*

$$\overline{Y}^j = \overline{X}^j \hat{\beta}^j \ (4)$$

The adoption gap in mean outcomes can be expressed as

$$\overline{Y}^i - \overline{Y}^j = \overline{X}^i \hat{\beta}^i - \overline{X}^j \hat{\beta}^j$$

$$\overline{Y}^i - \overline{Y}^j = \overline{X}^i \left(\hat{\beta}^i - \hat{\beta}^j \right) + \left(\overline{X}^i - \overline{X}^j \right) \hat{\beta}^j$$

$$\overline{Y}^i - \overline{Y}^j = \overline{X}^j \left(\hat{\beta}^i - \hat{\beta}^j \right) + \left(\overline{X}^i - \overline{X}^j \right) \hat{\beta}^i$$

$$\overline{Y}^i - \overline{Y}^j = \underbrace{\overline{X} \left(\hat{\beta}^i - \hat{\beta}^j \right)}_{\substack{\text{Unexplained effect} \\ (\text{Endowment return})}} + \underbrace{\left(\overline{X}^i - \overline{X}^j \right) \hat{\beta}^*}_{\substack{\text{Explained effect} \\ (\text{Endowment return})}}$$

where $\overline{X}$ is the vector of mean characteristics of the whole population and $\hat{\beta}^*$ is a weighted mean of group returns to endowment ($\hat{\beta}$). The second and third lines of the above equation provide a decomposition of the gap in the rate of adoption of advanced technologies assessed at the level of groups *i* and *j* of key business decision makers, a set of average characteristics that lead to the adoption of advanced technologies. The fourth row provides the weighted average of the previous two possibilities.

As the above equations illustrate, the endowment effect results from the difference between the average of characteristics of groups *i* and *j* of primary business decision makers ($\overline{X}^i - \overline{X}^j$). This part of the technological adoption gap could be ethically acceptable if it is the sole result of individual freedom of choice in terms of factors associated with the adoption of new technologies (socioeconomic characteristics of individuals and enterprises).

The unexplained effect stems from the difference in the returns to endowment ($\hat{\beta}^i - \hat{\beta}^j$). Unlike the endowment effect, the unexplained effect is generally considered to be unfair, as unequal returns to endowment could signal unequal treatment of equal groups *i* and *j* that share the same socioeconomic characteristics of individuals or enterprises, such as education level, age and enterprise size. However, it is not universally accepted that an unexplained positive effect systematically results from discrimination between groups. It could, for example, stem from unobserved characteristics, such as omitted or unobserved determinants of new technology adoption (e.g., networking, attitude to risk-taking and unobserved skills).

Regression-based results

The Blinder–Oaxaca decomposition method is applied to the technology adoption rate gap between (1) decision makers who are women, racialized individuals and recent immigrants and (2) their counterparts, that is, decision makers who are men, non-racialized individuals and long-term residents of Canada.

Exploring the factors behind the adoption rate gap: Overall explained and unexplained effects

Table 2 shows the average predicted probabilities of technology adoption among businesses run by the target groups (women, racialized individuals and recent immigrants) and their respective non-targeted counterparts (men, non-racialized individuals and long-term residents), their differences, and the parts of the differences attributable to observable characteristics or endowment effects (explained) and behaviours or returns to endowment (unexplained).[11]

Table 2 also indicates that the rate of adoption of at least one advanced technology is higher for the counterpart groups than for the target groups. Business decision makers who are women, racialized individuals or recent immigrants are less likely to adopt at least one advanced technology than their counterparts—men, non-racialized individuals and long-term residents—respectively, by an average of 12.5 percentage points.[12]

The results of the Blinder–Oaxaca decomposition reveal that the explained effect is negative and statistically significant for women and recent immigrants and the unexplained effect is negative and statistically significant for all groups except women. The explained effect contributes to 4.2 percentage points[13] of the adoption rate gap, accounting for about 33.6% of the gap. In other words, if the characteristics of business decision makers who are women or recent immigrants were the same as those of men or long-term residents, respectively, the probability of technology adoption by the former could increase by an average of 4.2 percentage points.

The unexplained effect contributes a larger share of the observed adoption gaps based on racialization and immigrant status. The unexplained effect contributes to 8.3 percentage points of the overall adoption rate gap, representing 66.4% of the gap. In other words, if business decision makers who are women, racialized individuals or recent immigrants had the same marginal return to their sociodemographic characteristics as their counterparts, their likelihood of technology adoption could have increased by 8.3 percentage points, on average.

Notably, the unexplained effect is less substantial (less than one-third) and not statistically significant in contributing to the gender adoption gap.

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11. Behaviours refer to behaving like typical businesses when they decide to adopt technologies based on their characteristics.
12. This is a simple average of the results for the different groups in Table 2.
13. This is a simple average of the explained effect results for the different groups in Table 2. This is also done for the unexplained effects in the next paragraph.

Table 2

Decomposition of the adoption rate gap for all technologies between groups of business decision makers

Blinder–Oaxaca decomposition model	Gender adoption gap (women)	Racialization adoption gap (racialized individuals)	Immigrant status adoption gap (recent immigrants)
	coefficient		
Adoption rate of decision maker (base)	0.571 ***	0.481 ***	0.499 ***
Adoption rate of decision maker (counterpart)	0.648 ***	0.646 ***	0.633 ***
Adoption rate gap	-0.077 *	-0.165 ***	-0.133 ***
Overall explained (endowment) gap	-0.055 ***	-0.030	-0.042 ***
Overall unexplained gap	-0.022	-0.136 ***	-0.091 **

* significantly different from reference category (p < 0.10)

** significantly different from reference category (p < 0.05)

*** significantly different from reference category (p < 0.01)

Sources: Calculated by the authors using the 2022 Survey of Advanced Technology and the National Accounts Longitudinal Microdata File.

Exploring the factors behind the adoption rate gap: Breakdown of explained and unexplained effects

Table 3 shows the contribution of individual factors to the explained effect. It suggests that barriers to technology adoption[14] play an important role in explaining the difference between women and men. They contribute to 54.5% of the explained effect of the gender technology adoption gap. So, if women decision makers faced the same barriers to technology adoption as men, the probability of technology adoption would increase by 3.0 percentage points. Barriers are explored further in the next section.

Among recent immigrant decision makers, the recreation and accommodation industry plays an important role in explaining the difference with long-term residents, contributing 47.6% to the explained effect of the technology adoption gap. So, if recent immigrants had the same proportion of businesses in this industry as long-term residents, their likelihood of adopting technology would increase by 2.0 percentage points. Notably, the 2022 SAT shows that the share of enterprises with a recent immigrant decision maker in the recreation and accommodation industry is 27.6%.

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14. In the SAT, respondents are asked to rate the significance of a barrier to technology adoption on a scale of 1 (not at all significant) to 5 (very significant). For this paper, only responses of 4 and 5 are included to capture barriers in the model.

Table 3

Breakdown of the adoption rate gap for all technologies between groups of business decision makers (explained gap)

Blinder–Oaxaca decomposition model	Gender adoption gap (women)	Racialization adoption gap (racialized individuals)	Immigrant status adoption gap (recent immigrants)
	coefficient		
Breakdown of the explained gap	**-0.055 *****	**-0.030**	**-0.042 *****
Women	...	-0.001	-0.004
Racialized individuals	-0.003 ***	...	-0.006
Recent immigrants	-0.002	-0.001	...
Individuals with lower education	-0.000	0.001 **	0.000
Young people	-0.001	-0.005 **	-0.001
Employment (base: enterprises with 250 employees or more)			
Enterprises with 10 to 99 employees	-0.001 ***	-0.001	-0.002 ***
Enterprises with 100 to 249 employees	0.000	0.000	0.001
Industry (base: other industries)			
Natural resources	0.000	-0.000	0.000
Manufacturing	-0.002	-0.001	0.000
Trade and transport	-0.000	0.000	-0.000
Professional services	-0.004	-0.000	-0.006
Education and health	0.003	0.001	-0.002
Recreation and accommodation	-0.000	-0.014 **	-0.020 **
Region (base: rest of Canada)			
Atlantic	-0.001	0.001	-0.001
Ontario	-0.004 *	0.014 ***	0.008 ***
Quebec	-0.001	0.005	0.003
Enterprise age	-0.000	0.001	0.001
Current ratio	0.000	0.000	0.000
Labour productivity	-0.000 *	0.000	-0.000 **
Profit margin	-0.002	-0.000	0.001
Obstacles to adoption	-0.030 ***	-0.025	-0.010

...Not application

* significantly different from reference category ($p < 0.10$)

** significantly different from reference category ($p < 0.05$)

*** significantly different from reference category ($p < 0.01$)

Notes: Natural resources corresponds to North American Industry Classification System (NAICS) codes 11 and 21; manufacturing to NAICS 31 to 33; trade and transport to NAICS 41, 44, 48 and 49; professional services to NAICS 51 to 56; education and health to NAICS 61 and 62; recreation and accommodation to NAICS 71 and 72; and other industries to all remaining NAICS codes. Individuals with lower education are decision makers without a university degree; young people are decision makers under the age of 30.

Sources: Calculated by the authors using the 2022 Survey of Advanced Technology and the National Accounts Longitudinal Microdata File.

Other dimensions for which a slight increase in the adoption rate would be observed if decision makers in the target groups shared similar characteristics as their counterparts include being a small business or being in Ontario.

Table 4 shows that the recreation and accommodation industry, business size, education, and barriers to technology adoption play an important role in explaining the difference between racialized and non-racialized individuals. Combined, they contribute to nearly all of the unexplained effect of the technology

Research article

Technology adoption and diversity among Canadian business decision makers:
Evidence from the survey of advanced technology

adoption gap based on racialization. In other words, if businesses owned by racialized individuals faced the same marginal return as an average business to technology adoption, with respect to operating in the recreation and accommodation industry, business size, education, and technology adoption barriers, the probability of technology adoption by businesses owned by racialized individuals would increase by 7.4, 4.4, 3.2 and 2.2 percentage points, respectively. In terms of the results by gender and immigrant status, most of the coefficients are not statistically significant.

Table 4
Breakdown of the adoption rate gap for all technologies between groups of business decision makers (unexplained gap)

Blinder–Oaxaca decomposition model	Gender adoption gap (women)	Racialization adoption gap (racialized individuals)	Immigrant status adoption gap (recent immigrants)
		coefficient	
Breakdown of the unexplained gap	**-0.022**	**-0.136 *****	**-0.091 ****
Women	…	0.012	0.029
Racialized individuals	0.006	…	0.014 **
Recent immigrants	0.002	0.003	…
Individuals with lower education	-0.002	-0.032 ***	-0.012
Young people	-0.003	0.001	-0.009
Employment (base: enterprises with 250 employees or more)			
Enterprises with 10 to 99 employees	0.022	-0.044 ***	0.009
Enterprises with 100 to 249 employees	0.000	0.002 ***	0.001
Industry (base: other industries)			
Natural resources	-0.002	0.001 *	0.002
Manufacturing	0.000	0.005 *	0.007
Trade and transport	0.003	-0.013	0.006
Professional services	0.009 ***	0.005	-0.003
Education and health	0.011	-0.014	-0.005
Recreation and accommodation	-0.011	-0.074 **	-0.038
Region (base: rest of Canada)			
Atlantic	-0.002	-0.000	-0.013
Ontario	0.028	-0.014	-0.011
Quebec	0.007	0.010	0.039
Enterprise age	0.028	0.051	-0.017
Current ratio	-0.007	0.002	-0.003
Labour productivity	-0.004	0.001	0.010
Profit margin	0.032	0.023	-0.003
Obstacles to adoption	0.017	-0.022 *	0.094 **

…Not applicable

* significantly different from reference category (p < 0.10)

** significantly different from reference category (p < 0.05)

*** significantly different from reference category (p < 0.01)

Notes: Natural resources corresponds to North American Industry Classification System (NAICS) codes 11 and 21; manufacturing to NAICS 31 to 33; trade and transport to NAICS 41, 44, 48 and 49; professional services to NAICS 51 to 56; education and health to NAICS 61 and 62; recreation and accommodation to NAICS 71 and 72; and other industries to all remaining NAICS codes. Individuals with lower education are decision makers without a university degree; young people are decision makers under the age of 30.

Sources: Calculated by the authors using the 2022 Survey of Advanced Technology and the National Accounts Longitudinal Microdata File.

Exploring the factors behind the adoption rate gap: Breakdown of obstacles to adoption

Table 5 presents an extension of the model presented in Section 5.2, whereby the impacts of barriers to technology adoption are broken down by type of barrier. It describes the effect of different barriers for different groups of business decision makers, when adopting or considering adopting technologies.

Difficulty in recruiting qualified staff is the most significant barrier for racialized individuals. That is, if racialized decision makers faced the same difficulties in recruiting qualified staff as non-racialized decision makers, the likelihood of adopting advanced technologies by racialized decision makers would increase by 2.9 percentage points. By contrast, difficulty in integrating new advanced technologies with existing systems, standards and processes has the greatest impact on the gender adoption gap. Notably, obstacles contributing to the unexplained effect vary by group. However, it appears that reducing barriers to adopting advanced technologies has a far greater impact on the rate of adoption by business decision makers through endowment returns than endowment effects.

Other obstacles that stand out include ensuring security and privacy of data for women decision makers and determining how new technologies will positively impact the business for racialized individuals. For instance, if women decision makers faced the same difficulty in ensuring security and privacy of data as men, the likelihood of advanced technology adoption by woman decision makers would increase by 0.3 percentage points.

Research article

Technology adoption and diversity among Canadian business decision makers:
Evidence from the survey of advanced technology

Table 5

Breakdown of the adoption rate gap for all obstacles to technology adoption between groups of business decision makers

Blinder–Oaxaca decomposition model	Gender adoption gap (women)	Racialization adoption gap (racialized individuals)	Immigrant status adoption gap (recent immigrants)
		coefficient	
Obstacles to adoption (explained gap)	**-0.053 *****	**-0.064 *****	**-0.013**
Lack of employee training	-0.001	-0.001	0.002
Employees' resistance to change	-0.000	-0.000	0.000
Difficulty in recruiting qualified staff	-0.013	-0.029 ***	0.013 ***
Low return on investment or long payback period	-0.002 **	-0.000	-0.000
Difficulty in accessing financial support	0.000	0.001	-0.000
Difficulty in accessing non-financial support	-0.000	-0.001	-0.001
Difficulty in integrating new advanced technologies with existing systems, standards and processes	-0.006 ***	-0.009	0.010 ***
Disruption of production for the integration of new technologies	0.005 ***	0.006 *	-0.003
Decisions made elsewhere in the organization and not in the enterprise itself	0.000	-0.001	0.004
Ensuring security and privacy of data	-0.003 **	-0.011	0.006
Challenges in identifying appropriate technologies	-0.000	0.000	-0.000
Determining how new technologies will positively impact the business	-0.002	-0.008 ***	0.002
Regulatory constraints or uncertainties	0.000	0.001	-0.002
Customer resistance	-0.000	-0.001	-0.006
Obstacles to adoption (unexplained gap)	**-0.024**	**0.101 *****	**-0.120 *****
Lack of employee training	0.006	0.004	-0.079 **
Employees' resistance to change	0.004	0.019	0.039
Difficulty in recruiting qualified staff	-0.014	0.030 *	0.038 *
Low return on investment or long payback period	-0.013	0.037	0.031
Difficulty in accessing financial support	-0.003	-0.085 **	-0.125 **
Difficulty in accessing non-financial support	0.013	0.066 ***	0.073 **
Difficulty in integrating new advanced technologies with existing systems, standards and processes	0.011	-0.009	0.046
Disruption of production for the integration of new technologies	-0.001	-0.010	0.033
Decisions made elsewhere in the organization and not in the enterprise itself	0.003	0.004	0.049 ***
Ensuring security and privacy of data	0.027 *	-0.011	-0.011
Challenges in identifying appropriate technologies	0.080 ***	0.025	-0.066
Determining how new technologies will positively impact the business	-0.057 ***	-0.036 ***	-0.045
Regulatory constraints or uncertainties	-0.015	-0.001	0.026
Customer resistance	-0.017	0.010	0.072

* significantly different from reference category (p < 0.10)

** significantly different from reference category (p < 0.05)

*** significantly different from reference category (p < 0.01)

Note: The regression in this table also includes all the variables other than the previous regression tables, except for the "obstacles to adoption" variable.

Sources: Calculated by the authors using the 2022 Survey of Advanced Technology and the National Accounts Longitudinal Microdata File.

In terms of the unexplained portion, some obstacles to technology adoption seem to have a significant impact on selected groups. In particular, if businesses owned by racialized individuals and recent immigrants faced the same marginal returns as a typical firm with respect to difficulty in accessing financial support, they would increase their likelihood of technology adoption by 8.5 and 12.5 percentage points, respectively. Lack of employee training is also a significant obstacle contributing to the unexplained gap for recent immigrant decision makers, while determining how new technologies will positively impact the business is a significant obstacle contributing to the unexplained gap for women decision makers.

Conclusion

This article combines the 2022 SAT with the National Accounts Longitudinal Microdata File database to investigate the adoption of advanced and emerging technologies by gender, immigrant status and racialization of business decision makers. The study reveals significant differences in the likelihood of adopting technology between decision makers who are men and women, racialized and non-racialized, and recent immigrants and long-term residents.

The Blinder–Oaxaca decomposition technique is used to show that more than half of the overall difference in technology adoption can be attributed to potential differences in unobserved factors between businesses run by women, racialized individuals and recent immigrants and those run by their counterparts. About one-third of the overall difference in technology adoption can be attributed to differences in observable characteristics or endowments, such as business size, industry and province. The behaviours (i.e., behaving like a typical business) that play an important role in explaining the overall difference are those related to barriers to technology adoption, business size, and activity in the recreation and accommodation industry and the professional services industry. The characteristics that play an important role in explaining the overall difference are barriers to technology adoption, business size, being located in Ontario, and activity in the recreation and accommodation industry. Notably, the unexplained effect makes a greater contribution to the racialized status adoption gap and the immigrant status adoption gap, while this effect is less substantial and not statistically significant in contributing to the gender adoption gap.

Reducing certain barriers to adoption could increase the adoption rate in the different groups of decision makers. These barriers include those related to difficulty in recruiting qualified staff; difficulty in integrating new advanced technologies with existing systems, standards and processes; difficulty in accessing financial support; and lack of employee training. Evidence suggests that reducing barriers to the adoption of advanced technologies has a significantly greater impact on the rate of adoption by business decision makers through endowment returns than endowment effects.

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