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Artificial intelligence (AI) is widely recognized as a transformative technology with the potential to reshape business operations and drive productivity growth. In Canada, AI adoption among businesses has accelerated in recent years. According to Statistics Canada (Bryan et al., 2025), 12.2% of Canadian firms used AI to produce goods or deliver services in 2025—doubling the share from the previous year—and an additional 14.5% planned to adopt AI within the next 12 months.

The enthusiasm surrounding AI is not unwarranted, given its projected impact on productivity. Estimates suggest that AI could lead to a rise of 0.5% to 0.7% in total factor productivity over a decade (Acemoglu, 2024) and an increase of up to 1.5 percentage points in annual labour productivity growth over a 10-year period in the United States (Goldman Sachs, 2023). For Canada, potential gains include an increase of 0.4 to 1.1 percentage points in annual labour productivity growth over the next decade (Filippucci et al., 2025).

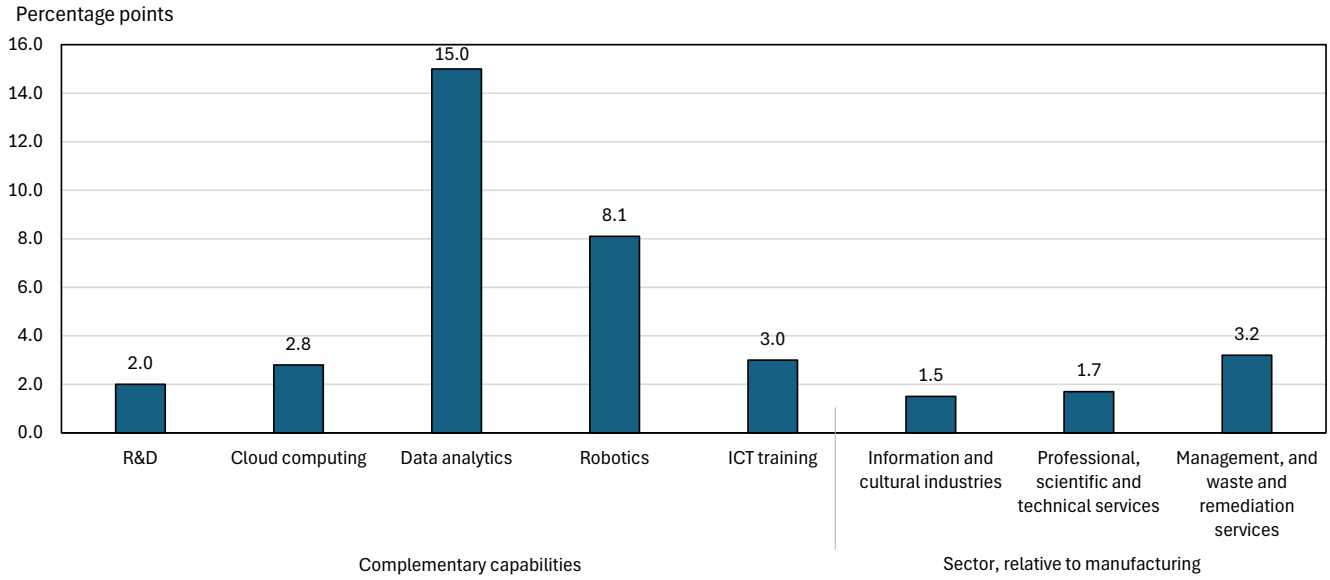
Understanding the relationship between AI adoption and business performance is critical for shaping policies that foster innovation, technology diffusion and sustainable economic growth, especially given Canada's persistent productivity challenges. For decades, productivity growth has been sluggish, hampered by weak business investment (Gu, 2024), declining business research and development (R&D) expenditures, and stalling growth in patent applications (Conference Board of Canada, 2024; Abbes et al., 2023), as well as a lagging contribution from intangible assets (Allen et al., 2025).

This article summarizes key findings from the study "The Role of Complementary Capabilities in AI Adoption and Productivity: Firm-Level Evidence from Canada" by Li and Liu (forthcoming), published in *Canadian Public Policy*. Using a novel firm-level database that links multiple waves of the Survey of Digital Technology and Internet Use (SDTIU) to administrative business microdata, the study examines factors influencing AI adoption among Canadian businesses and explores the relationship between AI adoption and firms' labour productivity.

Which firms are more likely to adopt AI? Firms with strong complementary capabilities—including R&D, cloud computing, data analytics, advanced robotics, and information and communications technology (ICT) training for employees—are significantly more likely to adopt AI.

Results from a probit regression using the pooled 2019 and 2021 waves of the SDTIU show that complementary capabilities—including R&D, cloud computing, data analytics, advanced robotics and ICT training—are strong predictors of AI adoption (Figure 1). For instance, firms using data analytics are 15.0 percentage points more likely to adopt AI than firms that do not, while those employing advanced robotics are 8.1 percentage points more likely to adopt AI than those that do not.

Figure 1
Probability of artificial intelligence adoption associated with firm characteristics



Notes: This figure shows the marginal effects of complementary capabilities and sector for the probability of artificial intelligence adoption. R&D refers to businesses with positive research and development expenditures. Cloud computing, data analytics, robotics, and information and communications technology (ICT) training are indicators of whether a business has adopted each respective category. Management, and waste and remediation services includes management of companies and enterprises and administrative and support, waste management and remediation services.
Source: Reproduced from Table 2, Li and Liu (forthcoming).

Sector differences also matter. Service industries exhibit higher adoption rates than manufacturing, particularly in information and cultural industries; professional, scientific and technical services; and management of companies and enterprises, and administrative and support, waste management and remediation services.

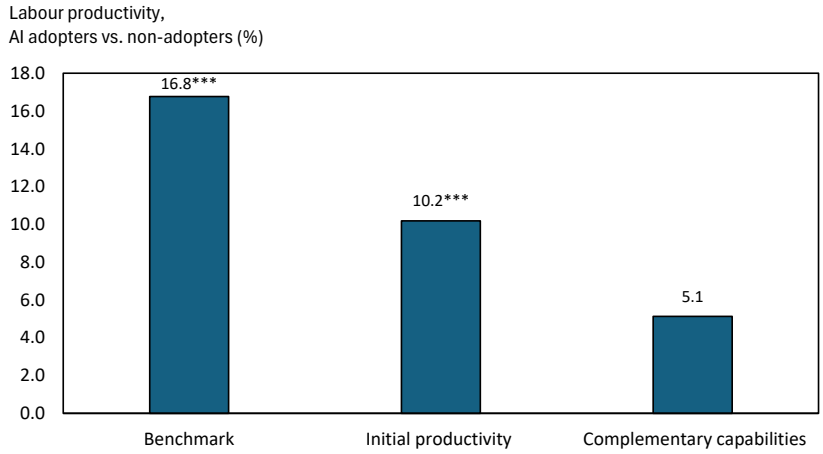
Other firm characteristics play a role as well. AI adoption tends to rise with firm size[1] and follows an inverted U-shape pattern over firm age, with uptake peaking around the pivotal eighth year. Higher wages are positively associated with adoption, while Canadian ownership and international trade involvement show weak or negative correlations.[2]

1. While the coefficients for firm size indicate a U-shaped relationship, the implied minimum size is approximately three employees, well below the five-employee threshold in the 2019 and 2021 survey samples.
2. Imports and exports refer to merchandise trade only.

Does AI adoption have an impact on productivity? AI adoption is associated with higher labour productivity, but this premium largely reflects firm selection and complementarities with broader innovation and digital transformation efforts rather than solely AI.

The study employs a sequential regression approach to investigate the association between AI adoption and firms' labour productivity (Figure 2). In the baseline specification, labour productivity is regressed on an AI adoption indicator along with firm characteristics that are commonly linked to productivity, including industry, size, age, capital intensity, ownership status and international trade activity. Results indicate that AI adopters exhibit an 16.8% higher productivity level, compared with non-adopters (shown as the "benchmark" bar in Figure 2).

Figure 2
Estimated impact of artificial intelligence on labour productivity



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

Notes: This figure shows the estimated marginal effect of artificial intelligence (AI) adoption on firms' labour productivity under three specifications. In the benchmark model, productivity is regressed on an AI adoption indicator and firm characteristics such as industry, size, age, capital intensity, ownership status and international trade activity. The second specification adds pre-adoption productivity. The third specification incorporates additionally complementary capabilities, including research and development, cloud computing, data analytics, advanced robotics, and information and communications technology training.
Source: Reproduced from Table 3, Li and Liu (forthcoming).

To address potential selection bias—where more productive firms may be more likely to adopt AI—the second specification adds the initial labour productivity level prior to AI adoption. Under this adjustment, the estimated productivity premium declines to 10.2% (the "Initial productivity" bar), indicating that part of the observed advantage reflects pre-existing productivity differences.

Finally, the model incorporates additional variables that capture complementary capabilities, such as R&D engagement, cloud computing, data analytics, robotics and ICT training. With these controls, the association between AI adoption and productivity falls to 5.1% and becomes statistically insignificant. This underscores that the productivity premium observed earlier may not be attributable to AI alone. Instead, it reflects the critical role of complementary investments in enabling AI's productivity-enhancing potential.

AI adoption does not appear to have a significant relationship with short-term productivity growth.

Conclusion

The empirical evidence suggests that, while AI adoption is associated with higher labour productivity, this relationship weakens when pre-existing productivity and complementary investments are considered. Overall, there is no statistically significant direct association between AI adoption and productivity. However, this should not be interpreted pessimistically because productivity gains from AI often take time to materialize and depend on organizational change and complementary investments. This indicates that AI is most effective when embedded within broader innovation and digital transformation strategies.

These findings carry important implications for Canadian AI policy. Crucially, the impact of AI on productivity depends on a supportive ecosystem—encompassing digital infrastructure, workforce skills and R&D—rather than the technology alone.

Maximizing the gains from AI will require coordinated actions across infrastructure investment, skills development, and research and innovation, while ensuring inclusivity and responsible deployment. AI adoption in isolation is likely insufficient to deliver transformative productivity gains.

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