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Artificial Intelligence and Canada's Productivity Challenge: Bridging the Gap Between Promise and Economic Reality

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Abstract: Artificial intelligence (AI) offers considerable potential to improve productivity, yet its growing adoption has not necessarily translated into corresponding gains in aggregate labour productivity. This paper examines Canada's AI productivity challenge using evidence from Statistics Canada, Bank of Canada research, academic literature, and documented expert commentary. It considers the historical productivity paradox alongside business adoption patterns, projected productivity gains, sectoral differences, and emerging labour-market adjustments. Canadian evidence highlights a gap between the widespread personal use of AI by business leaders and its integration into core business operations. Conceptual illustrations demonstrate how implementation costs, organizational restructuring, complementary investment, and workforce skill development may influence the realization of AI's economic benefits. The analysis distinguishes planned adoption from actual implementation, projected gains from observed outcomes, and associations from causal effects. It argues that realizing AI's productivity potential requires effective organizational integration, workforce learning, and broader diffusion across businesses. The paper concludes with policy implications for Canada and emphasizes the importance of monitoring productivity and labour-market outcomes as AI adoption evolves.

Keywords: *AI Productivity Paradox, Bank of Canada, Monetary Policy, Potential Output (Y*), Labour Market Adjustments, Technology Diffusion, General-Purpose Technologies, Two-Speed Economy.*

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I. INTRODUCTION

In today's world, a new term is echoing rapidly—AI (Artificial Intelligence), or' Super Intelligence' The media, major corporations, and technology experts claim daily that AI will transform the whole world. They assert that it will accomplish human tasks in minutes, multiply corporate efficiency profits, and propel national economies upward very fast.

Artificial intelligence (AI) is increasingly regarded as a transformative technology with the potential to enhance productivity, improve business efficiency, and reshape labour markets. However, despite rapid technological advances and growing corporate enthusiasm, the expected economic benefits have not yet been fully reflected in aggregate productivity growth in many advanced economies. This gap between technological potential and measured economic performance is commonly referred to as the *AI productivity paradox.*

Canada provides an important context for examining this issue because of its persistent productivity challenges and relatively modest economic growth. Canada provides an important context for examining this issue because of its persistent productivity challenges and relatively modest economic growth. According to Statistics Canada, business-sector labour productivity grew by 1.1% in 2025. This modest growth provides a relevant economic context for examining whether the increasing adoption of artificial intelligence can translate into sustained improvements in Canada's productivity performance.

Although the measures differ slightly in sectoral coverage, the figures highlight Canada's comparatively modest productivity performance. Meanwhile, the extent to which AI adoption will generate substantial productivity gains or significantly alter overall employment remains uncertain. Historical experience with general-purpose technologies suggests that their economic benefits may take time to materialize. The adoption of new technologies often requires complementary investments, organizational changes, and adjustments in work practices before substantial improvements in productivity become evident. AI may automate certain tasks while augmenting human capabilities in others; consequently, its overall effects on employment,

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wages, and economic growth will depend on the pace of adoption and the ability of firms to reorganize their activities.

These developments have important implications for the Bank of Canada. Its Staff Analytical Paper 2026-4, published in March 2026 under the title *AI Paradox: Promise vs. Reality—What It Means for Monetary Policy*, examines the potential economic and policy implications of AI. Assessing whether technological advances translate into sustained productivity gains is essential for estimating potential output, understanding inflation dynamics, and setting appropriate monetary policy. This article reviews the emerging evidence on AI's effects on productivity and employment, with particular attention to Canada's economic performance and the challenges these developments pose for monetary policymakers. It emphasizes the importance of distinguishing structural changes associated with technological adoption from cyclical fluctuations in economic activity when assessing the outlook for growth, inflation, and employment.

However, when we examine the real world—specifically the official economic data for Canada—the picture appears quite different. On one hand, there are grand promises surrounding an 'AI revolution,' while on the other, Canada's overall productivity and rate of economic growth remain sluggish. This is evident from the fact that there has been neither a large-scale loss of jobs nor a sudden surge in the nation's earnings.

II. METHODOLOGY

➢ *Research Design and Analytical Framework*

This study adopts an analytical and policy-synthesis approach to examine the gap between the adoption of artificial intelligence (AI) by businesses and its effects on aggregate labour productivity in Canada. It synthesizes evidence from official Canadian statistical sources, Bank of Canada research, academic literature, and documented public statements. The analysis draws on the historical productivity paradox and conceptual illustrations of technology adoption to explore why the availability and use of AI may not immediately translate into measurable economy-wide productivity gains. The study does not estimate a new econometric model; rather, it interprets existing evidence to identify the factors that may influence the realization of AI's productivity potential and their implications for Canadian economic policy.

➢ *Historical and Conceptual Framework*

The historical productivity paradox provides the principal context for the analysis. David (1990) examined the delayed productivity benefits associated with industrial electrification, while Solow (1987) highlighted the apparent disconnect between the growing presence of computers and measured productivity. This literature suggests that technological adoption may need to be accompanied by complementary investments, organizational changes, workflow redesign, and employee skill development before its benefits become evident in aggregate productivity statistics. Although AI differs from earlier technologies, this historical perspective helps frame the possibility of a similar adjustment period.

Two conceptual analogies illustrate this argument. The robot vacuum model highlights the distinction between acquiring a technology and realizing its net benefits: initial costs, maintenance, and adjustments to established routines may offset some early efficiency gains. Similarly, businesses adopting AI may incur costs related to infrastructure, data preparation, employee training, and organizational change.

The local bakery and digital marketplace model distinguishes improvements within individual firms from productivity growth across the wider economy. AI-enabled demand forecasting may help a bakery reduce waste and improve inventory management, but the aggregate effect depends on the scale and persistence of such gains and their diffusion across businesses and industries. These analogies are explanatory illustrations, not formally estimated models, and are used to clarify the mechanisms through which firm-level improvements may—or may not—translate into economy-wide productivity growth.

➢ *Secondary Data Sources and Indicators*

The study draws on secondary evidence from three principal source categories:

- Canadian statistical sources. Statistics Canada provides information on Canadian businesses' reported AI adoption and planned use, as well as relevant labour-market and productivity indicators.
- Central bank research. Bank of Canada analytical publications provide evidence and assessments concerning AI adoption, potential productivity effects, labour-market adjustment, and implications for monetary policy.
- Academic literature and documented public commentary. David (1990) and Solow (1987) provide the historical context for the productivity paradox. Bastani et al. (2025) provide research evidence concerning generative AI and learning in high-school mathematics. Andrew Ng's remarks at the NDTV World Summit on October 22, 2026, provide expert commentary on AI, employment, and the importance of acquiring new skills; these remarks are treated as commentary rather than independent empirical evidence.

The principal indicators examined include projected AI-related productivity gains, reported business plans to adopt AI, the extent of AI use in core business operations, differences in planned adoption across Canadian industries, and estimated labour-market adjustments across occupations with different levels of AI exposure. Historical evidence is used to contextualize the possibility that productivity gains may take time to emerge.

The evidence is assessed descriptively and comparatively within the Canadian context. Projections are distinguished from observed outcomes, planned adoption from actual implementation, and associations between AI exposure and labour-market outcomes from evidence of

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causation. This approach supports a policy-oriented interpretation of the available evidence without implying that the reported relationships establish causal effects of AI.

III. UNDERSTANDING THE AI PRODUCTIVITY PARADOX

The AI productivity paradox refers to the apparent gap between rapid advances in artificial intelligence and the limited or delayed improvements in overall economic productivity. Two everyday examples help explain why the benefits of a new technology may not be immediately visible in economic statistics.

➢ *Everyday Illustrations of the Productivity Paradox*

- *The Robot Vacuum: The Cost of Adopting New Technology*

Consider a family that purchases an advanced robotic vacuum cleaner, expecting it to reduce household cleaning time substantially. However, the family soon discovers that the device requires adjustments to the home environment. Thick carpets obstruct its movement, furniture must be rearranged, and time must be spent learning how to operate the machine. Additional expenses may also arise if changes to the home's electrical arrangements or other infrastructure are required.

During the initial period, the time and resources spent installing, adapting to, and operating the device may offset some of the expected savings. Only after these difficulties are resolved may the family experience the full benefits.

A similar situation can arise when businesses introduce AI. Firms may need to invest in digital infrastructure, employee training, data management, and changes to existing workflows before substantial productivity improvements become evident. Thus, the initial costs of adopting AI may delay its benefits, although the extent and duration of this adjustment period will vary across organizations.

- *The Bakery and the Local Market: From Individual Success to Aggregate Productivity*

Consider a bakery in a small town that introduces an AI-based system to forecast demand for cakes and biscuits. By analysing weather conditions, festivals, and previous purchasing patterns, the system helps the owner estimate daily demand more accurately. This may reduce waste, improve inventory management, and increase profitability.

At the level of the individual bakery, the technology may therefore produce clear benefits. However, suppose other businesses in the same market, including clothing shops, tailoring establishments, barber shops, and vegetable vendors, continue to use traditional methods. Some may lack the necessary digital skills, financial resources, or access to suitable technology.

Even when AI substantially improves the performance of one business, its contribution to the productivity of the wider economy may initially remain limited if adoption is restricted to a relatively small proportion of firms. Aggregate productivity gains depend not only on the success of individual adopters but also on the diffusion of technology, the scale of its use, and improvements in the efficiency of production across the economy.

➢ *Historical Evidence: Electricity and Computers*

Economic history provides useful examples of the time that may elapse between the introduction of a major technology and the emergence of its full economic benefits. The experiences of electricity and computers in the United States illustrate how complementary investments, organizational changes, and wider adoption can influence productivity outcomes.

- *The Electrification of American Industry*

Electricity gradually transformed American manufacturing during the late nineteenth and early twentieth centuries. However, its full potential was not realized simply by replacing existing sources of power with electric motors. Factories also needed to redesign their layouts, reorganize production processes, and adapt their operations to take advantage of the new technology.

These complementary changes helped electricity deliver substantial productivity benefits over time. The historical experience illustrates that the economic value of a general-purpose technology depends not only on its invention or initial adoption but also on the changes required to use it effectively.

- *The Computer Revolution and the Solow Productivity Paradox*

A similar pattern emerged with information technology. Computers began to spread through businesses well before their benefits became clearly visible in aggregate productivity statistics. In 1987, economist Robert Solow famously observed that the computer age could be seen everywhere except in the productivity statistics.

During much of the period from the 1970s to the mid-1990s, productivity growth in the United States remained relatively weak despite the increasing use of computers. From around 1995, however, productivity growth accelerated, reflecting several factors, including advances in information technology, investment in computers and software, and improvements in business processes.

➢ *Lessons from Artificial Intelligence*

The examples of the robotic vacuum cleaner, the local bakery, electricity, and computers illustrate three important points. First, adopting a new technology may involve initial costs that temporarily offset its benefits. Second, productivity improvements at the level of individual firms do not necessarily translate immediately into substantial gains across the entire economy. Third, complementary investments, organizational adjustments, employee training, and wider technology adoption can be essential for realizing the full economic potential of innovation.

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These lessons provide a useful framework for examining the AI productivity paradox in Canada. The central question is not simply whether AI can improve the performance of individual tasks or businesses, but whether its adoption can generate sustained and measurable improvements in national productivity.

Table 1 Artificial Intelligence, Productivity and Labour-Market Developments in Canada

Indicator	Evidence and findings	Implications for Canada's productivity challenge
Potential productivity gains from AI	The Bank of Canada's review reports projections suggesting that AI could raise annual labour productivity growth in Canada by 0.35–1.13 percentage points over the next decade (Brault et al., 2026).	The potential gains are substantial, but they are projections, not guaranteed outcomes. Their realization depends on AI adoption, complementary investment and organizational changes.
Business adoption of AI	In the third quarter of 2026, 25.2% of Canadian businesses planned to use AI to produce goods or deliver services over the following 12 months, compared with 14.5% in the third quarter of 2025 (Li et al., 2026).	Planned adoption is increasing, but intentions should not be confused with actual implementation or realized productivity gains.
Individual use versus core business operations	More than two-thirds of business leaders reported personally using AI tools in a typical work week, whereas only 8% of businesses reported significant AI use in their core operations (Chawla & Arnburg, 2026).	Individual experimentation does not necessarily imply that AI has been integrated sufficiently into business processes to improve overall productivity.
Sectoral differences in planned adoption	In Q3 2026, the proportions of businesses planning to use AI were 54.8% in professional, scientific and technical services, 48.0% in information and cultural industries, and 35.5% in finance and insurance (Li et al., 2026).	Uneven adoption across industries may lead to differences in the timing and scale of productivity gains across the Canadian economy.
Early labour-market adjustments	The estimated job-finding-rate gap between occupations at the 100% and 0% AI-exposure extremes widened from −2.2 percentage points on average in 2015–2019 to −13.9 percentage points in 2025 (Brouillette et al., 2026).	This widening gap suggests that workers in highly AI-exposed occupations may be experiencing greater difficulty finding employment relative to workers in occupations with no estimated AI exposure. These findings are an early signal of labour-market adjustment; they do not establish that AI alone caused the change.
Historical productivity paradox	David (1990) examined the delayed productivity benefits of electrification, while Solow (1987) famously observed that computers seemed visible everywhere except in productivity statistics.	Historical experience suggests that major technologies may require complementary investment, organizational restructuring and time before their benefits become visible in aggregate productivity statistics.

Note. Estimates of potential productivity gains are projections, while business-adoption figures reflect reported plans or current use. Labour-market estimates compare modelled AI-exposure extremes and should be interpreted as early evidence of possible adjustment, not proof that AI alone caused the observed changes. Brault et al. (2026); Brouillette et al. (2026); Chawla and Arnburg (2026); David (1990); Li et al. (2026); Solow (1987).

➢ *Evidence from Official Canadian Statistics*

According to Chawla and Arnburg (2026), a Bank of Canada survey found that more than two-thirds of business leaders personally used AI tools in a typical work week. However, only 8% of businesses reported using AI significantly in their core operations. A further 50% reported low or moderate use in core operations. This difference suggests that widespread individual experimentation has not necessarily translated into deep operational integration.

Statistics Canada's second-quarter 2026 findings also demonstrate substantial differences across industries. Over the preceding 12 months, 42.3% of businesses in information and cultural industries and 40.4% in finance and insurance reported using AI to produce goods or deliver services. By comparison, the corresponding proportions were 9.2% in construction and 4.5% in agriculture, forestry, fishing and hunting (Statistics Canada, 2026). These figures indicate that the extent of AI adoption varies considerably across sectors. The Primary sectors viz. Agriculture, fishing, hunting & Constructions uses AI for producing goods only 13.7%.

More recent evidence on planned adoption reinforces this pattern. Statistics Canada's third-quarter 2026 survey found that 25.2% of businesses planned to use AI to produce goods or deliver services over the following 12 months. The proportions were 54.8% in professional, scientific and technical services, 48.0% in information and cultural industries, and 35.5% in finance and insurance (Li et al.,

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2026). These figures represent business intentions rather than confirmed future adoption or realized productivity gains.

Taken together, the evidence supports a cautious conclusion: *AI adoption is expanding, but it remains uneven across Canadian businesses and industries.* Whether these developments produce sustained improvements in national productivity will depend not only on the availability of AI tools but also on their effective integration into production processes, complementary investment, workforce skills and organizational change.

IV. CHALLENGES FOR THE BANK OF CANADA

The Bank of Canada's primary monetary policy objective is to maintain price stability, with a 2% inflation target, while supporting maximum sustainable employment. To make informed interest-rate decisions, the Bank must assess current economic conditions and the economy's underlying productive capacity. Two important concepts in this assessment are potential output and the natural rate of unemployment.

Potential output (Y*) refers to the level of output the economy can sustain over time without generating persistent inflationary pressure. The natural rate of unemployment (U*) is the unemployment rate consistent with the economy's underlying structure when temporary cyclical influences are set aside. It is related to, but not identical to, the non-accelerating inflation rate of unemployment (NAIRU).

Neither measure can be observed directly; both must be estimated. AI adds uncertainty because it may increase productive capacity, change the demand for different types of labour and alter the relationship between economic activity and inflation. These developments create several challenges for monetary policy.

- *The Two-Speed Economy and the Inflation Dilemma*

AI adoption may contribute to differences in productivity growth across sectors. Businesses in finance, insurance and technology may integrate AI rapidly, while some businesses in construction, agriculture and other sectors may adopt it more slowly. This raises the possibility of a two-speed economy, in which productivity, labour demand and cost pressures evolve differently across industries.

Brault, Haghighi and Yang (2026), in their Bank of Canada working paper Monetary Policy in an AI-Driven Two-Speed Economy, examine precisely this challenge. Their analysis distinguishes between AI that augments workers' productivity and AI that automates tasks previously performed by workers. They show how these changes can create different employment and inflation pressures across sectors, even when the central bank has only one policy interest rate.

Consider a bakery that uses AI to improve demand forecasting, reduce waste and manage inventory. Its productivity rises, and its operating costs may fall. Meanwhile, a construction business that has not adopted comparable technology may continue to face rising labour and material costs. The two businesses can therefore experience very different economic conditions.

The monetary policy challenge becomes more difficult if AI-related changes also produce uneven demand and price pressures. If inflationary pressure strengthens in some sectors while employment and demand weaken in others, raising interest rates to control overall inflation may further restrain activity in sectors that are already struggling. Conversely, keeping interest rates lower to support weaker sectors may sustain inflationary pressure elsewhere.

This does not mean that AI adoption alone creates a two-speed economy or that national inflation becomes impossible to measure. Rather, the challenge is to determine how sector-specific changes combine to affect aggregate demand, productive capacity and the overall inflation outlook. Monetary policy must respond to economy-wide conditions while recognizing that its effects will differ across businesses and households.

- *Labour-Market Adjustment: Displacement, New Skills and Wage Pressures*

AI may change not only the number of worker's businesses require but also the types of skills they seek. This creates a challenge when estimating the natural rate of unemployment and assessing the degree of pressure in the labour market.

Consider the earlier bakery example. After introducing AI, the owner may need fewer cashiers but may require a software specialist or an employee with advanced digital skills. The displaced cashiers may not immediately possess the qualifications required for the new position. Even if a suitable vacancy exists, retraining and job matching take time.

At the same time, demand for workers with specialized AI skills may increase their wages. These wage increases could contribute to business costs, although their effect on consumer-price inflation would depend on productivity gains, profit margins and the extent to which higher costs are passed on to customers. Higher wages do not automatically produce inflation if they are matched by higher productivity.

Evidence from the Bank of Canada's August 2026 analysis provides an early indication of these adjustment difficulties. Brouillette, Dahlhaus and Galassi (2026) found that the estimated job-finding-rate gap between occupations with the highest and lowest AI exposure widened from 2.2 percentage points in 2015–2019 to 13.9 percentage points in 2025, with workers in more highly exposed occupations experiencing the lower job-finding rates. The authors caution that these are early signals and do not establish that AI alone caused the changes. For the Bank of Canada, the difficulty is distinguishing temporary labour-market weakness from structural changes associated with technology. If unemployment rises because workers need time to acquire new skills or move between occupations, the appropriate

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policy response may differ from the response to a conventional decline in aggregate demand. At the same time, wage pressures in particular occupations may coexist with weaker employment prospects in others.

Consequently, a single national unemployment rate may not fully reveal the adjustment taking place across occupations and industries. The Bank must consider a broader range of labour-market indicators, including job-finding rates, vacancies, wage growth, participation and changes in the composition of employment.

- *Implications for Monetary Policy*

These challenges do not imply that the Bank of Canada's traditional monetary policy framework has failed. Rather, they reinforce the importance of careful forecasting, uncertainty analysis and the use of multiple indicators.

AI may raise potential output by improving productivity, but the scale and timing of these gains remain uncertain. At the same time, automation and changing skill requirements may create short-term adjustment costs and uneven labour-market outcomes. If policymakers misjudge the extent to which potential output has increased, they may also misinterpret the balance between supply and demand and the resulting inflationary pressures.

The Bank therefore faces a central analytical question: How can it distinguish an AI-driven expansion in productive capacity from changes in aggregate demand and temporary labour-market disruption? Answering this question will require continued monitoring of productivity, prices, wages, employment and business adoption, while recognizing that the effects of AI may emerge gradually and unevenly across the economy.

- *Andrew Ng's Perspective: AI, Employment and the Importance of Learning New Skills:*

At the NDTV World Summit in New Delhi on October 22, 2026, computer scientist and AI entrepreneur Andrew Ng challenged predictions of an imminent "AI job apocalypse." He argued that AI can augment human capabilities, improve productivity and potentially support business expansion and employment growth. Using software engineering as an example, he observed that employment in the field had increased despite the availability of AI coding tools. However, this example does not establish that AI will create more jobs than it displaces across the economy; the overall outcome will depend on business adoption, changing demand and workers' ability to acquire new skills (Chaturvedi, 2026b).

Ng emphasized continuous learning and the need for educational institutions to adapt their curricula to technological change. He also warned that students who rely on AI chatbots to complete assignments may obtain answers without developing a sound understanding of the subject. He referred to research reporting poorer performance on closed-book assessments among students using AI during learning activities. This finding should be interpreted in the context of the particular study rather than generalized to every educational use of AI (Chaturvedi, 2026a; Bastani et al., 2025).

For Canada, Ng's perspective highlights that the productivity benefits of AI depend not merely on access to technology, but also on workforce skills, complementary investment and effective organizational adaptation. AI may improve task efficiency, yet sustained productivity growth requires these gains to translate into greater output or improved quality. Its effects on employment and wages will vary across industries and occupations. Consequently, AI should be viewed neither as a guaranteed solution to Canada's productivity challenge nor as an inevitable cause of widespread unemployment. Its economic effects must be evaluated using observed evidence as adoption progresses.

- *Way Forward: Policy Implications for Canada:*

Canada's productivity challenge requires a balanced approach to artificial intelligence that encourages innovation while recognizing the uncertainties associated with its adoption. The evidence reviewed in this article suggests that the economic benefits of AI will depend not only on technological advances but also on how effectively businesses integrate the technology into their operations. The Bank of Canada reports that, although individual use of AI is widespread among business leaders, its adoption in core business operations remains limited (Chawla & Arnburg, 2026). This gap highlights the importance of moving beyond experimentation towards effective implementation.

First, support wider and more effective business adoption. Policies should encourage businesses, particularly smaller firms, to assess where AI can improve productivity, reduce costs and enhance service quality. Access to appropriate technology, employee training and organizational expertise can help firms overcome implementation barriers. However, adoption should be evaluated by its measurable contribution to output, efficiency and quality rather than by the mere use of AI tools.

Second, invest in skills and workforce adaptation. As emphasized in Andrew Ng's perspective, continuous learning will be essential as AI changes the tasks performed in many occupations. Education and training programmes should develop digital competence, analytical reasoning and the ability to work effectively with AI. Particular attention should be given to workers and new entrants to the labour market who may face difficulties as employers change their recruitment practices. The Bank of Canada's analysis identifies early signs of adjustment in occupations more exposed to AI, while cautioning that the available evidence does not establish AI as the sole cause of these changes (Brouillette et al., 2026).

Third, strengthen the measurement and monitoring of productivity. Policymakers need reliable evidence on AI adoption, investment, labour productivity, employment and wages across industries and firm sizes. Regular surveys and appropriately designed empirical studies can help distinguish genuine productivity improvements from temporary efficiency gains or changes in the composition of economic

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activity. Such evidence is also necessary to assess whether the benefits of AI are broadly shared or concentrated in particular sectors.

Fourth, maintain flexibility in monetary-policy assessment. AI may increase productive capacity over time, but the timing and scale of its effects remain uncertain. During the transition, changes in business costs, labour demand and investment may occur unevenly across sectors. The Bank of Canada must therefore continue to distinguish structural changes in productive capacity from cyclical movements in demand and employment. Its analysis of the AI productivity paradox emphasizes that identifying these effects in real time is a significant policy challenge (Brault et al., 2026). Monetary policy should respond to the evolving evidence rather than assume that AI will automatically raise productivity or reduce inflation.

V. CONCLUSIONS

AI offers Canada an opportunity to address some of its longstanding productivity challenges, but the outcome is not predetermined. Realizing its potential will require effective business adoption, investment in human capabilities, sound measurement and evidence-based policymaking. As the historical experience of earlier general-purpose technologies suggests, technological progress alone does not guarantee immediate improvements in aggregate productivity. Canada's success will depend on how effectively firms, workers, educational institutions and policymakers adapt to the changes ahead and ground reality.

A1 Chat GPT AI was utilized to improve the language and grammar within the manuscript.

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