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CENTRE FOR
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**A Detailed Analysis of Canada's Post-2000
Productivity Performance and Pandemic-Era
Productivity Slowdown**

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Abstract

Labour productivity growth in Canada has diminished considerably relative to the pre-2000 period, dropping from 1.74% per year in the 1973-2000 period to an average of 0.86% per year for the past two decades. Work by many productivity researchers, including those at the Centre, evinces a second step-wise reduction in the annual growth rate of labour productivity following the year 2000, resembling the substantial slowdown observed in the 1970s. This report serves to both contextualize Canada's productivity performance and to identify the sources of the slowdown, leveraging recent Statistics Canada and OECD data to provide stylized facts on the post-2000 productivity slowdown in the country. Through comparisons with the United States and other peer countries in the OECD, we characterize Canada's productivity performance as relatively poor but hardly exceptional. We also identify a substantial differences in the size of the Canada-U.S. productivity gap depending on the aggregate chosen. Moreover, by utilizing the CSLS's own decomposition framework as well as Statistics Canada growth accounting estimates, we find that a) the post-2000 slowdown has been driven primarily by trends in within-sector productivity and b) the slowdown reflects broad deterioration in all three primary sources of growth. Ultimately, given the persistent challenges facing the Canadian economy like enduring supply chain constraints and fading investment (particularly in ICT) we frame the path back to 1% annual productivity growth as a narrow one.

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A Detailed Analysis of Canada's Post-2000 Productivity Performance and Pandemic-Era Productivity Slowdown

Executive Summary

Labour productivity growth in Canada has diminished considerably relative to the pre-2000 period, dropping from 1.74% per year in the 1973-2000 period to an average of 0.86% per year for the past two decades. Work by many productivity researchers, including those at the Centre, evinces a second step-wise reduction in the annual growth rate of labour productivity following the year 2000, resembling the substantial slowdown observed in the 1970s (Sharpe & Tsang, 2018).

This so-called productivity slowdown seems to be global and broadly-based, though the effects have been sharpest in developed economies (CEPR, 2021; Dieppe, 2020). Admittedly, the absolute decrease observed in Canadian labour productivity growth in recent years has been relatively mild compared to some other developed economies, but only because productivity growth in the country was quite sluggish to begin with (Sharpe & Tsang, 2018).

This report serves to both contextualize Canada's productivity performance and to identify the sources of the slowdown, leveraging recent Statistics Canada and OECD data to provide stylized facts on the post-2000 productivity slowdown in the country. We frame Canada's performance as relatively poor but not exceptional. Indeed, we posit that productivity developments in Canada are comparable to those of a number of peer countries, including the United Kingdom, France, Spain, Norway, and the Netherlands.

We recognize substantial disparities in productivity growth trajectory between the United States and Canada. However, the size of this disparity is sensitive to the aggregate chosen, with the total economy gap paling in comparison to the business sector gap. Furthermore, we characterize the United States as something of an outlier among Western industrialized economies and caution against the use of the United States as the sole point of comparison in productivity discourse.

Using the CSLS decomposition framework, we distinguish between within-sector effects re-allocation effects on labour productivity. We find that productivity growth in the post-2000 period is primarily driven by within-sector productivity growth, with generally small effects associated with the re-allocation of labour across industries. The industries with the largest contributions to productivity growth over the period were the finance and insurance sector, the wholesale trade sector, the manufacturing sector, the retail trade sector, and the agriculture, forestry, fishing, and hunting sector.

We also adapt the CSLS decomposition formula to identify provincial contributions to productivity growth and to distinguish between within-province productivity growth and

productivity growth attributable to the re-allocation of labour between provinces. We find that re-allocation effects in this context are generally minute and that productivity growth overwhelmingly reflects within-province trends.

Finally, through a growth accounting framework, we find that Canada's slowing labour productivity since the mid 20th century reflects broad-based deteriorations in the growth of labour quality, multifactor productivity (MFP), and capital intensity – in particular, ICT capital intensity. The latter two components are particularly impactful.

International Comparisons

Though much discourse paints Canada's slowing productivity growth as alarming and extraordinary, comparisons with other peer countries in the OECD underscore that Canada's situation is far from unique. Key findings include:

- The growth rate in labour productivity, defined as real output per hour, for the total Canadian economy averaged 0.85% annually between 2000 and 2022, placing it 28th out of 38 countries.
- Economies with slower average rates of total economy labour productivity growth from 2000 to 2022 include the United Kingdom at 0.72% per year, France at 0.63% per year, Norway at 0.61% per year, and the Netherlands at 0.59% per year,
- Among G7 countries, only the United States did appreciably better than Canada in terms of trend total economy productivity growth from 2000 to 2022.
- Between the 1973-2000 period and the 2000-2022 period, the average annual rate of total economy productivity growth in Canada fell 0.48 points, from 1.33% per year to 0.85% per year.
- Compared to other OECD economies, Canada's slowdown in productivity growth was not particularly severe. In the 1973-2000 period, Canada ranked 31 out of 37 in terms of total economy trend productivity growth rate. In the 2000-2022 period, Canada ranked 28 out of 38, reflecting the fact that most other countries experienced larger slowdowns.
- In 2022, Canada's total economy labour productivity stood at \$53.3 per hour USD (using 2015 PPPs), putting it in 18th place among the 38 OECD countries and on par with the OECD average of \$53.4 per hour.

Comparisons with the United States suggest a less optimistic narrative, though it should be noted that the U.S. is an outlier among peer countries in terms of its robust productivity performance. We find that:

- The post-2000 slowdown was present only in the Canadian case, with the U.S. business sector continuing to grow at the pre-2000 pace. From the 1973-2000 period to the 2000-2022 period, Canadian trend productivity halved (1.74% to 0.86%). Meanwhile, trend productivity growth in the United States rose 0.02 points relative to the 1973-2000 period (1.81% to 1.83%).
- The size of the Canada-U.S. productivity gap depends heavily on the aggregate chosen (total economy vs. business sector). The business sector gap for the 2000-2022 period is 0.97 percentage points (Canada: 0.86% per year, U.S. 1.83% per year) while the total economy gap is just 0.55 points (Canada: 0.85%, U.S.: 1.1.40%).
- Canadian business sector labour productivity as a proportion of U.S. business sector labour productivity reached a historic low of 69.0% in 2021: the first time in official statistics that the measure has dropped below 70.0%.

CSLS Decomposition

The CSLS decomposition framework involves distinguishing between **within-sector effects** on productivity growth and **re-allocation effects** on productivity growth. Within-sector effects refer to aggregate productivity growth attributable to productivity growth within sectors. Re-allocation effects stem from changes in the share of labour input associated with a sector. All else equal, an increase in the share of total labour input which is employed by a sector with above-average productivity will increase the aggregate labour productivity growth in the economy.

These re-allocation effects can be further decomposed into the level effect and the growth effect. The **level effect** captures changes in the productivity level resulting from the movement of inputs across sectors with different productivity *levels*. Conversely, the **growth effect** captures changes which result from the movement of labour between sectors which experience different degrees of productivity growth over the relevant period. Imperative to note is the fact that this calculation is performed using absolute changes in labour productivity, and not rates of productivity growth.

The key findings from this exercise include:

- Aggregate labour productivity growth over the 2000-2022 period was driven almost entirely by within-sector productivity growth.
- The re-allocation effect was largest in 2000-2008 period, where about a quarter of productivity growth was contributed by the re-allocation of labour towards industries with high productivity levels, namely the mining and oil and gas extraction sector (\$356

in output per hour in 2000, expressed in 2012 Canadian dollars). Over the period, the labour input share in the industry rose from 1.4% to 2.1%

- The industries with the most significant contributions to productivity growth over the 2000-2022 period – a measure which reflects both the labour input share of a sector and its productivity growth trajectory – were finance and insurance (contribution of 0.19 points; growth rate of 2.23% per year), wholesale trade (0.15 points; 2.27%), manufacturing (0.13 points; 0.79%), retail trade (0.13 points; 2.04%), and agriculture, forestry, fishing, and hunting (0.12 points; 3.09%).
- The industries which experienced the largest slowdown in annual productivity growth between 2008-2019 and 2019-2022 were the arts, entertainment and recreation sector (0.52% per year in 2008-2019 to -4.86% per year in 2019-2022), the administrative services, waste management and remedial services sector (0.58% vs. -3.87%), and the professional, scientific and technical services sector (0.83% vs. -3.19%).

The CSLS decomposition framework can be adjusted easily to decompose national labour productivity growth across individual provinces and territories and to identify within-province and re-allocation effects. To an even greater extent than in the industrial decomposition, re-allocation effects play a very minor role in influencing productivity growth. The only substantial re-allocation effect observed across the 2000-2022 period was a level effect which materialized between 2000 and 2008, reflecting an influx of labour to the highly productive oil and gas industry in Alberta.

Outside of this example, provincial re-allocation effects were extremely minimal, reflecting the fact that the inter-provincial re-allocation of workers is a much less common and important dynamic than the re-allocation of workers between sectors. Across all periods, Ontario, Quebec, Alberta, and British Columbia were by far the largest contributors to productivity growth: an unsurprising result given that these are Canada's 4 largest provinces and the homes of key economic hubs like Vancouver, Toronto, Montreal, and the core of Canadian resource development in the Alberta oil sands.

Growth Accounting

Another instructive way of understanding labour productivity growth is through a growth accounting framework. Official Statistics Canada growth accounting estimates allow us to distinguish between three key sources of labour productivity growth: multifactor productivity, capital intensity and labour quality.

Multifactor productivity is the part of an increase in output which remains after accounting for changes in capital and labour input. It is calculated as a residual and, as such, it is not particularly helpful for understanding the on-the-ground changes driving developments in productivity; rather, it is a measure of all that we are unable to account for, or put simply, how much we do not know. It is most commonly interpreted as representing the pace of underlying

technological progress but might also reflect economies of scale, organizational efficiencies, and measurement issues.

Productivity growth stemming from capital intensity reflects the increased productivity which arises as each unit of labour becomes equipped with more capital. Capital deepening means that each worker has more tools, machinery, and technology at their disposal and this generally translates to a higher level of labour productivity. On a macro-level, this means that within an economy there tends to be a close relationship between levels of investment, which drive capital formation, and levels of labour productivity.

Finally, changes in the quality or composition of the labour force can also bring about improvements in labour productivity. This is conceptualized as the process by which labour becomes more skilled and accumulates human capital, either through education or experience. Given that highly-skilled workers tend to be more productive than low-skill workers, a compositional shift in the type of labour employed in the economy towards highly-skilled workers can cause aggregate productivity to increase and vice versa.

Key take-aways from our growth accounting analysis include:

- Falling labour productivity since 1961 reflected the general deterioration in all three sources of growth. From the 1961-1981 period to the 2008-2019 period, the contribution from multifactor productivity fell from 0.97 points to 0.24 points, the contribution from capital intensity fell from 1.33 points to 0.54 points, and the contribution from labour quality fell from 0.53 points to 0.25 points.
- Multifactor productivity growth fell continually from 1961 to 2008. The 2008-2019 period represented a significant rebound, with the contribution from multifactor productivity growth increasing 0.78 points from -0.54 points in the 2000-2008 period to 0.24 points in the 2008-2019 period.
- Capital intensity also fell from 1961 to 2019, save for a brief period of recovery between 2000 and 2008, when the contribution from capital intensity jumped from 0.87 points in the 1981-2000 period to 1.13 points in the 2000-2008 period. However, the contribution promptly receded to 0.54 points in the 2008-2019 period.
- Slowing growth in capital intensity reflects slowdowns in both ICT and non-ICT capital intensity. Investment in ICT has faded more severely. The growth rate of ICT capital input fell from 8.17 points in the 1961-1981 period to just 2.33 points in the 2008-2019 period. In the 2008-2019 period, the contribution to productivity growth from ICT capital intensity stood at less than half of its contribution from 1961-1981, when modern ICT was in its infancy.
- The contribution from labour quality fell substantially from 1961 to 2000 but flattened out post-2000 at about 0.25 points.

- Pandemic disruptions and asymmetric losses in employment across industries and skill levels produced substantial fluctuations in the sources of growth. The contribution from multifactor productivity plummeted (0.24 points in 2008-2019 to -0.71 points in 2019-2021), while the contributions from capital intensity and labour quality more than doubled (0.54 points to 1.29 points; 0.25 points to 0.52 points).

The Path Back to 1%

Taken together, these exercises suggest an uncertain future for Canadian productivity growth. The exceptionality of the 2019-2021 period and the COVID-19 pandemic make it challenging to forecast future movements in Canadian labour productivity growth. Labour productivity is a long-term concept and hence, short-term fluctuations should not be afforded too much attention in projecting future developments, let alone highly unprecedented ones like those brought on by the pandemic.

Still, the path back to 1% annual growth is likely to be an arduous one following the shocks and disruptions of the pandemic. This is compounded by a number of entrenched problems and challenges. Investment in innovation, research and development, and ICT appears stagnant, leading to poor multifactor productivity and capital intensity growth.

Similarly, the high education level of the Canadian population makes it increasingly difficult to further improve the quality of the labour force. Finally, the green transition, in de-emphasizing the importance of the mining and oil and gas exploration sector, threatens to permanently impair Canadian productivity growth prospects. Still, there may be an upside as well, given that this sector has also at times constrained productivity growth.

Altogether, while it remains to be seen how the Canadian economy will emerge from the pandemic era, a return to 1% seems unlikely without some sustained shock to Canada's business environment. Even in the best-case scenario where productivity growth rebounds dramatically post-pandemic, in depressing productivity growth, the disruption caused by the pandemic has deprived Canadians of would-be productivity gains. Capturing those lost gains would require a rate of productivity growth well above 1%.

Assuming an 8-year business cycle, as occurred between 2000 and 2008, a business sector labour productivity growth rate of 1.46% per year would be needed to achieve 1% trend productivity growth for the full period. Assuming an 11-year business cycle, as occurred between 2008 and 2019, a growth rate of 1.29% per year would be required: prospects which, given the challenges outlined in this report, seem increasingly

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Introduction

Labour productivity growth in Canada has diminished considerably relative to the pre-2000 period, dropping from 1.74% per year in the 1973-2000 period to an average of 0.86% per year for the past two decades. Work by many productivity researchers, including those at the Centre, evinces a second step-wise reduction in the annual growth rate of labour productivity following the year 2000, resembling the substantial slowdown observed in the 1970s (Sharpe & Tsang, 2018).¹ This so-called productivity slowdown seems to be global and broadly-based, though the effects have been sharpest in developed economies (CEPR, 2021; Dieppe, 2020). Admittedly, the absolute decrease observed in Canadian labour productivity growth in recent years has been relatively mild compared to some other developed economies, but only because productivity growth in the country was quite sluggish to begin with (Sharpe & Tsang, 2018).

Analysis on the factors underlying Canada's recent period of weak labour productivity growth is still early. Previous research by the Centre has pointed squarely at the manufacturing sector as the chief source of declining labour productivity post-2000, although there have been further negative contributions from the construction, agriculture, retail, and agricultural industries (Sharpe & Tsang, 2018). With that said, this period, beginning in 2019 and concluding in 2022 with the most recent annual data from Statistics Canada, is particularly difficult to analyze due to the onset of the COVID-19 pandemic in 2020. It is extremely challenging to

¹ The first major slowdown in productivity growth was observed in the 1970s, with 1973 as the pivotal year. In an effort to align data with cyclical peaks (subject to data availability constraints), this paper at times decomposes the pre-2000 period into the period spanning from 1961 to 1981 and the period spanning from 1981 to 2000. Readers should note that the use of such time periods masks the magnitude of the 1970s slowdown. That is to say, the slowdown between periods would be meaningfully larger if the periods were aligned with the turning point in 1973.

untangle the impact of temporary compositional changes in the economy from more enduring pandemic effects and from longer-term pandemic-agnostic trends in labour productivity.

Nevertheless, this report aims to enhance and update understandings of Canadian productivity developments post-2000 by analyzing Canada's productivity performance from an international and historical perspective, and in particular, by applying the labour productivity decomposition framework developed by the Centre for the Study of Living Standards and advanced in Sharpe and Thompson (2010). This approach distinguishes between labour productivity growth attributable to within-sector productivity developments and growth attributable to the re-allocation of labour inputs across different sectors of the economy with different productivity levels and growth trajectories. We also investigate productivity growth trends through a growth accounting framework.

Our analysis serves to both contextualize Canada's productivity performance and identify the sources of the slowdown. We frame Canada's performance as relatively poor but not exceptional. Indeed, we posit that productivity developments in Canada are comparable to those of a number of peer countries, including the United Kingdom, France, Spain, Norway, and the Netherlands. With that said, we recognize substantial disparities in productivity growth trajectory between the United States and Canada. However, the size of this disparity is sensitive to the aggregate chosen, with the total economy gap paling in comparison to the business sector gap. Furthermore, we characterize the United States as something of an outlier among Western industrialized economies and caution against the use of the United States as the sole point of comparison in productivity discourse.

Using the CSLS decomposition framework, we distinguish between within-sector effects re-allocation effects on labour productivity. We find that productivity growth in the post-2000

period is primarily driven by within-sector productivity growth, with generally small effects associated with the re-allocation of labour across industries. The industries with the largest contributions to productivity growth over the period were the finance and insurance sector, the wholesale trade sector, the manufacturing sector, the retail trade sector, and the agriculture, forestry, fishing, and hunting sector. We also adapt the CSLS decomposition formula to identify provincial contributions to productivity growth and to distinguish between within-province productivity growth and productivity growth attributable to the re-allocation of labour between provinces. We find that re-allocation effects in this context are generally minute and that productivity growth overwhelmingly reflects within-province trends. As one might expect, the four largest provinces – Ontario, Quebec, British Columbia, and Alberta – are consistently the largest contributors to productivity growth in the post-2000 period. Notably, the pandemic-era productivity slowdown is attributable almost entirely to falloffs in productivity contributions from Ontario and Alberta in particular.

Finally, through a growth accounting framework, we find that Canada's slowing labour productivity since the mid 20th century reflects broad-based deteriorations in the growth of labour quality, multifactor productivity (MFP), and capital intensity – in particular, ICT capital intensity. The latter two components are particularly impactful. We also identify sudden pandemic-era improvements in these variables, likely owing to laying off and furloughing of employees throughout the pandemic, leading to changes in the capital-labour ratio and the composition of the labour force.

The first section of this report leverages recent OECD data to present a more detailed assessment of Canada's productivity performance relative to other economies. We first consider a cohort of peer countries within the OECD before moving to analyze the productivity growth

gap between the United States and Canada. In the second section, we perform the CSLS decomposition across sectors at the NAICS two-digit level, analyzing the within-sector and re-allocation effects on productivity in the post-2000 period. In the next section, we employ an adjusted form of the framework to decompose productivity growth on a province-by-province basis, isolating within-province effects on productivity and effects stemming from re-allocation of labour inputs across provinces. In the fourth section, we analyze productivity growth from 1961-2021 using official Statistics Canada estimates for the sources of productivity growth - i.e., capital intensity, labour quality, and multifactor productivity - and their contributions to growth pre- and post-2000. A final section concludes.

On balance, we characterize the outlook for productivity growth in Canada as mixed, if not somewhat pessimistic. From an international perspective, Canada is far from the worst-performing economy among its peers. With that said, entrenched challenges like fading investment, high levels of education, and enduring supply-side constraints mean that returning to 1% labour productivity growth per year is likely to be difficult. Moreover, structural changes like the green transition may pose further threats to productivity growth to the extent that they de-emphasize high productivity industries like mining and oil and gas extraction. Fundamentally, it is difficult to separate out longer-term productivity trends from ephemeral pandemic effects. Still, some indicators, like the fact that the 2008-2019 period represented historic low-points for growth in capital intensity and labour quality suggest that Canada's post-2019 productivity slowdown may be more than just a momentary setback.

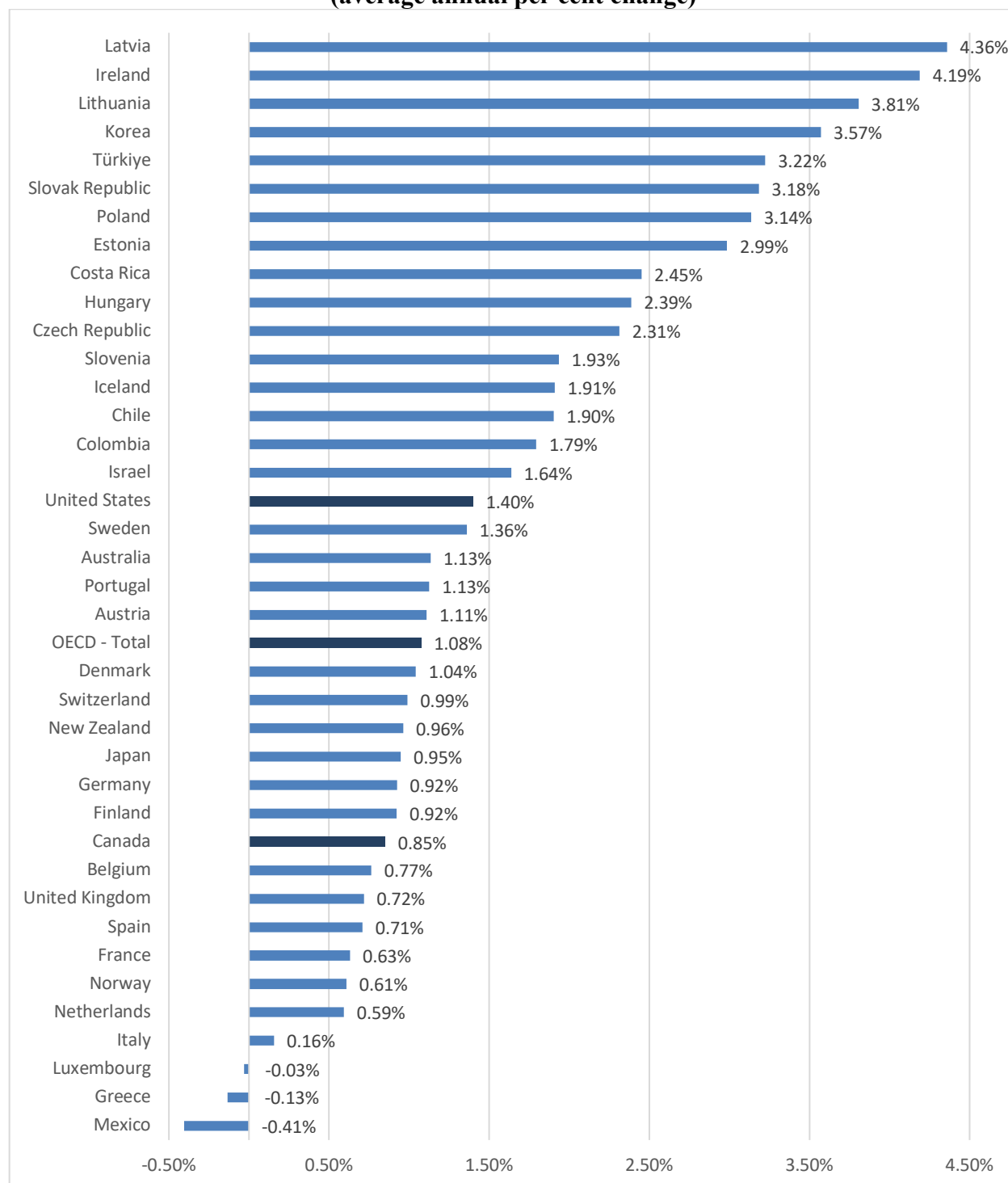
The Global Productivity Slowdown: Contextualizing Canada's Productivity Performance

Analysis of productivity trends generally either takes on either a historical perspective, assessing productivity trends across time within a country, or an international perspective which focuses primarily on comparisons between countries. While a historical perspective is part and parcel to understanding how Canada's productivity performance has progressed over time, a purely historical lens in some ways risks exaggerating the exceptionality of the Canadian case. After all, since the year 2000, slowdowns in productivity growth have been observed within a number of economies, particularly in Western industrialized countries. Indeed, an international lens depicts Canada's productivity growth trajectory as fairly average among comparable countries, though the narrative depends greatly on the cohort of countries chosen. For this reason, we begin our examination of Canadian productivity trends with an international overview of the post-2000 productivity slowdown. Our discussion begins by contextualizing Canada's performance within the OECD. We then move to investigate the distinct productivity trends in Canada and the United States.

Comparisons with Other OECD Economies

Though much discourse paints Canada's slowing productivity growth as alarming and extraordinary, comparisons with other peer countries in the OECD underscore that Canada's situation is far from unique. Chart 1 offers the trend productivity growth rate for 38 OECD economies for the 2000-2022 period, as well as the total trend across all countries. Productivity is a long-term concept, and therefore it is important to assess performance over long periods. It is also integral to note that this Chart presents output per hour measured for the total economy, not just the business sector.

Chart 1: Total Economy Output per Hour Growth in OECD Countries, 2000-2022
(average annual per cent change)



Source: https://stats.oecd.org/Index.aspx?DataSetCode=PDB_GR

Note: Some country series feature data breaks and estimated or provisional values instead of official statistics for some observations. For full detail on the countries and observations affected, please see the linked database.

A comparison of Canada with peer countries paints the country's performance as poor but not unique. The OECD reports that the growth rate in labour productivity, defined as output per hour, for the total Canadian economy averaged 0.85% annually between 2000 and 2022, placing it 28th out of 38 countries. Economies with slower average rates of labour productivity growth include the United Kingdom at 0.72% per year, France at 0.63% per year, Norway at 0.61% per year, and the Netherlands at 0.59% per year, among others. A number of countries just slightly outperformed Canada, including Germany and Finland at 0.92% per year, New Zealand at 0.96% per year, and Australia at 1.13% per year. The United States and Sweden, meanwhile, performed significantly better than Canada, at 1.40% per year and 1.36% per year, respectively.

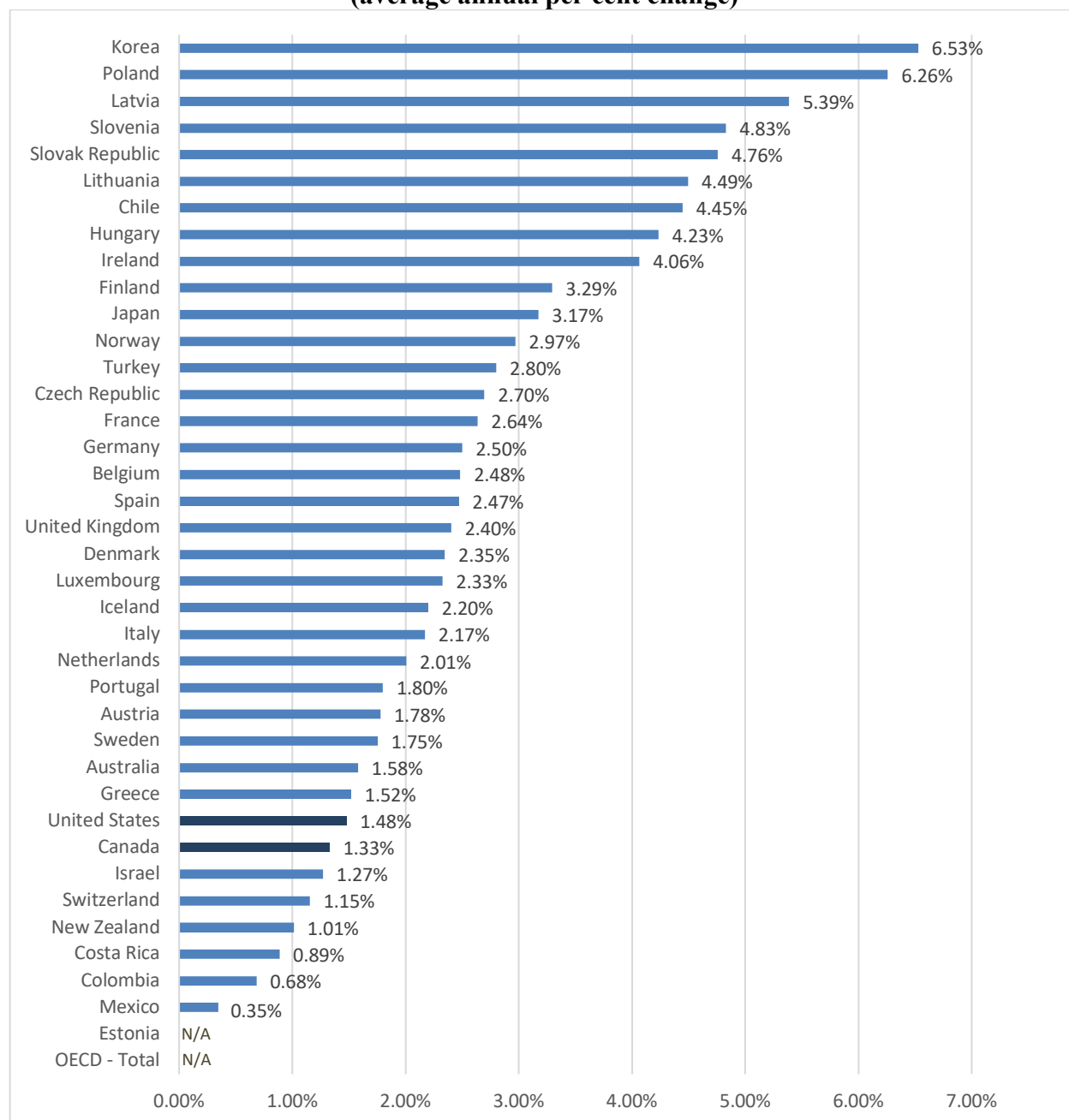
Most comparable countries to Canada (i.e. Western European and Oceanic countries) occupy a band centred around 1% annual productivity growth, ranging between 0.60% per year and 1.40% per year. It should be recognized that the United States is somewhat of outlier in its productivity performance; compared to countries like France, Germany, Norway, Australia, New Zealand, and the United Kingdom, Canada's sluggish productivity growth trajectory appears actually quite normal. Overall, Canada occupies a middling position compared to these countries, with an average productivity growth rate exceeding that of the UK, France, and Italy, and just 0.1 points below Japan and Germany; among G7 countries, only the US did appreciably better.

Countries with vastly higher rates of annual productivity growth above 1.5% per year tend to differ from Canada in systematic ways, and hence, these economies do not offer relevant comparisons. For example, Post-Soviet and Eastern Bloc countries like Lithuania, Latvia, Estonia, Poland, Hungary, and others have developed advanced economies, but have followed a vastly different timeline and trajectory for development than Western industrialized democracies.

Given the relative recency of the transition from planned to market economy which took place in these countries, they continue to experience a greater potential for economic growth which is reflected in their remarkable rates of productivity growth. This distinct history and path for economic development naturally prompts different policy prescriptions and a much different interpretation of productivity trends, making comparisons with Canada not particularly instructive. A similar argument can be applied to Latin American economies like Chile and Colombia.² Ireland, a consistent leader in productivity growth, is itself an anomaly due to its high-tech sector and the fact that many multinational firms book their profits in the country to take advantage of low tax rates (OECD, 2018; Papa, 2019).

² Mexico is an exception with a horrendously bad productivity performance at -0.41% per year on average between 2000 and 2022.

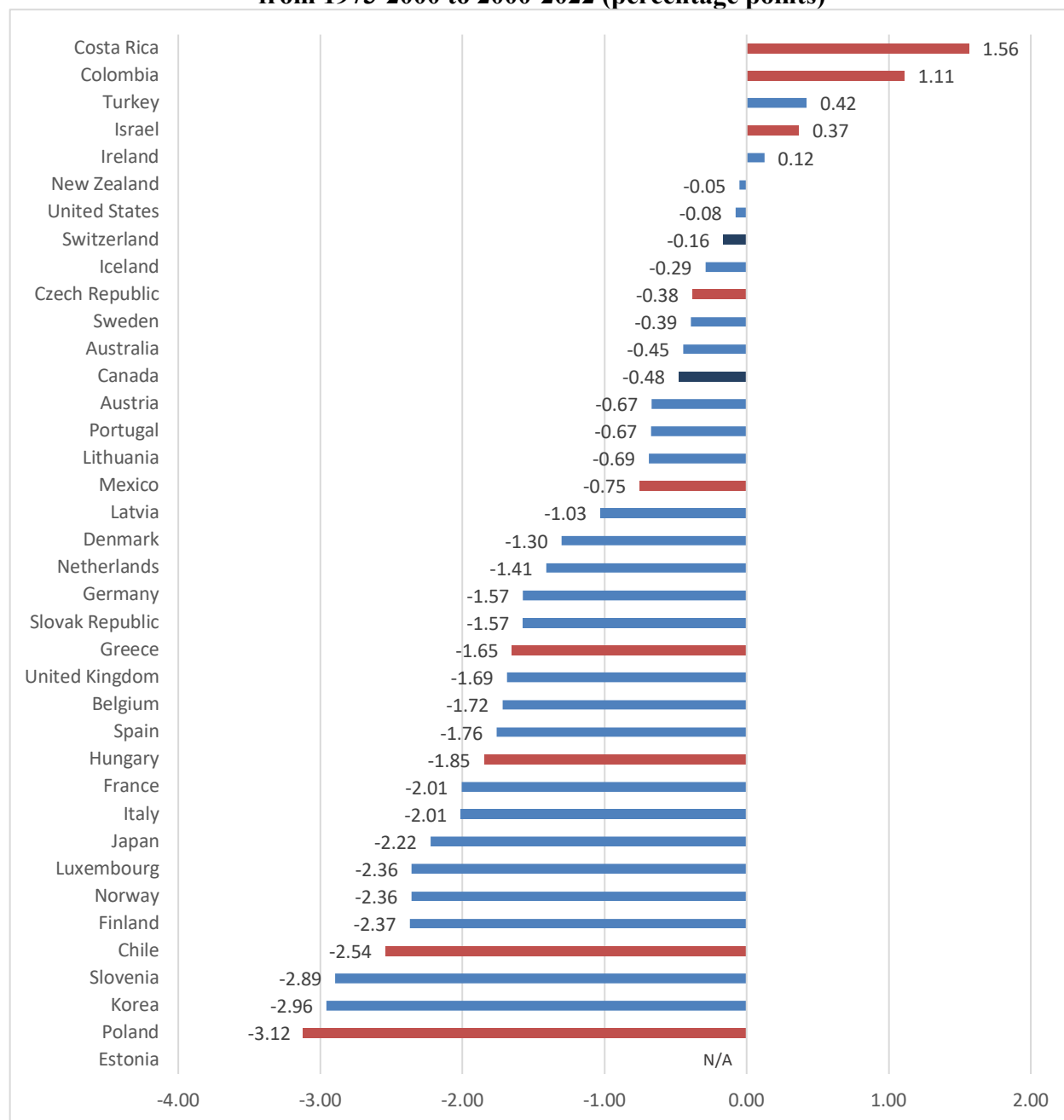
Chart 2: Total Economy Output per Hour Growth in OECD Countries, 1973-2000
(average annual per cent change)



Source: https://stats.oecd.org/Index.aspx?DataSetCode=PDB_GR

Note: Compound annual growth rates are calculated using shortened time periods for some countries due to a lack of available data: 1975-2000 for Colombia, 1981-2000 for Israel, 1983-2000 for Greece, 1986-2000 for Chile, 1991-2000 for Costa Rica, Hungary, and Mexico, 1993-2000 for the Czech Republic and Poland, 1995-2000 for Austria, Latvia, Lithuania, the Slovak Republic, and Slovenia. Data before 2000 is not available for Estonia. An average for the OECD as a whole is not provided due to these differences in data availability. Some country series feature data breaks and estimated or provisional values instead of official statistics for some observations. For full detail on the countries and observations affected, please see the linked database.

Chart 3: Period-to-Period Change in Average Annual Labour Productivity Growth Rate from 1973-2000 to 2000-2022 (percentage points)



Source: https://stats.oecd.org/Index.aspx?DataSetCode=PDB_GR

Note: Orange highlights indicate countries for which data is not available for the entire 1973-2000 period. See the note in Chart 2 for additional details. Data before 2000 is unavailable for Estonia. Some country series feature data breaks and estimated or provisional values instead of official statistics for some observations. For full detail on the countries and observations affected, please see the linked database.

Chart 2 provides average rates of total economy labour productivity growth for the 1973-2000 period, with Chart 3 displaying the period-to-period changes between the 1973-2000 period and the 2000-2022 period. However, caution should be exercised in interpreting these estimates as data for the full 1973-2000 period is unavailable for a number of OECD economies. Still, the figures evince the broad-based nature of the post-2000 productivity growth slowdown. Only 37 OECD countries are represented, due to a lack of pre-2000 productivity growth data for Estonia. 32 of these countries experienced a slowdown in productivity growth between periods. The most severe slowdown was observed in Poland, where average productivity growth dropped 3.12 points from 6.26% per year to 3.14% per year: a 50% decline in productivity growth. The most favourable period-to-period change in productivity growth trajectory, and one of the few examples of improvements in productivity growth over this time period, occurred in Costa Rica where annual productivity growth rose by 1.56 points (0.89% to 2.45%). Both of these countries have limited data available pre-2000 however (data is only available after 1991 for Costa Rica and after 1993 for Poland), so these changes are likely not completely representative of productivity trends in the 1973-2000 period. Among countries for which data is available for the 1973-2022 period, Turkey experienced the largest improvement in productivity growth (a change between periods of 0.42 points) and Korea, the country with the highest productivity growth rate pre-2000, experienced the largest slowdown (a change of -2.96 points).

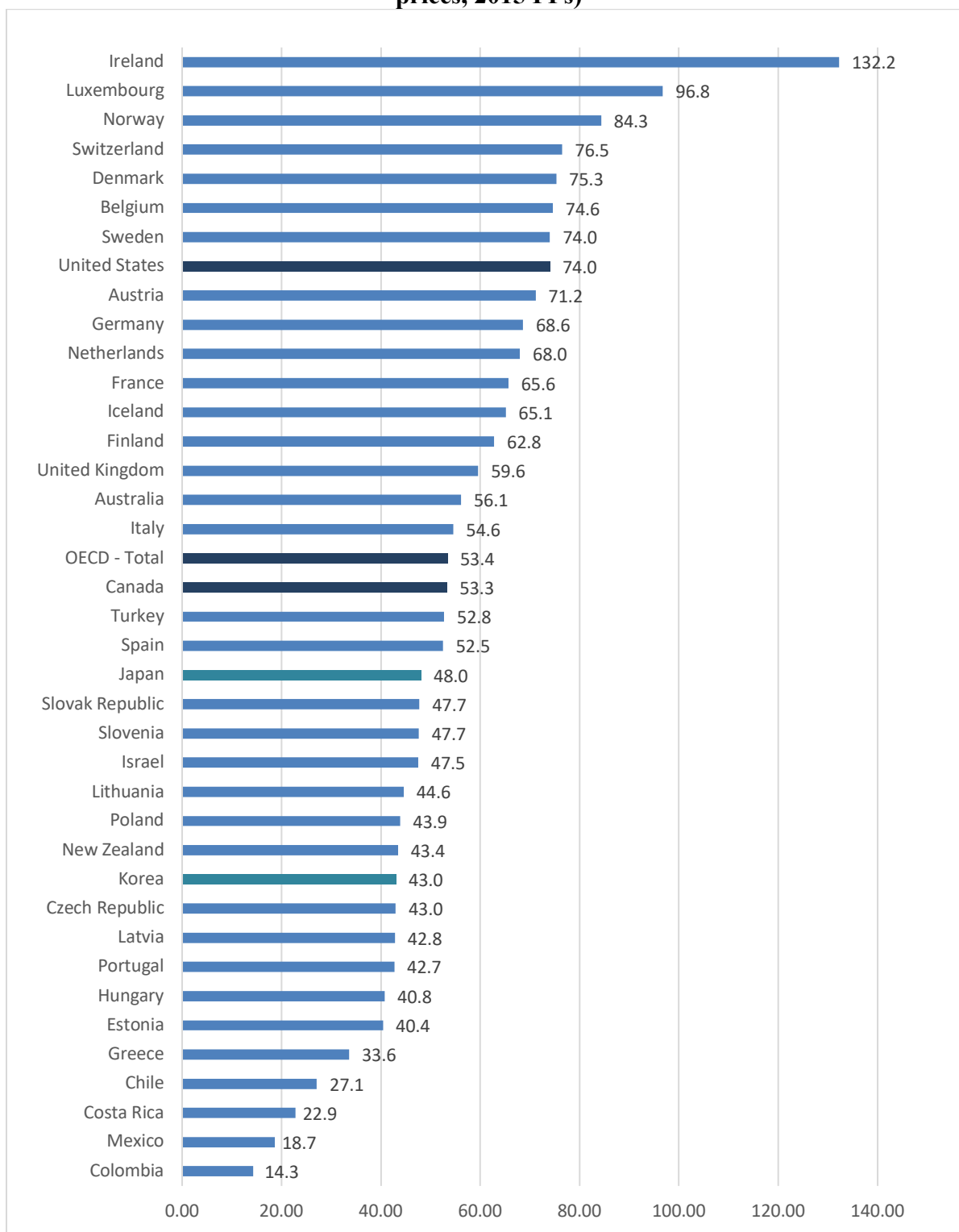
Compared to other OECD economies, Canada's slowdown in productivity growth was not particularly severe; between the 1973-2000 period and the 2000-2022 period, the average annual rate of productivity growth in Canada fell 0.48 points, from 1.33% per year to 0.85% per year. Out of the 37 OECD economies with pre-2000 data available, this represents the 13th largest between-period change; out of the 28 countries for which data is available for the entire

period from 1973 to 2000, this represents the 8th largest change. Expressed differently, out of the 32 economies for which a slowdown occurred, Canada experienced 25th largest slowdown. With that said, this relatively minor slowdown in productivity growth between periods likely reflects the fact that Canada's productivity growth trajectory was already relatively poor. After all, with the exception of Mexico, all of the countries which experienced poorer rates of productivity growth than Canada in the pre-2000 period saw less severe slowdowns, suggesting that there is indeed a relationship between pre-2000 rates of productivity growth and the magnitude of the post-2000 slowdown. Beyond this, there was no consistent pattern in the size of the productivity slowdown among peer countries. Countries like New Zealand (-0.05 points), Switzerland (-0.16 points), the United States (-0.20 points), Sweden (-0.39 points), and Australia (-0.45 points) experienced smaller slowdowns, though 2 of these countries had rates of productivity growth which were poorer than Canada's in the 1973-2000 period. Meanwhile, countries like the Netherlands (-1.41 points), Germany (-1.57 points), the United Kingdom (-1.69 points), France (-2.01 points), and Italy (-2.01 points) among others, experienced significantly larger slowdowns. However, it should be noted that all of these economies had higher rates of productivity growth to begin with.

Despite experiencing a higher average annual rate of labour productivity growth than Canada in the 1973-2000 period (1.48% in the United States vs 1.33% in Canada), the United States saw a slowdown of just 0.08 points: less than a fifth of the size of that experienced in Canada. This between-period change represents the 7th largest change of the 37 countries with pre-2000 data available and the 2nd smallest slowdown, behind just New Zealand. Whereas the United States possessed the 30th highest rate of productivity growth in the 1973-2000 period, it became the economy with the 17th highest growth rate post-2000. In other words, although the

United States experienced a slowdown of its own, the slowdown was so insignificant relative to other OECD economies that its position within the cohort improved considerably. In contrast, Canada had the 31st highest average annual rate of productivity growth in the 1973-2000 period and the 28th highest rate post-2000: a more modest improvement.

Chart 4: Total Economy Output per Hour Levels in OECD Countries, 2022 (USD, constant prices, 2015 PPs)



Source: https://stats.oecd.org/Index.aspx?DataSetCode=PDB_GR#

Note: Some country series feature data breaks and estimated or provisional values instead of official statistics for some observations. For full detail on the countries and observations affected, please see the linked database.

Looking at recent labour productivity levels in OECD countries, meanwhile, paints Canada's performance as firmly average. In 2022, Canada's total economy labour productivity stood at \$53.3 per hour USD (using 2015 PPPs), putting it in 18th place among the 38 OECD countries and on par with the OECD average of \$53.4 per hour. The United States performs well from this perspective, with a total economy output per hour of \$74.0: the 8th highest level among the 38 OECD countries. Canadian labour productivity makes up just 72% of this figure. With the exception of Ireland, which is both the country with the highest GDP per hour and the country with the second highest rate of annual productivity growth post-2000, the countries with the highest levels of labour productivity do not tend to be the highest performers in terms of productivity growth.

Luxembourg is the most obvious example of this as the economy with the second highest productivity level among OECD economies and the third lowest rate of annual labour productivity growth post-2000. Other countries with similar patterns of labour productivity growth include the Netherlands, Denmark, and Belgium. Indeed, 6 of the 10 countries with the highest levels of total economy labour productivity experience annual rates of productivity growth which are below the OECD average. Such an observation provides some evidence for the narrative that there are diminishing marginal returns to labour productivity growth; that as labour productivity improves, it becomes increasingly difficult for an economy to maintain the same rate of productivity growth. Interestingly, of the 17 countries with higher levels of labour productivity than Canada, 10 boast higher rates of labour productivity growth. This suggests that, even if we accept the hypothesis that higher productivity levels entail slower productivity growth, Canada's rate of productivity growth still seems somewhat low relative to its productivity level.

The use of total economy output per hour – a measure which includes the government sector and non-profit sector as well as the business sector – in the OECD figures in Charts 1 to 4 provides a few interesting insights when we compare to trends in business sector productivity. Notably, the recorded annual productivity growth rate for Canada over the 2000-2022 period is almost identical when using total economy output per hour rather than business sector output per hour; we find an annual average growth rate of 0.85% in the former case and 0.86% in the latter case. With that said, there is an inherent issue of measurement as many of the products from non-business sector industries (all in the case of the non-profit sector) lack prices which can be leveraged to evaluate outputs and estimate labour productivity levels. The official approach adopted by Statistics Canada is to derive the value of a product is by estimating the costs of the inputs, however this method gives labour productivity growth of 0, as outputs equal inputs in every period by construction. Total economy output numbers are hence imperfect, however they ought not to be ignored, given that upwards of 20% of total economic activity is attributable to the non-business sector in Canada (Statistics Canada, 2022). Given these measurement issues and the downward bias they create in measuring productivity growth, it is unexpected that total economy productivity growth in Canada is found to be almost identical to business sector productivity growth, and in fact, slightly higher.

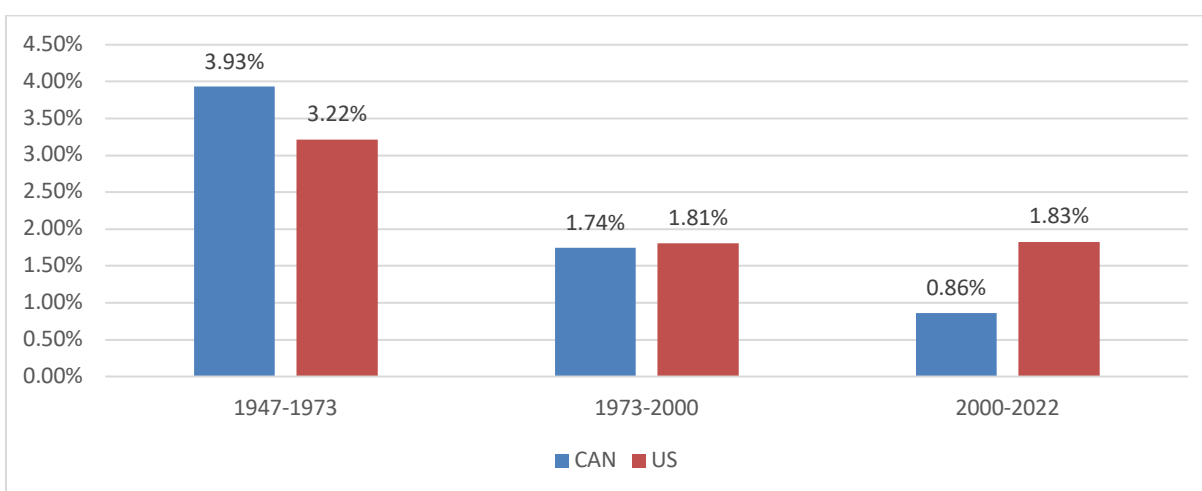
The U.S.-Canada Productivity Gap

Among Canada's peer countries, the United States is perhaps the most natural point of comparison for assessing Canada's productivity performance, given the close geographic, economic, and social ties between the two countries. Chart 5 provides the growth rates of business sector and total economy labour productivity for the United States and Canada for selected periods. Panel A shows the long-term business sector trends over the prior century

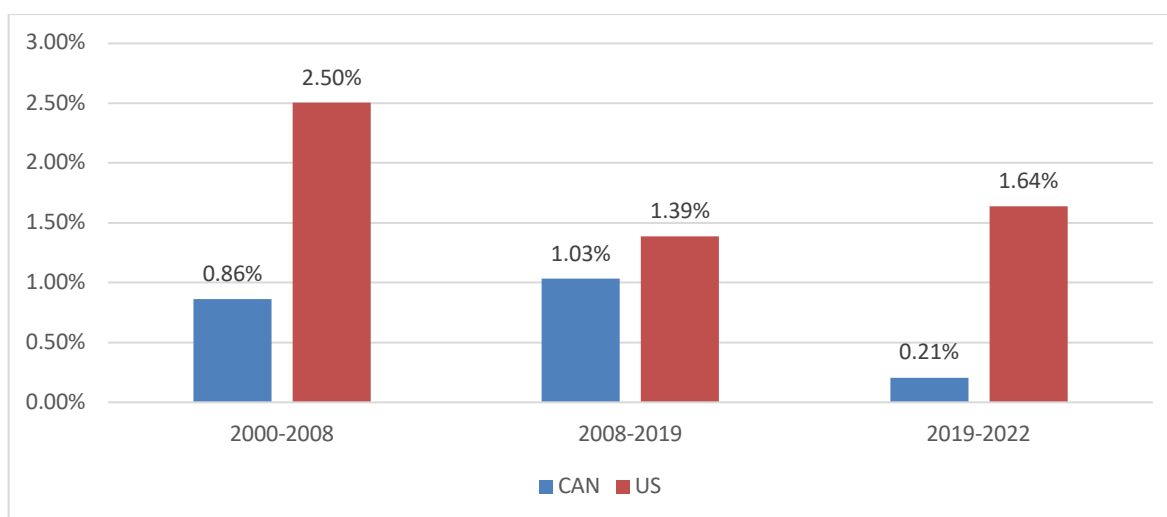
within three periods, 1947-1973, 1973-2000, and 2000-2022, with all but the latest period being cyclically neutral. Panel B zooms in on business sector productivity trends post-2000, providing rates of growth for the periods spanning 2000-2008, 2008-2019, and 2019-2022. Again, the first two periods are cyclically neutral while the most recent is not. Panels C and D offer rates of growth for the same periods but for the total economy rather than the business sector. However, due to lack of available data, the 1947-1973 period is omitted from Panel C.

Chart 5: Labour Productivity Growth Trends in Canada and the United States

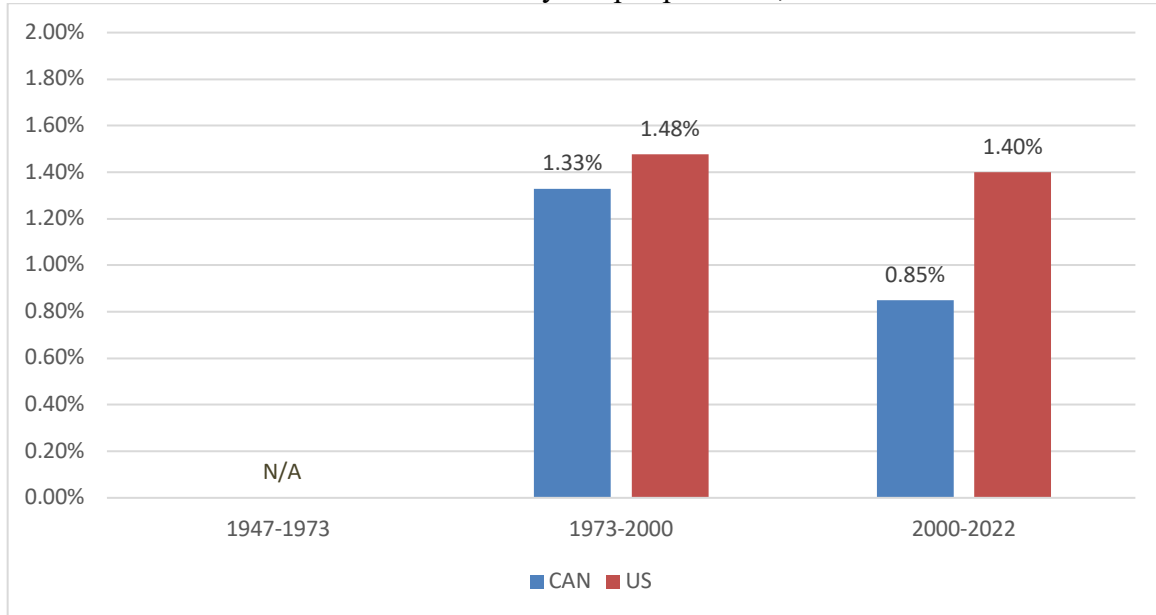
Panel A: Business Sector Output per Hour Trends, 1947-2022



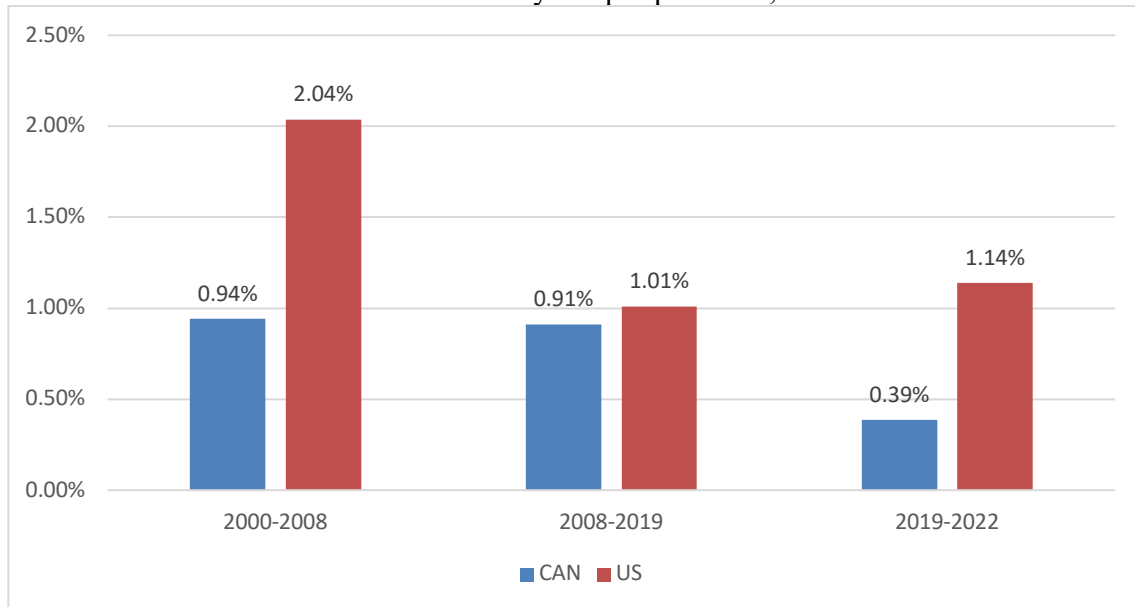
Panel B: Business Sector Output per Hour Trends, 2000-2022



Panel C: Total Economy Output per Hour, 1973-2022



Panel D: Total Economy Output per Hour, 2000-2022



Sources: Canada business sector labour productivity data from Statistics Canada: Table 36-10-0305-01 for 1947-1960, Table 36-10-0208-01 for 1961-2021, Table 36-10-040-01 for 2022. United States business sector labour productivity data from BLS Labour Productivity and Cost Measures – Major Sectors – August 3, 2023 (XLSX sheet). Total Economy labour productivity data from OECD – Productivity and ULC – Annual, Total Economy: https://stats.oecd.org/Index.aspx?DataSetCode=PDB_GR#.

Rates of business sector productivity growth in Canada have tended to lag those in the United States throughout the last century and this phenomenon has become most severe after 2000. In this respect, the post-war period of 1947-1973 period was unique, with Canadian business sector productivity growth over the period exceeding growth in the United States by 0.71 percentage points. This advantage was short-lived however. By the 1973-2000 period, productivity growth in both countries had fallen sharply, with the Canadian business sector figure comprising less than half what it was previously. Trend productivity growth was relatively less affected in the United States, falling 1.41 points period-to-period compared to 2.19 points in Canada. This brought the productivity trajectories of the two countries more-or-less in line with another (1.74% in Canada vs. 1.81% in United States).

Moving to the 2000-2022 period, Canadian business sector productivity once again halved, with trend productivity growth falling 0.88 points from the 1973-2000 period. Concerningly though, this drop was not mirrored in the American figures. In fact, as Canadian productivity growth plummeted period-to-period, trend productivity growth in the United States from 2000 to 2022 actually rose 0.02 points relative to the 1973-2000 period. Such developments suggest that, contrary to the post-war slump in productivity growth which affected both countries in a roughly equal manner, the post-2000 slowdown may not be so universal and instead may point to something unique to the Canadian business sector.

Comparing growth trends across Canada and the United States for shorter subperiods after 2000 offers a more precise understanding of the divergence in productivity developments across the two countries. In particular, the exercise underscores how short-term pandemic-era disruptions offer little explanation for the longer-term asymmetry in Canada-U.S. productivity trends. The largest discrepancy between the productivity growth rates of the two countries is

observed in the 2000-2008 period, where productivity growth in the United States averaged an impressive 2.50% annually while growth in Canada was dismal at 0.86% annually: a differential of 1.64 percentage points.

This discrepancy moderated significantly over the 2008-2019 period, as Canadian productivity growth rose 0.17 points to 1.03% and productivity growth in the United States experienced a sharp fall of 1.11 points down to 1.39%. Altogether, this reduced trend productivity growth in the United States to just 35% above Canadian trend productivity growth, likely reflecting the enduring, asymmetric effects of the 2008 financial crisis and the late-period resource boom which bolstered productivity contributions from the Canadian mining, oil and gas extraction industry.

However, with the 2019-2022 period, any prospect of a return to parity in productivity growth trends between the two economies grew more remote; Canadian productivity growth cratered in this period, dropping 0.82 points between periods to just 0.21% annually. And once again, this dramatic decline was not reflected in trends observed in the United States; rather, American trend productivity growth actually rebounded somewhat, rising 0.25 points from an average of 1.39% annually in the previous period to 1.64%. These divergent trends resulted in a substantial widening of the cross-country disparity in growth trends. Trend productivity growth in the United States now exceeded that in Canada by 1.43 percentage points. This is slightly smaller than the absolute gap observed in the 2000-2008 subperiod, however the gap in relative terms is by far the largest between 2019 and 2022, with trend productivity growth in the United States nearly 8 times larger than that in Canada.

For comparison, Panels C and D offer rates of labour productivity for the total economy. With the exception of the 1973-2000 period, the gap between the rates of growth in U.S. and

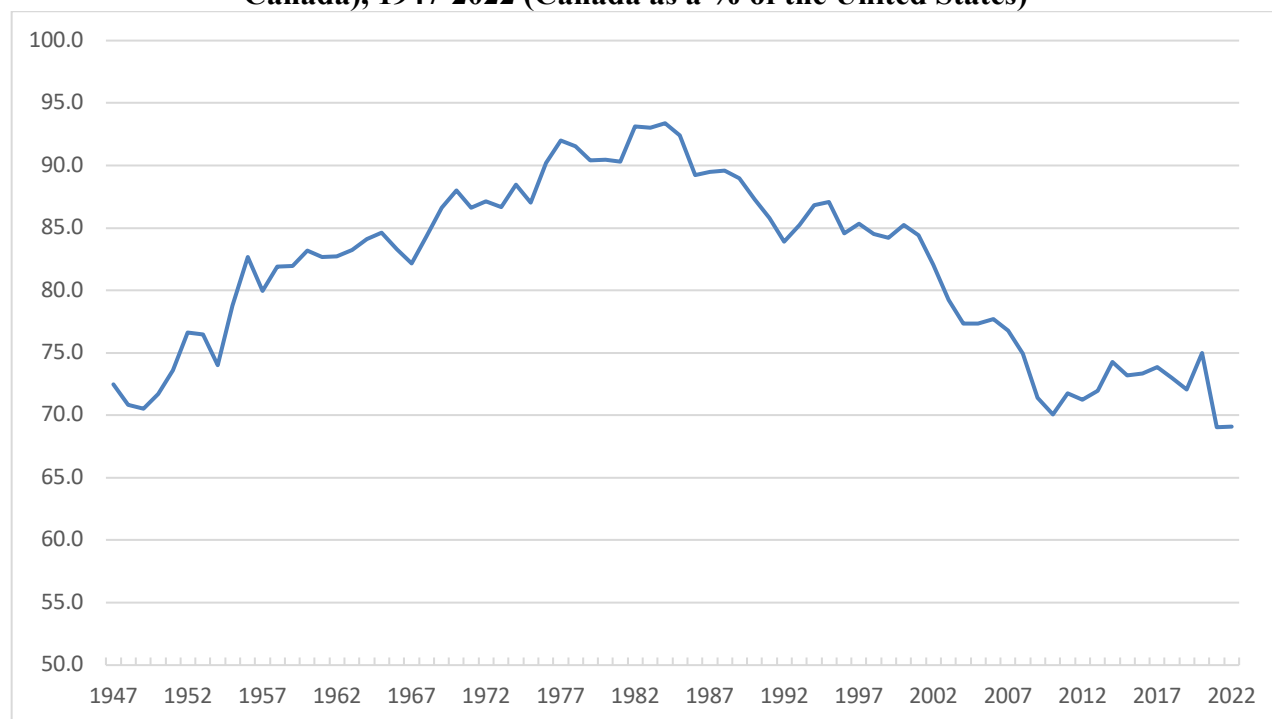
Canada is smaller in every period when using total economy measures rather business sector measures. This is particularly visible in the 2000-2008 period, where the total economy gap is 1.10 points compared to 1.64 points in the business sector, and the 2019-2022 period, where the total economy gap is 0.75 points compared to 1.43 points. These estimates for the 2019-2022 period should be interpreted with extreme caution however, given the extraordinary nature of the period and the fact that estimates for 2022 productivity growth may still be subject to revision. A fuller discussion of the significance of total economy measures in assessing the state of Canadian labour productivity growth follows later on in this section.

The Relative Labour Productivity Gap

Chart 6 provides an alternative view of the Canada-U.S. productivity gap by comparing business sector productivity levels over the full 1947-2022 period. The Chart graphs Canadian labour productivity levels (business sector output per hour) as a proportion of labour productivity levels in the United States, with purchasing power parity (PPP) based on a 1999 benchmark developed by Statistics Canada (2008).³ Naturally, the transformation of the gap closely tracks the trends in productivity growth rates presented in Chart 6, painting an alarming picture of a perpetually widening gap since the mid-1980s.

³ This benchmark from the Statistics Canada article “Relative Multifactor Productivity Levels in Canada and the United States: A Sectoral Analysis” (Catalogue no. 15-206-X, no. 019, July, p.32.) calculated Canadian business sector output per labour hour in 1999 as 84.2% of United States business sector output per labour hour.

Chart 6: Relative Labour Productivity Levels (GDP per Hour in the Business Sector in Canada), 1947-2022 (Canada as a % of the United States)



Source: Canada labour productivity data from Statistics Canada: Table 36-10-0305-01 for 1947-1960, Table 36-10-0208-01 for 1961-2021, Table 36-10-0480-01 for 2022. US labour productivity from BLS Labour Productivity and Cost Measures – Major Sectors – August 3, 2023 (XLSX sheet). 1999 benchmark of Canada's output per hour at 84.2% of US output per hour from Statistics Canada (2008) "Relative Multifactor Productivity Levels in Canada and the United States: A Sectoral Analysis" Catalogue no. 15-206-X, no. 019, July, p.32.

Note: US-Canada purchasing power parity based on 1Statistics Canada benchmark of Canadian business sector output per hour at 84.2% of US business sector output per hour in 1999 (Statistics Canada, 2008).

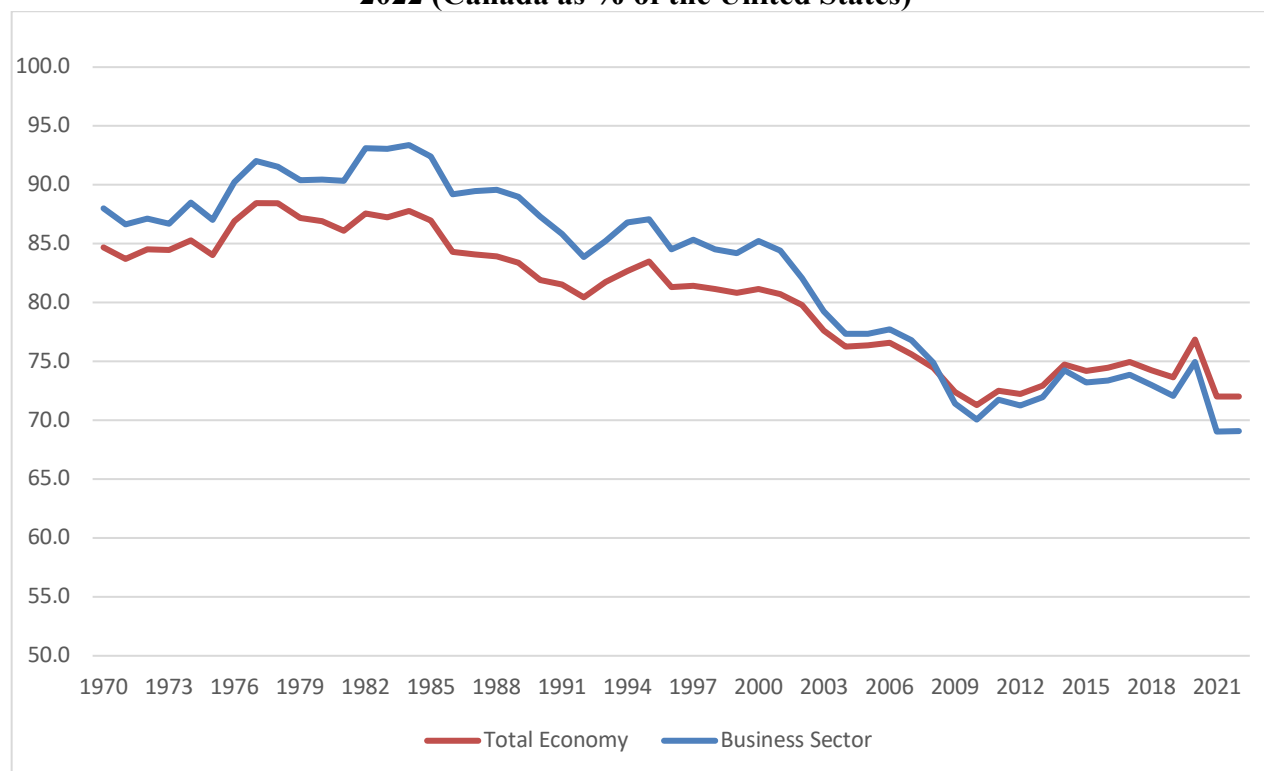
Canadian productivity levels have historically been overshadowed by productivity levels in the United States although the degree of this discrepancy tends to vary greatly by period. At its highest, Canadian business sector productivity approached parity with the United States, with the Canadian figure making up 93.4% of the level in the United States in 1984. Worryingly, the relative gap has never been larger than it was in 2021: the first time in official statistics that the Canadian business sector productivity has fallen below 70% of U.S. business sector productivity. Generally, the figure has remained between 70% and 90% of U.S. labour productivity.

The gap in productivity levels follows a striking parabolic pattern. As trend Canadian productivity growth exceeds trend U.S. productivity growth from 1947 to the mid-1980s, the

relative gap closes steadily. The 1973-2000 period, which overall represented a sharp decline in productivity growth compared to the 1947-1973 period really plays host to two distinct patterns of productivity growth, demarcated by a turning point in 1984. Prior to 1984, the relative gap shrinks in a continuation of the trend from the previous period; after 1984, the relative gap begins to grow rapidly and it is this latter trend that dominates when we look at the 1973-2000 period in full.

Post-2000, the relative disparity in productivity levels between the economies begins to widen at a faster rate, before rebounding somewhat following the Great Recession. Canadian business sector productivity made up 93.4% of U.S. business sector productivity in 1984. By 2000, this has fallen to 85.3%: a drop of about 8 percentage points over 16 years. In 2010, Canadian business sector productivity now made up 70.1% of the U.S. figure, dropping 15.2% in just 10 years as a consequence of divergent ICT investment trends in the two economies. Notably, from 2007 to 2019, there was no deterioration in the gap. Rather, a small rebound began to materialize, as Canadian business sector productivity growth slightly outpaced that in the U.S. and pandemic-related re-allocation effects boosted Canadian productivity levels relative to the U.S. in 2020. However, economic disruption and further compositional shifts associated with the continuation of the pandemic quickly reversed these initial productivity gains.

Chart 7: Relative Labour Productivity Levels (GDP per Hour in Total Economy), 1970-2022 (Canada as % of the United States)



Source: Total economy data from OECD – Productivity and ULC, Annual Total Economy – https://stats.oecd.org/Index.aspx?DataSetCode=PDB_GR. Canada business sector labour productivity data from Statistics Canada: Table 36-10-0305-01 for 1947-1960, Table 36-10-0208-01 for 1961-2021, Table 36-10-0480-01 for 2022. US business sector labour productivity data from BLS Labour Productivity and Cost Measures – Major Sectors – August 3, 2023 (XLSX sheet). 1999 benchmark of Canada's output per hour at 84.2% of US output per hour from Statistics Canada (2008) "Relative Multifactor Productivity Levels in Canada and the United States: A Sectoral Analysis" Catalogue no. 15-206-X, no. 019, July, p.32.

Note: Total economy time-series is constructed from OECD data on U.S. and Canada total economy labour productivity growth using constant prices and 2015 purchasing power parity. Business sector time-series is constructed from Statistics Canada and US Bureau Labour of Statistics data. Business sector purchasing power parity is based on the Statistics Canada benchmark of Canadian business sector output per hour at 84.2% of US business sector output per hour in 1999 (Statistics Canada, 2008).

The narrative offered in Chart 7, which presents the relative total economy labour productivity levels for the United States and Canada from 1970-2022, is broadly similar. Beginning in 1970, total economy labour productivity in Canada initially rose as a proportion of the US figure before peaking in 1978. Following this, Canadian GDP per hour worked fell steadily relative to the United States, with the steepest declines occurring post-2000. Between 1970 and 2000, Canadian GDP per hour worked as a proportion of the US level fell 3.5

percentage points, from 84.7% to 81.2%; between 2000 and 2022 – a shorter time period – the same measure fell 9.1 points to just 72.0%.

Although the measures track each other quite closely, small discrepancies are seen across the period. From 1970 to 2003, the productivity gap was larger for the total economy than for just the business sector. However, from 2004 onwards, this pattern inverted, and the productivity gap was found to be smaller for the total economy compared to the business sector. In general, the total economy measure of the labour productivity gap is broader and hence it is somewhat less volatile than the business sector labour productivity gap.⁴ Whereas Canadian business sector labour productivity reached a peak of 93.4% of the US level in 1984, total economy output reached an attenuated peak of 88.4% in 1977. A meaningful difference was also observed between the measures during the pandemic. The business sector gap grew substantially, with Canadian labour productivity falling from 72.1% of US labour productivity in 2019 to a low of 69.1% in 2022. The increase in the total economy gap was only half as large, with Canadian labour productivity dropping from 73.7% of US labour productivity in 2019 to 72.0% in 2022.

⁴ While the discrepancy observed in the Canada-U.S. productivity gap when using total economy measures rather than business sector measures may well represent something meaningful, readers should note the difficulty of calculating the appropriate PPPs to enable such comparisons. Comparing total economy productivity between the two countries is simple, as expenditure PPPs for the total economy are readily available for the two countries. However, PPPs for the business sectors of the two countries are more complex to estimate. We use a benchmark developed by Statistics Canada in 2008: a benchmark which may be outdated. Hence, this decision may be contributing to the apparent disparity in Canada and U.S. productivity trends when using total economy versus business sector measures.

Pandemic-Era Developments

Table 1: Business Sector Output, Hours Worked and Annual Labour Productivity Growth Rates, U.S and Canada, 2019-2022

	2019	2020	2021	2022	2019-2022
Canada					
output (2012 = 100)	117.3	109.5	115.0	119.6	-
hours worked (2012 = 100)	107.4	92.3	103.0	108.5	-
compound annual growth rate of labour productivity	0.62%	8.57%	-5.80%	-1.54%	0.21%
U.S					
output (2012 = 100)	121.2	117.0	126.0	128.8	-
hours worked (2012 = 100)	112.3	103.8	109.4	113.6	-
compound annual growth rate of labour productivity	1.88%	4.42%	2.18%	-1.60%	1.64%

Sources: Canada labour productivity data from Statistics Canada: Table 36-10-0208-01 for 2019-2021, Table 36-10-0480-01 for 2022. United States labour productivity from BLS Labour Productivity and Cost Measures – Major Sectors – August 3, 2023 (XLSX sheet).

To further contextualize the effect of the pandemic on the Canada-U.S. productivity gap, and in particular, the asymmetrical manner in which it affected labour productivity in the two economies, Table 1 provides the annual productivity growth rates for Canada and the U.S. for each year in the 2019-2022 period as well as indexes of output and hours worked. While both economies experienced a boost in aggregate productivity with the onset of the pandemic in 2020, this leap was larger in Canada where year-over-year productivity growth was 8.60% compared to just 4.42% in the U.S. This seems to suggest that the initial re-allocation effects seen as workers in low-productivity industries left the workforce were stronger in Canada than the U.S, likely owing to stricter public health measures and a more cohesive and proactive pandemic response.⁵

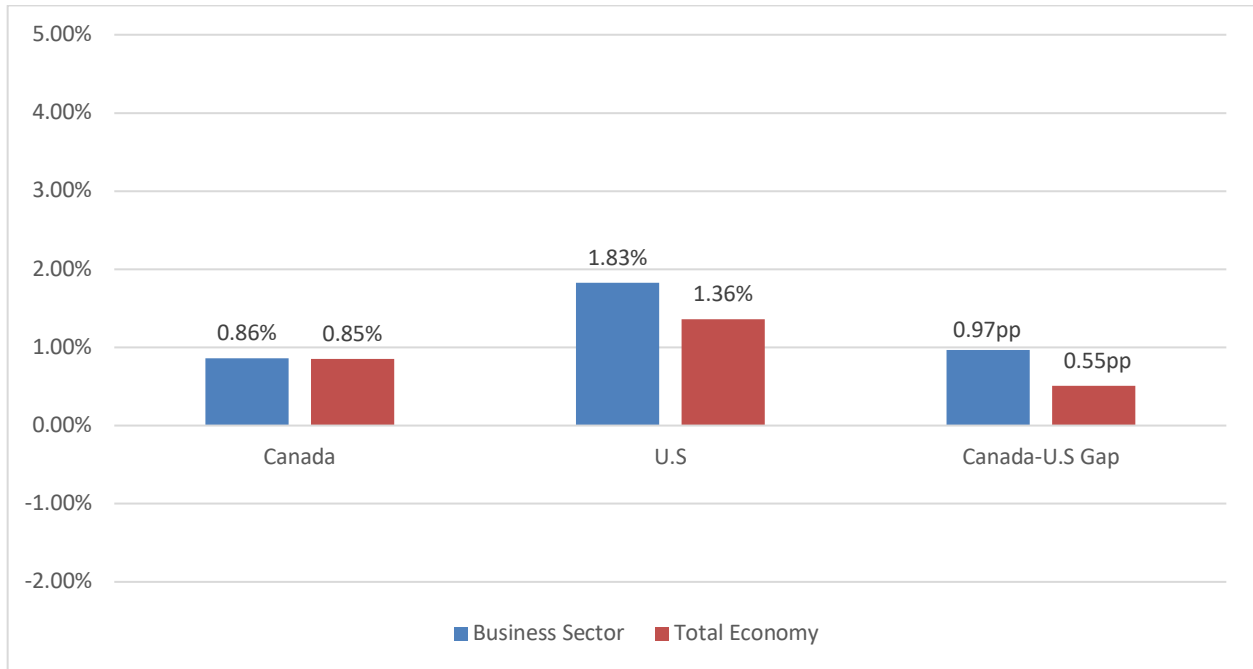
⁵ It is imperative to note that the re-allocation effect described here need not refer to the actual flow of workers between different industries. Rather, “re-allocation” refers to changes in the share of total economy labour input which individual industries account for. As such, asymmetric job losses, as occurred during the pandemic, are re-allocative to the extent that the input shares of the affected industries fall and, conversely, the input shares of other industries rise. In contrast, widespread job losses which affect all industries more or less the same, would have negligible or null re-allocation effects.

As one might expect, this lack of a strong re-allocation driven boost to productivity in the U.S. in 2020 seems to have manifested in a softer return to normalcy compared to Canada. Whereas Canada saw deeply negative productivity growth of 5.90% in 2021 as these workers began to return to the workplace, U.S. productivity remained at an impressive 2.18%. As these trends continued to play out, both economies saw negative productivity growth of a similar magnitude in 2022. Altogether, these asymmetric effects resulted in a backsliding of Canadian business sector productivity relative to the U.S., plunging the Canadian level to 69% of the U.S. level. Still, as stressed throughout the analysis in this report, it is extremely challenging to decouple pandemic effects from non-pandemic related developments in productivity, and hence, readers must exercise caution in making projections for future productivity developments based on these most recent figures.

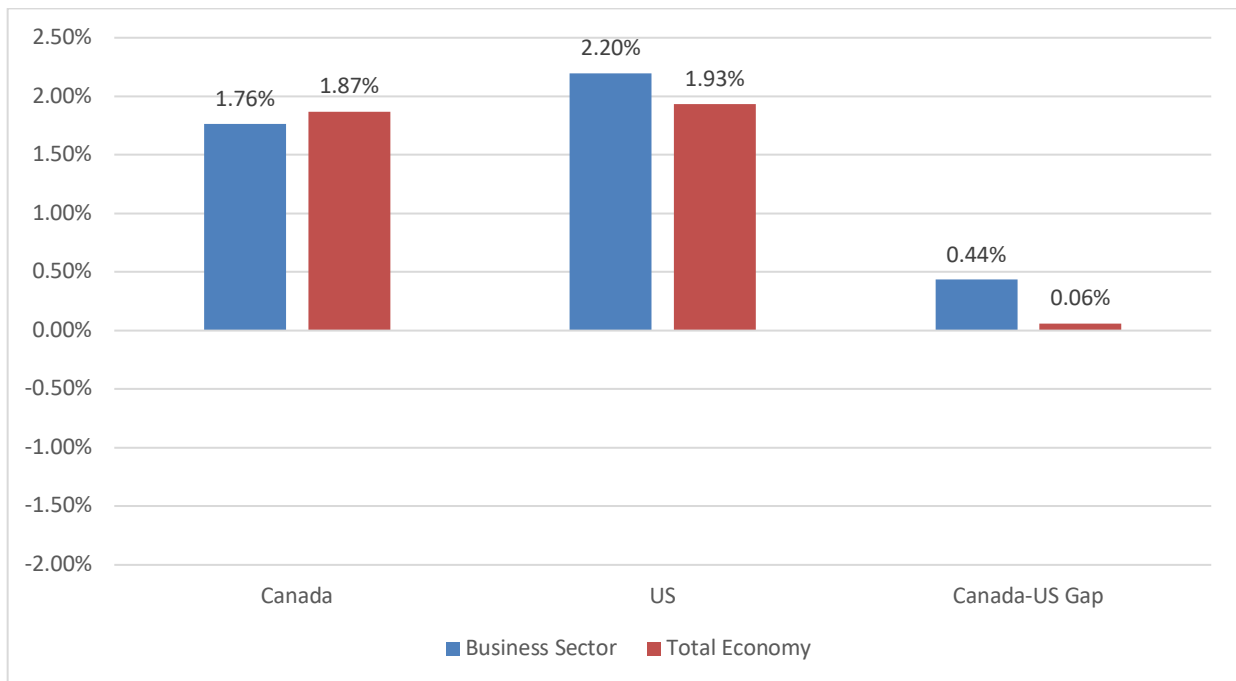
Dualling Narratives: The Total Economy Gap versus the Business Sector Gap

Chart 8: Canada and U.S. Productivity Growth Gap, Business Sector vs. Total Economy, Average Annual Growth Rates, 2000-2022

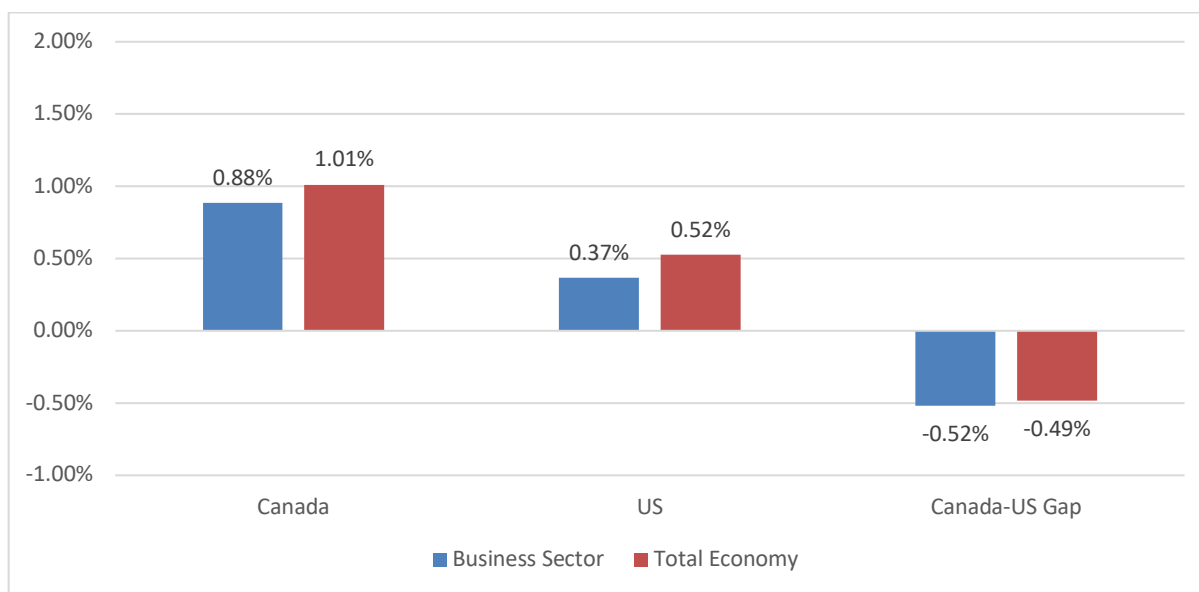
Panel A: Labour Productivity (Output per Hour)



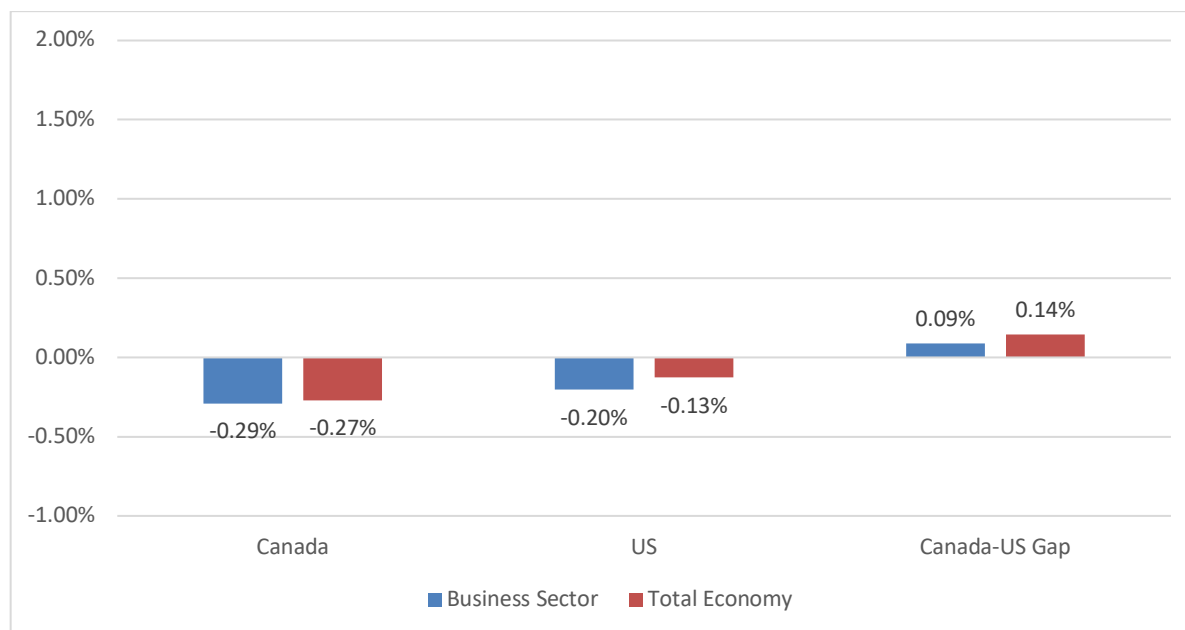
Panel B: Real Output



Panel C: Total Hours Worked



Panel D: Average Hours Worked per Employed Person



Source: Canada business sector labour productivity data from Statistics Canada: Table 36-10-0208-01 for 2000-2021, Table 36-10-0480-01 for 2022. Canada hours worked and business sector output data from Statistics Canada Table 36-10-0480-01. Canada total economy labour productivity and output data from OECD: Productivity and ULC – Annual, Total Economy - https://stats.oecd.org/Index.aspx?DataSetCode=PDB_GR. United States business sector labour productivity, hours worked, and output data from BLS Labour Productivity and Cost Measures – Major Sectors – August 3, 2023 (XLSX sheet). United States total economy productivity, hours worked, and output data from OECD: Productivity and ULC – Annual, Total Economy.

Using total economy measures of labour productivity growth (as in Charts 1 to 4 and Panels C and D of Chart 5) rather than business sector measures causes the Canada-U.S. productivity growth gap to attenuate significantly. Chart 8 visualizes this dynamic, providing business sector and total economy rates of growth for labour productivity, hours worked, and real output in Canada and the US. Whereas U.S. business sector productivity growth from 2000 to 2022 averaged 1.83% annually, U.S. total economy productivity growth over the same period averaged only 1.40% annually: 0.43 percentage points lower or about 23% smaller. This tracks with the logic suggested in the previous section: measurement issues mean that non-business sector activities tend to be assessed as less productive and hence, one would expect total economy labour productivity to trail business sector labour productivity. The fact that this phenomenon is virtually non-existent in Canada, where the growth rate for the two levels of aggregation is essentially the same, is puzzling. What results is a total economy productivity gap that is much narrower relative to the business sector gap. When using business sector measures of productivity, the gap is large at 0.97 percentage points: larger than the Canadian business sector growth rate over the period. When using total economy measures, this gap declines to a still significant but much-reduced 0.55 percentage points⁶.

The differing magnitude of these gaps may reflect distinct trends in employment and output growth in the two countries. In Canada, annual employment growth is higher in the total economy than in the business sector (1.01% per year vs. 0.88% per year). This would seem to primarily reflect strong hiring in the Canadian public sector post-2000. All else equal, one would expect this to detract from labour productivity growth in the total economy relative to the

⁶ See CSLS (2004) for a more detailed discussion of differences in the measurement of the non-market sector between the U.S. and Canada. It should be noted that an important part of the non-market sector for which there is real output growth is the imputed rents for owner-occupied housing, and CSLS (2004) finds that differences in growth rates between the U.S. and Canada were able to explain some although not all of the difference in real output growth of the non-market sector prior to 2004.

business sector. However, real output growth is also higher in the total economy (1.87% vs. 1.76%), and as such, higher rates of employment growth in the total economy do not manifest detrimentally on labour productivity growth. In contrast, while employment growth is similarly stronger in the US total economy compared with the US business sector, there is no counterbalance in the form of high real output growth. Indeed, real output growth is actually meaningfully lower in the US total economy at 1.93% annually compared to 2.20% annually in the business sector. What results is a lower rate of labour productivity growth in the US total economy vis-à-vis the business sector. These conflicting patterns across the United States and Canada lead to a total economy labour productivity gap that is much reduced compared to the business sector gap.

Ultimately, these two measures of labour productivity offer distinct narratives on the state of Canadian labour productivity growth: one which suggests the situation is quite dire, while the other is decidedly more optimistic. In either case though, it is key to recognize that the American economy is consistently a high performer comes to productivity growth. As such, trends in the United States are not particularly representative of overall trends in peer countries. An unyielding focus on comparison with the United States hence risks obscuring the larger picture of what appears to be quite a broad-based slowdown in labour productivity growth.

Decomposing Labour Productivity Growth by Sector

To identify the sources of slowing productivity growth, the CSLS has developed a decomposition formula which breaks down aggregate productivity growth into within-sector effects and re-allocation effects. The decomposition can be expressed as follows:

$$\Delta P = \sum h_i^0 \Delta P_i + \sum (P_i^0 - P^0) \Delta h_i + \sum (\Delta P_i - \overline{\Delta P}) \Delta h_i$$

Where P is the overall business sector labour productivity level, P_i is the labour productivity level in sector i , h_i is the share of total economy-wide labour hours which is employed in sector i , the subscript 0 indicates a variable in time 0 (the beginning of the period) as opposed to time 1 (the end of the period), Δ indicates change over the period, and $\overline{\Delta P}$ is the average change in business sector productivity across sectors over the period.

The first term in the decomposition captures what we call **within-sector effects**. Within-sector effects refer to aggregate productivity growth attributable to productivity growth within sectors. The latter two terms, meanwhile, capture two distinct re-allocation effects. Re-allocation effects stem from changes in the share of labour input associated with a sector. All else equal, an increase in the share of total labour input which is employed by a sector with above-average productivity will increase the aggregate labour productivity growth in the economy. Conversely, an increase in the labour input share of a sector with below-average productivity will reduce aggregate labour productivity growth in the economy. These re-allocation effects can be further decomposed into the level effect and the growth effect: the second and third term in the decomposition equation, respectively. The **level effect** captures changes in the productivity level resulting from the movement of inputs across sectors with different productivity *levels*.

Conversely, the **growth effect** captures changes which result from the movement across sectors which experience different degrees of productivity growth over the relevant period. Imperative to note is the fact that this calculation is performed using absolute changes in labour productivity, and not rates of productivity growth. The next section applies this decomposition framework to the 2000-2022 period to identify what changes in Canadian labour productivity growth are due to slowdowns or losses in within-sector productivity and which changes are due to compositional changes in the Canadian economy.

Table 2: CSLS Decomposition by Province, Within-Sector and Re-allocation Effects on Canadian Business Sector Labour Productivity Growth, 1997-2022

	1997-2000	2000-2008	2008-2019	2019-2022	2000-2022
Within-Sector Effect	3.32	0.73	1.15	0.18	0.86
Re-allocation Level Effect	-0.34	0.52	-0.03	0.20	0.20
Re-allocation Growth Effect	-0.14	-0.25	-0.06	-0.10	-0.13
Net Re-allocation Effect	-0.48	0.27	-0.09	0.11	0.07
Summed Effects	2.84	1.00	1.06	0.29	0.93
Observed Business Sector Productivity CAGR	3.16	1.00	1.05	0.23	0.92
discrepancy (summed effects minus observed rate of growth)	-0.33	0.00	0.01	0.05	0.01

Source: CSLS calculations based on Statistics Canada Table: 36-10-0480-01.

Table 2 provides a breakdown of the within-sector and re-allocation effects on aggregate business sector labour productivity growth for the post-2000 period alongside four subperiods. Appendix A also provides the underlying two-digit NAICS industry-level data on labour productivity levels and labour input for key years in the 1997-2022 period, as well as measures of productivity growth subperiods for each of the periods of interest. 2000-2008 and 2008-2019 are cyclically neutral peak-to-peak periods; the 2019-2022 subperiod is not cyclically neutral given that the current business cycle is incomplete. An incomplete cycle for the 1997-2000 period is also included to highlight the contrast between the pre-2000 and post-2000 period; data for periods before 1997 cannot be disaggregated by province. Given that we are interested in decomposing not only by sector but also by province or territory, we restrict our scope to the

1997-2022 timeframe. The growth rates provided in Table 2 for labour productivity in the business sector demonstrate the uniquely poor productivity performance of Canada in the post-2000 period. Overall, rates of annual labour productivity growth hover close to 1% over the 2000-2022 period: a decline from the 1980s and 1990s, where rates of productivity growth stuck closer to 2%. For example, between 1981 and 1989, annual labour productivity growth averaged 1.55% per year; between 1989 and 2000, the rate of growth averaged 1.85% per year. Rates of growth for the (admittedly incomplete) cycle beginning in 2019 are significantly lower, sitting barely above 0.

Table 3 presents the contribution to business sector labour productivity growth by NAICS two-digit industry for each of the periods in Table 2. These contributions represent the combination of within-sector and re-allocation effects. The industry contributions and overall productivity growth trends for each period are discussed in detail in the following subsections. Finally, Table 4 offers the compound annual growth rate for each business sector industry in each period post-2000.

Table 3: CSLS Decomposition by Industry, Contributions to Business Sector Canadian Labour Productivity Growth, 2000-2022 (percentage points)

	2000-2008 (1)	2008-2019 (2)	2019-2022 (3)	change (4)=(3)-(2)	2000-2022 (5)
Business sector industries (observed)	1.00	1.05	0.23	-0.82	0.92
Business sector industries (sum of contributions)	1.00	1.06	0.29	-0.77	0.93
Agriculture, forestry, fishing and hunting	0.11	0.11	0.11	0.00	0.12
Mining and oil and gas extraction	-0.07	0.15	0.02	-0.13	0.05
Utilities	0.03	0.01	-0.01	-0.02	0.02
Construction	-0.02	0.03	-0.03	-0.06	-0.01
Manufacturing	0.15	0.12	-0.05	-0.16	0.13
Wholesale trade	0.21	0.14	0.04	-0.10	0.15
Retail trade	0.14	0.10	0.24	0.14	0.13
Transportation and warehousing	0.08	0.01	-0.07	-0.07	0.02
Information and cultural industries	0.10	0.05	-0.04	-0.09	0.06
Finance and insurance	0.13	0.20	0.29	0.08	0.19
Real estate, rental and leasing	0.07	0.06	0.06	-0.01	0.06
Professional, scientific and technical services	0.02	0.06	-0.34	-0.40	-0.02
Holding Companies	0.01	0.04	-0.06	-0.10	0.01
ASWMRS	-0.02	0.03	-0.17	-0.20	-0.03
Educational services	0.00	-0.01	0.01	0.02	0.00
Health care and social assistance	0.00	-0.03	0.03	0.06	-0.01
Arts, entertainment and recreation	-0.02	0.01	-0.01	-0.02	-0.01
Accommodation and food services	0.06	-0.04	0.18	0.21	0.03
Other Private Services	0.03	0.03	0.10	0.08	0.04

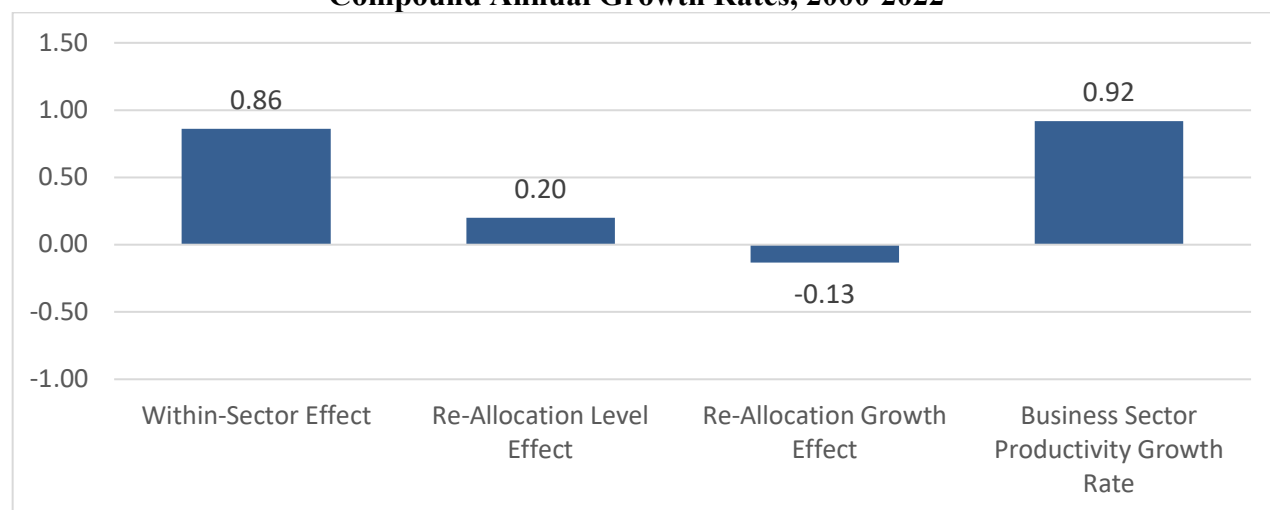
Table 4: Labour Productivity Growth Rate by Business Sector Industry, Compound Annual Growth Rate, 2000-2022 (percentage points)

	2000-2008 (1)	2008-2019 (2)	2019-2022 (3)	change (4) = (3) – (2)	2000-2022 (5)
Business sector industries	1.00	1.05	0.23	-0.82	0.92
Agriculture, forestry, fishing and hunting	1.85	3.73	4.05	0.33	3.09
Mining and oil and gas extraction	-4.57	1.52	0.54	-0.98	-0.87
Utilities	1.05	0.93	0.24	-0.68	0.88
Construction	-0.03	0.43	-0.13	-0.56	0.19
Manufacturing	1.09	0.87	-0.31	-1.18	0.79
Wholesale trade	3.23	2.05	0.51	-1.54	2.27
Retail trade	2.89	1.28	2.62	1.34	2.04
Transportation and warehousing	1.37	0.46	-1.59	-2.05	0.51
Information and cultural industries	2.74	1.00	-2.72	-3.72	1.11
Finance and insurance	1.73	2.41	2.96	0.55	2.23
Real estate, rental and leasing	0.24	0.71	2.99	2.28	0.85
Professional, scientific and technical services	0.31	0.83	-3.19	-4.02	0.08
Holding Companies	2.30	2.84	-24.45	-27.29	-1.58
ASWMRS	0.69	0.58	-3.87	-4.45	0.00
Educational services	1.24	-0.23	2.42	2.65	0.66
Health care and social assistance	0.08	-0.44	0.83	1.27	-0.08
Arts, entertainment and recreation	-1.46	0.52	-4.34	-4.86	-0.88
Accommodation and food services	0.88	0.56	-0.46	-1.02	0.54
Other private services	1.41	1.03	2.57	1.54	1.38

Source: CSLS calculations based on Statistics Canada Table: 36-10-0480-01.

2000-2022

Chart 9: CSLS Labour Productivity Decomposition by Industry, Business Sector, Compound Annual Growth Rates, 2000-2022



Source: CSLS calculations based on Statistics Canada Table: 36-10-0480-01.

Chart 9 presents the results of the decomposition for the 2000-2022 period. Across the post-2000 period, the bulk of business sector productivity growth – about 92% – is accounted for by within-sector productivity growth. Re-allocation effects also contribute positively to labour productivity growth; although the growth effect is negative, it is slightly outweighed by the level effect, which is substantial and favourable to business sector productivity growth. Whereas within-industry productivity growth only averaged 0.86% annually for the 2000-2022 period, the aggregate growth rate was slightly higher at 0.92%, boosted 0.06 points by the net movement of labour into sectors with above-average productivity. The growth effect was negative at -0.13 points, indicating that on average, labour tended to move towards sectors with below-average productivity growth. Growth was driven mainly by within-sector productivity gains in five key sectors: finance and insurance (contribution of 0.19 points; growth rate of 2.23%), wholesale trade (0.15 points; growth rate of 2.27%), retail trade (0.13 points; 2.04%), manufacturing (0.13 points; 0.79%), and agriculture, forestry, fishing, and hunting (0.12 points; 3.09%). With the

exception of the manufacturing sector, these were also the sectors with the highest rate of within-sector productivity growth.

Chart 10: CSLS Decomposition by Industry, Within-Sector and Re-allocation Effects on Canadian Business Sector Labour Productivity Growth, 2000-2008 and 2008-2019



Source: CSLS calculations based on Statistics Canada Table: 36-10-0480-01.

2000-2008 and 2008-2019

Similar trends are reflected in the 2000-2008 period. Panel A of Chart 10 presents the results of the CSLS labour productivity decomposition for this period. Between 2000 and 2008, within-sector productivity growth averaged 0.73%, contributing about three-quarters of the aggregate productivity growth rate observed over the subperiod. The level effect in this case was considerable, with a contribution equal to about half of the aggregate growth rate at 0.52 points; the growth effect (-0.25 points) was smaller and negative, leading to a still positive but attenuated net re-allocation effect of 0.27 points. Drilling down to individual sectors, the largest contributors were wholesale trade (0.21 points; annual growth rate of 3.23%), manufacturing (0.15 points; 1.09%), retail trade (0.14 points; 2.89%), and finance and insurance (0.13 points; 1.73%). The information and cultural industries sector also experienced a high rate of productivity growth (2.74%), though the small size of the industry resulted in a contribution of just 0.10 points. Altogether, these contributions overwhelmingly reflected within-sector productivity growth.

Productivity effects between 2008 and 2019 subperiod took on a slightly different structure; Panel B of Chart 6 presents these effects. Over the subperiod, within-sector productivity exceeded the aggregate rate of business sector productivity growth; business sector productivity growth averaged 1.05% annually, while annual within-sector growth averaged 1.15%. This dynamic stems from the fact that both re-allocation effects were negative, indicating that, on net, labour moved towards sectors with below-average productivity levels (level effect of -0.03 points) and below-average productivity growth (growth effect of -0.09 points). Still, these re-allocation effects were small in magnitude. Six sectors in particular drove productivity growth over the subperiod, contributing about 77% of the business sector growth rate. These sectors

were: finance and insurance (0.20 points; growth rate of 2.41%), mining and oil and gas exploration (0.15 points; 1.52%), wholesale trade (0.14 points; 2.05%), manufacturing (0.12 points; 0.87%), agriculture forestry, fishing, and hunting (0.11 points; 3.73%) and retail trade (0.10 points; 1.28%). Contributions from these industries almost exclusively reflected within-sector productivity growth. In general, re-allocation effects were extremely small across all industries in this subperiod.

Changes in the composition of productivity growth effects between the two periods were myriad. Productivity growth within sectors improved substantially, causing the within-sector effect on business sector productivity to rise by 0.42 points period-to-period. These gains were counterbalanced by a stark reduction in the re-allocation level effect (-0.56 points) which stunted business sector productivity growth significantly. Re-allocation effects in the 2000-2008 period stemmed directly from the shift of labour hours towards the mining and oil and gas extraction sector (labour input share of 1.4% in 2000 vs. 2.1% in 2008) which boasted a labour productivity level of \$356 per hour worked at the start of the period.⁷ This continued in absolute terms in the 2008-2019 period, with hours worked rising from 494 million to 534 million. However, as a proportion of total business sector labour input, hours worked in mining and oil and gas extraction actually fell from 2.08% in 2008 to 2.06% in 2019. In other words, expansion in other sectors of the economy outpaced expansion in the mining and oil and gas extraction sector, reducing the industry's contribution to productivity growth and turning the re-allocation effect within the industry slightly negative. Productivity in the sector also fell dramatically from 2000-2008 (\$356 to \$245), though this, in fact, had a moderating effect on the fall in the re-allocation level effect; if productivity in the industry had remained higher, then the impact on productivity growth from the slight reduction in the sector's labour input share would have been larger. In

⁷ All dollar estimates in this section on industrial decomposition are expressed in 2012 Canadian dollars.

other words, if within-sector productivity had not fallen, the opportunity cost, or the lost output from not employing labour in such a high productivity sector, would have been higher.

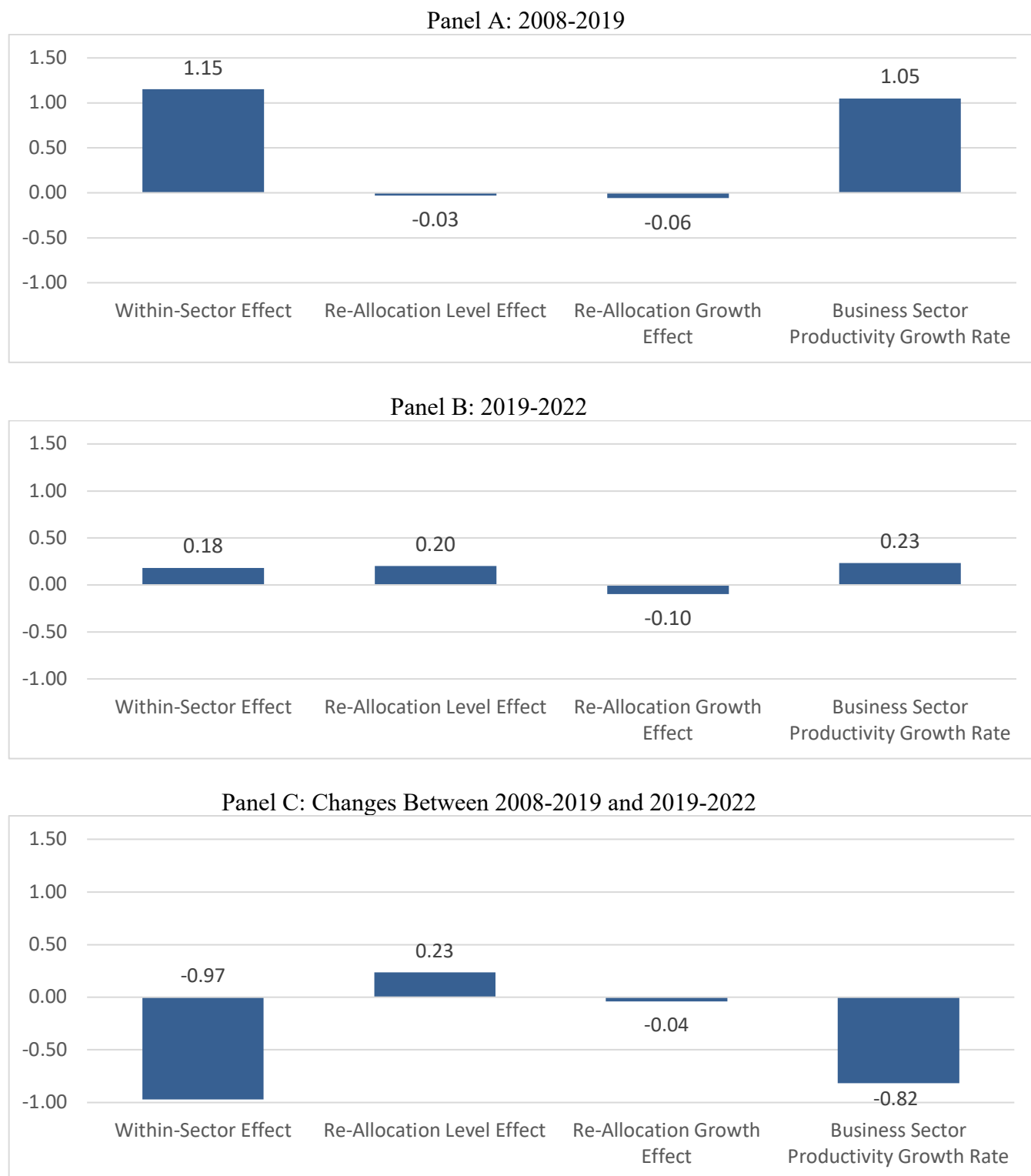
An increase in re-allocation growth effects also contributed to the difference in productivity growth trends across the two periods. Between 2000 and 2008, the re-allocation of labour towards sectors with below-average productivity growth had constrained business sector productivity growth meaningfully. Once again, this was driven by the re-allocation of labour towards the mining and oil and gas extraction sector: an industry that, despite consistently elevated levels of productivity, had a deeply negative productivity growth trajectory in the 2000-2008 period. While the increased labour share of the industry improved business sector productivity growth on balance, there was both a positive impact, in the form of a dominating positive level effect, and a negative impact, in the form of a smaller but still substantial and negative growth effect. Similar to the re-allocation level effect, this growth effect moderated in the 2008-2019 period, resulting in a small but negative net re-allocation effect. By 2008-2019, the re-allocation of labour towards the sector had slowed in absolute terms and actually reversed slightly as a proportion of total labour input share. As such, even though within-sector productivity growth rebounded in this period for the mining, oil and gas exploration sector, the impact on business sector productivity growth was negligible. Without much change in the share of labour in mining, oil and gas extraction over the period, the overall growth effect moderated compared to the previous period, rising from -0.25 points to -0.06 points.

Overall, the change in effects observed between periods reflects optimistically on the growth trajectory and growth potential of labour productivity in the Canadian business sector. While within-sector productivity growth was relatively low at 0.73 percent annually during the 2000-2008 period, it jumped 0.42 points or 58% in the 2008-2019 period. If re-allocative trends

had remained the same between the two periods, the period-to-period jump in trend productivity growth would have been even larger. However, there are two important caveats to this observation. Firstly, the re-allocation and within-sector trends cannot be entirely disentangled. In some cases, within-sector productivity improvements are linked to a decline in the size of the workforce of a sector and the compositional changes that arise as the least productive workers are let go. In this way, improvements in within-sector productivity can come at the expense of re-allocation effects and vice versa.

Second, by far the largest contributor to the within-sector productivity improvements observed in this period was the mining, oil and gas exploration sector, where the within-sector effect improved from -0.40 points in 2000-2008 to 0.16 points in 2008-2019. To the extent that a future net-zero transition de-emphasizes the importance of this industry to the Canadian economy and shifts resources to other sectors, it may become increasingly difficult to maintain the 1% target for productivity growth. With that said, the industry also has the capacity to depress within-sector productivity growth massively, as it did in the 2000-2008 period as high resource prices encouraged the exploitation of lower- quality resources. Hence, the impact of a much smaller mining, oil and gas exploration sector on productivity growth may be net neutral in the long-run. In the near- and medium-term though, the declining labour share of such a high-productivity industry is likely to weigh heavily on business sector productivity growth. Nevertheless, the fact that within-sector productivity growth rebounded so significantly between periods, and that the growth rate was relatively robust prior to the pandemic ought to inspire some confidence in the prospect of getting back to productivity growth of 1% following the recent slowdown.

Chart 11: CSLS Decomposition by Industry, Within-Sector and Re-allocation Effects on Canadian Business Sector Labour Productivity Growth, 2008-2019 and 2019-2022



Source: CSLS calculations based on Statistics Canada Table: 36-10-0480-01.

2008-2019 and 2019-2022

The 2019-2022 period, as mentioned prior, saw a substantial fall in the rate of business sector productivity growth, down from 1.05% annually in the previous period to just 0.23% annually. Within-sector productivity was nearly stagnant over the period, with an average growth rate across the business sector of just 0.18% annually. Labour input shifted towards industries with above-average levels of labour productivity, adding an additional 0.20 points to business sector productivity growth, though a negative growth effect (-0.10 points) offset about half of this increase. The most substantial industry contributions stemmed from finance and insurance (0.29 points; growth rate of 2.96%), retail trade (0.24 points; 2.62%), accommodation and food services (0.18 points; -0.46%), and the agriculture, forestry, hunting and fishing (0.11 points, 4.05%). The real estate, rental and leasing sector (2.99%), educational services (2.42%), and “other private services” sector (2.57%) which includes services like personal care, laundry, and funeral services as well as automotive and non-automotive repair and maintenance, also featured notable rates of productivity growth.

Given the short timespan for this subperiod and the extraordinary nature of the pandemic, it is useful to discuss the individual year-over-year growth rates in addition to the period trends. Business sector productivity growth in 2020 was 8.57%, reflecting the temporary compositional changes brought on by the laying-off and furloughing of employees in low-productivity sectors during the pandemic. These gains quickly began to disappear, with annual productivity growth turning negative as they reversed over the following years (-5.80% in 2021 and -1.54% in 2022). Over the entire period, this amounted to an increase in labour productivity of just 0.7% in output per hour and an annual growth rate of just 0.23%: a substantial slowdown in productivity growth

compared to the 2008-2019 period (total productivity growth of 12.2%, annual growth rate of 1.05%).

The structure of productivity effects in the 2019-2022 period represented a significant departure from previous periods; Chart 11 presents the within-sector and re-allocation effects for the period. Panels A also present the effects for the 2008-2019 period, while Panel C displays the changes in effects between the two periods. Most of the fall in productivity growth between the two periods can be ascribed to the massive crash in within-sector productivity observed between the two periods. Whereas within-sector productivity growth had remained within the 0.7-1.2 percentage point range in the previous two periods, growth within sectors fell to just about 0.2 points in the 2019-2022 period. This drop reflects a broad-based deterioration of productivity growth across many industries within the Canadian business sector; in some sectors, productivity growth simply decelerated while in many others, rates of growth turned negative as productivity within sectors fell back. Professional, scientific and technical services was the most pronounced example of this. Trend labour productivity growth rate in the sector fell 4.02 percentage points between periods and the within-sector effect plunged from 0.06 points in the 2008-2019 period to -0.25 points in the most recent period: a fall of 0.31 points or nearly a third of the total drop observed in the within-sector effect between periods (Panel C of Chart 11). Similar trends were observed in the manufacturing sector (within sector effect of 0.14 in previous period to -0.04 in 2019-2022 period), the information and cultural industries sector (0.04 to -0.12), and the administrative services, waste management and remediation sector (0.02 to -0.13) among others.

In contrast, the re-allocation level effect rebounded somewhat between the 2008-2019 period and the 2019-2022 period, from -0.03 points to 0.20 points. By far the largest contribution originated from the accommodation and food services industry, which contributed 0.19 points.

Stemming from pandemic disruptions, the input share of the sector dropped substantially from 7.7% to 6.8%. As the industry that consistently has the lowest productivity level of any NAICS two-digit business sector industry (2019 labour productivity of \$22 per hour vs. business sector average of \$57), this outflow of labour over the period pushed up overall labour productivity growth meaningfully. Positive re-allocation level contributions were also associated with the information and cultural industries (0.10 points), retail trade (0.07 points) and other private services (0.05 points) sector. In the case of the information and cultural industries sector, an increase in the sector's labour share (2.53% to 2.91%) over the period buttressed business sector productivity growth, reflecting the above-average productivity level of the industry at the start of the period (\$101 vs. business sector average of \$57). The latter two sectors, meanwhile, had relatively low levels of productivity in 2019 (\$35 and \$25, respectively). Hence, business sector productivity growth was boosted as their respective labour input shares declined over the period.

Reallocation growth effects were generally small, albeit slightly more important compared to the previous period. Most sectors were associated with negligible growth effects. Altogether, it is unclear what part of the productivity slowdown in this period is reflecting pandemic disruptions and the associated ebb and flow of compositional changes, and what degree of the slowdown is reflecting non-pandemic trends like long-term technological progress. There was no clear pattern in the types of sectors which faced productivity losses. This group included a wide array of industries from art, entertainment and recreation (within-sector effect of -0.04 points) to transportation and warehousing (-0.12 points) to manufacturing (-0.04 points). Ultimately, it seems likely that these broad-based declines in within-sector productivity reflect common disruptions caused by pandemic shocks such as public health measures and work safety

regulations, labour shortages, supply chain challenges, and shifts in consumer preferences, many of which seem likely to be temporary.

Notably, sectors which experienced sustained productivity growth over the period seem to be those for which disruptions were minimal or those poised for e-commerce. The finance and insurance (trend growth rate of 2.96%, making for a within-sector effect of 0.28 points) and retail trade (trend growth rate of 2.62%, within-sector effect of 0.18 points) industries, for example, have become increasingly online-focused and tech-integrated; the pandemic likely represented a watershed moment for expanding these competencies and shedding or re-allocating employees in low-productivity positions, particularly in brick-and-mortar operations. For the retail trade industry, there was a fall in labour input share over the period, albeit a small one (12.19% in 2019 vs. 11.74% in 2022) suggesting that some of the within-sector productivity gains here might be compositional, generated by the laying off of low-productivity employees. However, for the finance and insurance industry, the labour input share grew slightly over the period (6.31% vs. 6.36%), suggesting that productivity improvements must reflect technological or organizational improvements. It should be noted though that both of these sectors are consistent leaders in terms of productivity performance and within-sector effects in every period; hence, the productivity growth here may simply represent the continuance of longer-term trends and may be unrelated to pandemic shocks. The agriculture, forestry, fishing, and hunting sector was another key locus of within-sector productivity growth over the 2019-2022 period, with a within-sector effect of 0.11 points. In this case too, the productivity performance of the sector was consistent with its trajectory over previous periods. Moreover, in line with previous periods, growth in productivity coincided with a decrease in input share (2.90% to 2.63%). Hence, it seems unlikely that productivity growth in agriculture was affected by pandemic disruptions.

The second-largest contributor to productivity growth over the period – the real estate, rental and leasing (trend growth rate of 2.99%, within-sector effect of 0.19 points) sector – has not been a leading sector with respect to productivity growth since prior to 2000. This lends credence to the notion that productivity growth in this sector is attributable to pandemic developments. It is possible that the real estate, rental, and leasing sector too benefited from a moment of tech integration and/or re-structuring, as hours worked in the industry declined from 668 million to 610 million. Contrary to what this contraction in the size of the sector's workforce might suggest, the Canadian real estate market continued to boom during the pandemic, with demand rising, particularly for single-family homes in suburban areas (Statistics Canada, 2020; National Bank, 2021). Some productivity researchers argue that productivity advancements are most likely in times of strong business activity and economic expansion (Smith, 2023); hence, some of these productivity gains might actually reflect real improvements in production efficiency facilitated by pandemic-era growth in the real estate market.

It is worth discussing what it would require for productivity growth to return to the previous trend level of 1% annually. Even if the pandemic-era slowdown were to reverse entirely in 2023 and promptly rebound to a growth rate of 1% per year, the rate of growth over the complete business cycle would likely still land well below 1%. Rather, to attain the 1% target over the current business cycle, productivity growth in the coming years would need to average well above 1% to compensate for the lost productivity gains associated with the pandemic. Assuming an 8-year business cycle, as was the case with the 2000-2008 period, an annual growth rate of 1.46% would be needed over the remaining 5 years (2022-2027) to attain a period growth rate of 1%. Assuming an 11-year business cycle, as was the case with 2008-2019 business cycle, a 1% rate of growth over the period would require an annual growth rate of 1.29%. Both of these

scenarios may be unrealistic for several reasons. First, these rates are well-above the average pre-pandemic rates of annual growth. Second, there may still be some vestiges of the pandemic's compositional effects which need to be unraveled, and which may continue to impact negatively on labour productivity growth. Indeed, official estimates for labour productivity growth in Q1 and Q2 suggest that productivity growth is yet to recover; year-over-year growth from Q1 2022 to Q1 2023 sits at -1.5%, while year-over-year growth for Q2 sits at -1.7% (Statistics Canada, 2023a). Finally, productivity growth tends to follow business cycle trends and, while the prospect of a recession is still uncertain, economic activity in the Canadian economy certainly seems to be decelerating. In sum, the pathway back to 1% seems quite narrow.

Decomposing Labour Productivity Growth by Province

In much the same way that an aggregate representation of Canadian productivity can mask remarkable heterogeneity in within-industry trends and the components driving these trends (within-sector vs. re-allocation effects), a national perspective can hide divergences in productivity trends across regions. For this reason, we are also interested in decomposing post-2000 developments in Canadian productivity by province. Thankfully, the framework outlined in the sectoral decomposition section can be easily adjusted to investigate productivity growth and re-allocation trends, within and across provinces. This revised decomposition by province can be expressed as follows:

$$\Delta P = \sum h_j^0 \Delta P_j + \sum (P_j^0 - P^0) \Delta h_j + \sum (\Delta P_j - \overline{\Delta P}) \Delta h_j$$

Where P is the overall business sector labour productivity level, P_j is the labour productivity level in province or territory j , h_j is the share of total economy-wide labour hours which is employed in province or territory j , the subscript 0 indicates a variable in time 0 (the

beginning of the period) as opposed to time 1 (the end of the period), Δ indicates change over the period, and $\overline{\Delta P}$ is the average change in business sector productivity across provinces over the period.

Table 5: Labour Productivity Growth by Province and Territory, Compound Annual Growth Rates, 2000-2022

	2000-2008 (1)	2008-2019 (2)	2019-2022 (3)	change (4) = (3) – (2)	2000-2022 (5)
Canada	1.00	1.05	0.23	-0.82	0.92
Newfoundland and Labrador	5.02	-0.67	-2.04	-1.37	1.17
Prince Edward Island	1.12	0.77	1.69	0.91	1.03
Nova Scotia	0.49	1.11	0.24	-0.87	0.76
New Brunswick	1.11	0.57	1.30	0.73	0.87
Quebec	0.95	0.99	0.65	-0.34	0.93
Ontario	0.67	0.99	0.12	-0.86	0.75
Manitoba	1.96	1.42	-0.44	-1.86	1.36
Saskatchewan	1.51	0.89	0.63	-0.26	1.08
Alberta	0.18	1.37	-0.50	-1.87	0.68
British Columbia	1.28	1.04	1.04	-0.01	1.13
Yukon	4.80	0.02	12.33	12.31	3.35
Northwest Territories	3.16	-0.51	-2.78	-2.27	0.49
Nunavut	0.86	0.62	8.36	7.74	1.73

Source: CSLS calculations based on Statistics Canada Table: 36-10-0480-01.

Table 5 provides the compound annual rates of labour productivity growth for each of Canada's provinces and territories for the 2000-2022 period as well as three subperiods: 2000-2008, 2008-2019, and 2019-2022. Across the entire 2000-2022 period, the strongest rates of annual labour productivity growth were seen in Yukon (3.35% per year) and Nunavut (1.73%), though these figures seem to mainly represent pandemic-era distortions. Interestingly, such an

effect is not observed in the Northwest Territories, which experienced the lowest annual rate of productivity growth over the period at just 0.49% per year. More generally though, the small size of the economy in the Canadian territories means that even small shocks and fluctuations are exaggerated in productivity growth figures, and furthermore, that productivity developments in the territories have little impact on Canadian productivity trends write large. For this reason, our analysis in this section focuses on the Canadian provinces. Excluding the territories, labour productivity growth for the full 2000-2022 period was highest in Manitoba (1.36% per year), Newfoundland and Labrador (1.17% per year), and British Columbia (1.13% per year). Alberta, Ontario, and Nova Scotia, meanwhile, saw the lowest rates of labour productivity growth at 0.68%, 0.75%, and 0.76% per year, respectively.

While there is some variance across the subperiods in which provinces lead in productivity growth, this pattern of high- and low- performers is fairly consistent. From 2000 to 2008, the highest rates of productivity growth were found in Newfoundland and Labrador (5.02% per year), Manitoba (1.96% per year), and Saskatchewan (1.51% per year), while the lowest rates were seen in Alberta (0.18% per year), Nova Scotia (0.49% per year), and Ontario (0.67% per year): broadly similar to the trends for the overall period with the exception of Newfoundland and Labrador and Saskatchewan's exceptional growth as well as Alberta's remarkably poor performance. However, 2008-2019 saw something of a reversal, with Alberta (1.37% per year) and Nova Scotia (1.11% per year) joining Manitoba (1.42% per year) as the provinces with the fastest rates of productivity growth. Atlantic Canada experienced particularly poor productivity growth over the 11-year timespan, with Newfoundland and Labrador's productivity growth trajectory turning negative leading to a growth rate of -0.67% per year. New

Brunswick and Nova Scotia too experienced some of the poorest rates of growth among the province at 0.57% per year and 0.77% per year, respectively.

The 2019-2022 period saw widespread slowdowns in productivity slowdowns across provinces in response to myriad pandemic-related disruptions. Over the period, Prince Edward Island (1.69% per year), New Brunswick (1.30% per year), and British Columbia (1.04% per year) experienced the highest rates of labour productivity growth, while Alberta (-0.50%), Manitoba (-0.44%), and Ontario (0.12%) experienced the lowest. 7 of the 10 provinces experienced a slowdown in productivity growth between the 2008-2019 period and the 2019-2022 period. By far the largest reductions in productivity growth occurred in Alberta and Manitoba where trend productivity growth fell 1.87 points (1.37% per year to -0.50% per year) and 1.86 points (1.42% per year to -0.44% per year), respectively. Newfoundland and Labrador (change of -1.37 points), Nova Scotia (change of -0.87 points), and Ontario (-0.86 points) also suffered significant slowdowns in labour productivity growth between periods. The only two provinces to experience improvements in productivity growth were Prince Edward Island and New Brunswick, where the trend rate of annual productivity growth rose by 0.91 points and 0.73 points, respectively.

Table 6: CSLS Decomposition by Province, Within-Province and Re-allocation Effects on Canadian Business Sector Labour Productivity Growth, 2000-2022

	2000-2008	2008-2019	2019-2022	2000-2022
Within-Province Effect	0.88	1.03	0.24	0.86
Re-allocation Level Effect	0.12	-0.03	-0.01	0.02
Re-allocation Growth Effect	-0.01	0.00	0.00	0.00
Net Re-allocation Effect	0.11	-0.04	-0.02	0.03
Summed Effects	0.99	1.00	0.22	0.89
Observed Business Sector Productivity CAGR	1.00	1.05	0.23	0.92
discrepancy (summed effects minus observed rate of growth)	-0.01	-0.05	-0.01	-0.03

Source: CSLS calculations based on Statistics Canada Table: 36-10-0480-01.

Table 6 presents the results of the CSLS labour productivity growth decomposition across provinces in Canada. Estimates are offered for the same periods as the sectoral decomposition. Similar to what we observe when decomposing across sectors, the CSLS decomposition of productivity growth across provinces and territories over the post-2000 period finds that growth is driven almost entirely by productivity advances within individual provinces or territories. However, compared to the sectoral decomposition, re-allocation effects play a more minor role in determining productivity growth here.⁸ For three of the periods which we consider, the effects of labour input re-allocation between provinces on productivity growth are essentially negligible. The 2000-2008 period is the sole exception, with a total re-allocation effect of 0.11 points,

⁸ This is not particularly surprising. Movement of labour across provinces is much less common movement of labour between different sectors of the economy. Moreover, the employment level (i.e. the labour input share) within provinces is generally more stable than in individual sectors. Hence, it makes sense that sectoral re-allocation is a more important dynamic than provincial re-allocation.

representing 11% of the business sector labour productivity growth rate over the period. Still, compared to the sectoral decomposition, where re-allocation effects comprise between 8% and 37% of total productivity growth depending on the period, this contribution was relatively small. The effect stemmed solely from the massive shift of labour input towards Alberta which occurred over the period and which caused hours worked in the province to rise from 2.5 billion to 3.2 billion, raising the national labour input share of the province from 11.55% to 13.52%. The level of labour productivity in the province was the highest among all provinces (though lower than Nunavut and the Northwest Territories) at the beginning of the period, and hence, this shift generated a moderately-sized positive level effect. The growth effect for the province was insignificant at just -0.01 points. Although the province had the lowest productivity growth over the period of all provinces and territories, the difference between Alberta's productivity growth trajectory and Canada's overall growth trajectory was small; between 2000 and 2008, Alberta labour productivity rose \$1 compared to the national average of \$3.90. Hence, the impact in terms of a re-allocation growth effect was negligible.

Appendix Table B1 presents the productivity contributions by subperiod for each of Canada's 13 provinces and territories. These contributions are derived from the absolute changes in productivity levels and the labour input shares observed for each period. As one might expect, productivity growth in the country since 2000 has been driven primarily by a handful of provinces, with the remaining regions making relatively minor contributions. These provinces are Ontario, Quebec, Alberta and British Columbia, which is somewhat unsurprising given that these are the country's 4 largest provinces and the loci of the key economic hubs of Vancouver, Toronto, and Montreal, and the core of Canadian resource development in the Alberta oil sands.

Given that the most populous provinces are shown to be the most important in terms of productivity contributions, it is interesting to consider productivity contributions controlling for the population or the share of labour employed in a given province or territory. Table 7 does exactly this, presenting the difference between the absolute (i.e., non-negative) percentage contribution to productivity growth and the population (Panel A) and labour input share (Panel B) within each province. For example, in Panel A, a value of 4.2 for Alberta for the 2000-2022 period indicates that Alberta's contribution to Canadian productivity growth over the period (15.8%) was 4.2 percentage points larger than its share of the Canadian population. Similarly, in Panel B, a value of 2.8 indicates Alberta's contribution to productivity growth over the period was 2.8 percentage points higher than its share of total Canadian employment.

Figures are provided for each subperiod of interest, utilizing population and labour input share data for the beginning of the period in all cases. While there is significant variance across the periods, there are consistent trends in which provinces over-perform or under-perform relative to their size. The western provinces – Alberta, Saskatchewan, and Manitoba, in particular – are consistently associated with productivity contributions that are large relative to the population share and share of Canadian labour employed. Over the entire period, the Yukon Territories and Nunavut also offer productivity contributions which are multiple times larger than their share of population and labour share, though the magnitude of this dynamic is, of course, very small. Conversely, Ontario, despite being the largest driver of productivity growth in absolute terms, actually underperforms significantly relative to its population and labour input share

Table 7: Population and Labour Share Productivity Contribution Differentials

Panel A: Population-Productivity Contribution Differential, Percentage Points

	2000-2008	2008-2019	2019-2022	2000-2022
Canada	0.00	0.00	0.00	0.00
Newfoundland and Labrador	7.06	-0.01	16.22	0.09
Prince Edward Island	-0.02	-0.30	1.35	-0.13
Nova Scotia	-1.94	-0.19	-2.41	-1.06
New Brunswick	-0.21	-0.76	7.08	-0.30
Quebec	-4.14	-4.47	38.40	-2.70
Ontario	-10.87	-2.32	-20.55	-5.11
Manitoba	2.56	0.78	1.94	1.14
Saskatchewan	2.97	0.50	-1.14	1.34
Alberta	2.83	12.21	20.86	5.96
British Columbia	0.53	-1.89	44.20	0.38
Yukon	0.30	-0.10	4.86	0.25
Northwest Territories	0.95	0.32	3.12	-0.12
Nunavut	0.00	0.19	4.18	0.26

Source: CSLS calculations based on Statistics Canada Table: 36-10-0480-01 and Table 17-10-0009-01.

Note: Differentials are calculated using the population shares at the beginning of the period.

Table x: Labour Share-Productivity Differential, Percentage Points

	2000-2008	2008-2019	2019-2022	2000-2022
Canada	0.00	0.00	0.00	0.00
Newfoundland and Labrador	7.60	0.38	16.52	0.76
Prince Edward Island	0.03	-0.25	1.38	-0.08
Nova Scotia	-1.40	0.17	-2.02	-0.26
New Brunswick	0.04	-0.59	7.30	0.32
Quebec	-2.19	-2.45	39.78	0.34
Ontario	-13.41	-3.04	-21.87	-7.28
Manitoba	2.78	1.06	2.36	1.68
Saskatchewan	3.05	0.51	-0.98	1.81
Alberta	1.08	9.54	19.63	2.80
British Columbia	1.09	-1.87	43.79	-0.54
Yukon	0.31	-0.07	4.88	0.27
Northwest Territories	0.97	0.33	3.14	-0.08
Nunavut	0.05	0.24	4.19	0.27

Source: CSLS calculations based on Statistics Canada Table: 36-10-0480-01 and Table 17-10-0009-01

Note: Differentials are calculated using the labour input shares at the beginning of the period.

Sources of Labour Productivity Growth: A Growth Accounting Perspective

Another instructive way of understanding labour productivity growth is through a growth accounting framework. Given a standard Cobb-Douglas production function of the form

$$Y = AL^{\beta}K^{\alpha}$$

growth in labour productivity can be expressed as:

$$\Delta \ln \left(\frac{Y}{L} \right) = \Delta \ln(A) + \left(\frac{\alpha}{\alpha + \beta} \right) \Delta \ln(K) + \left(\frac{\beta}{\alpha + \beta} \right) (\Delta \ln(L) - \Delta \ln(H))$$

The first term in this decomposition represents growth in multifactor productivity (also sometimes referred to as total factor productivity). Multifactor productivity is the part of an increase in output which remains after accounting for changes in capital and labour input. It is calculated as a residual and, as such, it is not particularly helpful for understanding the on-the-ground changes driving developments in productivity; rather, it is a measure of all that we are unable to account for, or put simply, how much we do not know. It is most commonly interpreted as representing the pace of underlying technological progress. Other factors which contribute to multifactor productivity include economies of scale, changes in organizational structure, improvements in infrastructure and institutions, as well as spillover and network effects (OECD, 2023). Due to its nature as a residual, measurement errors related to factors of production also tend to be reflected in measures of multifactor productivity.

The second term represents growth in capital intensity, or the increased productivity which arises as each unit of labour becomes equipped with more capital. Capital deepening means that each worker has more tools, machinery, and technology at their disposal and this generally translates to a higher level of labour productivity. On a macro-level, this means that

within an economy there tends to be a close relationship between levels of investment, which drive capital formation, and levels of labour productivity.

The final term represents changes in the quality of labour input, also called labour composition. This is conceptualized as the process by which labour becomes more skilled and accumulates human capital, either through education or experience. Given that highly-skilled workers tend to be more productive than low-skill workers, a compositional shift in the type of labour employed in the economy towards highly-skilled workers can cause aggregate productivity to increase and vice versa. Statistics Canada estimates labour quality using data on wages and educational attainment, with the assumption that higher wages tend to reflect higher levels of skill and productivity. Among the three sources of growth identified in this decomposition framework, changes in labour quality tend to be the least substantial in terms of their contribution to overall labour productivity trends.

Table 8: Sources of Canadian Business Sector Labour Productivity Growth, 1961-2021

Panel A: Absolute Contributions (percentage points)

	1961-1981	1981-2000	2000-2019	2000-2008	2008-2019	2019-2021
Labour Productivity Growth	2.85	1.72	0.96	0.86	1.03	1.09
Multifactor Productivity	0.97	0.46	-0.09	-0.54	0.24	-0.71
Capital Intensity	1.33	0.87	0.79	1.13	0.54	1.29
ICT Capital Intensity	0.18	0.56	0.22	0.43	0.07	0.14
Non-ICT Capital Intensity	1.20	0.35	0.56	0.70	0.48	1.15
Labour Quality	0.53	0.38	0.26	0.28	0.25	0.52
Total Contributions	2.82	1.71	0.96	0.87	1.03	1.10

Panel B: Relative Contributions (%)

	1961-1981	1981-2000	2000-2019	2000-2008	2008-2019	2019-2021
Labour Productivity Growth	100.0	100.0	100.0	100.0	100.0	100.0
Multifactor Productivity	34.0	26.6	-9.2	-63.3	23.7	-65.4
Capital Intensity	46.6	50.6	82.1	131.5	52.2	117.9
ICT Capital Intensity	6.2	32.4	22.4	49.5	6.8	12.6
Non-ICT Capital Intensity	42.3	20.3	58.8	81.0	46.3	105.4
Labour Quality	18.5	22.3	27.0	32.3	23.8	48.0
Total Contributions	99.1	99.5	99.9	100.5	99.7	100.6

Panel C: Compound Annual Growth Rates for Sources of Growth, Factor Costs, and Hours Worked

	1961-1981	1981-2000	2000-2019	2000-2008	2008-2019	2019-2021
Labour Quality	0.85	0.63	0.44	0.48	0.42	0.90
Capital Input	5.68	3.73	2.89	3.96	2.12	1.04
ICT Capital Input	8.17	13.51	5.18	9.23	2.33	1.15
Non-ICT Capital Input	5.46	2.43	2.54	3.15	2.09	1.03
Hours Worked	2.03	1.42	0.97	1.22	0.79	-2.06

Panel D: Labour and Capital Share of Input Costs

	1961-1981	1981-2000	2000-2019	2000-2008	2008-2019	2019-2021
Labour Share of Costs	62.0	60.5	58.9	58.7	58.8	58.5
Capital Share of Costs	38.0	39.5	41.1	41.3	41.2	41.5
ICT Capital Share	2.9	4.6	5.1	5.3	4.6	4.3
Non-ICT Capital Share	35.1	34.9	36.0	36.0	36.6	37.2

Source: CSLS calculations based on Statistics Canada Table 36-10-0208-01

Note: Contributions from growth in multifactor productivity, capital intensity, and labour quality are official Statistics Canada estimates. Contributions from growth in ICT and non-ICT capital intensity are calculated using Statistics Canada data on hours worked and ICT/non-ICT capital inputs and costs for each period. Labour and capital cost shares are calculated by taking the arithmetic average of the share of costs for labour and capital at the start and end of each period.

Table 8 presents official Statistics Canada growth accounting estimates for business sector Canadian labour productivity growth from 1961 to 2021. Contributions to labour productivity growth are provided for the three sources of growth identified above: multifactor productivity, capital intensity, and labour quality. In the case of multifactor productivity, the contribution simply represents the rate of growth in multifactor productivity over the given period. In the case of the latter two sources, the contribution is calculated as the growth rate of

the component weighted by the share of income which accrues to the relevant factor of production (capital or labour) or the share of input costs associated with that factor: $\left(\frac{\alpha}{\alpha+\beta}\right)$ in the case of capital and $\left(\frac{\beta}{\alpha+\beta}\right)$ in the case of labour. These parameters are assumed to represent the respective contributions of capital and labour to output. All else equal, when capital is more important within a production function, the effect of an increase in capital intensity on labour productivity will be larger. Conversely, when labour is more important within a production function, the effect of an increase in labour quality on labour productivity will be larger.

Panel A provides the estimated contributions to labour productivity growth in absolute terms, while Panel B expresses contributions in relative terms, as a proportion of the total labour productivity growth rate.⁹ Panel C, furthermore, provides compound annual growth rates for the variables underlying the contributions, namely labour quality, capital input, and labour input in the form of hours worked. Finally, Panel D offers the share of input costs associated with capital and labour inputs, respectively. Estimates are provided for 6 periods: 1961-1981, 1981-2000, 2000-2019, 2000-2008, 2008-2019, and 2019-2021. All of these periods, with the exception of the most recent period from 2019 to 2021, are cyclically neutral. The 2019-2021 period is not cyclically neutral due to being incomplete. For this reason, and with the disruptions of the pandemic in mind, readers should exercise caution in interpreting estimates for this period.

⁹ The sources of growth decomposition performed here using official Statistics Canada data is not perfectly additive. As such, the relative contributions in Panel B, which are calculated using the contributions and the observed rates of labour productivity growth presented for each period in Panel A, do not add to 100%. Still, the discrepancy is small.

1961-1981

Aggregate labour productivity growth trends for the six periods presented in Table 10 lay bare the stepwise productivity slowdowns observed in the 1980s and then again in the post-2000 period. In the 1961-1981 period, trend labour productivity growth was 2.85 percent per year: a far cry from the 1% growth trajectory experienced in recent years. This was driven primarily by increases in capital intensity over the period, which contributed 1.33 points, or about half of overall labour productivity growth. Improvements in ICT capital intensity accounted for 0.18 points of the contribution, while non-ICT capital deepening accounted for 1.20 points. Labour productivity growth in this period reflected massive year-over-year growth in investment, particularly in ICT where capital input grew 8.17% annually (though it should be noted that ICT was relatively nascent with small absolute levels of investment during this period). However, investment in non-ICT capital was also strong; the growth rate of non-ICT capital input over the period was 5.46% per year. Multifactor productivity growth was similarly impressive, contributing 0.97 points or a third of overall labour productivity growth. Improvements in labour quality were less important, contributing just 0.53 points.

1981-2000

The first labour productivity slowdown is seen between the 1961-1981 period and the 1981-2000 period as trend labour productivity growth falls off substantially, dropping 1.13 points to an annual trend productivity growth rate of 1.72%.¹⁰ Growth accounting estimates do not identify a solitary reason for this decline, as all three sources of growth offered weaker contributions in this period compared to the previous period. However, in both absolute and

¹⁰ This drop-off is even steeper when centring the pre-2000 periods around 1973: the pivotal year for the 1970s productivity slowdown. Between 1961 and 1973, trend productivity growth was 3.55% per year. During the period from 1973 to 2000, meanwhile, trend productivity growth was 1.74% per year: a decline of 1.81 points or just over half.

relative terms, the steepest drop-off was seen in Canadian multifactor productivity growth, which fell 0.51 points from 0.97% annually to 0.46% annually. This fall represents a decline in the contribution of multifactor productivity of more than half compared to the previous period. A downturn of a similar magnitude was observed in the contribution from capital intensity, which fell by 0.46 points or about a third between periods (1.33 points to 0.87 points). This was driven by a large reduction in the contribution from non-ICT capital intensity which fell from 1.20 points in the previous period to just 0.35 points. The contribution from ICT capital intensity, on the other hand, grew substantially, jumping 0.38 points between periods (0.18 points to 0.56 points).

2000-2019

Growth in ICT investment soared between periods, with the annual growth rate of ICT capital input rising 5.34 points period to period. However, non-ICT capital input growth slowed down, with the growth rate falling 1.97 points or just over a third. The contribution from labour quality, meanwhile, fell only 0.15 points (0.53 points to 0.38 points). These relative changes between periods are reflected in the relative contributions of each source of growth to overall labour productivity growth between 1981 and 2000; as the source of growth which fell most sharply, multifactor productivity growth accounted for only 26.6% of overall labour productivity growth, while changes in capital intensity and labour quality become relatively more important, contributing 50.6% and 22.3% respectively.

These trends largely continued with the 2000-2019 period, which brought another stepwise reduction in business sector labour productivity growth. In absolute terms, this fall was substantially smaller compared to that seen between the previous periods, with the trend growth rate falling 0.76 points between periods compared to 1.13 points in the earlier slowdown.

However, in this case, the weakening in productivity growth was attributable almost completely to the deterioration of multifactor productivity growth between periods. Between the 1981-2000 period and the 2000-2019 period, the contribution from multifactor productivity growth decreased 0.55 points, turning slightly negative. That is to say, whereas previous periods had seen substantial annual growth in multifactor productivity, multifactor productivity growth not only stalled but actually began slipping backwards over the 2000-2019 period; official Statistics Canada data on multifactor productivity growth assigns an indexed value of 105.15 to multifactor productivity in the year 2000 (the base year of the index is 2012) and an indexed value of 103.39 for the year 2019, indicating a slight retrenchment in multifactor productivity over the 19 year timespan.

In contrast, while the contributions from capital intensity and labour quality also fell period-to-period, the changes were less substantial. Growth in capital intensity continued to be the most substantial source of labour productivity growth, though the contribution declined about from 0.87 points to 0.79 points. The small decline reflected a fall in the contribution from ICT capital intensity, which dropped from 0.56 points to 0.22 points between periods: a reduction of 0.34 points or more than half. Non-ICT capital intensity bounced back somewhat, rising 0.21 points to 0.56 points. Interestingly, the observed fall in the contribution from capital intensity was much less dramatic than trends in ICT and non-ICT investment might have suggested. Growth in ICT investment, in particular, crashed between periods; ICT capital input fell 8.33 points (13.51% in the 1981-2000 period to 5.18% in the 2000-2019 period). In contrast, non-ICT capital input actually grew slightly from 2.43% to 2.54%. The contribution from improvements in labour quality fell as well, by 0.12 points, down to 0.26 points. Still, given the collapse of multifactor productivity growth over the period, both capital intensity and labour quality came to

account for a larger proportion of the trend labour productivity growth rate: 82.1% and 27.0% respectively.

Sources of Growth in the Post-2000 Period: 2000-2008 and 2008-2019

An overview of labour productivity trends from 1961 to 2019 appears to implicate an implosion in multifactor productivity growth as the cardinal source of Canada's lethargic productivity growth in recent years, though all three sources of growth weakened considerably over this period. Drilling down to the subperiods comprising the 2000-2019 period allows us to more carefully trace the contributions from each source of growth through the post-2000 productivity slowdown. Distinct trends in the drivers of labour productivity growth are observed across the 2000-2008 and 2008-2019 periods, though a general downward trajectory remains.

Between 2000 and 2008, labour productivity growth reached its lowest point pre-pandemic at just 0.86% per cent annually, again brought about by a crash in multifactor productivity growth. Restricting our analysis to this period makes the post-2000 productivity slump appear even more jarring. Compared to the 1981-2000 period, multifactor productivity growth plummeted by 1.00 point from 0.46 points to -0.54 points, indicating a moderately negative growth trajectory over the period. Multifactor productivity in 2000 took on an indexed value of 105.15 and had fallen to just 100.65 in 2008: a decrease of 4.5% over 8 years. In contrast, the contribution from capital intensity bounced back after a substantial fall between the 1961-1981 and 1981-2000 period, this time jumping 0.26 points between periods. These gains reflected improvements in both ICT capital intensity, which contributed 0.43 points (up 0.21 points from the previous period), and non-ICT capital intensity, which contributed 0.70 points (up 0.14 points period-to-period). Whereas the contribution had only accounted for about half of

productivity growth over the 1981-2000 period, it now made up more than 100% of the overall labour productivity growth rate. These gains occurred despite trends in capital input growth, which began to fall post-2000. Between the 1981-2000 period and the 2000-2008 period, the annual growth rate of ICT capital input fell 4.28 points from 13.51% to 9.23%. In contrast, the annual growth rate of non-ICT capital input rose 0.72 points from 2.43% to 3.15%. The contribution from labour quality fell somewhat compared to the 1981-2000 period, dropping 0.10 points between periods. With that said, the crash in multifactor productivity growth again spelled an increase in the relative contribution from labour quality, boosting the contribution to 32.3% of the labour productivity growth rate.

Trends reversed somewhat abruptly with the 2008-2019 period, likely reflecting the impact of the Great Recession. Labour productivity growth over this period was 1.03%: slower than pre-2000 but 0.17 points higher than the prior period, with the increase entirely reflecting period-to-period improvements in multifactor productivity growth. The contribution from multifactor productivity growth made a sizeable recovery post-2008, rising 0.78 points and turning positive once again. Conversely, the contribution from capital intensity fell sharply, reaching the lowest point in the six periods surveyed. From the 2000-2008 period to the 2008-2019 period, the absolute contribution fell 0.59 points or about half. Contributions from both ICT and non-ICT capital intensity declined significantly, with the former dropping 0.36 points or 83% period-to-period (0.43 points to 0.07 points) and the latter dropping 0.22 points or 31% (0.70 points to 0.48 points). This tracked with the trend in ICT capital input, which fell 6.90 points or by about three quarters compared to the 2000-2008 period. Non-ICT investment growth followed suit, dropping 1.06 points from period to period. Finally, improvements in labour quality were not particularly important over the 2008-2019 period; the absolute contribution

continued to fall, dropping 0.03 points from 0.28 to 0.25 points, while the relative contribution decreased more significantly, from 32.3% to 23.8%.

Future Outlook

The exceptionality of the 2019-2021 period and the COVID-19 pandemic make it challenging to forecast future movements in Canadian labour productivity growth and the three sources of growth.¹¹ The data that exists on productivity trends in 2022 indicate that labour productivity growth is likely to have fallen dramatically compared to 2021 (Table 2), driven by continually poor multifactor productivity growth and a retreat to normality in terms of the labour composition and the capital-labour ratio. While multifactor productivity growth may have stabilized somewhat as the worst of the pandemic disruptions subsided, this was likely overshadowed by negative contributions from capital intensity and labour quality as employment levels returned to normal. As a post-pandemic regression-to-the-mean in many respects, 2022 appears to have been a low-point in Canadian labour productivity growth.

While labour productivity growth is certainly expected to rebound somewhat following this anomalous period, the prospect for strong future productivity growth, or even a return to 1% annual growth, is uncertain. All three sources of productivity growth have generally been deteriorating in recent years in Canada. Multifactor productivity growth declined sharply from the 1981-2000 to the 2000-2008 period and again between 2019 and 2021. Admittedly, a small recovery was observed between 2008 and 2019, however such a phenomenon seems increasingly unlikely given enduring supply-chain disruptions and the renewed push for onshoring and friend-shoring post-pandemic. In other words, a number of the general production inefficiencies brought on by the pandemic may be here to stay. Contributions from capital intensity meanwhile

¹¹ Data on sources of growth for the 2019-2021 period can be found in Table 10.

have fallen continually since 1961 save for a brief spike between 2008 and 2019 and a pandemic-induced resurgence. This downward trend seems to reflect a general trend of fading investment in Canada, particularly in research and development, innovation, and ICT: a trajectory which likely won't be altered without a meaningful shock to Canada's business environment.

Finally, the contribution of labour quality has been likely the most consistent of the three sources of growth in its long-run path (save for a pandemic-induced spike), slipping gradually from period to period. The barrier here is perhaps the most entrenched of the three: Canada's population is already extremely well-educated, and as the average level of education in the population increases, this leaves less and less room for growth. Indeed, in 2021, 57.5% of Canadians aged 25-64 had a college or university credential: the highest among any country in the G7 (Statistics Canada, 2022). Immigration has been an asset in previous years to the extent that it provided another source of highly-educated labour. However, there is again an inherent ceiling to growth here that is confronted as the Canadian population becomes increasingly well-educated. Moreover, although the situation is improving, an alarming number of immigrants continue to face barriers applying their credentials in Canada. In 2021, 25.8% of Canadian immigrants with foreign degrees worked in jobs demanding no more than a high school education (Statistics Canada, 2022). This rate is twice as high compared to those born and/or educated in Canada. Ultimately, a growth accounting perspective only reinforces the intuition that the path back to 1% labour productivity growth per year is likely to be arduous.

Conclusion

This report serves as an overview of recent labour productivity developments in Canada. It examines the sources of slowing productivity growth post-2000 and provides an account of the structural and compositional changes which affected productivity growth through the pandemic. A survey of international productivity data finds that Canada's productivity slowdown is far from exceptional and that the country's productivity performance, though poor, is in line with a number of other peer countries, namely the United Kingdom, France, Spain, Norway, and the Netherlands. On the other hand, comparisons with the United States, where business sector productivity has remained stable post-2000, are not very favourable to Canada. Notably though, we find that the magnitude of the gap in labour productivity growth rates between the two countries is heavily dependent on the aggregate chosen, with the total economy disparity being much smaller than the business sector disparity. Moreover, we highlight the exceptional nature of the US productivity growth trajectory and advocate a broader scope of comparison in discourse on the productivity slowdown.

Our decomposition of labour productivity growth into within-sector and re-allocation effects based on the framework advanced in Sharpe and Tsang (2018) identifies productivity growth within sectors as the primary driver of aggregate productivity growth post-2000. Re-allocation effects were generally smaller though still significant. The re-allocation level effect tended to be positive, indicating a net movement of labour towards industries with above-average levels of productivity. Conversely though, the re-allocation growth effect was, on average, negative for the 2000-2022 period, indicating a net movement of labour towards industries with below-average rates of productivity growth. The pandemic-era slowdown that saw productivity growth decline from 1.05% per year in the 2008-2019 period to just 0.23% per year in the 2019-

2022 period reflected a collapsing of within-sector productivity growth. This is likely due to the myriad disruptions brought on by the pandemic and subsequent policy responses, but it is difficult to untangle what degree of this slowdown reflects a) ephemeral effects of the pandemic which will have little impact on future productivity growth, b) more enduring effects of the pandemic which may have a longer-term effect on the structure of the economy and Canada's productivity growth trajectory, and c) pandemic-agnostic productivity developments.

Throughout the post-2000 period, the sectors with the most substantial contributions to productivity growth were the finance and insurance sector, the wholesale trade sector, the manufacturing sector, the retail trade sector, and the agriculture, forestry, fishing, and hunting sector. The contribution from the mining and oil and gas extraction was highly volatile, at times contributing massively to productivity growth, like in the 2008-2019 period, and at other times constraining it, like in the 2000-2008 period. As an industry with extremely high levels of productivity but an often poor or negative growth trajectory, the mining and oil and gas extraction industry was responsible for much of the re-allocation effects observed post-2000 as resource price fluctuations inspired employment in the sector to wax and wane.

Decompositions of labour productivity growth by province finds that, not surprisingly, the bulk of productivity growth post-2000 is contributed by four provinces: Ontario, Quebec, Alberta, and British Columbia. This is somewhat unsurprising given that these provinces are not only the most populous provinces, but also the homes of Canada's key economic hubs. In addition, the pandemic-era slowdown is found to be linked to substantial drop-offs in the contributions from two provinces in particular: Ontario and Alberta. This observation aligns closely with the fact that two of the industries with the largest drop-offs were manufacturing and mining and oil and gas exploration.

Growth accounting estimates going back to 1961 find slowing productivity since the mid-20th century is linked to the deterioration of all three sources of growth. Multifactor productivity growth has fallen precipitously since the 1960s, with the rate of growth becoming deeply negative in the early 2000s between 2000 and 2008 and once again during the pandemic (likely a reflection of pandemic-induced production inefficiencies). Growth in capital intensity has also fallen substantially and has continued to slow down post-2000, particularly pre-pandemic in the 2008-2019 period. This reduction in capital intensity growth reflects both a long-term stagnation in non-ICT capital intensity growth and a collapse of ICT capital intensity growth since the 1980s and 1990s, which reached a nadir between 2008 and 2019. Capital intensity has, of course, soared in the pandemic era, though this likely reflects a temporary boost to the capital-labour ratio brought on by the laying off and furloughing of employees. Finally, the contribution from labour quality, too, has declined steadily since the 1960s, though the impact of this has been less substantial compared to the other two sources of growth. Pandemic shocks have similarly affected labour quality, with labour quality improving overnight as a result of the fact that job losses tended to be concentrated in low-skill positions and industries.

Taken together, these exercises suggest an uncertain future for Canadian productivity growth. The path back to 1% annual growth is likely to be an arduous one following the shocks and disruptions of the pandemic. This is compounded by a number of entrenched problems and challenges. Investment in innovation, research and development, and ICT appears stagnant, leading to poor multifactor productivity and capital intensity growth. Similarly, the high education level of the Canadian population makes it increasingly difficult to further improve the quality of the labour force. Finally, the green transition, in de-emphasizing the importance of the mining and oil and gas exploration sector, threatens to permanently impair Canadian productivity

growth prospects. Still, there may be an upside as well, given that this sector has also at times constrained productivity growth.

Altogether, while it remains to be seen how the Canadian economy will emerge from the pandemic era, a return to 1% seems unlikely without some sustained shock to Canada's business environment. Even in the best-case scenario, in depressing productivity growth, the disruption caused by the pandemic has deprived Canadians of would-be productivity gains. Capturing those lost gains would require a rate of productivity growth well above 1%: a prospect which, given the challenges outlined here, seems increasingly dim.

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Appendix A: Detailed Data Tables for CSLS Decomposition of Labour Productivity Growth by Industry

Appendix Table A1: Labour Hours Worked in Canadian Business Sector by Industry, 1997-2022

Panel A: Hours Worked (in millions)

	1997	2000	2008	2019	2022
Business sector industries	20,146	21,586	23,749	25,879	26,150
Agriculture, forestry, fishing and hunting	1,154	1,007	820	750	689
Mining and oil and gas extraction	326	305	494	534	532
Utilities	176	179	199	199	196
Construction	1,593	1,715	2,491	2,900	3,039
Manufacturing	3,798	3,965	3,327	3,110	3,083
Wholesale trade	1,437	1,497	1,588	1,615	1,639
Retail trade	2,472	2,572	2,960	3,155	3,069
Transportation and warehousing	1,316	1,421	1,490	1,897	1,819
Information and cultural industries	428	526	558	654	762
Finance and insurance	1,264	1,337	1,518	1,633	1,664
Real estate, rental and leasing	446	457	569	668	610
Professional, scientific and technical services	1,181	1,459	1,850	2,216	2,723
Holding Companies	198	229	304	102	90
ASWMRS	891	1,103	1,440	1,537	1,625
Educational services	85	106	126	173	169
Health care and social assistance	745	822	931	1,190	1,208
Arts, entertainment and recreation	290	344	402	433	402
Accommodation and food services	1,437	1,574	1,626	1,990	1,772
Other Private Services	911	968	1,054	1,122	1,058

Source: Statistics Canada Table: 36-10-0480-01.

Panel B: Share of Total Hours Worked (%)

	1997	2000	2008	2019	2022
Business sector industries	100.00	100.00	100.00	100.00	100.00
Agriculture, forestry, fishing and hunting	5.73	4.67	3.45	2.90	2.63
Mining and oil and gas extraction	1.62	1.41	2.08	2.06	2.03
Utilities	0.87	0.83	0.84	0.77	0.75
Construction	7.91	7.95	10.49	11.20	11.62
Manufacturing	18.85	18.37	14.01	12.02	11.79
Wholesale trade	7.13	6.94	6.69	6.24	6.27
Retail trade	12.27	11.91	12.46	12.19	11.74
Transportation and warehousing	6.53	6.58	6.28	7.33	6.95
Information and cultural industries	2.12	2.44	2.35	2.53	2.91
Finance and insurance	6.27	6.19	6.39	6.31	6.36
Real estate, rental and leasing	2.22	2.12	2.40	2.58	2.33
Professional, scientific and technical services	5.86	6.76	7.79	8.56	10.41
Holding Companies	0.98	1.06	1.28	0.39	0.35
ASWMRS	4.42	5.11	6.06	5.94	6.21
Educational services	0.42	0.49	0.53	0.67	0.64
Health care and social assistance	3.70	3.81	3.92	4.60	4.62
Arts, entertainment and recreation	1.44	1.59	1.69	1.67	1.54
Accommodation and food services	7.13	7.29	6.85	7.69	6.78
Other Private Services	4.52	4.48	4.44	4.33	4.05

Source: CSLS calculations based on Statistics Canada Table: 36-10-0480-01.

**Appendix Table A2: Labour Productivity Levels in Canadian Business Sector by Industry,
1997-2022 (real output per hour worked, chained 2012 dollars)**

	1997	2000	2008	2019	2022
Business sector industries	42.9	47.1	51.0	57.2	57.6
Agriculture, forestry, fishing and hunting	23.5	31.0	35.9	53.7	60.5
Mining and oil and gas extraction	318.5	355.5	244.6	288.8	293.5
Utilities	174.6	169.9	184.7	204.4	205.9
Construction	46.6	47.7	47.6	49.9	49.7
Manufacturing	44.9	53.2	58.0	63.8	63.2
Wholesale trade	34.1	40.0	51.6	64.5	65.5
Retail trade	19.5	22.3	28.0	32.2	34.8
Transportation and warehousing	38.2	39.9	44.5	46.8	44.6
Information and cultural industries	64.3	72.8	90.4	100.9	92.9
Finance and insurance	51.7	55.1	63.2	82.1	89.6
Real estate, rental and leasing	107.7	121.9	124.3	134.3	146.7
Professional, scientific and technical services	44.1	48.1	49.3	54.0	49.0
Holding Companies	32.6	32.1	38.5	52.4	22.6
ASWMRS	31.9	30.2	31.9	34.0	30.2
Educational services	20.2	21.3	23.5	22.9	24.6
Health care and social assistance	47.2	45.9	46.2	44.0	45.1
Arts, entertainment and recreation	35.9	32.4	28.8	30.5	26.7
Accommodation and food services	18.5	19.2	20.6	21.9	21.6
Other Private Services	18.6	20.2	22.6	25.3	27.3

Source: Statistics Canada Table: 36-10-0480-01.

Appendix Table A3: Absolute Changes in Labour Productivity Level in Canada by Business Sector Industry, 1997-2022 (real output per hour worked, chained 2012 dollars)

	1997-2000	2000-2008	2008-2019	2019-2022	2000-2022
Business sector industries	4.2	3.9	6.2	0.4	10.5
Agriculture, forestry, fishing and hunting	7.5	4.9	17.8	6.8	29.5
Mining and oil and gas extraction	37.0	-110.9	44.2	4.7	-62.0
Utilities	-4.7	14.8	19.7	1.5	36.0
Construction	1.1	-0.1	2.3	-0.2	2.0
Manufacturing	8.3	4.8	5.8	-0.6	10.0
Wholesale trade	5.9	11.6	12.9	1.0	25.5
Retail trade	2.8	5.7	4.2	2.6	12.5
Transportation and warehousing	1.7	4.6	2.3	-2.2	4.7
Information and cultural industries	8.5	17.6	10.5	-8.0	20.1
Finance and insurance	3.4	8.1	18.9	7.5	34.5
Real estate, rental and leasing	14.2	2.4	10.0	12.4	24.8
Professional, scientific and technical services	4.0	1.2	4.7	-5.0	0.9
Holding Companies	-0.5	6.4	13.9	-29.8	-9.5
ASWMRS	-1.7	1.7	2.1	-3.8	0.0
Educational services	1.1	2.2	-0.6	1.7	3.3
Health care and social assistance	-1.3	0.3	-2.2	1.1	-0.8
Arts, entertainment and recreation	-3.5	-3.6	1.7	-3.8	-5.7
Accommodation and food services	0.7	1.4	1.3	-0.3	2.4
Other Private Services	1.6	2.4	2.7	2.0	7.1

Source: CSLS calculations based on Statistics Canada Table: 36-10-0480-01.

Appendix B: Charts and Detailed Data Tables for CSLS Decomposition of Labour Productivity Growth by Province

Appendix Table B1: CSLS Decomposition by Province, Contributions to Business Sector Canadian Labour Productivity Growth, 2000-2022

Panel A: Absolute Contributions (percentage points)

	2000-2008	2008-2019	2019-2022	2000-2022
Canadian Business Sector (observed)	1.00	1.05	0.23	0.92
Canadian Business Sector (sum of contributions)	0.99	1.00	0.22	0.89
Newfoundland and Labrador	0.09	-0.02	-0.04	0.02
Prince Edward Island	0.00	0.00	0.00	0.00
Nova Scotia	0.01	0.03	0.00	0.02
New Brunswick	0.02	0.01	0.02	0.02
Quebec	0.20	0.19	0.13	0.19
Ontario	0.27	0.36	0.04	0.29
Manitoba	0.06	0.04	-0.01	0.04
Saskatchewan	0.06	0.04	0.00	0.04
Alberta	0.12	0.23	-0.07	0.14
British Columbia	0.14	0.11	0.13	0.12
Yukon	0.00	0.00	0.01	0.00
Northwest Territories	0.01	0.00	-0.01	0.00
Nunavut	0.00	0.00	0.01	0.00

Source: CSLS calculations based on Statistics Canada Table: 36-10-0480-01.

Note: The 1997-2000 period has been omitted due to a lack of data on Nunavut and the Northwest Territories for the years 1997 and 1998.

Panel B: Relative Contributions (%)

	2000-2008	2008-2019	2019-2022	2000-2022
Canadian Business Sector (sum of contributions)	100.0	100.0	100.0	100.0
Newfoundland and Labrador	8.8	-1.5	-17.6	1.8
Prince Edward Island	0.4	0.1	1.8	0.3
Nova Scotia	1.1	2.6	-0.2	2.0
New Brunswick	2.2	1.5	9.1	2.1
Quebec	19.8	18.9	61.0	21.2
Ontario	27.3	36.4	18.2	33.1
Manitoba	6.3	4.4	-5.6	4.9
Saskatchewan	6.2	3.6	2.0	4.6
Alberta	12.6	23.1	-32.5	15.8
British Columbia	13.7	11.2	57.8	13.5
Yukon	0.4	0.0	5.0	0.3
Northwest Territories	1.1	-0.5	-3.2	0.0
Nunavut	0.1	0.3	4.3	0.4

Source: CSLS calculations based on Statistics Canada Table: 36-10-0480-01.

Note: The 1997-2000 period has been omitted due to a lack of data on Nunavut and the Northwest Territories for the years 1997 and 1998.

Appendix Table B2: Labour Hours Worked in Business Sector by Province, 1997-2022

Panel A: Hours Worked (in millions)

	1997	2000	2008	2019	2022
Canada	20,146	21,586	23,749	25,879	26,150
Newfoundland and Labrador	233	251	272	281	271
Prince Edward Island	78	85	87	100	102
Nova Scotia	506	538	580	568	585
New Brunswick	442	472	493	477	475
Quebec	4,402	4,745	5,060	5,490	5,464
Ontario	7,943	8,786	9,370	10,358	10,548
Manitoba	755	758	786	832	834
Saskatchewan	710	688	725	763	734
Alberta	2,341	2,493	3,212	3,320	3,391
British Columbia	2,677	2,718	3,106	3,619	3,682
Yukon	20	20	18	22	20
Northwest Territories	-	24	30	25	24
Nunavut	-	9	11	23	21

Source: Statistics Canada Table: 36-10-0480-01.

Panel B: Share of Total Hours Worked (%)

	1997	2000	2008	2019	2022
Canada	100	100	100	100	100
Newfoundland and Labrador	1.16	1.16	1.14	1.09	1.04
Prince Edward Island	0.39	0.39	0.36	0.39	0.39
Nova Scotia	2.51	2.49	2.44	2.19	2.24
New Brunswick	2.20	2.19	2.08	1.84	1.82
Quebec	21.85	21.98	21.31	21.22	20.89
Ontario	39.43	40.70	39.46	40.03	40.34
Manitoba	3.75	3.51	3.31	3.22	3.19
Saskatchewan	3.52	3.19	3.05	2.95	2.81
Alberta	11.62	11.55	13.52	12.83	12.97
British Columbia	13.29	12.59	13.08	13.99	14.08
Yukon	0.10	0.09	0.08	0.09	0.08
Northwest Territories	-	0.11	0.13	0.10	0.09
Nunavut	-	0.04	0.04	0.09	0.08

Source: CSLS calculations based on Statistics Canada Table: 36-10-0480-01.

Appendix Table B3: Labour Productivity Levels in Business Sector by Province, 1997-2022 (real output per hour worked, chained 2012 dollars)

	1997	2000	2008	2019	2022
Canada	42.9	47.1	51.0	57.2	57.6
Newfoundland and Labrador	52.7	61.9	91.6	85.1	80.0
Prince Edward Island	29.8	31.0	33.9	36.9	38.8
Nova Scotia	31.3	35.1	36.5	41.2	41.5
New Brunswick	33.8	36.9	40.3	42.9	44.6
Quebec	38.5	42.2	45.5	50.7	51.7
Ontario	41.3	45.8	48.3	53.8	54.0
Manitoba	34.9	39.2	45.8	53.5	52.8
Saskatchewan	60.8	67.4	76.0	83.8	85.4
Alberta	65.2	68.8	69.8	81.1	79.9
British Columbia	37.8	41.0	45.4	50.9	52.5
Yukon	41.0	39.8	57.9	58.0	82.2
Northwest Territories	-	99.6	127.7	120.7	110.9
Nunavut	-	77.6	83.1	88.9	113.1

Source: Statistics Canada Table: 36-10-0480-01.

Appendix Table B4: Absolute Changes in Labour Productivity Level in Business Sector by Province, 2000-2022 (real output per hour worked, chained 2012 dollars)

	2000-2008	2008-2019	2019-2022	2000-2022
Canada	3.9	6.2	0.4	1.0
Newfoundland and Labrador	29.7	-6.5	-5.1	-0.7
Prince Edward Island	2.9	3.0	1.9	0.8
Nova Scotia	1.4	4.7	0.3	1.1
New Brunswick	3.4	2.6	1.7	0.6
Quebec	3.3	5.2	1.0	1.0
Ontario	2.5	5.5	0.2	1.0
Manitoba	6.6	7.7	-0.7	1.4
Saskatchewan	8.6	7.8	1.6	0.9
Alberta	1.0	11.3	-1.2	1.4
British Columbia	4.4	5.5	1.6	1.0
Yukon	18.1	0.1	24.2	0.0
Northwest Territories	28.1	-7.0	-9.8	-0.5
Nunavut	5.5	5.8	24.2	0.6

Source: CSLS calculations based on Statistics Canada Table: 36-10-0480-01.

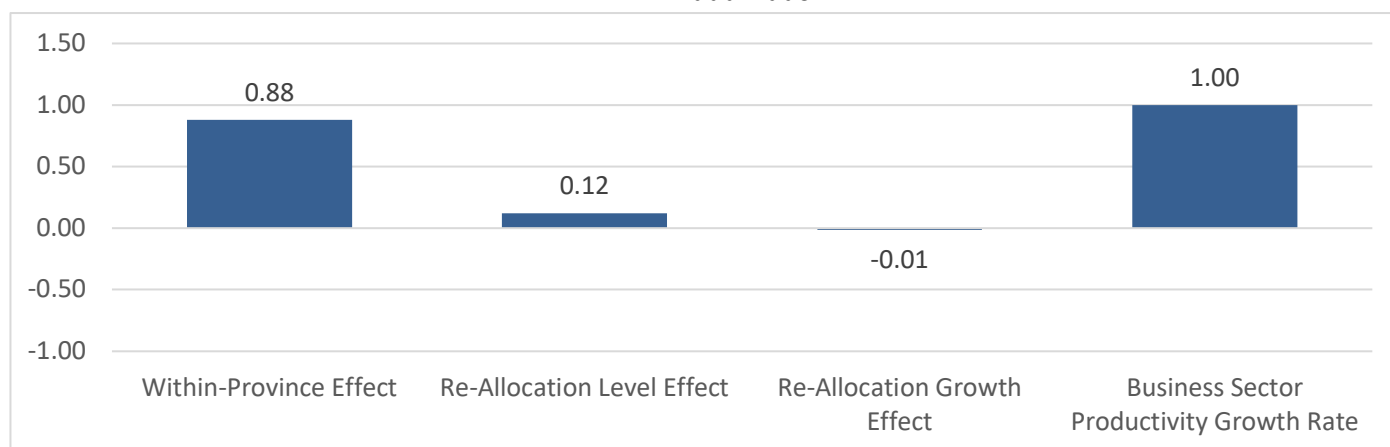
**Appendix Table A5: Labour Productivity Growth Rate of Business Sector by Province,
Compound Annual Growth Rate, 2000-2022 (percentage points)**

	2000-2008	2008-2019	2019-2022	2000-2022
Canada	1.00	1.05	0.23	0.92
Newfoundland and Labrador	5.02	-0.67	-2.04	1.17
Prince Edward Island	1.12	0.77	1.69	1.03
Nova Scotia	0.49	1.11	0.24	0.76
New Brunswick	1.11	0.57	1.30	0.87
Quebec	0.95	0.99	0.65	0.93
Ontario	0.67	0.99	0.12	0.75
Manitoba	1.96	1.42	-0.44	1.36
Saskatchewan	1.51	0.89	0.63	1.08
Alberta	0.18	1.37	-0.50	0.68
British Columbia	1.28	1.04	1.04	1.13
Yukon	4.80	0.02	12.33	3.35
Northwest Territories	3.16	-0.51	-2.78	0.49
Nunavut	0.86	0.62	8.36	1.73

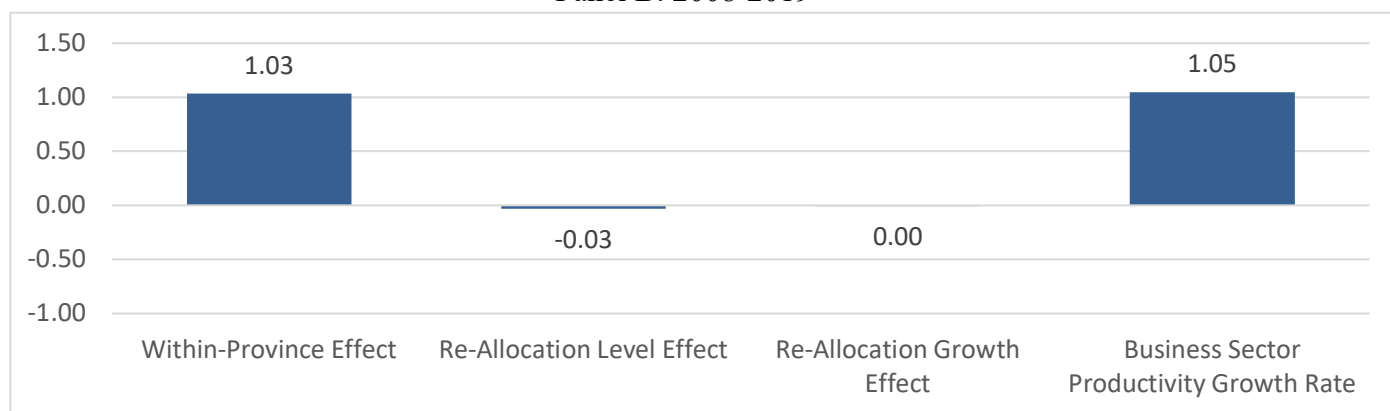
Source: CSLS calculations based on Statistics Canada Table: 36-10-0480-01.

Appendix Chart B1: CSLS Decomposition by Province, Within-Province and Re-allocation Effects on Canadian Business Sector Labour Productivity Growth, 2000-2008 and 2008-2019

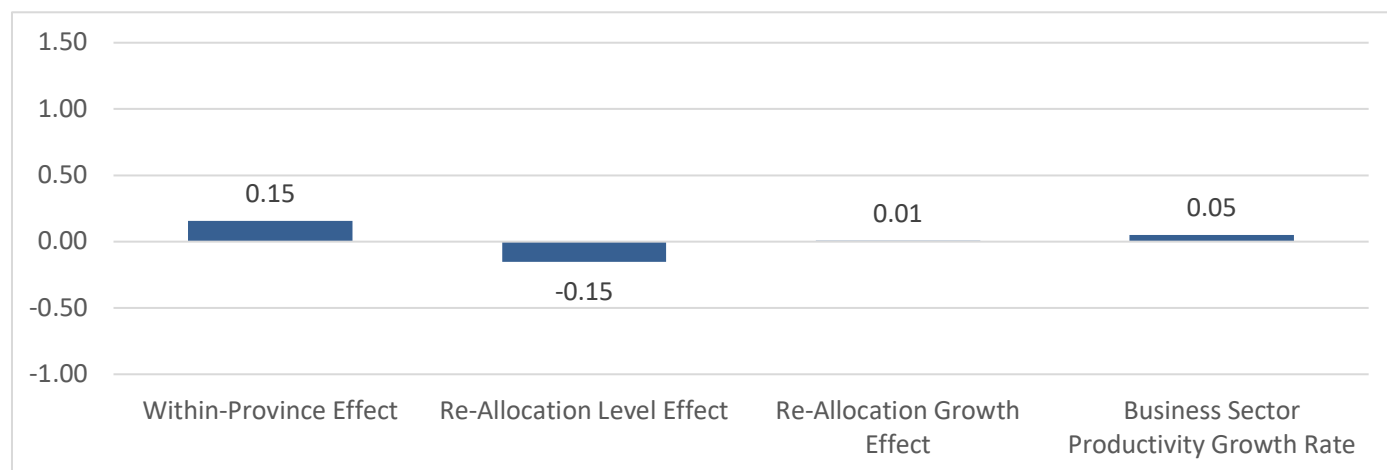
Panel A: 2000-2008



Panel B: 2008-2019



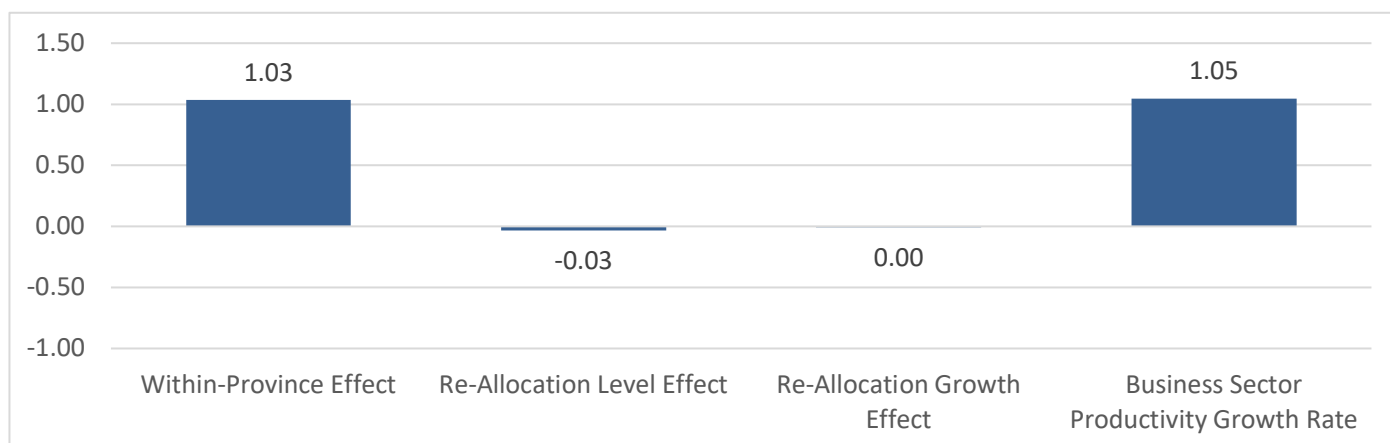
Panel C: Changes Between 2000-2008 and 2008-2019



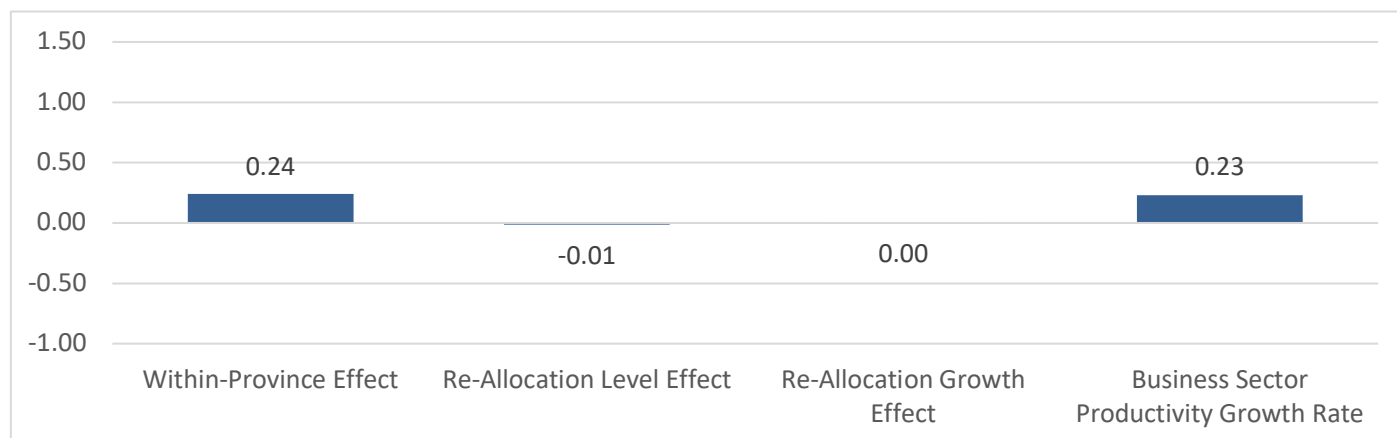
Source: CSLS calculations based on Statistics Canada Table: 36-10-0480-01.

Appendix Chart B2: CSLS Decomposition by Province, Within-Province and Re-allocation Effects on Canadian Business Sector Labour Productivity Growth, 2008-2019 and 2019-2022

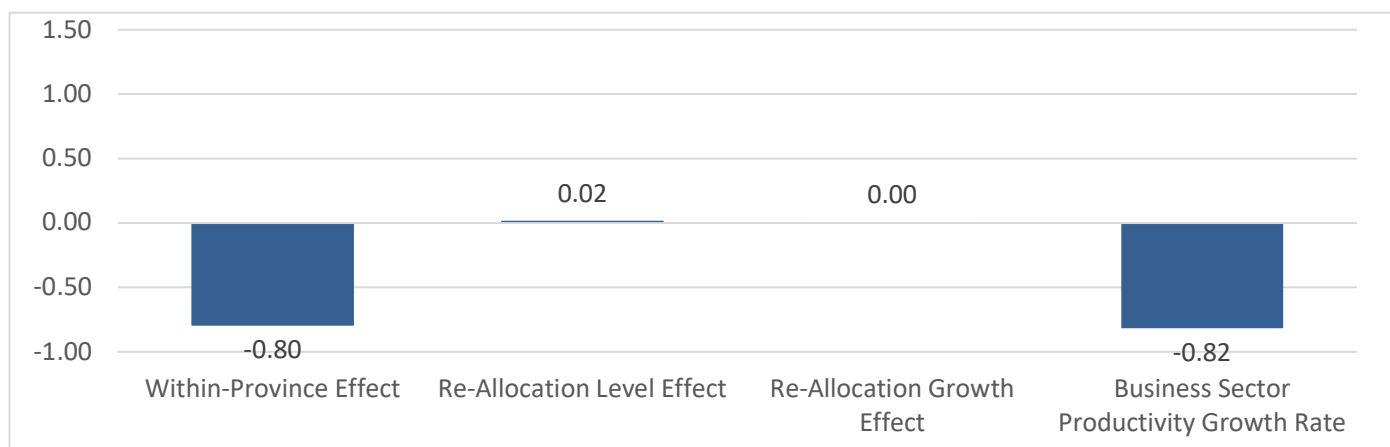
Panel A: 2008-2019



Panel B: 2019-2022



Panel C: Changes Between 2008-2019 and 2019-2022



Source: CSLS calculations based on Statistics Canada Table: 36-10-0480-01.