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Income dynamics of new immigrants to Canada

OFFICE OF THE PARLIAMENTARY BUDGET OFFICER
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The Parliamentary Budget Officer (PBO) supports Parliament by providing economic and financial analysis for the purposes of raising the quality of parliamentary debate and promoting greater budget transparency and accountability.

This report highlights some recent changes in the relative income of new immigrants to Canada. During the period 2014 to 2018 their relative income went from 55 per cent to 78 per cent of that of all Canadian tax filers. We explore some of the characteristics of that change (source countries, destination province, education and occupation, etc.) and a potential impact on measured productivity growth of Canada.

This report updates Figure 5 of the original publication (January 12th, 2024).

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Table of Contents

Highlights

The federal government announced substantial increases in its planned immigration targets: reaching 500 thousand people for the years 2025 and 2026. In this report, we look at some recent evolution of median total incomes of new immigrants so as to inform expectations regarding that policy change.

From 2014 to 2018 the median total income of new-immigrant tax-filers rose from 55 per cent of the median total income of all tax-filers, to 78 per cent.

Trends driving that change include greater pre-landing Canadian work experience, a shift of source-countries to south Asia, and greater family connections of incoming migrants. These trends are discernible from the mid-2000s.

Immigrants from India made the largest contribution to that gain.

The increase in relative income is dominated by professional groups such as engineers, applied scientists, etc.

A disproportionate share of the reduced income gap between new immigrants and all tax filers (45% in 2014, versus 22% in 2018) is attributable to those living in Ontario.

Lower relative incomes of new immigrants could create a temporary drag on Canadian measured productivity growth through a compositional effect. Though that effect would be removed as the cohort of new immigrants

> integrate into the labour force, the arrival of new immigrants each year would re-initiate the impact. The recent smaller gaps between the incomes of new immigrants and the Canadian median could reduce that compositional effect on measured productivity. At the outer bound, productivity growth in Canada could be increased by as much as 0.21 percentage points if the gap were eliminated.

Summary

The federal government announced substantial increases in its planned immigration targets, reaching 500 thousand people for the years 2025 and 2026 as announced by Immigration, Refugees and Citizenship Canada (IRCC 2022, 2023).

It is expected that it will boost the Canadian economy over the long term by expanding the labour supply. Whether that translates into a benefit for the existing population is uncertain, especially over the short to medium term when the newcomers need to be integrated into the economy. Indeed, in the last section "Immigration, income, and productivity growth" and Appendix A of this report we note that immigration tends to negatively affect the measurement of economy-wide productivity over the short term.

Nonetheless, the focus of this report is on how the median income of newly arrived immigrants has changed compared to those of all Canadian tax-filers and some underlying facets of that change. The data suggest that the trend began before the important policy changes of 2015 – the introduction of the Express Entry system.

More precisely, between 2014 and 2018, the median total income of newly arrived immigrants (1 year after acquiring permanent residency, referred to in the report as "landing") went from 55 per cent of the median total income of all tax-filers, to 78 per cent. This implies that the total income of new immigrants rose significantly faster than did the total income of all tax-filers.

Box 1 - Immigration trends

- Trends driving that change include greater pre-landing experience, a shift of source-countries to south Asia, greater family connections of incoming migrants. They are discernible from the mid-2000s.
- The increase in relative income is dominated by professional groups such as engineers, applied scientists, etc.
- A disproportionate share of the reduced income gap between new immigrants and all tax filers (45% in 2014, versus 22% in 2018) is attributable to those living in Ontario.
- Due to immigrants starting to work in Canada at lower incomes than the median income, this leads to a compositional effect which potentially biased observed labour productivity downward. The recent convergence of immigrant income to the Canadian median could remove part of that effect, by as much as 0.21 percentage points at the outer bound if such convergence continues.

The data suggest that this change was somewhat broadly based since it applied to immigrants from a wide range of source countries. Nonetheless, a closer examination reveals that the change occurred disproportionately with immigrants from India, though Philippines and China also contributed significantly.

The gain in relative median income also occurred disproportionately in a few broad occupational categories. Those in professional occupations (e.g., engineers, applied scientists, teachers, accountants, physicians, etc.) were responsible for much of the narrowed gap, in terms of their incomes one year after landing.

Additionally, we found that the Canadian experience of immigrants just before landing was an important correlate. An increasing number of immigrants are working in Canada on a temporary basis, and then gain permanent status. Their median total Canadian income in the year before landing has been increasing since 2007: it went from about 49 per cent of all residents in 2006, to about 89 per cent in 2013.

A related finding is that the increase in income occurred while the number of immigrants with family ties in Canada was increasing – suggesting that pre-existing social networks are important for economic outcomes. Consistent with that latter observation is that there was a regional component to the increased income. Residents of Ontario and British Columbia contributed the most to narrowing the income gap, and those are areas with large *in-situ* communities from the source countries.[1]

This change over time in new-immigrant's relative income is also relevant more broadly than for immigration alone, for example, in the measurement of Canadian productivity. Given the link between an individual's income and the market value of his/her work, income tends to be linked to productivity. When relative incomes of new immigrants are lower, their measured productivity is likely to be lower, especially in the initial years when they are not yet fully integrated into the Canadian workforce. Those lower relative incomes can create a compositional effect in calculating an economy-wide productivity growth. We estimate that this measurement issue potentially contributed ceteris paribus to lowering annual Canadian productivity growth by 0.21 percentage points at the outer bound between 1990 and 2014. In this regard, rising new-immigrant incomes could potentially remove a drag on measured productivity growth.

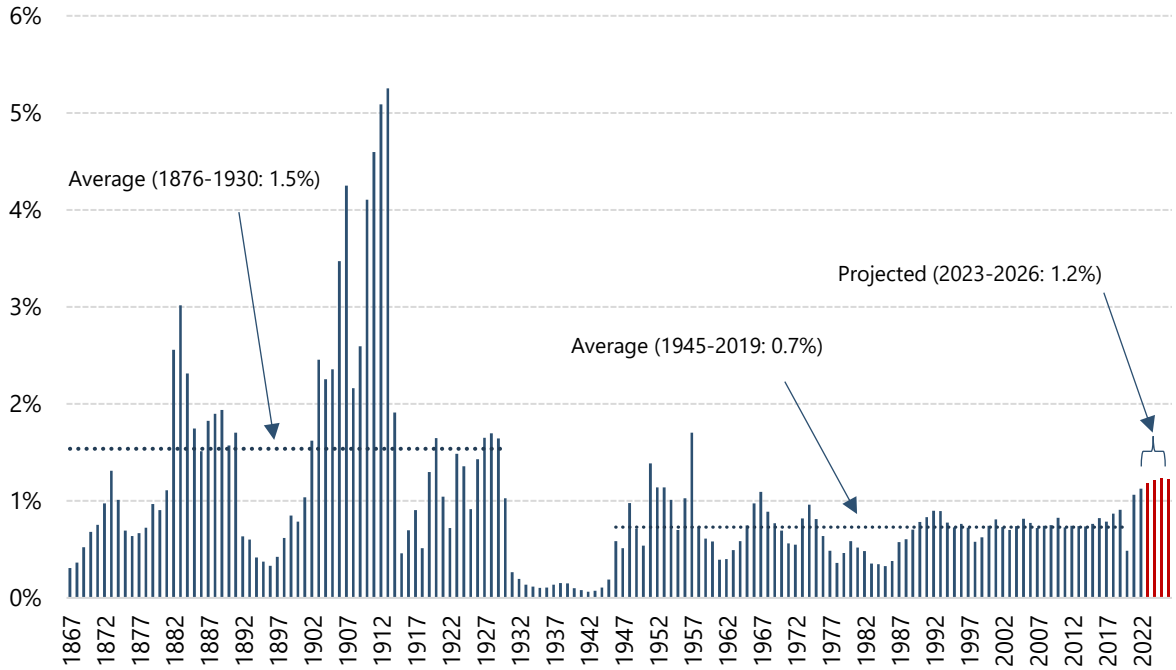
Background

Historical context for the new immigration targets

The federal government's announced immigration targets for 2023-26 (IRCC 2022, 2023) come at a time of ongoing evolution in Canada's immigrant profile. In retrospect, this should not be surprising given that there have often been shifts in immigration policy throughout Canada's history. There is little in the past that can be termed a "normal" period of immigration as each wave – after the first English and French migrants – were coming from increasingly diverse regions (Troper, 2013).

Nevertheless, relative to recent experience, the announced targets represent a significant increase in the level of immigration, as well as proportional to the domestic population (Figure 1). The targeted immigration levels will average 1.2 per cent between 2023 and 2026. During the period from 1945 to 2020 the ratio fluctuated a little but remained centred on an annual rate of 0.7 per cent, which itself represented a substantial change from the periods of greater variation prior to 1930 where the ratio nonetheless averaged 1.5 per cent.

Figure 1
Canada's immigration ratio



Textual description:
The vertical axis represents the ratio of immigration for that year relative to the existing population. The projected populations are based on Statistics Canada's M6 projections (Table 17-10-0057-01). The dotted lines represent respective period averages, and the final red bars are projections based on the Government's announced targets.

Sources:
Parliamentary budget officer.

Statistics Canada, Tables 17-10-0057-01, 17-10-0040-01, 17-10-0009-01, 11-630-X2016006.

Various editions of Census of Canada.

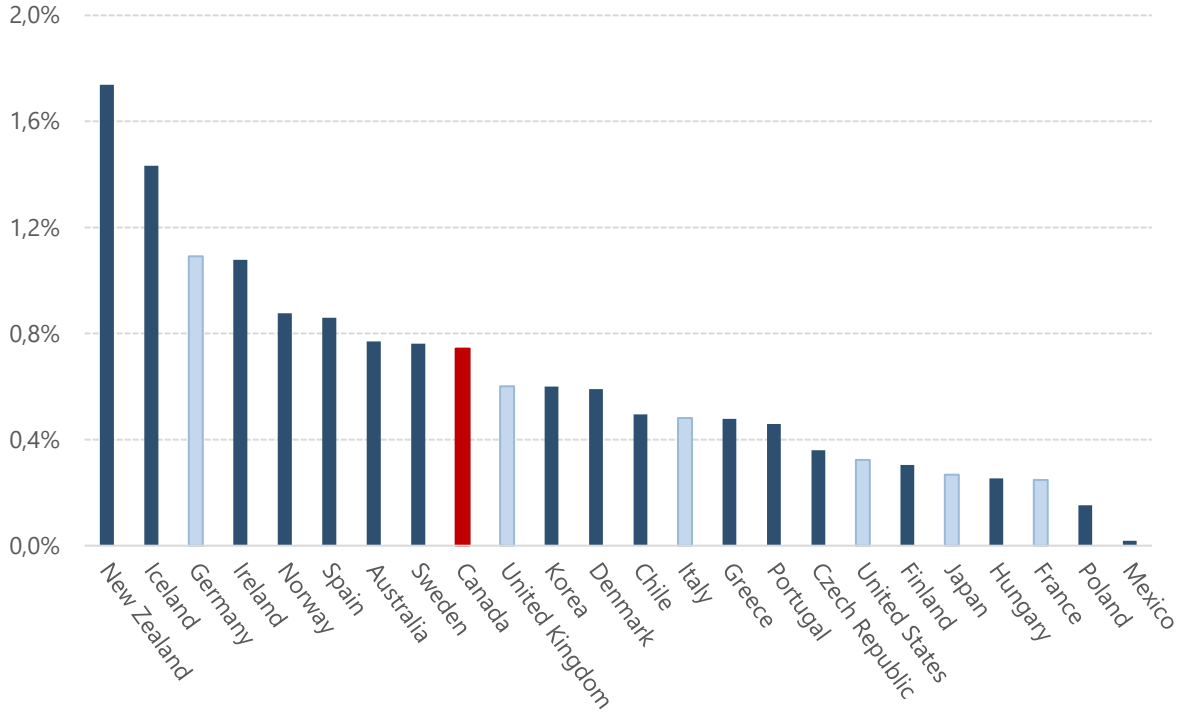
Note:
Does not include temporary residents or returning Canadian citizens.

Canada in an international context

In comparison to other countries, Canada's average immigration ratio is higher than that in most large economies (Figure 2), but it is not an outlier

within a group of 24 Organisation for Economic Co-operation and Development (OECD) countries.

Figure 2
OECD immigration ratios (1996-2020 averages)



Textual description:
The vertical axis represents the ratio of immigration relative to the existing population. Canada (red bar) had a higher immigration ratio than most Group-of-seven countries (light blue bars) but was closer to the middle for the grouping of 24 countries.

Source:
OECD Economic Outlook No. 112.

Note:
Only countries with data for 1996 to 2020 are represented.

Relative income of all immigrants

Whereas historically Canada mostly accepted immigrants of European and American origins, this began to change in the latter part of the 20th century. A points-based system was introduced in 1967 that was more

economically oriented. A further reform in 1976 increased access to non-Europeans and made the system more egalitarian across ethnic groups. This was intended to facilitate entry of people whose skills matched criteria that were deemed complementary to Canada's resident labour force.

Those changes to the immigration system, however, did not result in the seamless integration of new immigrants. Indeed, there was a slow shift from earlier pre-1970s immigrants whose incomes shortly after landing were closer to those of Canadian-born of similar skills, to a widening gap between them (Frenette and Morisette, 2006; Picot, 2005; Aydemir and Skuterud, 2004). By 2008, the median total income of recently landed immigrants had fallen to 52 per cent that of all non-temporary residents.[2]

For all immigrants, the overall picture is less clear. Data from Statistics Canada show that in 2019 the overall median income gap for all immigrants in terms of employment income was small (bottom row of Table 1), but this masks two significant issues. The first is heterogeneity of income gaps across educational groups.

Coincident with Canada prioritising educational qualifications of immigrants is that larger income gaps exist for individuals with higher education, as well as apprenticeships that are not fully recognised (in 2019, relative to all non-temporary residents; Table 1).

Table 1

Relative income of all immigrants by education, 2019

Education	Immigrants share of the non-temporary population	Ratio of immigrant median employment income to that of the non-temporary population
Below secondary	4.2%	115%
Secondary or equivalent	6.0%	101%
Non-apprenticeship trade	0.9%	89%
Apprenticeship certificate	0.7%	72%
Non-university diploma	4.1%	91%
University below bachelor	1.1%	89%
Bachelor's degree	6.0%	86%
University above bachelor	0.7%	80%
Medicine, dentistry, etc	0.3%	74%
Master's degree	2.6%	84%
Earned doctorate	0.5%	93%
Overall	**27.1%**	**97%**

Textual description:
Immigrants comprise 27.1% of the combined immigrant plus non-immigrant population with non-zero income. Excluded are individuals who are in Canada on a temporary work or study permit.

Source:
Statistics Canada, Table 98-10-0439.

Note:
This table does not distinguish immigrants by time elapsed since arrival. It includes all immigrants who filed taxes with non-zero income in 2019. Educational qualifications of immigrants are self-reported, so equivalency to Canadian educational standards is not assured – particularly over a time span as long as that used here. There was also imputation of education by IRCC for landings from 2011 to 2018. Nonetheless, broad distinctions in educational groups should be robust to such caveats.

The second issue that is missed in Table 1 is that of income gaps across time. Long-established immigrants as a group have median income that is indistinguishable from that of non-immigrants. Whereas, as outlined earlier,

new immigrants have had evolving median incomes relative to the rest of the population.

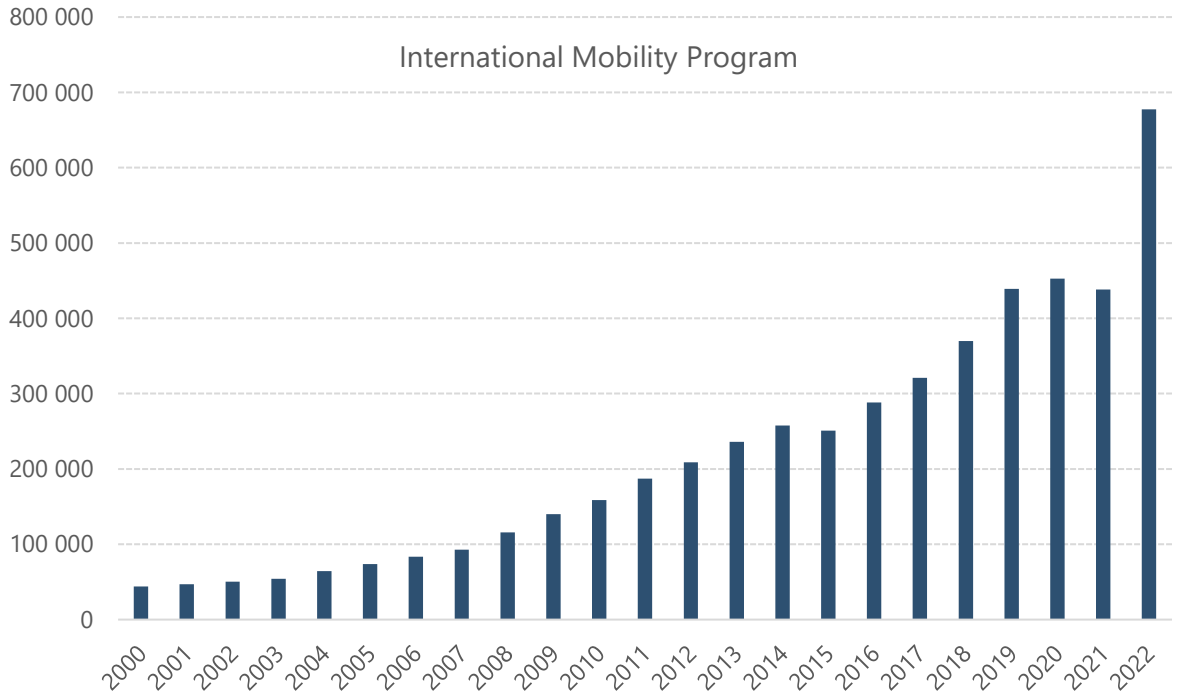
More recently, there have been further changes in the median income gap of new immigrants; it has narrowed. In this report we focus on that change and explore some of its underlying characteristics.

Temporary residents

Particularly relevant as background to that changing income gap is the increasing numbers of temporary residents (Figure 3).

Figure 3

Residents with temporary work permit



Textual description:
The number of residents with temporary work permits has been accelerating since the mid-2000s. The increase from 2005 to 2019 was almost 6-fold.

Source:
Immigration, Refugees and Citizenship Canada (2022).

Note:
These data do not include temporary residents who do not have a work permit (e.g., international students), or those in the Temporary Foreign Worker Program.

Between 2014 and 2018 their numbers increased by 44 per cent (112,000) (excluding students and refugees), or by 57 per cent (204,000) when including students and refugees. Of the 112,000 increase in temporary workers, India accounted for about 45,000.

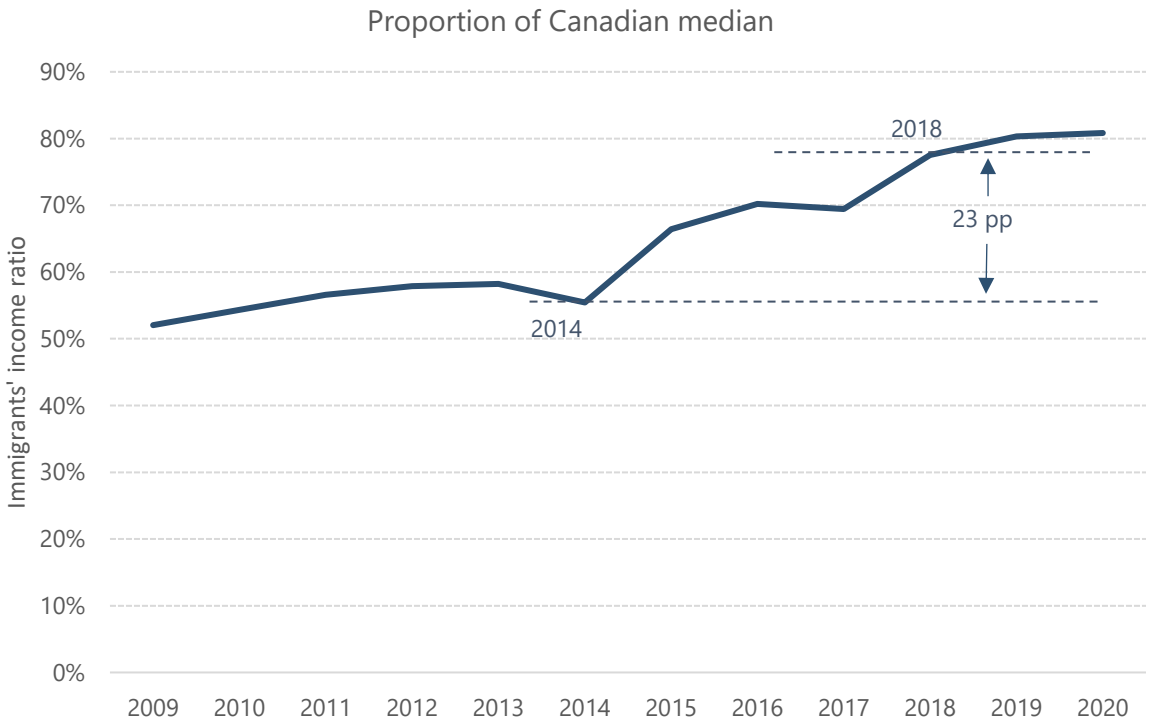
Temporary residents often transition into permanent status, at which point they have greater work/study experience and/or familiarity with Canada. This trend, combined with larger *in-situ* communities that provides a more supportive social network,[3] means that new immigrants are coming into a more receptive environment, facilitating their labour market transition.

Income convergence of new immigrants

From roughly the 1960s through the 1970s, for which comparable data are available, immigrants arriving in Canada began their working lives with wages that were somewhat similar to those of Canadian-born residents (Picot, 2005). From the 1980s, the relative income of immigrants began to deteriorate.

Available data show that from 1990 to 2014 immigrants had a median total income one year after landing that was persistently below 60 per cent of the median for all tax-filers. After 2014, the ratio began to increase significantly, where it went from 55 per cent to 78 per cent in 2018, continuing to drift up afterwards (Figure 4).[4]

Figure 4
Median total income ratio 1 year after entry



Textual description:
The vertical axis represents the proportion of median immigrant income (one year after landing) relative to the income of all tax filers.

Source:
Statistics Canada, Tables 43-10-0027, 18-10-005, and 11-10-0055.

Note:
Total income is used. In both cases deflated by the Consumer Price Index.

Two periods in particular stand out for relatively rapid change: during the years 2015 and 2018 the increases were, respectively, 11 percentage points, and 9 percentage points. That is high relative to other years and has not been reversed.

The source of the large increase in incomes in 2015 is not easily discerned. The introduction of Express Entry (January 1st, 2015) was a step in a more focussed process of bringing immigrants to Canada in a range of specialised areas. Nonetheless, it was too late to be a causal factor for the

increased 2015 immigrant incomes since what is illustrated is the income 1 year after landing (so for 2015 it would have been those who landed in 2014).

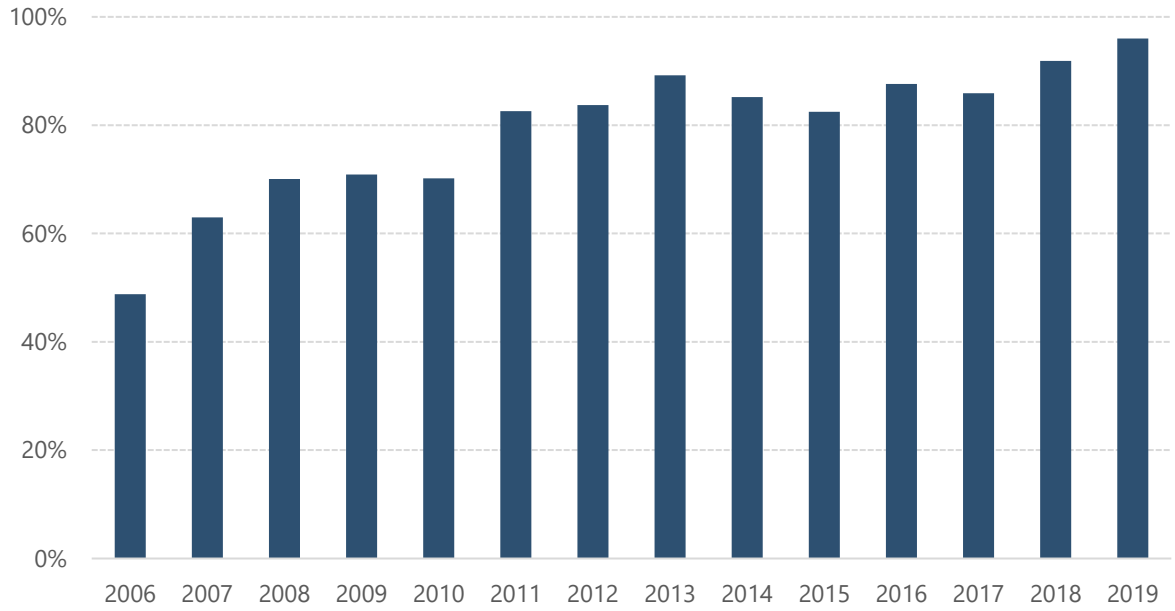
A similar observation can be made for 2017, where residents who landed in that year had narrower income gaps both before and after landing.

Potential contributors to these events include those outlined in a hypothesis that, since the Express Entry system started taking applications in May of 2014, there may have been a demonstration effect for skilled individuals – who then applied for permanent residency during 2014. Similarly for 2017, there was a decline in the cut-off scores needed to qualify for Express Entry, and events in the United States may have led to changed views and policies regarding immigration (Cheatham and Roy, 2023).

Perhaps more compelling, however, is that these events boosted a trend already in progress. Anyone working in Canada (temporary or permanent) must pay taxes to the Canada Revenue Agency when they have employment income in Canada above a minimum level. Those who have spent more than 183 days in the country will be deemed resident and be liable for taxes on worldwide income. This includes those who are not permanent residents. When we examined Canadian incomes of immigrants in the year before they landed (e.g., while they were in Canada working with a temporary permit), a clear trend emerged (Figure 5). While relative year-after landing incomes have been trending upward since 2014 (Figure 4), the year-before landing Canada-based incomes have been increasing since 2006. Those already working in Canada before landing have a significant income advantage (Hou and Bonikowska, 2015). This means that Canada has been attracting more individuals who are here temporarily (Figure 3) and gain higher levels of income while working. They then go on to become permanent residents. Events like the establishment of Express Entry system was not a game-changer *per se*, instead it was part of an evolution that has facilitated the integration of immigrants into the workforce.

Figure 5

Relative median total income of immigrants already working in Canada in the year before permanent residence (landing)



Textual description:

The vertical axis represents the ratio of median incomes. The numerator is the median income that immigrants earned in Canada the year before they landed (i.e., acquired permanent status). The denominator is the median income of all permanent residents. In both cases, individuals who filed with zero income are excluded – but those with negative income are included.

Source:

Statistics Canada Longitudinal Immigration Database. Reproduced and distributed on an "as is" basis with the permission of Statistics Canada.

Note:

When zero-income tax filers are included, the ratio is substantially lower in 2006: 0.28 when included versus 0.49 when excluded. By 2014, the gap between them had shrunk considerably: 0.78 when included versus 0.85 when excluded. Since many tax filings with zero income are made for administrative reasons (e.g., to access government programs), the quasi convergence of the two concepts by 2014 suggests that immigrants-in-waiting were thereafter less distinguishable from other Canadians in administrative tax filings. For other analyses in this report, the inclusion or exclusion of zero-income tax filers was less consequential in cases where it was tested. Given data availability, all tax filers are generally used unless otherwise stated.

Sources of income convergence of new immigrants

These relative increases in the incomes of immigrants are worth exploring further given the context of increasing future immigration. The trends illustrated in Figures 4 and 5 may be the result of policy initiatives, or they may be the result of changes originating outside of Canada. The distinction is consequential since it may indicate the limits of what government has achieved on its own.

We now outline some characteristics of the change that can help distinguish between the two. In particular we focus on the period between 2014 and 2018 since that is when the significant changes occurred.

Country of origin effects

Turning again to the income of immigrants one year after entry, those from Asia have gained the most in relative incomes (Table 2). Of the 22.7 percentage point gains in relative income between 2014 and 2018 (Figure 4), almost three quarters (16.1 percentage points) are sourced in Asian countries, with India dominating at 8.5 percentage points (almost a third of the 22.7 percentage points total).

Table 2
Contributions to gains in relative median total income of new immigrants (2014-2018)

Region	Percentage point (pp) gain in relative median total income
Europe	2.7
Africa	2.0
Americas	2.0
Asia	16.1
India	8.5
China	3.1
Other Asia	4.5
Total	22.7pp

Textual description:
This table identifies the main contributors to the narrowing from 55% to 78% of the income gap between newly arrived immigrants and all Canadian tax-filers (Figure 4).

Source:
Statistics Canada, Table 43-10-0027.

Note:
Rounding may cause sums to be inconsistent.

Immigrants from China also contributed to the gain. However, even though their incomes rose a little more sharply than those from India (70 per cent for Chinese immigrants versus 67 per cent for Indian immigrants), the number of immigrants from China fell by 15 per cent over that period, whereas those from India increased by 63 per cent. Indeed, immigration from India has continued to increase at high rates. For the year 2019, 2.4 times as many immigrants from India landed as did in 2013.

Immigrants from India were also rising as a proportion of all immigrants who landed between 2013 (14 per cent) and 2017 (19 per cent). It subsequently reached 25 per cent in 2019.[5]

Policy likely contributed since median income rose broadly for all immigrant sources, but other factors may also have played an important

role. More likely is that circumstances in India itself caused a larger out-migration of relatively skilled people. In principle, given the size of India's population, such a trend could continue indefinitely – though the country's recent rapid economic growth suggests that emigration out of India may be uncertain in the future.[6]

We can also delve more deeply into the characteristics of immigrants for additional insight. We first note that, as in the previous section, a strong contributor is prior experience in Canada. Those who are temporarily in Canada, to study and/or work, gain experience and have relatively good labour market outcomes when they become permanent residents. Of the gains in relative income between 2014 and 2018, some 85 per cent was attributable to prior study and/or work experience in Canada.

This suggests that allowing temporary entry of immigrants and subsequently granting permanent residence is contributing to narrower income gaps for immigrants. Since relative incomes have been increasing even in the year prior to landing (Figure 5), allowing temporary entry did not simply pull forward (closer to the time of landing) narrower income gaps that might eventually have occurred anyways (see Figure 8 and more discussion below).

Another aspect is strong family ties which provided a boost to income. Immigrants who were sponsored by family members made a significant contribution to relative-income improvements of immigrants. Having access to a network of contacts on arrival likely provides a boost to a good labour market outcome.

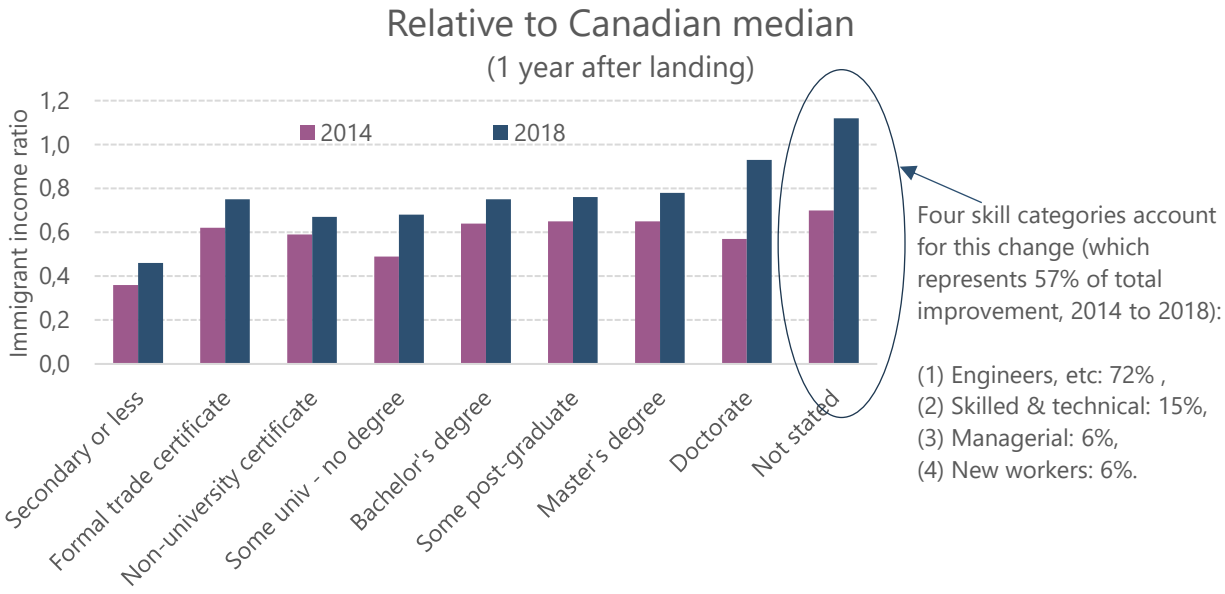
Education

The gaps in relative income for various educational levels (Table 1 above) are potentially important indicators of Canada's capacity to integrate immigrants into employment that corresponds to their qualifications. In principle, a large relative income gap signals a persistent mismatch.

The gaps reported in Table 1 (for 2019) are comprehensive in that they include all cohorts of immigrants. A different picture emerges when the focus is narrowed to changes that occurred during the recent period of rapid income gain (Figure 4; 2014 to 2018). Unfortunately, a large number of tax filers who landed in 2017 did not have their education qualification recorded ("Not stated" in Figure 6). Those with Not stated education qualifications accounted for 58 per cent of the closing income gap between 2014 and 2018.

Insight into the Not-stated group can be gained by looking at their intended occupations. In four out of ten broad intended occupation categories, the increases were substantial, but engineers and other professionals were particularly prominent. Since the focus here is on change over time, the results should be robust to caveats regarding educational attainment since there is likely to be consistency over time in sources of errors (e.g., Fortin et al, 2016).

Figure 6
Changes in income by education levels



Textual description:
This figure identifies, by education, the change in the relative income between newly arrived immigrants (1 year after landing) and all tax-filers (Figure 4).

Source:
Statistics Canada, Longitudinal Immigration Database. Reproduced and distributed on an "as is" basis with the permission of Statistics Canada.

Note:
The "Not stated" group had a strongly disproportionate impact on the income gap since it accounted for 57% of the improvement, but only 28% of all immigrants. The proportion of immigrants in other sectors included: Secondary or less, 22%; Formal trade certificate, 5%; Non-university certificate, 6%, Some university – no degree, 6%; Bachelor's degree, 22%; Some post-graduate, 2%; Master's degree, 8%; Doctorate, 1%.

Link to destination of immigrants

Another marker that can be gleaned from the gain in income between 2014 and 2018 concerns the destination of immigrants. Immigrants arriving in Ontario account for a large share of the reduction in the total income gap (Table 3). The results are weighted by the share of immigrants going into

each province, therefore, they do not by themselves indicate immigrants going into Ontario had large income gains.

Since Indian immigrants provided an outsized contribution to gains in median income (8.5pp of the 22.7pp change; Table 3), their destinations are worth noting. While receiving a little more than half of immigrants from India, Ontario accounts for more than three quarters of their contribution to relative income gain (6.6pp of the 8.5pp change; Table 3). Much of the remaining contribution is then made up of residents of British Columbia. Both provinces have substantial *in-situ* communities from South Asia.

Table 3

Gains in Canada-wide relative income of new immigrants by destination (2014-2018)

Percentage point gain in relative median total income

Destination	From world	From India
Ontario	15.5	6.6
British Columbia	5.0	1.2
Quebec	1.4	0.2
Alberta	0.7	0.4
Manitoba	0.3	0.1
Maritimes and North	0.0	0.0
Saskatchewan	-0.3	-0.1
Total	22.7	8.5

Textual description:
This table distinguishes provinces by contributors to the narrowing national income gap between newly landed (1 year prior) immigrants and all tax-filers (weighted by immigration into each region). The columns link Table 2 (Total and India) to the destination of those immigrants.

Source:
Statistics Canada, Table 43-10-0027.

Note:
Since the results are weighted, they do not necessarily reflect relative income gains across provinces. For example, Indian immigrants arriving in Quebec had larger income

gains than those arriving in Alberta, but since it received fewer immigrants from this country, Quebec's contribution to closing the national gap was smaller.

The implications of this result for future immigration are not clear because causality has not been demonstrated. Nonetheless, it does indicate that if that past trend were to continue, one province, in particular, would likely benefit more from it (or be less adversely affected).

Insights into sources of convergence

We can now summarise some characteristics of new immigrants for additional insight.

As outlined earlier, a strong contributor to income convergence is prior experience in Canada. Those who are temporarily in Canada to work and/or study, gain experience and have relatively good labour-market outcomes when they become landed (become permanent residents). Of the gains in relative income between 2014 and 2018, some 85 per cent of it was attributable to prior work and/or study experience in Canada.

This suggests that allowing temporary entry of immigrants and subsequently granting permanent status (landing) is contributing to narrower income gaps for new immigrants. This does not mean that higher future incomes for those immigrants are simply being pulled forward (see Figure 7 below for a time profile of post-landing incomes). Relative incomes of temporary residents have been increasing even in the year prior to landing (Figure 5), implying that something more broadly is facilitating new immigrants in achieving good labour market outcomes.

Another contributor is family ties, which provided a boost to income. Immigrants who were sponsored by family members made a significant contribution to the relative-income improvements of immigrants. Having access to an *in-situ* culturally similar community on arrival likely provides a boost to finding good employment.

Occupation is also a strong contributor. Those in professional groupings gained disproportionately between 2014 and 2018. This is against a backdrop of growing *in-situ* communities in particular regions of Canada – underscored by a growing proportion of immigrants in the population.

Given the number of temporary workers in Canada, and gains in income of residents prior to landing, have been increasing since the mid-2000s, the gains in relative income between 2014 and 2018 may have been manifestations of trends that started much earlier.

Immigration, income, and measured labour productivity

In this section we examine a potential compositional link between new-immigrant incomes and measured economy-wide productivity growth.

We begin by outlining an empirical relationship between the number of new immigrants entering Canada and productivity growth. We then note that the value of their productivity in their place of employment is related to their income, and that economy-wide productivity would be measured lower even if incomes were lower only during their initial integration into the Canadian labour market. We end by observing that recent increases in the relative income of new immigrants could remove that drag on measured productivity growth of Canada.[7]

Empirical observations

Empirical analysis undertaken for this report, as well as that reported elsewhere, finds a negative short-term impact of immigration on productivity growth (Box 2, Appendix A, and Doyle et al, 2023).

Box 2 - Immigration and productivity growth

OECD (2019) reported that for 35 countries, the average immigration to population ratio was 10.4 per cent, with a low of 0.8 in Mexico and a high of 46.3 per cent in Luxembourg. This provides a good basis for testing whether immigration and productivity are linked.

Using labour productivity as the dependant variable, we estimated a negative relationship with the immigration ratio as a regressor in a cross-country panel (see Annex 1). Even for Canada individually we estimated a statistically significant and stronger negative relationship, which was somewhat surprising given that Canada's immigration ratio changed less than that in other countries.

Subsequently, a more detailed sectoral analysis for Canada using 3-digit North American Industry Classification System (NAICS) sectors gave results that were weaker than the OECD data (Annex 1). That is, high annual immigration ratios within sectors were generally (though not uniformly) associated with lower productivity growth in those sectors. An important caveat is that the intensity and sign of the effect varied considerably across sectors.

This suggests a relationship between the income of new immigrants and their impact on productivity growth: i.e., a narrower income gap results in a smaller negative impact.

Neither the empirical results reported in Appendix A nor in Doyle et al, (2023) imply that new immigrants are less productive *per se*. In both cases the negative link between new-immigrants and productivity growth is an empirical observation that requires further analysis to determine its

underlying cause. Below, we hypothesise that it is a compositional effect whose source is in the lower incomes that new immigrants have received (particularly during past decades).

Income and productivity

To link new-immigrant income and observed national productivity, consider that productivity is measured as gross domestic product (GDP) per hour worked. This includes the value-added of workers, as well as the value-added of capital. A worker's employment income is related to his/her own value-added; in the national accounts, labour's income is defined as labour's value-added. If a worker's productivity is low in that employment, his/her income will also be low unless there is an offset by capital that the worker is able to capture.

When new immigrants begin working at employment income levels below the median, observed labour productivity would be biased downward because their employment income is low.

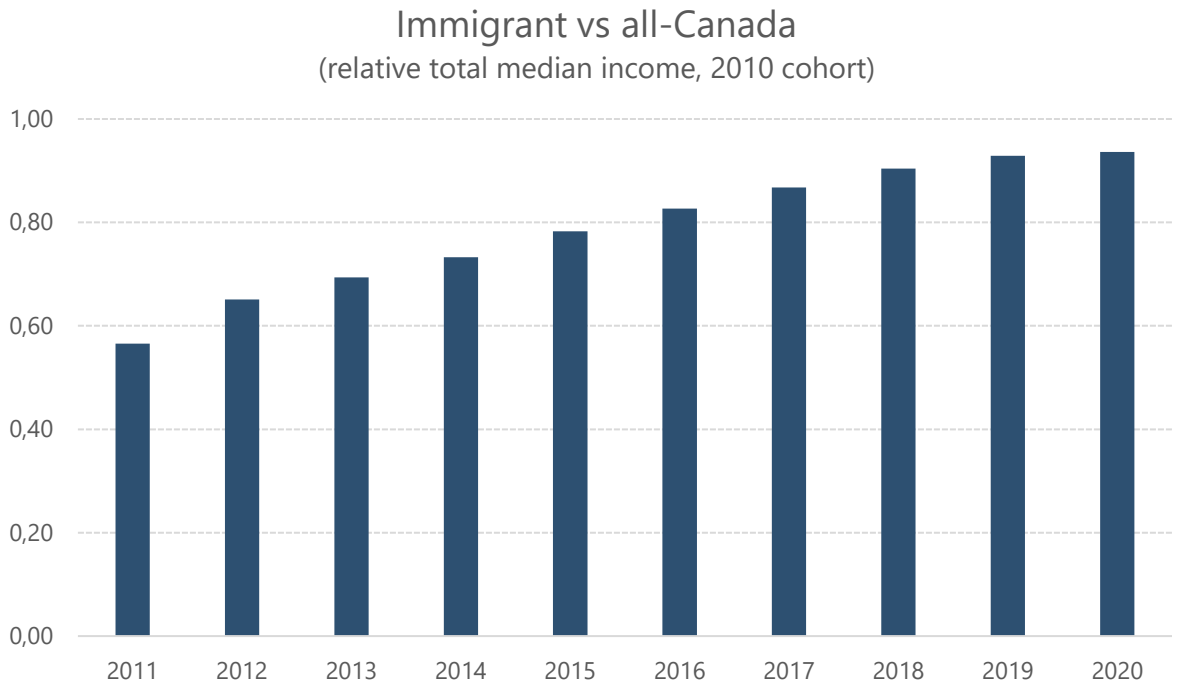
This would appear in the aggregate data unless the "immigrant surplus" (Borgias, 1995) was positive and large enough to offset the median income gap. That is, unless the income of capital and other workers increased by at least the median income gap of new immigrants. The potential existence of an immigrant surplus means that the income gap of new immigrants is an outer bound indicator of the productivity drag.

The negative impact of new immigrants on productivity found above suggests that, at least in the short term, there is not a full offset to lower new-immigrant incomes that come from capital and other workers.

That short-term impact, however, appears to dissipate over time as the income of immigrant cohorts landing in Canada increases. For example, the cohort that landed in 2010 had a median income in 2011 that was 57 per

cent of the overall average. Nine years later, it had risen to 94 per cent, and would be expected to continue rising, but more gradually (Figure 7).

Figure 7
Time profile of relative income



Textual description:
Immigrants who arrived in 2010 began, on average, working with an income that was 57 per cent of their resident counterparts. Over time, that cohort's income increased significantly (relatively).

Source:
Statistics Canada, Tables 43-10-0027, 11-10-0055, 18-10-0005.

Note:
Incomes have been deflated using the Consumer Price Index.

A potential compositional effect

When newly arrived immigrants are continually restarting the dynamic illustrated in Figure 7 with each new cohort, the result is potentially a compositional effect that impacts economy-wide productivity. It combines a lower productivity in one segment of the workforce (new and recent

immigrants) with a higher productivity in the rest of the workforce. The result would also be observed as lower productivity growth, even if the productivity growth of longer-term residents was unaffected by recent immigration.

For illustrative purposes, we gauge the upper limit on how much such a dynamic profile could impact on measures of productivity growth. For income in the year 2014, we calculate the gap in income by year of landing for those who landed between 1989 and 2013. The amalgamation of the gaps allows us to calculate the downward bias in productivity for the year 2014. That is, the 2014 income gap for those who landed in 2013 is combined with the 2014 income gap for those who landed in 2012, all the way back to the 2014 income gap for those who landed in 1989.

This then allows us to calculate an average annual effect for 1989 and 2014. 1989 is chosen because the 1980s was the beginning of the decline in immigrant incomes (1-year after landing).

Under the assumption that immigrants had little impact on the labour productivity of longer-term residents (i.e., the immigrant surplus is small), our estimate is that in 2014, measured labour productivity was 5.4 per cent lower than it would have been without immigrants.[8] This means that over the period 1990 to 2014, aggregate annual productivity growth was measured some 0.21 per cent lower. The flip side is that productivity growth of all non-immigrant residents would have been higher than the reported national productivity growth.

Given that measured productivity growth over that period averaged 0.6 per cent, this is a potentially significant compositional issue. Moderating that impact is any positive spillover that immigrants may have on labour and capital (the immigrant surplus). For the effect to disappear, the immigrant surplus would have to be larger than their income gap.

The upshot is that Canada's national productivity growth would be measured lower than it otherwise would be without new immigrants, this

compositional effect, however, is not related to the rate of technological change in Canada.[9]

Some indirect support for a hypothesized compositional effect comes from the sectoral analysis (Appendix A) that found a weaker immigration impact on productivity when immigrants who didn't receive a T4 slip were excluded. Those with T4 slips on average had incomes some 4 times higher than those without. The other (aggregated) analyses were comprised of all immigrants – even those with lower incomes. If the strength of the impact depends in part on the income of immigrants, then it suggests that the compositional impact on national productivity growth would be weakened as the income of new immigrants rose relative the rest of the population.

That observation, when combined with the result that the impact of immigration on productivity growth is larger in Canada than in other countries (Appendix A, second column of Table A-1) suggests that that compositional effect is relatively stronger – so the trend toward removing that drag on productivity growth would have more effect in Canada than in other countries, *ceteris paribus*.

Appendix A: Estimation results

Analysis with OECD data links new immigration to lower measured productivity growth (column (1) of Table A-1). The independent variable is lagged annual immigration as a proportion of the existing population. The dependent variable is growth of labour productivity (GDP per hour worked).

Table A-1

Immigration impact on productivity growth

	(1) OECD Panel	(2) Canada only (OECD data	(3) Sectoral panel (NAICS)
Constant	0.035** (0.005)	0.055* (0.024)	0.028** (0.009)
Immigration ratio (lagged)	-0.632* (0.318)	-6.064* (3.100)	-2.427** (0.731)
Time trend	0.008** (0.002)		-0.0002 (0.004)
Sample size	1995-2020	1995-2020	2000-2019

Source:
Estimated from a non-public Statistics Canada Longitudinal Immigration Database, 2023 (no endorsement implied); OECD Economic Outlook No. 112; Statistics Canada Table 36-10-0480-01.

Notes:
* and ** Indicate significance at the 95% and 99% per cent level, respectively.

Column (1), Driscoll/Kraay standard errors are reported in brackets (cross-sectional dependence was found; Driscoll and Kraay, 1998). With and without the Driscoll/Kraay correction, the coefficient on lagged immigration remained significant at the 95% level.

Column (2), robust standard errors are reported in brackets. An autoregressive coefficient of 0.1 was estimated, whose correction only mildly affected the standard errors.

Column (3), Driscoll-Kraay-corrected standard errors are reported in brackets. With fixed effects. The immigration ratio is for one year after landing. Includes 96 3-digit sectors.

The effect of immigration on productivity growth is strong across the 35 countries included in the analysis (some countries with limited data were included here, but not in Figure 2 of the main text above). It implies that for every percentage point increase in the immigration ratio, there is a measured lowering of productivity growth by 0.632 per cent. The sign on the impact of immigration is consistent with the results reported in Doyle, et al (2023).[10]

When Canada is examined individually, the effect appears even stronger, almost ten times as much (column (2) of Table A-1). We also attempted to explore deeper productivity effects by looking at income, employment, and productivity data from Statistics Canada at the 3-digit North American Industry Classification System (NAICS) level of disaggregation. In all, some 96 sectors with data on year-after-landing employment of immigrants and sector-wide productivity were available. Value-added in these sectors represented roughly 93% of Canadian GDP in 2018.

At the sectoral level, the impact of immigration on productivity growth (i.e., value-added per hour worked) is weaker than when aggregated (column (3) of Table A-1). Since sectors are not weighted according to value-added size, or numbers of immigrants, it could be a compositional effect (though some limited experimentation with weighting schemes did not support that hypothesis). Nevertheless, the sectoral data cover roughly 93 per cent of the economy but only about 70 per cent of immigrants, so it is suggestive of a distinction between the 70 per cent who were included, and the 30 per cent who were not.

There are two data sources that are combined to produce NAICS coding for sectoral immigration data. One is the code that is applied by Canada Revenue Agency on the basis of a tax-filer's T4. The other is administrative data. Only 70 percent of immigrants with income receive T4 slips. Their median income is 4 times that of immigrants who do not receive T4 slips. Since it is not immigrants *per se* that impact on productivity, this supports the conjecture made earlier that a lower income at the start of an

immigrant's working life in Canada creates a compositional effect on overall Canadian productivity.

Looking further at sectoral details, a little more than half of the sectors individually have negative coefficients on the immigration ratio. The overall negative impact of immigration on productivity growth is thus not true for all the component parts. Moreover, those sectors with opposing signs for immigration's impact are intermingled across broad categories. This means that it is not possible to concretely distinguish broad groupings such as manufacturing versus agriculture, fishing, and forestry, or even high-tech sectors versus low-tech sectors. Indeed, an illustrative example is sector 493, which is Warehousing and Storage, and includes online companies such as Amazon. It is arguably a high-tech sector that has been growing rapidly and was hiring proportionally more new immigrants even before the Covid pandemic. The median income of those workers is generally below the Canadian median, and their impact on sectoral productivity growth is empirically negative, and statistically significant. Since overall labour productivity growth in that sector has also been trending downward from 2000, the effect is not from immigration alone.

To further highlight the heterogeneity of immigration's impact, we used those individual-sector results in a stepwise regression to form two panels. One panel comprised the sectors where the individual coefficients were negative, while the other comprised the sectors that had positive coefficients. Given the problems that arise with inference as a result of such a selection process, the exercise is only illustrative (we did not try to adjust the standard errors for the stepwise selection process). The panels gave the foreseeable result that the group with coefficients that had been negative produced an overall negative coefficient. The group with coefficients that had been positive produced an overall positive coefficient. Though in both cases the calculated standard errors were quite small relative to the estimated coefficients, inference was not attempted, and the result is purely illustrative of heterogeneity.

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Notes

[1] Though we do not provide detailed analysis of the role of *in-situ* communities, this would be consistent with the experience of earlier generations of European immigrants who were able to move into communities with a familiar language and cultural background.

[2] Interestingly, in Canada, total individual median income for the population as a whole (and total compensation per hour worked) nevertheless kept pace with increases in aggregate productivity (1981-2019). This contrasts to cases such as the United States, where median personal income stagnated after 1998 despite continued economy-wide productivity gains.

[3] Canada's population of Indian descent numbered 1.4 million in the 2021 census, with an additional 1.2 million also being of South Asian origin.

[4] In most of the data used for this report there is little difference between including or excluding immigrants and Canadians with zero income. Given the easier availability data that include all tax filers, we have focused on those data. In the case of Figure 5, that difference is significant, so both sets of data are outlined and discussed.

[5] Even though for immigrants from India the median income in the year after landing rose by 70 per cent (i.e., 2018 compared to 2014), the level of their median income still remained below that of the rest of the population.

[6] For example, in China, with economic development coincided with a slowdown in out-migration.

[7] In this report, productivity will refer to value-added per unit of labour input (generally hours worked).

[8] For immigrants who landed after 1989. The data for tax filers in 2014 includes both immigrants who had landed between 1990 and 2014, and

those who were working in Canada but not yet permanent residents (i.e., landed). This latter category includes those who eventually became permanent residents up to 2020.

[9] There is some evidence that links immigrants to innovation, which would improve productive efficiency (Hunt and Gauthier-Loiselle, 2010). At the firm level in Israel high-skilled immigration led to positive productivity impacts, whereas low-skilled immigration had a negative impact on productivity (Paserman, 2013). For Canada, immigration has been argued to have helped firms improve productivity (Gu, et al, 2020). These are distinct from the empirical findings in Appendix A, where the focus is on new immigrants – and we argue that its source is a compositional impact on aggregate productivity through a low median income after landing.

[10] The results reported here were obtained independently of Doyle, et al (2023), but adjustments were made to our analysis on the basis of their work.

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