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Potential output and the neutral rate in Canada: 2021 update

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Overview

We present the Bank of Canada update on potential output and neutral rate estimates for Canada.[1] We expect potential output growth to be stronger from 2020 to 2023 (**Table 1**) than we anticipated at the time of the October 2020 *Monetary Policy Report*. This upgrade is driven by a higher starting point for the economy and a stronger outlook for growth, which translate into a more favourable path for trend labour productivity. Uncertainty, however, remains high around these estimates.[2] While the stronger potential output profile leads to higher point estimates and ranges for some of the neutral rate models, that was not enough for us to change our overall assessment. The nominal neutral rate ranges between 1.75 and 2.75 percent (**Table 2**), the same as in the October 2020 Report.

Table 1: Comparison of potential output estimates relative to October 2020

Annual rates (percent)

	Potential output annual growth	Excluding COVID-19 containment effects		Revisions to the level of potential output
		Potential output annual growth	Range for potential output growth	
2020	-1.1 (-1.7)	1.4 (0.7)	0.8–2.0	1.2
2021	3.7 (3.0)	1.5 (0.9)	0.8–2.2	1.9
2022	1.6 (1.5)	1.3 (1.1)	0.4–2.2	1.9
2023	2.0 (1.2)	2.0 (1.2)	1.0–3.0	2.7
2024	2.2	2.2	1.2–3.2	

Note: Estimates of annual growth rates of potential output from the October 2020 reassessment appear in parentheses.

Table 2: Summary of estimates of the nominal neutral policy rate

Annual rates (percent)

	2021 estimates	2020 estimates
Pure interest rate parity	1.75–2.75	1.75–2.75
Risk-augmented neoclassical growth model	2.00–2.75	1.75–2.75
Reduced-form model	2.00–2.75	2.00–2.50
Overlapping-generations model	2.25–3.00	2.25–3.00
Overall assessment	1.75–2.75	1.75–2.75

Note: Rates are in nominal terms. All estimates have been rounded to the nearest 25 basis points. Reported ranges are constructed methodologically based on different counterfactuals for key parameters and inputs.

[1] The 2020 reassessments were published in October 2020 rather than in April 2020 because of the COVID-19 pandemic. Here we return to our usual practice of reassessing potential output and the neutral rate with the April *Monetary Policy Report*.

[2] See Brouillette, Champagne and Mc Donald-Guimond (2020) for a discussion about the range.

Canadian potential output

In our October 2020 reassessment, we revised down potential output relative to April 2019.[3] If we set aside the temporary effects of the pandemic containment measures, potential output growth was on average reduced by almost 1 percentage point over 2020–22. These negative revisions were driven mostly by slower capital accumulation. Scarring effects on labour market trends and trend total factor productivity (TFP) also contributed to the downgrade of potential output. Overall, the October profile suggested that the level of potential output for 2022 would be 2.6 percent lower than in the April 2019 reassessment.

Since October, the economic outlook has improved more than expected owing to several factors, including a greater resilience of the economy to restrictions and public health guidelines, faster than expected vaccine developments, more fiscal spending in Canada and the United States and higher commodity prices.

Revisions to growth

Relative to the October 2020 Report, potential output growth is revised up over 2021–23, on average by 0.5 percentage points. Despite these revisions, the pandemic continues to be a drag on potential output: the level of potential output for 2022 remains about 0.7 percent lower than in the April 2019 reassessment.

We expect capital to accumulate faster than in the previous reassessment as a result of better investment prospects (**Chart 1**, blue bars). Reduced uncertainty and a stronger outlook for demand after the pandemic should encourage firms to start resuming their investment plans more quickly than previously expected. Moreover, public investment in capital is revised up to capture the fiscal stimulus announced in the Fall Economic Statement and positive historical revisions.

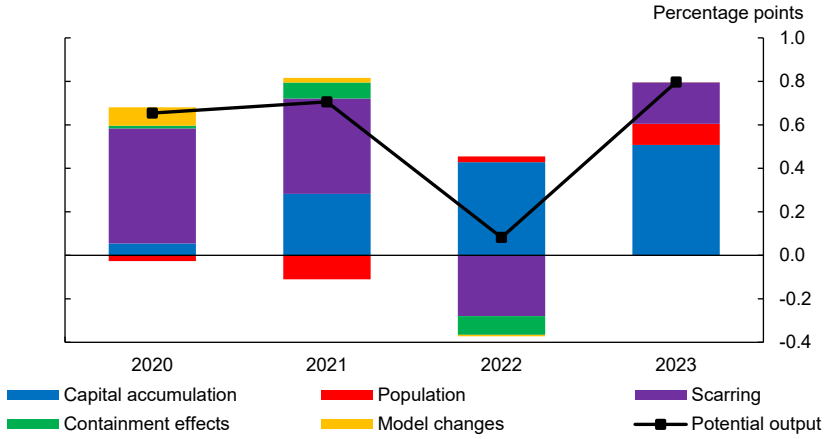
The pandemic negatively affected inflows of immigrants and non-permanent residents landing in Canada slightly more than expected. This explains the greater drag from immigration on potential output growth in 2021 (**Chart 1**, red bars). However, higher immigration targets set by the federal government in late October 2020 are expected to provide more support after 2021.

Stronger than expected gross domestic product (GDP) in recent quarters suggests that firms have been better able to adapt to public health restrictions. Therefore, we have reduced our estimate of the drag coming from containment measures. This leads to a small positive revision for potential output growth in 2021 (**Chart 1**, green bars). Containment effects are temporary and are still expected to dissipate completely by the end of 2021.

[3] See Brouillette, Champagne and Mc Donald-Guimond (2020) for more details on the 2020 revisions and the framework used to assess potential output.

Chart 1: Potential output growth is revised up as the pandemic recedes

Annual growth



Sources: Statistics Canada and Bank of Canada estimates and projections

Last data plotted: 2023

More favourable economic conditions relative to what was expected in October and smaller impacts from containment measures are expected to remove TFP scarring over the projection horizon (**Chart 1**, purple bars). This will likely limit the extent of destruction of viable firms and the loss of human capital by preserving jobs that would otherwise have disappeared. Moreover, accelerated automation and digitalization observed since the beginning of the pandemic are expected to boost TFP more than previously expected. In contrast, our assessment of labour market scarring remains relatively unchanged.[4]

Dynamics of potential output growth

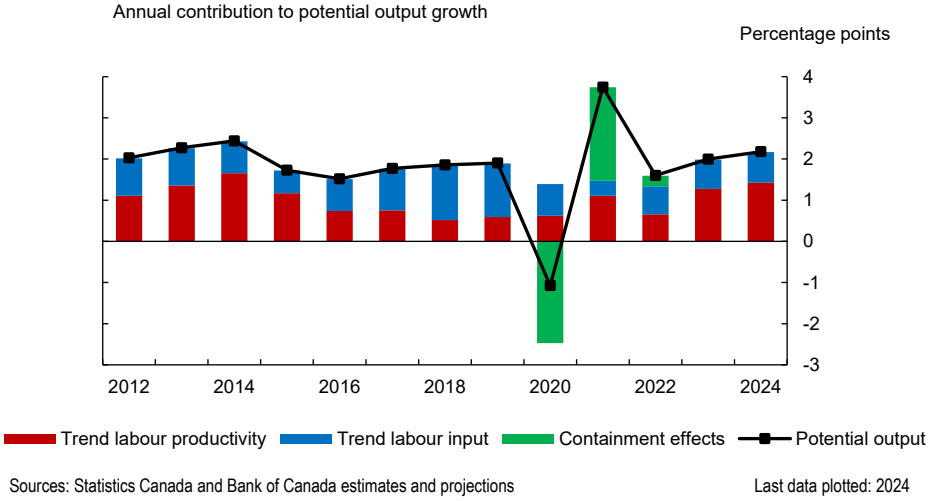
As in the previous reassessment, potential output growth is greatly affected by pandemic-related containment effects. If we set aside the temporary effects of the pandemic containment measures (**Chart 2**, green bars), we expect potential output growth to increase after 2020, from 1.5 percent in 2021 to 2.2 percent in 2024 (**Chart 2** and **Table 3**).

We expect trend labour productivity (TLP) growth to increase over the projection horizon because of faster capital accumulation (**Chart 2**, red bars). Business investment should accelerate going forward given the positive effect of the rollout of vaccine programs, increased foreign demand and accommodative financial conditions. Moreover, the federal government committed to continue supporting the recovery, as announced in the Fall Economic Statement. Additional fiscal stimulus should support public capital formation. By 2024, TLP growth is expected to reach 1.4 percent, higher than its 2010–19 average.

[4] See the Appendix for a description of how labour market trends are estimated along with scarring effects due to the pandemic.

Chart 2: Potential output growth increases over the projection horizon because of faster capital accumulation

Annual contribution to potential output growth



Sources: Statistics Canada and Bank of Canada estimates and projections

Last data plotted: 2024

Table 3: Potential output growth excluding COVID-19 containment effects

Annual rates (percent)

	Potential output growth	Trend labour input	Trend labour productivity
2010–19	1.9 (1.8)	0.9 (1.0)	0.9 (0.9)
2020	1.4 (0.7)	0.8 (1.1)	0.6 (-0.3)
2021	1.5 (0.9)	0.4 (0.7)	1.1 (0.1)
2022	1.3 (1.1)	0.7 (0.7)	0.7 (0.5)
2023	2.0 (1.2)	0.7 (0.6)	1.3 (0.6)
2024	2.2	0.7	1.4

Note: Estimates of annual growth rates of potential output from the October 2020 reassessment appear in parentheses. Numbers may not add to total because of rounding.

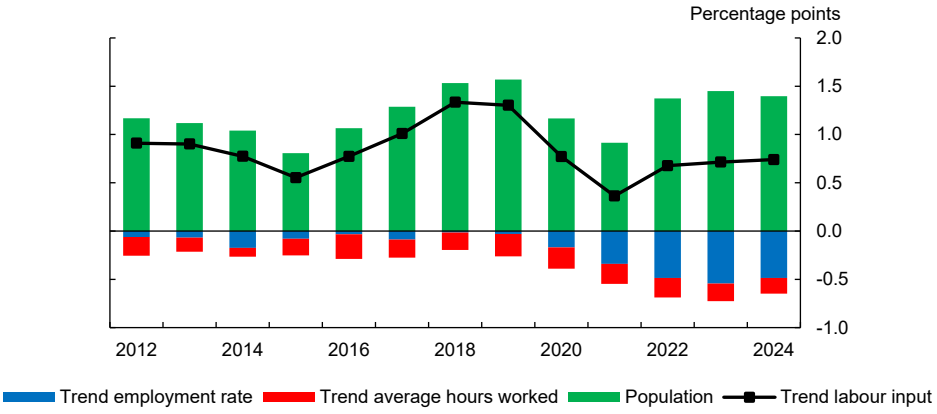
Trend labour input (TLI) growth remains roughly flat over the projection horizon (0.7 percent) because of two offsetting factors (**Chart 2**, blue bars). Population growth—mostly through immigration—remains the main contributor to TLI growth (**Chart 3**). After a slowdown in 2020 and 2021, population growth is expected to resume and to average 1.4 percent over 2022–24. This growth is supported by the higher immigration targets and an expected return in 2022 to pre-pandemic levels of flows of non-permanent residents.

In contrast, trend average hours worked (TAHW) and the trend employment rate (TER) are dragging on TLI growth (**Chart 3**). This is due to both structural factors (such as population aging) and cyclical factors (the pandemic). From 2021 to 2024, TLI growth would be on average about 0.6 percentage points higher had the structure of the population not changed since 2010. In addition, the pandemic could have persistent effects if it results in some people experiencing longer spells of unemployment. Depreciation of human capital could lead some

workers to drop permanently from the labour force. In our projection, we expect that labour market scarring will hold back TLI growth by 0.2 percentage points by 2024. The Appendix gives details on how labour market scarring is estimated.

Chart 3: Trend employment rate and trend average hours worked are dragging down trend labour input growth

Annual contributions to trend labour input growth



Sources: Statistics Canada and Bank of Canada estimates and projections

Last data plotted: 2024

Uncertainty around the base-case scenario

Despite recent positive developments, such as the greater resilience of the economy to public health restrictions and the faster vaccine rollout, the uncertainty around our estimates of potential output remains unusually high. In this section, we present a few risks around the assumptions we are using.

The extent of labour market scarring is highly uncertain. A key indicator to monitor is long-term unemployment, which has increased substantially during the pandemic.[5] Longer spells of unemployment are often associated with loss of human capital and more discouraged workers. Given the strength of the recovery in GDP, it is possible that the labour market recovery will speed up and that long-term unemployment will decrease quickly in the coming months.[6] This would suggest that people will return to work faster, leaving less potential for scarring.

We removed TFP scarring because of more favourable economic conditions and the accelerated pace of automation and digital transformation (see, for instance, Blit 2020). However, the gains from these positive factors could be offset by ongoing permanent costs. For instance, Bloom et al. (2020) cite additional expenses to redesign offices and stores to allow

[5] The number of long-term unemployed peaked at about 510,000 in January 2021. In comparison, it peaked at 335,000 following the 2008–09 recession, and from 2017 to 2019, long-term unemployment was on average 205,000.

[6] We need to be careful in interpreting monthly variation, but long-term unemployment has decreased by about 45,000 since January 2021.

for physical distancing; the need to increase inventory and restructure supply chains to make them more robust—but possibly less efficient; and the duplication of capital to facilitate working from home. These costs could represent an additional drag on trend TFP as firms divert resources to activities adding less value.

In the years before the pandemic, inflows of immigrants and non-permanent residents were the main driver of population growth in Canada. Inflows of non-permanent residents were at a record high, particularly for international students. In our base case, we assume that these inflows will return to their pre-pandemic levels by 2022. Therefore, a negative risk could emerge if immigration falls short of expectations due to lingering effects from the pandemic. Lower-than-expected immigration inflows resulting in slower TLI growth could drag on potential output.

Canadian neutral rate

As in previous neutral rate updates, we use a medium- to longer-run concept that defines the neutral rate as the policy rate consistent with output at its potential level and inflation equal to the target after the effects of all cyclical shocks have dissipated (Mendes 2014).

We assess that the Canadian nominal neutral rate still lies in the range of 1.75 to 2.75 percent. This represents no change compared with the last update in October 2020. The last assessment reflected the sizable effects of the COVID-19 pandemic: a reduction in the neutral rate was driven by a fall in the estimated global neutral rate, a higher level of macroeconomic risk and a decline in the projected growth of potential output (Matveev, Mc Donald-Guimond and Sekkel 2020). Despite the current upward revision in the growth of potential output, our overall assessment of the Canadian nominal neutral rate of interest has not changed materially.

The estimated range for the Canadian neutral rate is based on the output from four assessment methods used in previous years (**Table 2**). These methods were first introduced by Mendes (2014) and later updated by Carter, Chen and Dorich (2019).[7] Reported ranges are constructed based on different counterfactuals for key parameters and inputs. While the range of estimates in the overall assessment remains unchanged, some methods imply slightly higher point estimates. The risk-augmented neoclassical growth model suggests an increase of 25 basis points in the lower bound of its range of estimates. The reduced-form model implies an increase of 25 basis points in the upper bound of its estimates. An interval constructed using all ranges from these methods would result in an upper bound of 3.0 percent. However, this upper bound is supported only by a specific calibration of the overlapping-generations model. Moreover, this model does not explicitly consider the pandemic-related increase in aggregate risk, which, if it were included, would tend to lower the model's range of estimates. Therefore,

[7] See these papers for a detailed description of these methods.

like last year, we do not include 3.0 percent in the overall range; rather, we maintain the usual practice of focusing on an interval of 100 basis points.

Assessment of the Canadian neutral rate

In the remainder of the note, we discuss in greater detail the four methods used in the assessment of the Canadian neutral rate and their estimates.

Under the pure interest rate parity approach, the Canadian neutral rate is determined solely by global factors and equals the global neutral rate. We continue to use an estimate of the US neutral rate as a proxy for the global neutral rate (see Bootsma et al. 2020 for the methodology used to estimate the US neutral rate of interest). The US neutral rate remains unchanged from the 2020 reassessment (Carter et al. 2021). As a result, the estimate of the range for the Canadian nominal neutral rate remains 1.75 to 2.75 percent.

The risk-augmented neoclassical growth model is a closed-economy general equilibrium model with aggregate uncertainty; thus, it takes into account only domestic factors. The neutral rate is determined entirely by factors affecting households' consumption and savings decisions. Higher potential output growth in this reassessment, which also implies that the long-term effects of the pandemic will be slightly less negative, results in higher estimates of the Canadian neutral rate. However, significant effects of the COVID-19 pandemic—seen in higher perceived tail risk of future economic shocks—persist and continue to exert some negative pressure on the neutral rate (see Matveev, Mc Donald-Guimond and Sekkel 2020 for details). Overall, the lower bound of the range of estimates is thus revised up by only 25 basis points. As a result, the model implies a nominal neutral rate in the range of 2.0 to 2.75 percent.

While each of the first two models looks exclusively at either foreign or domestic factors, the reduced-form model aims to take both into account. This model estimates the Canadian neutral rate using the global neutral rate (proxied by the US neutral rate) and long-run potential output growth within a regression framework. Higher potential output growth puts upward pressure on the estimates of the neutral rate. This implies an increase in the upper bound of our range of estimates by 25 basis points compared with the 2020 estimates. As a result, in this model the Canadian nominal neutral rate estimate falls in the range of 2.0 to 2.75 percent.

The last model we use is an open-economy general equilibrium model with overlapping generations. In this model, the Canadian neutral rate is the sum of the global neutral rate and a country-specific risk premium, which is determined by domestic factors. Higher potential output growth lowers Canada's net foreign asset position relative to its gross domestic output. This in turn causes a small increase in the country-specific risk premium. But this increase was not enough to change this model's estimate of the neutral rate range. Persistent negative economic conditions resulting from the COVID-19 pandemic together with an unchanged estimate of the global neutral rate (proxied by the US neutral rate) imply that the model's estimate of the nominal neutral rate remains in the range of 2.25 to 3.0 percent.

Finally, it is important to stress the inevitable uncertainty surrounding estimates of an unobservable variable such as the neutral rate of interest. This uncertainty is especially pertinent given the current context of the ongoing global pandemic. While the ranges above reflect the sensitivity of our estimates to different models and their inputs, these ranges are narrower than what econometric models would suggest.

Appendix: Scarring effects on labour market trends

Modifying the framework

In our standard approach to estimating trend labour input, we use historical data on the employment rate (ER) and average hours worked (AHW), disaggregated by sex and age groups. Specifically, let $y_{i,t}$ be ER or AHW for group i in year t. Then we estimate the following regressions using ordinary least squares with cohort effects:

$$y_{i,t} = \rho y_{i,t-1} + \boldsymbol{\beta} \boldsymbol{x}_{i,t} + \varepsilon_{i,t}, \quad (1)$$

where $\boldsymbol{x}_{i,t}$ is a vector of explanatory variables. Then the trend $y^*_{i,t}$ is constructed by replacing $\boldsymbol{x}_{i,t}$ with its trend $\boldsymbol{x}^*_{i,t}$:

$$y^*_{i,t} = \rho y^*_{i,t-1} + \boldsymbol{\beta} \boldsymbol{x}^*_{i,t}. \quad (2)$$

Finally, we aggregate $y^*_{i,t}$ to construct trend employment rate (TER) and trend average hours worked (TAHW), which are combined with population projections to produce the trend labour input.

Because of the extraordinary shocks to both the ER and AHW in 2020, simply re-estimating the model with 2020 data would have large effects on the parameter estimates (ρ and $\boldsymbol{\beta}$) and would, as a result, change the historical trends before 2020. This raises concerns because it is difficult to argue that the COVID-19 pandemic should change our view on past economic events. Therefore, we modified our standard approach to minimize the impact of the 2020 data on parameter estimates by including an additional explanatory variable capturing the 2020 shock:

$$y_{i,t} = \rho y_{i,t-1} + \boldsymbol{\beta} \boldsymbol{x}_{i,t} + \gamma d_{i,t} + \varepsilon_{i,t}, \quad (3)$$

where $d_{i,t}$ is an "exposure index" that summarizes how much each demographic cohort was exposed to the pandemic. Then we construct the trend by assuming that the estimated impact $\gamma d_{i,t}$ affects future trends through a time-varying "pass-through" parameter α_t that reflects how a shock generates persistent effects on the trend, or the scarring effect:

$$y^*_{i,t} = \rho y^*_{i,t-1} + \boldsymbol{\beta} \boldsymbol{x}^*_{i,t} + \alpha_t \times \gamma d_{i,t}. \quad (4)$$

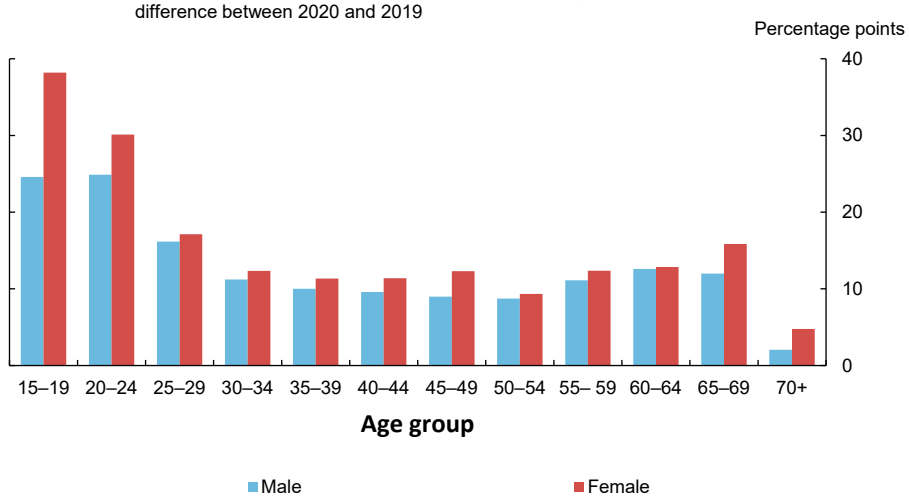
The exposure index

The pandemic had larger effects on workers in high-contact occupations and industries, where physical distancing is difficult. Our index captures this unevenness across sex and age groups.[8] Following Lemieux et al. (2020), we use the Labour Force Survey data from April 2020 to measure the differential effects of the initial lockdown across workers.

Specifically, for each group, we calculate (i) the portion of workers who lost their job between February and April 2020 and (ii) the fraction of workers who worked less than half of their usual weekly hours. These statistics reflect the effects of the lockdown on ER and AHW, respectively. Then the exposure indexes are calculated as differences of these statistics relative to April 2019. Not surprisingly, the exposure indexes are higher for women and youth—workers who are more likely to be employed in sectors that were affected by lockdowns (**Chart A-1** and **Chart A-2**).

Chart A-1: Exposure index for trend employment rates

Portion of workers who lost their job between February and April, difference between 2020 and 2019



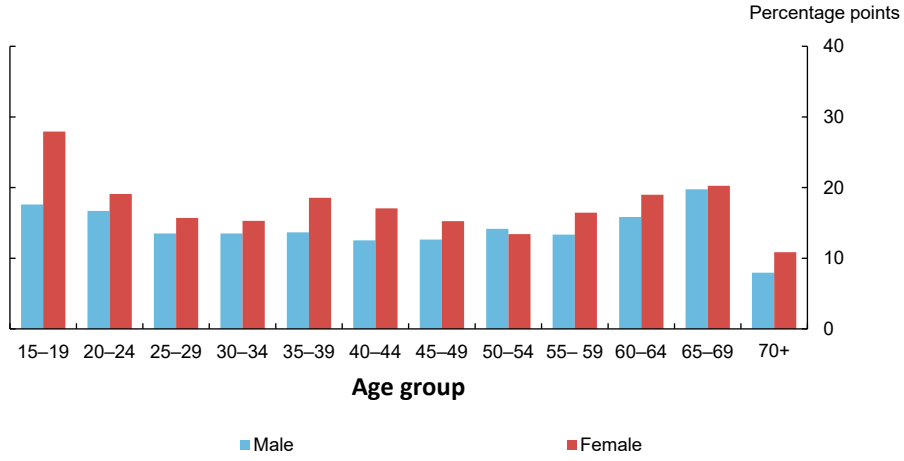
Sources: Statistics Canada and Bank of Canada calculations

Last observation: April 2020

[8] A similar approach is taken by Holston, Laubach and Williams (2020), who exploit the cross-country variation measured by the Oxford COVID-19 Government Response Tracker (developed by the University of Oxford's Blavatnik School of Government) in estimating the neutral interest rates of multiple countries.

Chart A-2: Exposure index for trend average hours worked

Portion of workers working less than half their usual weekly hours in April, difference between 2020 and 2019



Sources: Statistics Canada and Bank of Canada calculations

Last observation: April 2020

Pass-through parameters

We estimate the relationship between changes in labour market trends and their historical shocks to get estimates of the pass-through parameters. Although it is difficult to directly estimate this parameter, investigating how the trend responded to shocks in the past gives some insights regarding the magnitude of α_t.[9]

Specifically, we regress $y^*_{i,t+j} - y^*_{i,t}$ on $\Delta\varepsilon_{i,t}$ from equation 3, controlling for $\varepsilon_{i,t-1}, \ldots, \varepsilon_{i,t-p}$, to estimate the effect of a shock in year t on the trend in year $t+j$. Depending on the time horizon, the estimates suggest a value for α_t of around 0.1–0.2 for TER and 0.02 for TAHW. This gives us some basis to adjust the level of labour trends in response to the shock in 2020.

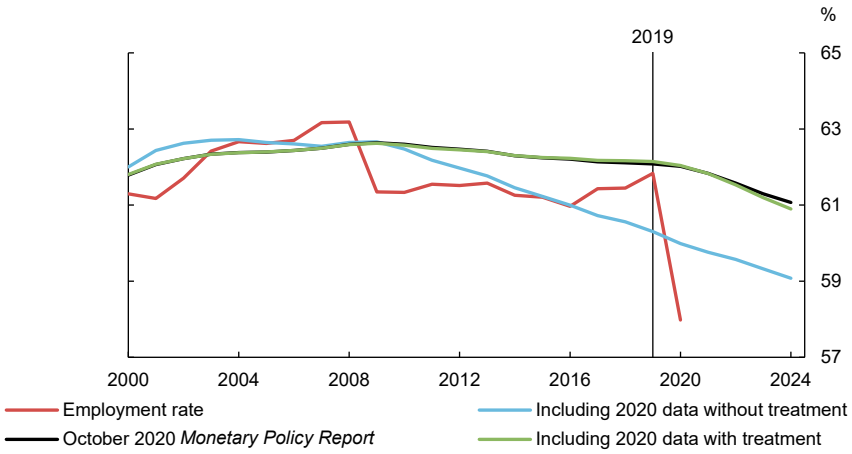
Conclusion

The new framework is a flexible way of accounting for the labour market shock in 2020. As **Chart A-3** and **Chart A-4** show, labour trends are not revised before 2020 (black and green lines). In comparison, the blue lines show the trends as estimated with our old models. More importantly, the framework allows us to formally incorporate our judgment on labour market scarring, explained above. As mentioned earlier, our view on labour scarring has not changed materially since October 2020, as shown by the similar black and green lines after 2019.

[9] Jordà, Singh and Taylor (2020) and Martín Fuentes and Moder (2020) also explored the relationship between estimated historical trends and historical events.

Chart A-3: Comparison of trend employment rate

Annual data

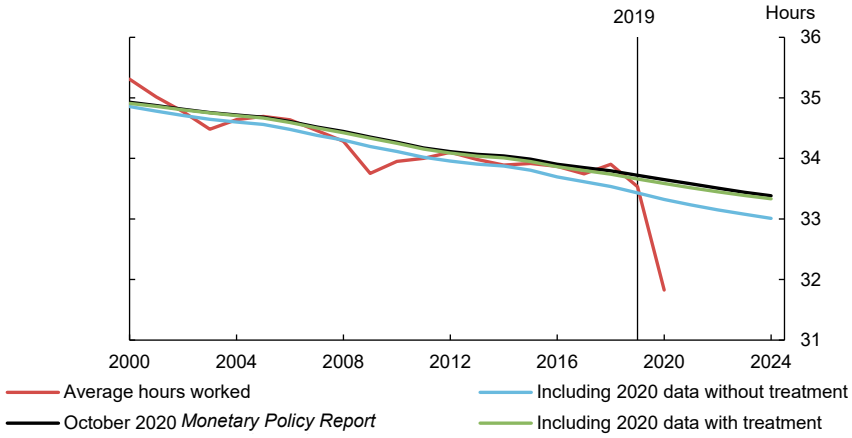


Sources: Statistics Canada and Bank of Canada calculations

Last data plotted: 2024

Chart A-4: Comparison of trend average hours worked

Annual data



Sources: Statistics Canada and Bank of Canada calculations

Last data plotted: 2024

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