

BACKGROUND



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January 12, 2017

BACKGROUND is published by the Institute of Fiscal Studies and Democracy at the University of Ottawa.

Editor: Jessica Rached

BACKGROUND est publié par l'Institut des finances publiques et de la démocratie à l'Université d'Ottawa.

Éditrice : Jessica Rached

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Demographics Is Destiny

The impact of aging on potential GDP growth and neutral interest rates

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Abstract

As the global economy emerged from the 2009 recession, the recovery that followed was considered lackluster by many commentators. A plethora of theories emerged to explain the low-growth, low-interest rate environment, the most prominent of which is the secular stagnation hypothesis. However, demand-side theses like secular stagnation have come up short. Instead, empirical research has found that much of the observed weakness can be explained by a rapidly aging population, which has caused saving to outpace investment while reducing the growth rate of labour input. Similarly, the analysis presented here also finds that the leading cause of weak growth in the US and Canada is the result of demographics, with long-term growth expected to average around 2.1% and 1.6%, respectively. And along with diminished growth prospects has come the secular decline in real interest rates. Indeed, at around 3%, long-term neutral interest rates in the US and Canada are forecast to remain relatively low going forward, in line with the findings of other research.

Résumé

Alors que l'économie internationale a émergé de la récession de 2009, la reprise économique qui a suivie a longtemps laissé à désirer, selon plusieurs analystes. Ceci a produit une gamme de théories qui expliquent l'environnement où la croissance est faible et où les taux d'intérêt sont bas. Parmi ces théories, il y a l'hypothèse de la stagnation séculaire. Cependant, les thèses sur le plan de la demande sont des réponses insuffisantes. Plutôt, les recherches empiriques menées dans ce domaine ont trouvé que les faiblesses susmentionnées sont dues au vieillissement rapide de la population. Grâce à ce vieillissement, l'épargne a dépassé l'investissement et le taux de croissance de la main-d'œuvre s'est ralenti. De la même façon, l'analyse présentée ici conclue que les situations démographiques des États-Unis ainsi que du Canada sont les premières causes de la croissance faible des deux pays : les taux de croissance économique prévus sont 2,1% pour les É-U et 1,6% pour le Canada. Les perspectives de croissance diminuées aussi mènent à un déclin des taux d'intérêt réels. En effet, aux États-Unis et au Canada, les taux d'intérêt neutres de 3% au long terme sont conformes aux conclusions de plusieurs recherches.

DEMOGRAPHICS IS DESTINY

The impact of aging on potential GDP growth and neutral interest rates

Much oxygen has been inhaled in recent years as economists have debated the causes of the prolonged low-growth, low-interest rate environment that has followed the Great Recession of 2009. Among the more prominent theories that have gained traction with economists and policymakers is secular stagnation. Lawrence Summers, former United States Secretary of the Treasury and arguably the main proponent of the secular stagnation hypothesis, defines secular stagnation as "an imbalance resulting from an increasing propensity to save and a decreasing propensity to invest. The result is that excessive saving acts as a drag on demand, reducing growth and inflation, and the imbalance between savings and investment pulls down real interest rates."¹ In order to alleviate this savings-investment imbalance, Summers has called for significant dissaving on the part of governments. Public demand, it is argued, will make up for the persistent lack of private demand, thereby returning savings and investment to equilibrium. This should help to push up real GDP growth and, in combination with a sharp increase in sovereign debt, real interest rates. Crucially, for secular stagnation to hold true, the steady-state levels of these variables – known as potential GDP growth² and real neutral interest rates³ – must be assumed to not have come down materially in recent years. Instead, they are thought to remain persistently above observed real GDP growth and real interest rates.

However, the theoretical and empirical evidence for secular stagnation makes for some pretty thin gruel. A quick examination of the ascribed causes of secular stagnation—such as historically low public investment (as a share of GDP), rising income inequality, and the falling relative price of capital—shows that they have made a minor contribution to the current economic environment. Instead, arguments focused on changing demographics—a supply-side consideration—have proven to be more robust in explaining the secular deceleration in potential GDP growth and falling real interest rates since the early 1980s. Indeed, work by central banks—most notably the United States Federal Reserve and Bank of England—have concluded that the gradual decline in real interest rates over the past 35 years can largely be attributed to the greying of the global population, particularly in advanced economies. Indeed, people save for retirement while working and spend those savings when retired, thereby causing the savings and investment to shift over time. They also tend to work less as they age. The post-WWII baby boom and subsequent bust has taken this lifetime savings path to an unprecedented aggregate extreme, and one that should not be extrapolated going forward.

Consider for instance the often-cited research published by the Bank of England in December 2015.⁴ Looking at the decline in global real interest rates from 1980 to 2015, the authors found that slowing labour supply growth and other demographics-related considerations accounted for the largest share of this downshift. The demand-side reasons often cited by Summers—including lower public investment, rising income inequality, and the falling relative price of capital—accounted for a much smaller portion of the decline. Other contributing factors include the rising spread between the rate of return on capital and the risk-free rate as well as (though to a lesser extent) the shift in preferences toward higher saving by emerging market governments following the Asian crisis. The Bank of England authors then go on to forecast the evolution of the global real interest rate through 2030. Recognizing the uncertainty inherent in prediction, in the absence of a ramp-up in public investment, they found that real interest rates are likely to be pushed higher almost entirely due to shifting demographics, in

¹ Summers, L. (2016, March & April). The age of secular stagnation: What it is and what to do about it. *Foreign Affairs*. Retrieved from <http://fam.ag/2dxrmyf>

² Potential GDP is the trend level of real output when the influence of business cycles and temporary factors are removed.

³ The real neutral interest rate is the prevailing monetary policy interest rate when the economy is operating at its potential and inflation is at its target.

⁴ Rachel, L., & Smith, T. (2015). *Secular drivers of the global real interest rate* (Bank of England Staff Working Papers, No. 571). London, UK: Bank of England. Retrieved from <http://www.bankofengland.co.uk/research/Documents/workingpapers/2015/swp571.pdf>

the absence of a ramp-up in public investment. Of course, this doesn't rule out the potential benefits of public investment. It just suggests that real interest rates are likely to move higher without it.

Researchers at the U.S. Federal Reserve reached a similar conclusion around the impact of aging in October 2016, when they published the results of an overlapping generations (OLG) model with a rich demographic structure.⁵ They found that the “model accounts for a 1¼-percentage-point decline in both real GDP growth and the equilibrium real interest rate since 1980—essentially, all of the permanent declines in those variables according to some estimates. The model also implies that these declines were especially pronounced over the past decade or so because of demographic factors most directly associated with the post-war baby boom and the passing of the information technology boom.” They also conclude that, as per the model, “these developments were largely predictable”. The authors go further to suggest that real GDP growth and real interest rates will remain low in the coming decades thanks to demographic forces.

This research helps to reinforce the well-known findings of Laubach and Williams (2015) and Holston, Laubach and Williams (2016) as well.^{6,7} These researchers have worked to both quantify real neutral interest rates as well as the driving forces behind their secular decline. Laubach and Williams (2015) did this work for the United States, while Holston, Laubach and Williams (2016) did this same work for the United Kingdom, Euro Area, and Canada, in addition to the US. This research attributes the secular decline in real interest rates to shifts in demographics and a trend slowing in productivity growth, as well as global factors. Indeed, regarding the latter contributing factor, “the country-by-country estimates are found to display a substantial amount of co-movement over time, suggesting an important role for global factors in shaping trend growth and natural rates of interest.”

This research dovetails well with the 2014 Bank of Canada discussion paper about neutral interest rates.⁸ In Rhys Mendes's work, the author explores four different approaches to determining the neutral rate of interest in Canada: pure interest parity, the neoclassical growth model, a reduced-form model, and an OLG model. Using these approaches, “Bank staff estimate that the neutral policy rate in Canada is between 1 and 2 per cent in real terms, or between 3 and 4 per cent in nominal terms”, reflecting the range of estimates from the various approaches. The primary drawback of these estimates is that they are static, such that they represent an equilibrium value of the neutral rate as opposed to estimating how they evolve over history and projection. But as one of the few pieces of research on this topic in Canada, Mendes (2014) provides the most often cited long-term estimate of Canada's neutral interest rate.

This note aims to build on the research discussed here and to fill some of the existing gaps in the literature on neutral interest rates in Canada. To do this, the Institute of Fiscal Studies and Democracy (IFSD) has developed models of potential GDP for both Canada and the US. The results of these models are then used to estimate and forecast neutral interest rates over history and projection, using the Laubach and Williams (2015) approach for the US and a modified version of the Mendes (2014) reduced-form model for Canada. One can conclude from the output of these models that potential

⁵ Gagnon, E., Johannsen, B. K., & Lopez-Salido, J. D. (2016). Understanding the new normal: The role of demographics (Finance and Economics Discussion Series, No. 2016-080). Washington, DC: Board of Governors of the Federal Reserve System. <http://dx.doi.org/10.17016/FEDS.2016.080>.

⁶ Laubach, T., & Williams, J.C. (2015). Measuring the natural rate of interest redux (Federal Reserve Bank of San Francisco Working Paper Series, No. 2015-16). San Francisco, CA: Federal Reserve Bank of San Francisco. Retrieved from <http://www.frbsf.org/economic-research/files/wp2015-16.pdf>

⁷ Holston, K., Laubach, T., & Williams, J.C. (2016). Measuring the natural rate of interest: International trends and determinants (Federal Reserve Bank of San Francisco Working Paper Series, No. 2016-11). San Francisco, CA: Federal Reserve Bank of San Francisco. Retrieved from <http://www.frbsf.org/economic-research/files/wp2016-11.pdf>

⁸ Mendes, R.R. (2014). The neutral rate of interest in Canada (Bank of Canada Discussion Paper, No. 2014-5). Ottawa, ON: Bank of Canada Canadian Economic Analysis Department. Retrieved from: <http://www.bankofcanada.ca/wp-content/uploads/2014/09/dp2014-5.pdf>

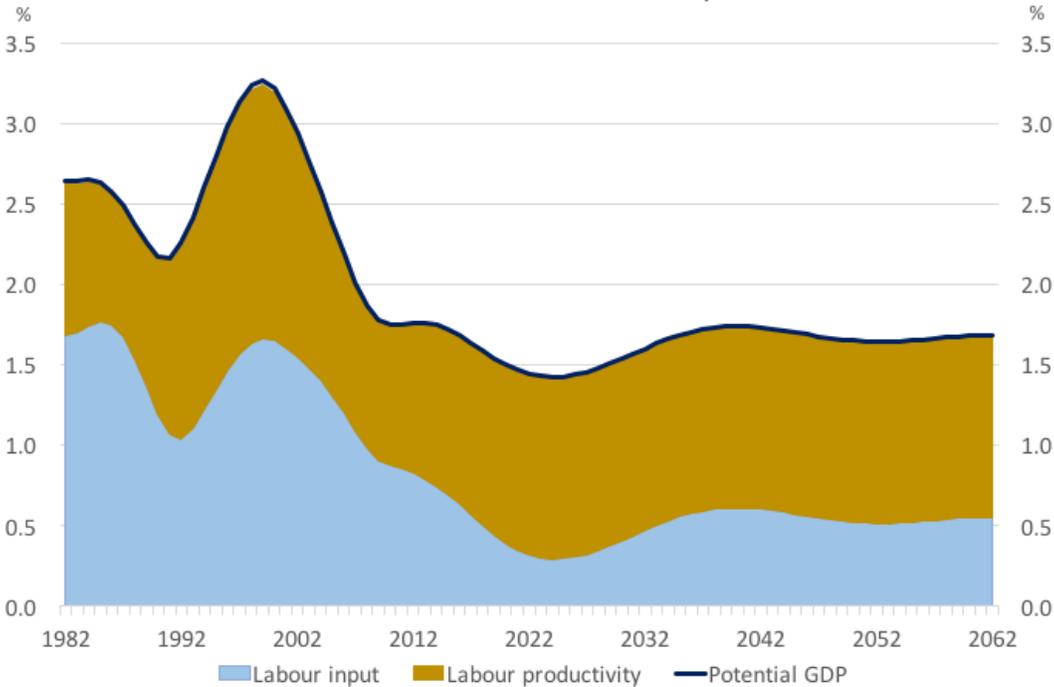
GDP growth and neutral rates of interest in Canada and the US have both slowed dramatically since the late 1990s because of an aging population. However, they are expected to stage a modest comeback in the coming years, with rates of potential GDP growth forecast to settle around 2.1% annually in the US and 1.6% in Canada. Meanwhile, nominal neutral interest rates are expected to average around 3% in both countries and to oscillate within a range of roughly 2.75% to 3.25% over time. This is consistent with the findings of Mendes (2014), albeit at the low end of the Bank of Canada’s estimated range.



Estimating and Projecting Potential GDP Growth

There are a variety of ways to calculate potential GDP—the trend level of real GDP once one removes the impact of business cycles, temporary economic shocks, and the like. The approach used here is very similar to that of the Parliamentary Budget Officer (PBO)⁹, federal Department of Finance¹⁰, and the Bank of Canada’s integrated framework approach.¹¹ What all of these models have in common is that they forecast either labour force employment rates or participation rates, or both, by age and sex cohort. Average weekly hours worked are similarly forecast. The underlying trend is then extracted from these series. They are then combined with the official projection of the working-age population by age and sex cohort from Statistics Canada to determine total hours worked (also known as labour input).¹² Trend labour input growth is expected to slow most dramatically around 2025, reaching about 0.3%, to rise gradually to reach 0.6% in 2040, and then converge to about 0.5% thereafter (see Chart 1).

Chart 1: Growth in Potential GDP and Components in Canada



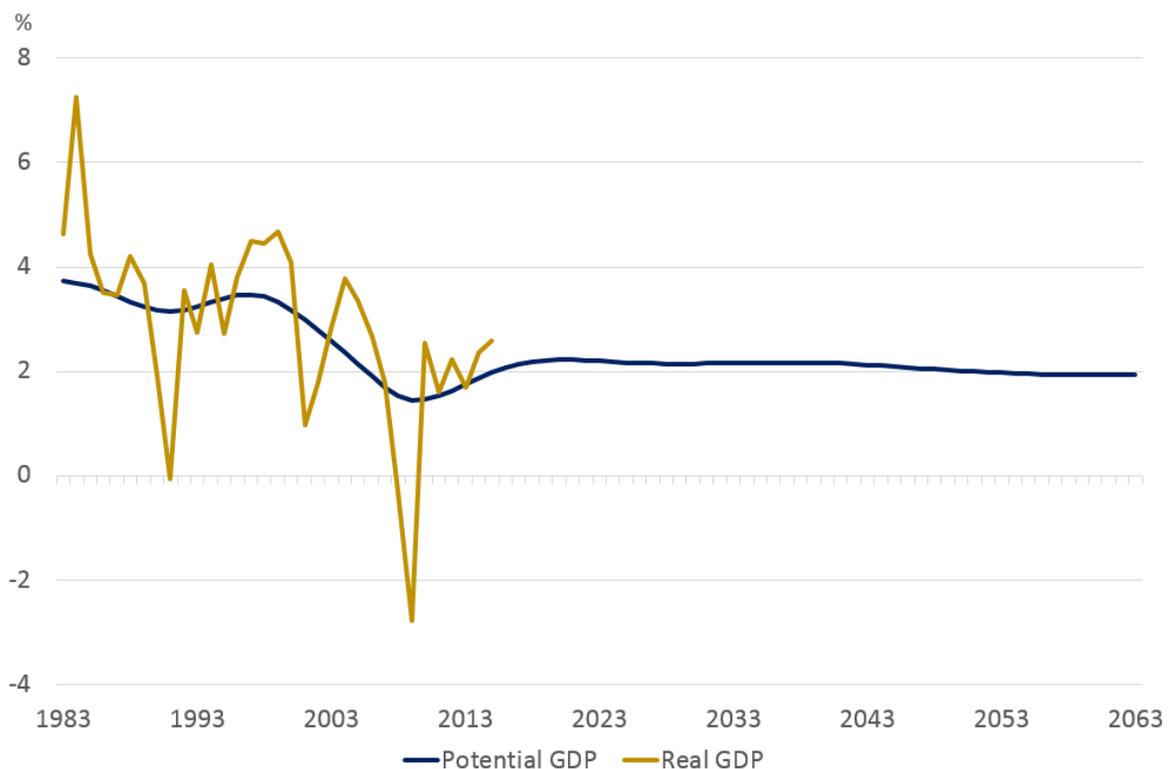
Source: Institute of Fiscal Studies and Democracy using Statistics Canada data.

⁹ Barnett, R., & Matier, C. (2010). Estimating potential GDP and the government’s structural budget balance (Parliamentary Budget Officer Technical Note). Ottawa, ON: Office of the Parliamentary Budget Officer. Retrieved from http://www.parl.gc.ca/PBO-DPB/documents/Potential_CABB_EN.pdf
¹⁰ James, S., Sargent, T., Barnett, R., & Lavoie, C. (2007). The Canadian labour force participation rate revisited: Cohort and wealth effects take hold (Department of Finance Working Papers, No. 2007-01). Ottawa, ON: Department of Finance Canada. Retrieved from <http://fin.gc.ca/pub/pdfs/wp2007-01e.pdf>
¹¹ Pichette, L., St-Amant, P., Tomlin, B., & Anoma, K. (2015). Measuring potential output at the Bank of Canada: The extended multivariate filter and the integrated framework (Bank of Canada Discussion Paper, No. 2015-1). Ottawa, ON: Bank of Canada Canadian Economic Analysis Department. Retrieved from <http://www.bankofcanada.ca/wp-content/uploads/2015/01/dp2015-1.pdf>
¹² The population projection used here is the M1 medium-growth projection scenario, which assumes 1991/1992 to 2010/2011 trends. Other projection scenarios make different trend assumptions, and the results will differ somewhat as a result.

The next step is to determine labour productivity, or output per hour worked. While easily estimated over history, forecasting labour productivity is much more difficult. For simplicity, many forecasters assume that labour productivity returns to its historical average in the long run, and this analysis assumes just that. More challenging is the path to reach this long-run average, which relies heavily on the richness of one's macroeconomic models. For instance, there is a positive relationship between increased business investment and the level, and growth, of labour productivity. However, for simplicity, this analysis assumes that labour productivity quickly converges to its long-run average, and indeed reaches its long-run growth rate of 1.1% by the beginning of the next decade (see Chart 1).

Finally, potential GDP is a product of trend labour input and trend labour productivity. It is the level of output reached when the economy is neither too hot nor too cold. And when combining the growth rates discussed above, potential GDP growth is expected to oscillate between 1.4% and 1.7% over the coming five decades (see Chart 1). This means that real GDP growth should average around this level as well, albeit with some additional volatility resulting from business cycles. These estimates and projections fall very much in line with those recently published by the PBO¹³, Bank of Canada¹⁴, and federal Department of Finance.¹⁵

Chart 2: Growth in U.S. Potential and Real GDP



Source: Bureau of Economic Analysis, Bureau of Labor Statistics, US Census Bureau, Institute of Fiscal Studies and Democracy.

Using a similar approach for the United States, we find that overall potential GDP growth is expected to be higher, on average, than in Canada, falling to around 2.1% for much of the forecast (see Chart 2). This largely reflects the higher trend labour productivity growth in the United States, of around 1.6%.

¹³ Office of the Parliamentary Budget Officer. (2016). Fiscal sustainability report 2016. Ottawa, ON: Office of the Parliamentary Budget Officer. Retrieved from http://www.pbo-dpb.gc.ca/web/default/files/Documents/Reports/2016/FSR_2016/FSR_2016_EN.pdf

¹⁴ Governing Council of the Bank of Canada. (2016). Monetary policy report: October 2016. Ottawa, ON: Bank of Canada. Retrieved from <http://www.bankofcanada.ca/wp-content/uploads/2016/10/mpr-2016-10-19.pdf>

¹⁵ Department of Finance Canada. (2016). Update of long-term economic and fiscal projections. Ottawa, ON: Department of Finance Canada. Retrieved from <http://www.fin.gc.ca/pub/ltefp-peblt/pdf/ltefp-peblt-eng.pdf>

Meanwhile, trend labour input growth in the US is expected to be roughly in line with, albeit slightly lower than, that of Canada, averaging around 0.5% over the projection. The IFSD's U.S. potential GDP growth forecast presented here are close to those recently published by the Congressional Budget Office¹⁶ and International Monetary Fund.¹⁷



Estimating and Projecting Neutral Rates of Interest

Looking to the models described in Laubach and Williams (2015) and Mendes (2014), the common driver of the evolution of the real neutral interest rate is potential GDP growth. The relationship between these two variables is a function of the fact that relative savings and investment are determined by prevailing interest rates and potential GDP growth. And when the economy is operating consistently at its trend, savings and investment must be equal. The world interest rate, as proxied by the U.S. interest rate in Mendes (2014), also exercises significant influence over domestic interest rates. The role of potential GDP growth and the world interest rate on domestic rates was further reinforced by the empirical findings of Holston, Laubach and Williams (2016).

For the US, Laubach and Williams (2015) use a Kalman filter approach to derive the real neutral interest rate from the evolution of potential GDP growth. For simplicity, they also provide a linear specification to estimate the long-run real neutral interest rate using this approach, which takes the form: $r^*_{LR} = -3.3 + 2.0G^*$, where G^* is the growth rate of potential GDP. Using this equation, one can estimate the level of the long-run real neutral rate of interest. Adding the target rate of inflation to this estimate and projection¹⁸, one can observe that the nominal neutral rate of interest in the US has fallen from a recent peak of 6.0% in 1997 to a trough of 1.8% in 2010. However, since then, it has begun to creep back up, and is expected to reach 3.4% in 2020 but to stay roughly in the range of 2.75% to 3.25% thereafter (see Chart 3). This range neatly bookends the December 2016 median longer-run federal funds rate projection of the Federal Open Markets Committee – the U.S. Federal Reserve's monetary policy decision-making body.¹⁹

The U.S. real neutral interest rate is then incorporated into the reduced-form equation from Mendes (2014), modified to estimate real interest rates as opposed to nominal. The resulting estimate and projection of the Canadian nominal neutral interest rate is very similar to that of the US. The primary reason is that the real neutral rate of interest in Canada is largely driven by the U.S. rate, with differences resulting from dissimilar potential GDP growth profiles. Much like the US, the Canadian nominal neutral rate of interest is expected to average about 3% over the long term, within a range of roughly 2.75% and 3.25% (see Chart 3).

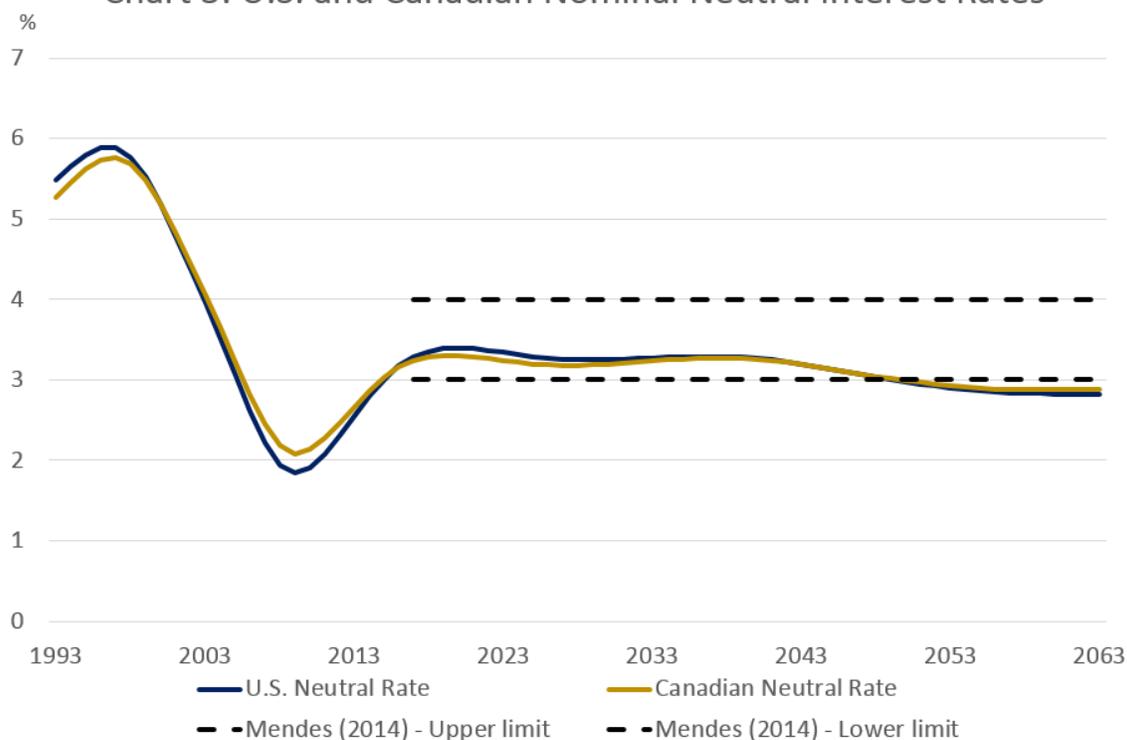
¹⁶ Congressional Budget Office. (2016). An update to the budget and economic outlook: 2016 to 2016. Washington, DC: Congress of the United States. Retrieved from <https://www.cbo.gov/sites/default/files/114th-congress-2015-2016/reports/51908-2016outlookupdate-2.pdf>

¹⁷ International Monetary Fund. (2016). World Economic Outlook: October 2016 – Subdued Demand: Symptoms and Remedies (World Economic and Financial Surveys World Economic Outlook Series). Washington, DC: International Monetary Fund. Retrieved from <http://www.imf.org/external/pubs/ft/weo/2016/02/pdf/text.pdf>

¹⁸ For consistency in estimating the nominal neutral interest rate in the US and Canada, the Consumer Price Index (CPI) inflation is used for both countries. While unquestionably appropriate for Canada, where the Bank of Canada targets total CPI inflation of 2%, the U.S. Federal Reserve instead targets 2% growth in the core Personal Consumption Expenditure (PCE) price index. Thankfully, there is extensive documentation on the difference between the year-over-year growth in the core PCE price index and core CPI (see, for example, http://www.bea.gov/scb/pdf/2007/11%20november/1107_cpiyce.pdf). As such, this analysis assumes that core CPI inflation is 26 basis points higher than the growth in the core PCE price index, meaning it is 2.26% (y/y) in equilibrium as opposed to 2%.

¹⁹ Economic projections of Federal Reserve Board members and Federal Reserve Bank presidents under their individual assessments of projected appropriate monetary policy, December 2016. Retrieved from <https://www.federalreserve.gov/monetarypolicy/files/fomcprojtabl20161214.pdf>.

Chart 3: U.S. and Canadian Nominal Neutral Interest Rates



Source: Bureau of Economic Analysis, Bureau of Labor Statistics, US Census Bureau, Institute of Fiscal Studies and Democracy.

This level of the Canadian nominal neutral interest rate projected using the approach outlined here is similar to that presented in Mendes (2014), albeit at the low end of the author’s range of estimates. However, this analysis goes a step beyond the work of Mendes (2014) by estimating the path of the Canadian neutral interest rate over history and projection, from 1993 through 2063.²⁰ It also clearly illustrates that the Bank of Canada’s overnight rate is likely to remain below its roughly 4.0% average reached in the decade prior to the 2008-09 recession, from 1998 to 2007.



Conclusion

In the quest to explain the secular decline in both real interest rates and real GDP growth, hypotheses like secular stagnation have come to dominate the narrative. However, demand-side explanations continue to come up short. Instead, as has been demonstrated here and elsewhere, the primary driver of slowing potential GDP growth over the past few decades has been an aging population. And real interest rates have followed output growth lower at the same time. Indeed, this conclusion flows directly from extensive research done by major central banks.

Looking ahead, the Canadian population is expected to continue to age, thereby putting further downward pressure on potential GDP growth. This path is not smooth, however, with growth expected to oscillate modestly due to a shifting age profile. Combining this demographic outlook with the expectation that labour productivity growth will return to its long-run average means that potential GDP growth should improve in Canada going forward. The same is true for the US. Demographics is destiny, as they say.

²⁰ These dates were chosen to reflect the introduction of inflation targeting regimes in both countries.

Given the role that potential GDP growth plays in determining the real neutral rate of interest, these are also expected to rise going forward. And when combined with inflation, the projections of the long-run nominal neutral interest rate fall roughly in the 2.75% to 3.25% range in both countries through 2060. This result is in line with the estimates of Mendes (2014), albeit with a view to the anticipated level of neutral interest rates through time as opposed to solely in equilibrium.

Going forward, these estimates and projections of potential GDP and real neutral interest rates in Canada and the US, as well as other labour market and demographic variables, will be incorporated into a macroeconomic model of these economies. The results of this model will be published in the coming weeks.