

SPECIAL REPORT

TD Economics



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LET'S GET FISCAL: GLOBAL GROWTH TO BENEFIT FROM FISCAL STIMULUS BUT NO GAME CHANGER

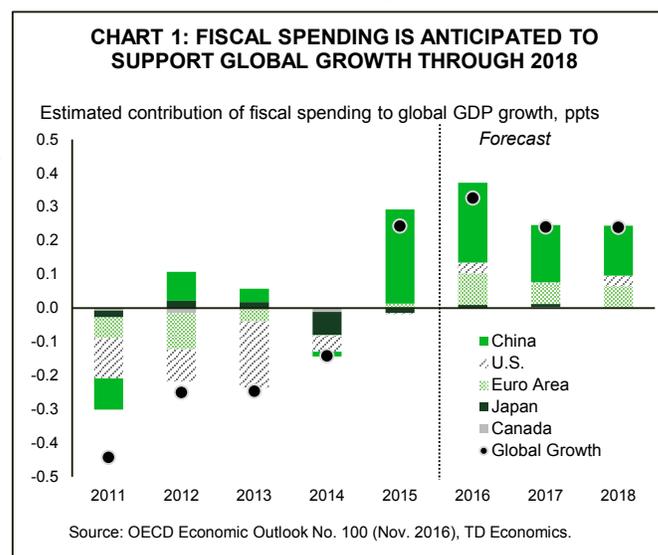
Highlights

- Global financial markets have been on a tear since the end of last year, largely reflecting growing optimism in the economic outlook. One important factor supporting this sentiment is the expectation that fiscal policy will provide a substantial boost to economic activity.
- After years of fiscal consolidation, governments around the world have begun to loosen their purse strings, providing a complement to highly accommodative monetary policy. Still, government spending plans reveal a relatively modest lift to global expansion rather than an outsized one.
- A number of advanced economies, including Canada and the U.S., have sufficient fiscal space to implement growth-boosting policies without having to be overly concerned about longer-term debt sustainability. However, fiscal stimulus solely for the sake of achieving short-term growth objectives may only serve to weaken longer-term fiscal and economic prospects. Instead, governments should target tax and spending policy toward areas that will enhance the long-run trend growth rate of the economy.
- All told, we expect fiscal policy to add 0.2 percentage points to global economic growth over the next two years. This is marginally weaker than the boost provided over the past two years.

Optimism in global financial markets since the end of last year has been rooted in improving near-term prospects for the global economy that has helped quash previous concerns of deflation. Implicit in this rosier outlook is the expectation of a smooth and gradual transition from ultra-accommodative monetary policy to more stimulative fiscal policy.

This shift has in part been driven by a growing unease with unconventional monetary policies by policymakers (i.e. negative/zero interest rates). However, the pivot to fiscal policy is also viewed by policymakers as necessary in order to battle structural headwinds from aging labour forces and lower labour productivity growth that are acting to constrain economic growth.

A closer look reveals that this pivot is occurring in baby steps rather than a quantum leap, at least from a global perspective. Even using optimistic assumptions on the timing of any eventual U.S. fiscal stimulus, the support to global economic growth from government policy measures is projected to be a moderate 0.2 percentage points (ppts) this year and next.

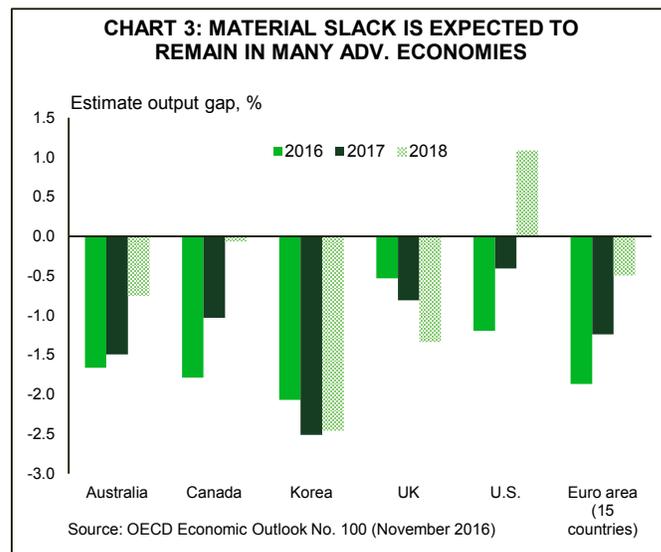


This injection would be broadly in line with those estimated since 2015, which marked an end to a four-year period of restraint (Chart 1). While the overall estimated magnitude is likely to maintain the status quo, it hides some shifts across economies. Notably, China is expected to ease its foot off the fiscal accelerator this year, while a number of advanced economies, including Canada, take up some of the slack.

A key factor conspiring against the broader use of fiscal policy to support economic growth is the concern about elevated debt-loads that in many cases have risen further in the years following the financial crisis. What’s more, the improvement in commodity prices and the return to at or above trend growth in many advanced economies has lessened the urgency to undertake stimulative fiscal policies.

But, not all economies should be concerned about high-debt loads. While Japan and countries in Europe’s periphery appear to have run up against fiscal constraints, our analysis shows that a number of countries enjoy considerable fiscal capacity. Within the eighteen economies included in our analysis that were found to have adequate fiscal space, fourteen are operating below full capacity (countries in the top left quadrant in Chart 2), and are therefore potential candidates for making the pivot from monetary to fiscal policy.

Nonetheless, not all fiscal stimulus is created equal. Fiscal sustainability is highly dependent on a country’s ability to maintain adequate rates of economic growth and modest interest rates well into the future. Sacrificing long-term growth for a quick near-term boost is unlikely to be a worthwhile proposition for most countries. Indeed, it’s wise for policymakers to use the fiscal space available to them in order to fund policies that raise long-term growth prospects of the economy, such as investments in human and physical



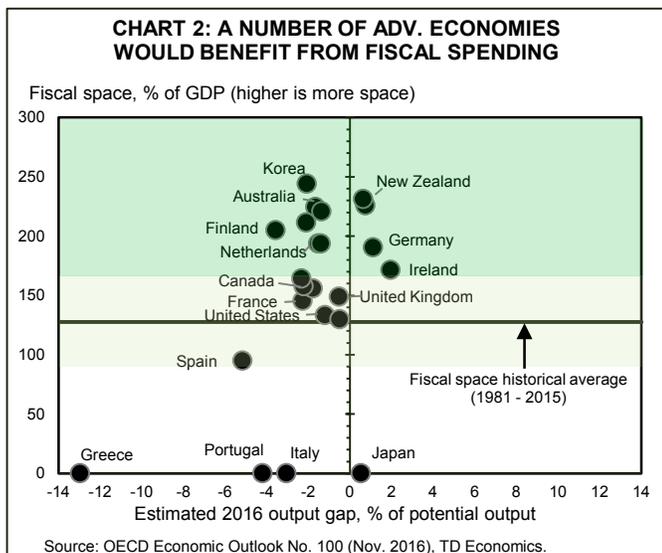
capital and reductions in marginal effective tax rates.

Monetary policy has been the only game in town

Slow growth in the aftermath of the financial crisis, particularly in advanced economies, has raised questions around the optimal mix of policies necessary to help close what are generally believed to be substantial output gaps in advanced economies (Chart 3). Since the financial crisis, monetary policy has been the favoured and often only lever used to encourage economic growth. Politicians have been reluctant to lift spending beyond that warranted by automatic stabilizers – unemployment and related income support programs. Much of this reluctance to undertake larger fiscal stimulus measures was driven by concerns that rising budget deficits and debt-to-GDP ratios would hurt credit ratings, while in Europe policymakers wanted to ensure that fiscal rules were respected.

However, the extraordinary monetary policy measures that were undertaken by many advanced economies in the aftermath of the financial crisis are increasingly coming under the spotlight. Policymakers are becoming more nervous that low, or in some cases negative, nominal interest rates have encouraged excess risk taking by firms and households, pushing up valuations across asset classes. As interest rates begin to rise and central banks reduce asset purchases, the concern is that asset prices collapse, resulting in yet another financial crisis. While this remains an outside risk and central bankers are likely to be extremely gradual in weaning their economies off ultra-loose monetary policy (Chart 4), it is enough of an argument to constrain any additional monetary stimulus.

In addition to financial stability concerns posed by low-

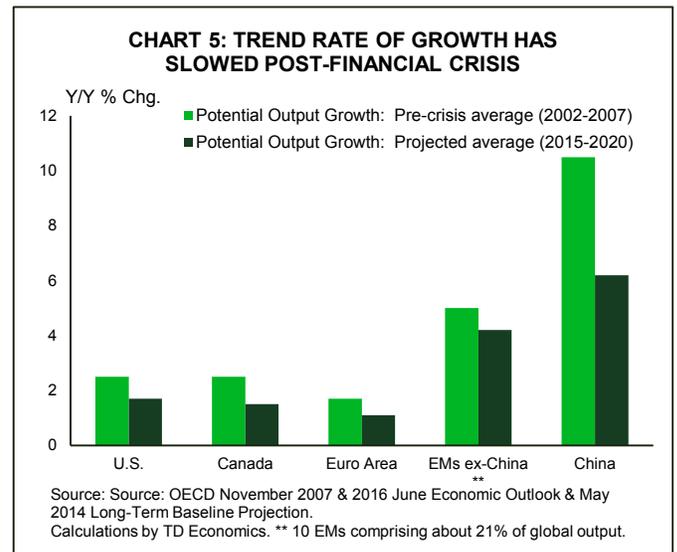


for-long interest rates is the fact that monetary policy alone can do little to battle the structural headwinds acting to hold back trend growth globally. Aging labour forces and weak productivity growth has reduced the trend pace of output growth in both advanced and emerging market economies in recent years (Chart 5). Fiscal stimulus and structural reform measures are more suited to targeting these factors than the blunt tool of low interest rates alone.

Fiscal stimulus expected to pick up through 2018

Chart 1 (front page) outlines how changes to fiscal policies have evolved in large advanced economies in the aftermath of the financial crisis. Fiscal consolidation by a number of advanced economies in the aftermath of the largest global recession since the Great Depression subtracted a substantial amount off of global growth at a time when economies were sputtering along well below capacity, as evidenced by the persistence of below target inflation (Chart 6). Specifically, fiscal consolidation was most fierce in Europe – owing largely to strict fiscal rules – and the U.S. – as result of the political gridlock (recall the fiscal cliff standoff and subsequent sequestration cuts). Overall, we estimate that fiscal consolidation during the 2011 to 2014 period shaved about 0.3 ppts off annual global economic growth.

A turning point seemed to take place in 2015, when Chinese authorities began relying more on infrastructure spending to boost aggregate demand. Fiscal stimulus was used as a means to manage the slowdown in growth driven by the deliberate rebalancing of economic activity away from investment and manufacturing toward more sustainable service industries. This was a follow-up to earlier stimulus measures undertaken by Chinese authorities to support the

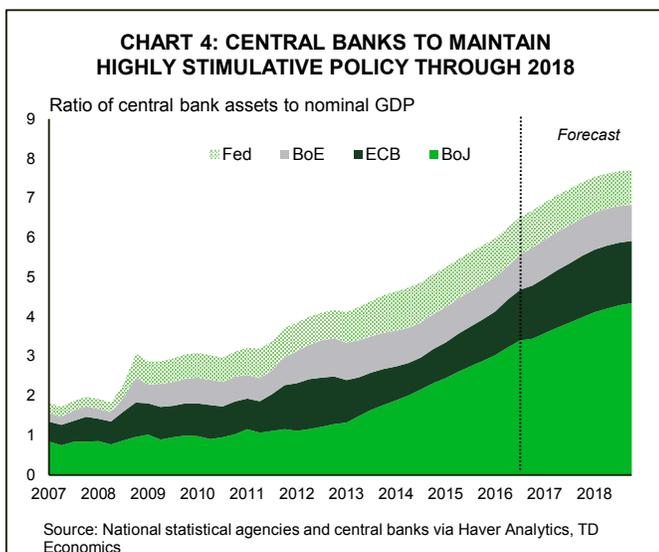


domestic economy after the housing market crash in 2012.

But it wasn't really until 2016 when attitudes began to shift in favour of fiscal stimulus. That year, the newly-elected government of Canada joined South Korea and Japan in communicating that deficit financed spending programs will become an integral part of economic stimulus measures for the next few years. Somewhat surprisingly, European governments also boosted spending, albeit mainly within prescribed fiscal rules.

The assumptions underlying our global fiscal estimates are found in Table 1. These estimates are derived from baseline forecasts by the OECD last November, with adjustments made to reflect our outlook (Table 2 shows how much we deviate from OECD assumptions).¹ For Canada, we assume that fiscal stimulus commitments made by the Liberal government in last year's budget, largely in the form of infrastructure investment, contribute about 0.3 ppts and 0.2 ppts to annual GDP growth in 2017 and 2018, respectively. However, given Canada's small share of the global economy, this will have a tiny positive impact on global growth through 2018. For Canada in particular, our view reflects persistent budget deficits amounting to more than 1% of annual GDP, with a large component of the stimulus devoted to infrastructure investment instead of government consumption. This view also partly reflects provincial stimulus plans, including increased spending in British Columbia over the next two years, and a surplus position in Quebec that should motivate the provincial government to invest more in updating and adding to the existing stock of infrastructure.

Our assumptions for the U.S. are less optimistic than the growth impact assumed by the OECD. First and foremost, the main difference is the timing of the stimulus measures.



In its analysis, the OECD assumes that personal and corporate tax reforms plus increased government spending that amounts to between 1% - 1.75% of GDP annually through 2018, which adds about 0.4 ppts to 2017 and 0.8 ppts to 2018 GDP growth.² Furthermore, the OECD assumed that Congress would be able to pass legislation that would see fiscal stimulus beginning to kick in within the first half of 2017.

With the benefit of hindsight, progress on this front has been slow. Under a best case scenario, tax reform in the U.S. Congress is passed in late 2017, and while it could be made retroactive, the economic impact won't be felt until 2018. Moreover, the potential increase in infrastructure spending is likely to be significantly smaller than initial estimates suggested, and unlikely to hit the economy before 2018. As such, our estimates in Table 1 reflect both a revised implementation time table and less optimism that the new administration will be able to push through a meaningful infrastructure spending plan that will materially boost near-term economic growth, given Congress's concerns about rising budget deficits and U.S. government debt. As a result, we have adjusted the OECD estimate to build in a materially smaller U.S. fiscal impact.

China will remain the most important economy for which fiscal stimulus spending will provide strong support

to both domestic and global GDP profiles. Fiscal measures in China will likely be in the form of infrastructure spending, particularly at the local government level for Tier 1 and Tier 2 cities. Our internal estimates differ from the OECD's only slightly, in that we believe that China will be more aggressive in curtailing its dependence on debt financed infrastructure spending plans in 2017-2018 to avoid exacerbating heightened domestic financial stability concerns. Nevertheless, uncertainty also surrounds the outlook for fiscal stimulus given recent developments in China. As Chinese authorities turn their attention toward mitigating domestic financial stability risks, they become more likely to ease away from using infrastructure spending to support growth, leaving growth to slow instead of exacerbating soaring debt levels.³

In Europe, government spending is expected to be buoyed by continued outlays for defense against fears of Russian aggression, security threats posed by terrorists, and the need to integrate hundreds of thousands of refugees and economic migrants.

What is clear from Chart 1 (page 1) is that we anticipate only a gradual and modest lift to global growth from fiscal measures in 2017 and 2018. Fiscal stimulus measures are likely to support global growth to the tune of about 0.2

Table 1: Assumptions on contribution of fiscal stimulus measures on domestic and global annual GDP growth (contribution to global growth in parentheses).				
	% Share of Global Growth*	2016	2017	2018
China	17.3	1.4% (0.2%)	1.0% (0.2%)	0.9% (0.1%)
United States	15.8	0.0% (0.0%)	0.0% (0.0%)	0.2% (0.0%)
Euro Area	12.0	0.8% (0.1%)	0.5% (0.1%)	0.5% (0.1%)
Japan	4.2	0.2% (0.0%)	0.2% (0.0%)	0.0% (0.0%)
Canada	1.4	0.1% (0.0%)	0.3% (0.0%)	0.2% (0.0%)
Other Advanced	7.3	-0.2% (0.0%)	-0.1% (0.0%)	-0.1% (0.0%)
Total Global	58.0	0.3%	0.2%	0.2%

* Using 2015 IMF PPP weights
Source: OECD Economic Outlook 100 (November 2016), TD Economics.

Table 2: Deviation from OECD assumptions on the contribution of fiscal stimulus measures to global annual GDP growth, percentage points.				
	% Share of Global Growth*	2016	2017	2018
China	17.3	0.0	-0.0	-0.1
United States	15.8	0.0	-0.1	-0.3
Euro Area	12.0	0.0	0.0	0.0
Total Global	45.0	0.0	-0.2	-0.3

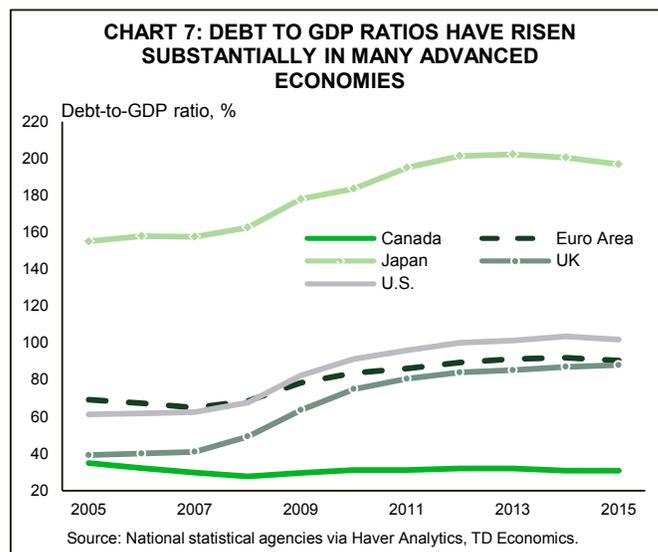
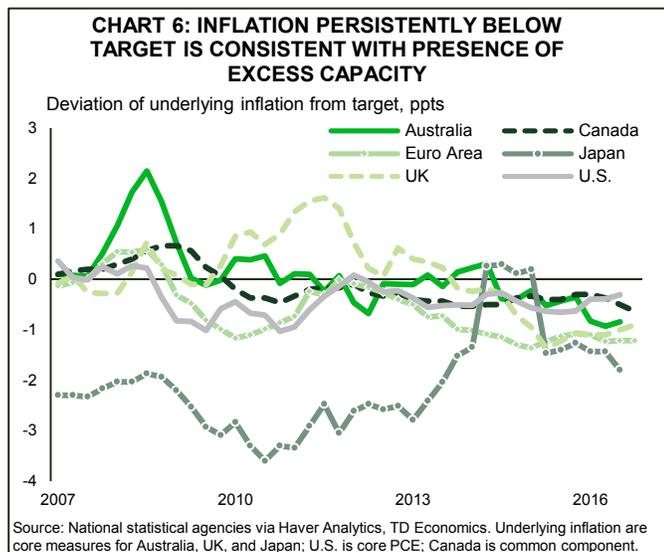
* Using 2015 IMF PPP weights
Source: OECD Economic Outlook 100 (November 2016), TD Economics.

ppts per year through 2018. Infrastructure spending plans in China is responsible for the majority of the support to global growth in 2017. However, the contribution to growth is evenly split between China and the Euro Area in 2018, with the U.S. contributing a small positive amount as well.

Uncertainties abound on fiscal impulse estimates

A key factor working against a more constructive boost to fiscal stimulus is the continued firming in global economic growth, which coincides with the recovery in commodity prices. As such, fiscal authorities may no longer feel the urgency to undertake stimulus to boost economic growth, fearing the impact that new spending or tax cuts may have on already elevated debt-to-GDP ratios (Chart 7). While government bailouts and income support programs explain much of the recent rise in debt-to-GDP ratios, the very gradual recovery in economic activity following the financial crisis has not helped matters – an outcome that could have been mitigated by governments increasing rather than reducing spending after 2009. In the long-run, the debt-to-GDP ratio acts as a binding fiscal constraint on government spending plans, as lenders willingness to finance deficits ultimately determines the cost of debt, and therefore the proportion of the government’s budget that must be allocated to service this debt.

Furthermore, the economic benefits from increased spending are likely to be more subdued given the stage in the economy cycle many advanced economies are at. Estimates of fiscal multipliers tend to suggest that in times when excess capacity persists, a dollar spent yields more than a dollar in economic activity.⁴ But in the opposite case, when the economy is operating near or above capacity, an



additional dollar spent by fiscal authorities is likely to yield less than a dollar in economic activity. In some advanced economies, such as the U.S., the economy has absorbed a lot of the excess capacity that materialized during the Great Recession, and a fiscal program could end up adding more to the debt stock without materially boosting economic activity.

Fiscal space abundant in advanced economies, but...

Not all economies should be worried about rising debt-to-GDP ratios when contemplating government stimulus. Our analysis shows that a number of countries enjoy considerable fiscal space that could be used to boost economic growth without posing risks to longer-term debt sustainability, given the current low interest rate environment and the outlook for nominal GDP growth.

Before we dive into the details, we have to be transparent about a few things. For one, fiscal space is a somewhat vague term that, for the purpose of this report, simply reflects the gap between the current and estimated theoretical ceiling of a country’s debt-to-GDP ratios. While conceptually simple, there is no real consensus among economists on the definition of fiscal space. Its definition depends on the methodology used to calculate it.

Secondly, the fiscal ceiling estimated for each country is a function of government borrowing costs and trend nominal income growth. As such, it is very sensitive to changes in these variables for each country. Although many advanced economies seem to have a large amount of fiscal space at their disposal in the current low interest rate environment, this space could easily disappear if risk premiums were to suddenly rise, raising long-term borrowing costs, thereby reducing the fiscal ceiling.

For those who are more technically inclined, the details of our estimation methodology of the fiscal ceiling and fiscal space calculations can be found in the Appendix of this report. To reiterate, our definition of fiscal space is the difference between a country’s current and estimated maximum debt-to-GDP ratio. The estimated maximum debt-to-GDP ratio is also simply referred to as the fiscal ceiling in this report.

A summary of the results of our fiscal space analysis for seven of the largest OECD countries is presented in Chart 8 (fiscal space estimates for all 23 OECD countries included in the analysis are presented in Chart A.3 in the Appendix). As we cautioned earlier, the expected uptick in long-term interest rates this year and next reduces the available fiscal space slightly. Note that, historically, advanced economies have on average maintained fiscal space equating to 127% of GDP as a cushion against economic shocks. This average is not very meaningful on its own, so we divide the distribution of fiscal space estimates into three parts in Chart 8: low fiscal space (bottom), Goldilocks Zone (middle), and ample fiscal space (top).⁵

What does this all mean? Well, these results certainly do not give license to any government to spend until it hits its estimated maximum. For one, the maximum depends heavily on the outlook for government borrowing costs and nominal GDP growth, and the projected evolution of the debt-to-GDP ratio. To be clear, aside from the usual risk of forecast error, this analysis lacks an explicit consideration of how government finances are expected to evolve over time, a major drawback of this methodology.

Moreover, Chart 8 shows that South Korea has the largest estimated fiscal space at the end of 2015, while Japan

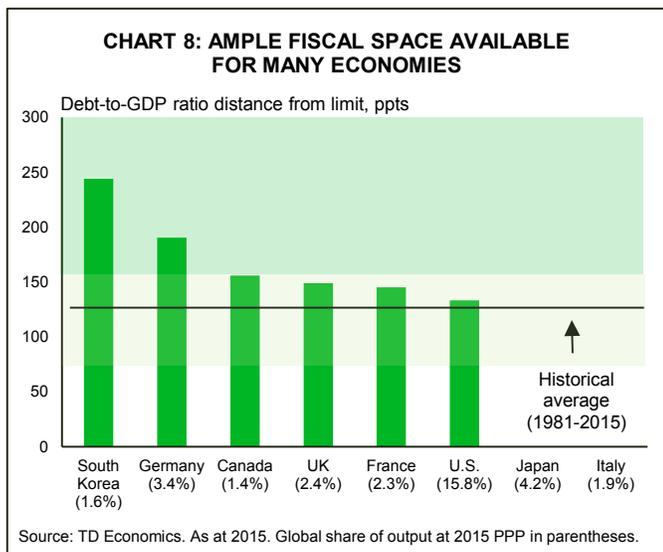
and Italy have no fiscal space. Both Canada and the U.S. fall in the Goldilocks Zone; they each have enough space to engage in some fiscal stimulus without elevating its debt and debt service costs such that they become onerous, but they should lean toward maintaining a sufficient buffer as a means to combat any sudden deterioration in economic growth or a spike in interest rates. It is also worth mentioning that the reasons for Italy and Japan having no fiscal space is that, despite interest rates in these nations holding at historic lows, they are well above the trend rate of nominal income growth in each economy, suggesting the need for fiscal consolidation in these nations to come sooner rather than later.

Perhaps a better way to interpret these results is to consider them in a context of which economies are likely to benefit most from net fiscal injections over the near term. To do so, we group the countries by fiscal space and estimated output gaps as of 2016 (Chart 2 on page 2). The idea is that countries operating below capacity are likely to benefit more from government stimulus measures than countries operating at or above full capacity. This suggests that of the eighteen economies that we identify as having adequate fiscal space, fourteen are operating below full capacity and could benefit more from an increase in government spending (countries in the top left quadrant in Chart 2).⁶ In this context, both the Canadian and U.S. economies would benefit from some additional stimulus, although the smaller output gap in the U.S. would signal the need for fiscal authorities to be more selective in their spending in order to ensure that they get the economic return sufficient to mostly offset the corresponding rise in debt.

It’s clear that not all countries would necessarily benefit by increasing fiscal injections. Those in the upper right hand quadrant of Chart 2 (New Zealand, Germany, and Ireland), are estimated to be operating at or above full capacity, implying that an additional dollar of government debt would do little to boost economic activity. And Spain, a country that is estimated to have substantial economic slack, has very little ability to utilize a fiscal stimulus program to boost economic activity since its borrowing costs have only recently come down from the high levels observed during the 2010-2012 euro crisis.

Ultimately, quality matters more than quantity

While our analysis reveals that there is an adequate amount of space in the majority of selected advanced economies to accommodate an unfunded increase in government spending or tax reductions, the design of any proposed stimulus program is very important. Put another way, it’s



not the size of the spend, rather what the money is spent on that matters most. Economists generally agree that stimulus spending should favour initiatives that enhance the supply side of the economy and not initiatives which provide only a short-term boost to income growth. Supply-enhancing stimulus includes increased spending on productivity enhancing infrastructure, and educational programs that serve to enhance the stock of human capital. These measures are broadly viewed as having a larger return (or higher multiplier) in terms of output for each dollar spent than other measures, and therefore reduces the likelihood of deficits becoming structural.⁷

Some fiscal stimulus plans currently under consideration by governments, such as the package of measures proposed by the new U.S. administration, involve reductions in personal and corporate income taxes, as well as regulatory reforms. For the U.S. in particular, there is a great scope for these changes to fundamentally alter the competitive landscape for businesses. The average statutory corporate tax rate in the OECD is 25.5%, while the going rate in the U.S. is 35%. Any move to reduce the corporate tax rate to or below the OECD average would significantly improve the global competitiveness of U.S. firms.⁸

However, the estimated economic impact of tax reforms can vary in a few ways. First, tax cuts tend to be more expansionary when an economy is operating below capacity. The U.S. economy is expected to absorb its remaining excess capacity by the end of 2018, making tax cuts slightly less stimulative to economic growth than they would be otherwise. Moreover, tax reforms that shift the burden away from investment toward consumption, such as the proposed border adjustment tax currently being considered in the U.S., tend to improve the long-term productive potential of the economy. But there is a lot of pushback against this proposal, particularly from import-intensive industries, such as retailers and oil refiners, which makes it a proposal that may be postponed or scrapped altogether.

Tax reforms are also much easier said than done. Negotiations will be challenging but if the administration and Congress can reach an agreement, these reforms, together with a material commitment to renew public infrastructure, could go a long way to strengthening the longer term growth potential of the U.S. economy, with the potential to create positive spillovers to the global economy as well.

ENDNOTES

- 1 OECD estimates of the fiscal impulse are derived from model simulation in their large general equilibrium macroeconomic model (NiGEM). Specifically, they assume paths for government consumption and investment for China, the Euro Area, and the United States – the world’s largest economies – based on government communications as of November 2016. For more details see OECD Economic Outlook Volume 2016, Issue 2: <http://www.oecd.org/eco/outlook/general-assessment-of-the-macroeconomic-situation-oecd-economic-outlook-november-2016.pdf> ↑
- 2 The OECD assumes the following:
 - Government consumption and investment each rise by 0.25% relative to baseline GDP in 2017 and 2018.
 - Personal income tax reforms result in a reduction in government revenue of 0.5% of GDP in 2017 and 2018.
 - Corporate tax reforms reduce tax revenue by 0.75% of GDP in 2018, which is a reflection of the average corporate tax rate from 35% to just over 10%.
 - Multiplier effects help boost household consumption and business investment such that the overall impact on domestic GDP growth is a 0.4% addition to 2017 GDP growth, and +0.8% on 2018 GDP growth. Spillovers to major trading partners result in a boost to global growth of about 0.1% and 0.3% in 2017 and 2018, respectively.See Box 1.1 in OECD Economic Outlook Volume 2016, Issue 2: <http://www.oecd.org/eco/outlook/general-assessment-of-the-macroeconomic-situation-oecd-economic-outlook-november-2016.pdf> ↑
- 3 Comments late last year by President Xi Jinping suggest that the continuation of policies that exacerbate financial stability risks for the sake of arbitrary growth targets should be reconsidered. See Bloomberg News. “President Xi Open to Growth in China falling below 6.5%”. December 23, 2016. <https://www.bloomberg.com/news/articles/2016-12-23/xi-said-to-express-openness-to-growth-below-6-5-as-debt-climbs-ix1qz3tz> ↑
- 4 See Batini et al (2014) for a comparison of fiscal multipliers at different stages of the business cycle.
Batini, N, Eyraud, L. and Forni, L (2014). Fiscal Multipliers: Size Determinants, and Use in Macroeconomic Projections. International Monetary Fund, Fiscal Affairs Department. <https://www.imf.org/external/pubs/ft/tnm/2014/tnm1404.pdf> ↑
- 5 This segmentation was done based on analysis of the historical distribution of fiscal space estimates of all 23 countries in our sample. ↑
- 6 In Chart 2, in addition to showing fiscal space relative to the historical average, we also identify three different regions. Countries falling in the top third (darker green) region are considered to have the most fiscal space, while those in the middle third straddling the historical average ratio have adequate fiscal space but should be more selective on stimulus measures. Those in the bottom third of the chart have insufficient fiscal space to protect against a sudden shock to growth or interest rates. ↑
- 7 However, a big caveat here is that the identification and differentiation of shocks to output from government spending versus tax cuts is very difficult to tease out empirically given the concurrent nature of these policies. An excellent overview of the literature on fiscal multipliers was published by the IMF (2014).
Batini, N, Eyraud, L. and Forni, L (2014). Fiscal Multipliers: Size Determinants, and Use in Macroeconomic Projections. International Monetary Fund, Fiscal Affairs Department. <https://www.imf.org/external/pubs/ft/tnm/2014/tnm1404.pdf> ↑
- 8 For a detailed explanation and estimates of the economic impact of the proposed tax reforms by the new U.S. administration, see “Answering the Big Questions on U.S. Tax Reform” by TD Economics.
Marple et al (2017). “Answering the Big Questions on U.S. Tax Reform”. TD Economics, February 27, 2017. https://www.td.com/document/PDF/economics/special/US_tax_reform.pdf ↑

Appendix

Methodology for estimating fiscal space in advanced economies

There are two popular methods of estimating fiscal space. The most popular method relies on the notion that once a nation breaches the theoretical upper limit of their government gross debt-to-GDP ratio, they lose market access. This theoretical upper limit of the debt-to-GDP ratio is calculated from an equation that utilizes the differential between the interest rate and nominal GDP growth, and the estimated historical relationship that describes the reaction of the primary budget balance to the debt-to-GDP ratio. Fiscal space is simply the difference between the estimated upper limit and the current or projected government debt-to-GDP ratio of an economy. This train of thought relies on a non-linear risk premium that rises sharply once the debt-to-GDP ratio approaches its upper limit.^a One major deficiency of this method is that the anticipated evolution of the primary balance is not explicitly accounted for, and structural changes in the economy that could result in persistent budget deficits, such as population aging, are generally ignored.^b

The second method measures fiscal space from a long-term fiscal sustainability perspective. This generally utilizes the concept of measuring the tax gap, or the differential between the current and estimated long-term sustainable ratio of tax revenues to GDP. The long-term sustainable tax rate is one in which would keep the debt-to-GDP ratio unchanged at the end of the period evaluated. This approach generally is undertaken in a general equilibrium framework, and applies only when the interest rate for government debt is expected to exceed the rate of economic growth. This implies that this method would be inappropriate in the current environment of interest rates being below economic growth, which would result in the projection of persistent budget deficits.

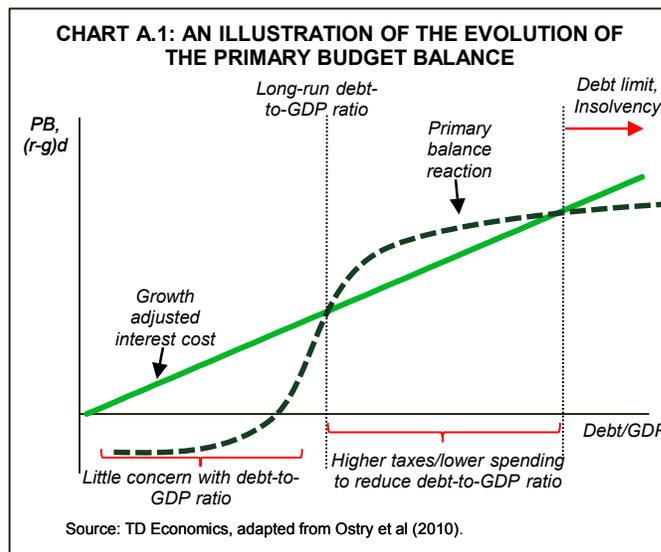
Keeping with the definition and methodology popularized by the IMF and Moody's Analytics, we define fiscal space as the distance between the current and sustainable maximum debt-to-GDP ratio.^c While the results are conceptually easy to interpret, there are some pitfalls to this approach. For one, the estimation of the theoretical maximum debt-to-GDP depends on numerous factors, with data gaps requiring some assumptions on the historical trend for some variables. Moreover, the expected evolution of the primary balance does not directly feed into the fiscal space calculation, only in the estimation of its historical evolution given the debt-to-GDP ratio. These pitfalls are not unusual when conducting panel regression analysis but we acknowledge that these as factors could act to bias our results or limit their replication.

The estimation of fiscal space is a two-step process. The first step in this exercise is to empirically estimate a reaction function for the primary budget balance, PB (Equation 1):

$$\text{Equation (1): } PB_{i,t} = \beta_1 D_{i,t-1} + \beta_2 D_{i,t-1}^2 + \beta_3 D_{i,t-1}^3 + \gamma X_{i,t} + \mu_i + \varepsilon_{i,t} .$$

The primary budget balance evolves with the debt-to-GDP ratio, D , while controlling for a number of factors, X , that could explain abrupt moves in the primary budget balance unrelated to market concerns about a country's debt-to-GDP ratio. Examples of such factors include the state of the business cycle, the government expenditure gap, trade openness, population aging, and fiscal rules.^d In our analysis, we estimate a more parsimonious model than that estimated in Ghosh et al (2013), Zandi et al (2011), or Ostry et al (2010), controlling only for the business cycle via the inclusion of the output gap.^e

Once this reaction function is identified, the next step requires estimation of the maximum debt-to-GDP ratio given the historical differential between the nominal interest rate on government debt and the nominal growth rate for each economy included in the panel.^f The logic here is quite simple and is sketched out in Chart A. 1:



- If the nominal interest rate is growing at or below the rate of economic growth, then the cost of financing a deficit is affordable and is unlikely to result in a reduction in government expenditures. In this scenario, governments would not be concerned with a market reaction from a rise in the debt-to-GDP ratio from a primary budget deficit, and the debt-to-GDP ratio gradually rises toward the long-run average debt-to-GDP ratio.

- However, if the nominal rate of interest is above the rate of economic growth then the cost of servicing new debt required to finance primary budget deficits acts as a drag on government finances, motivating a cutback in spending or increases in taxes by the government in order to reduce the government debt-to-GDP ratio back toward its long-run average. A failure of a government to reduce the primary budget balance could result in a rise in the debt-to-GDP ratio beyond the maximum limit deemed sustainable by the market, resulting in government insolvency and a loss of market access.

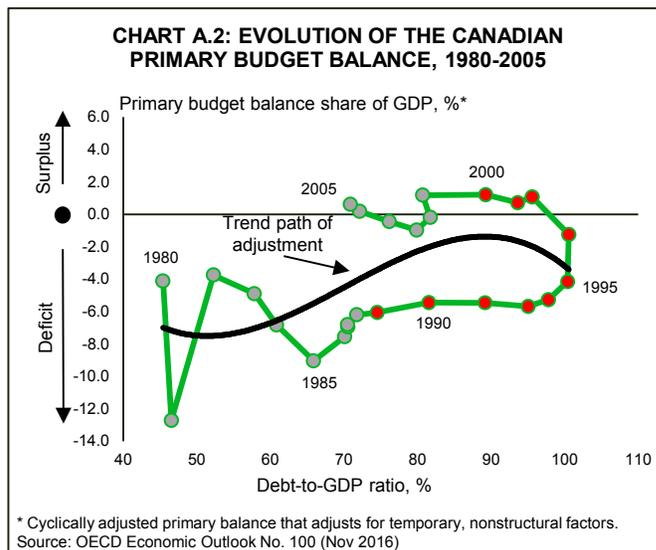


Chart A.2 provides a good example of this process using the Canadian experience of fiscal consolidation in the 1990s. It illustrates how the government’s cyclically adjusted budget balance evolved as Canada’s gross debt-to-GDP ratio rose to new highs. While this was happening, nominal borrowing costs (not shown) were rising, making it more onerous for the Canadian government to finance deficits. By 1990, nominal interest rates exceeded the historical pace of nominal income/economic growth to such a degree that the economic cost of an additional dollar of government spending outweighed any benefits, implying that there was no fiscal space i.e. the debt-to-GDP ratio was at or above its sustainable threshold (years with red dots in Chart A.2). In fact, in order to reduce the probability of default, nearly a decade of fiscal consolidation was necessary until the debt service ratio was able to fall enough to restore some fiscal space.

The key to estimating fiscal space for a nation begins with the black trend line in Chart A.2. At the global level, this trend-line maps the evolution of the primary budget balance to changes in the debt-to-GDP and debt service ratios across all advanced economies, and serves as the basis for the calculation of the debt limit, which is found along the concave portion of said trend line.

The relationship between the debt-to- GDP ratio and the differential between nominal interest rates and economic growth is described by Equation 2:

$$\text{Equation (2): } (R_{i,t} - G_{i,t})D_{i,t}^{max} = \beta_1 D_{i,t}^{max} + \beta_2 D_{i,t}^{max 2} + \beta_3 D_{i,t}^{max 3} + \varphi_i,$$

where a country’s maximum debt-to-GDP ratio, D^{max} , depends on the differential between the nominal interest rate, R , and a moving average of nominal GDP growth, G . Solving equation (2) for D^{max} by utilizing the coefficients estimated in equation (1) results in the estimate of the maximum debt-to-GDP ratio at time, t , for each country, i .

Fiscal space is then calculated by subtracting the current level of the gross government debt-to-GDP ratio from the estimated debt limit (countries with the current debt-to-GDP ratio exceeding the estimated limit are assumed to have zero fiscal space). Fiscal space estimates for all 23 advanced economies in our sample are available in Table A.1, and in Chart A.3 below.

Endnotes to the Appendix

- a. For a deeper discussion, see Ghosh et al. (2013), and Nerlich, C. and Reuter, W.H. (2015).

Ghosh, A.R., et al. (2013). “Fiscal fatigue, fiscal, space, and debt sustainability in advanced economies”. *The Economic Journal*, vol. 123: F4-30.

Nerlich, C. and Reuter, W.H. (2015). “Fiscal rules, fiscal space and procyclical fiscal policy”, ECB Working Paper No. 1872/ December 2015. ↑

- b. See in Botev, J. et al. (2016) for a deeper discussion of the two main methods, and a discussion of a third method that uses the Laffer curve framework.

Botev, J. et al.(2016). “A re-assessment of fiscal space in OECD countries”. OECD Economics Department Working Papers, No. 1352 (November, 23 2016). ↑

- c. See Ostry et al. (2010) and Zandi, M. et al. (2011).

Ostry et al. (2010). “Fiscal Space”. IMF Staff Position Note, SPN/10/11 (September 1, 2010). <http://www.imf.org/external/pubs/ft/spn/2010/spn1011.pdf>

Zandi, M. et al. (2011). “Special Report: Fiscal Space”. Moody’s Analytics, December 20, 2011. <https://www.economy.com/mark-zandi/documents/2011-12-13-Fiscal-Space.pdf> ↑

- d. Fiscal rules were not found to be significant in the estimation of the historical evolution of the primary budget with the debt-to-GDP ratio in the EU (Equation 1), but they do help explain the evolution of fiscal space (Equation 3) in Nerlich C. and Reuter, W.H. (2015). ↑
- e. The selection of the more parsimonious model reflects the fact that the inclusion of more control variables did not yield material changes in the estimated coefficients over the sample period, 1981 – 2015. ↑
- f. A total of 23 nations were included in the panel estimation: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, South Korea, Netherlands, New Zealand, Norway, Portugal, Slovakia, Slovenia, Spain, Sweden, U.S., and UK. ↑

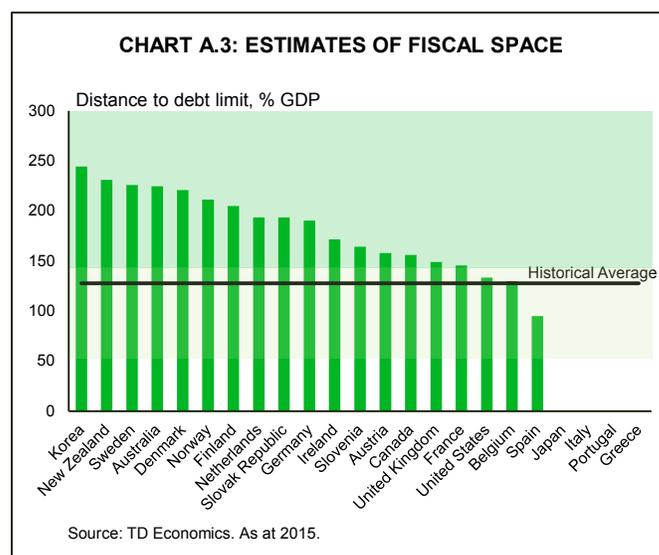


Table A.1: Fiscal space estimates by country

	2015 PPP Share of Global GDP, %	2015 Debt-to-GDP Ratio, %	Debt Limit, % of GDP	Fiscal Space, % of GDP
United States	15.80	105	239	134
Japan	4.24	248	NA	0
Germany	3.38	71	261	190
United Kingdom	2.37	89	238	149
France	2.34	96	242	145
Italy	1.91	133	NA	0
Korea	1.62	38	282	244
Canada	1.43	91	247	156
Spain	1.42	99	194	95
Australia	1.00	38	262	225
Netherlands	0.74	65	259	194
Belgium	0.43	106	236	130
Sweden	0.42	43	269	226
Austria	0.36	86	244	158
Norway	0.31	28	239	211
Ireland	0.27	79	250	172
Portugal	0.25	129	NA	0
Greece	0.25	177	NA	0
Denmark	0.23	46	266	221
Finland	0.20	63	268	205
New Zealand	0.15	30	261	231
Slovak Republic	0.14	53	247	194
Slovenia	0.06	83	247	164

Source: TD Economics.

Table A.2: Panel Regression Estimates

Dependent Variable: PBALY_
 Method: Panel Least Squares
 Date: 01/25/17 Time: 06:08
 Sample: 1981 2015
 Periods included: 35
 Cross-sections included: 23
 Total panel (unbalanced) observations: 622

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.645510	0.754494	-0.855553	0.3926
DEBTGY_(-1)	-0.104273	0.027658	-3.770080	0.0002
DEBTGY_(-1)^2	0.001159	0.000289	4.010548	0.0001
DEBTGY_(-1)^3	-3.12E-06	8.25E-07	-3.783002	0.0002
YGAP_	0.064774	0.048349	1.339715	0.1808

Effects Specification			
Cross-section fixed (dummy variables)			
R-squared	0.389630	Mean dependent var	-2.868908
Adjusted R-squared	0.362958	S.D. dependent var	3.397474
S.E. of regression	2.711690	Akaike info criterion	4.875459
Sum squared resid	4375.191	Schwarz criterion	5.067886
Log likelihood	-1489.268	Hannan-Quinn criter.	4.950246
F-statistic	14.60841	Durbin-Watson stat	0.347884
Prob(F-statistic)	0.000000		

Estimation Notes:

- Changes to sample sizes resulted in often dramatic different coefficient estimates. We caution that all estimates reported in this report are specific to the sample period considered.
- The inclusion of other control variables in the estimation resulted in changes in the signs of the coefficients that no longer allowed for positive solutions for the maximum debt-to-GDP ratio for a number of economies. We hope to explore this issue further in our internal research.

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