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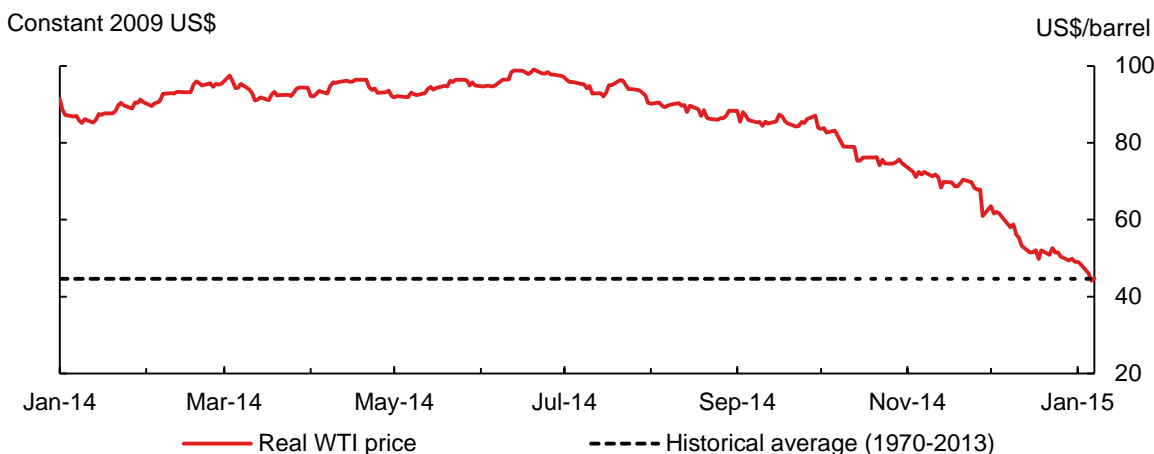
## Drilling Down—Understanding Oil Prices and Their Economic Impact

### Introduction

Good afternoon. I want to thank the Madison International Trade Association for inviting me to this annual outlook event. I'm happy to be back in America's Midwest, a region that has many important ties to Canada. Your economy has a lot in common with ours, and it is affected by many of the same global forces.

The dramatic drop in oil prices over the past few months is certainly a major new force in the world economy today (**Chart 1**). Oil prices affect almost everyone, for better or for worse. Petroleum products are a big slice of families' budgets and a significant cost of production for a myriad of industries.

### Chart 1: Oil prices have declined dramatically



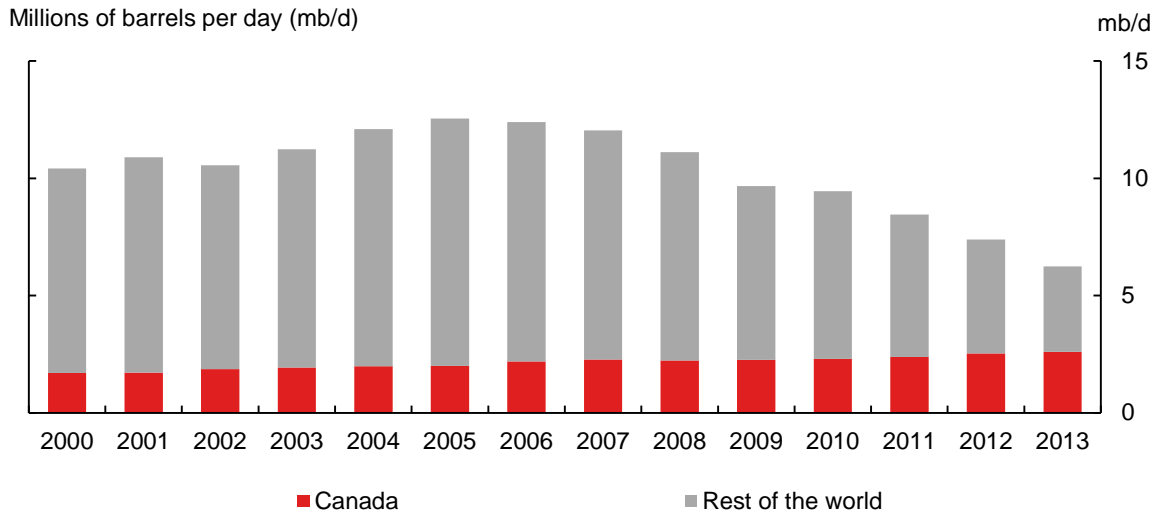
Notes: Nominal prices deflated using the U.S. GDP deflator. WTI = West Texas Intermediate  
Sources: U.S. Bureau of Economic Analysis and Bank of Canada calculations

Last observation: 7 January 2015

Oil is especially important to both of our countries. In Canada, oil extraction now accounts for about 3 per cent of our GDP and crude oil about 14 per cent of our exports. The United States is still the world's largest consumer of oil and, with the emergence of shale-oil production, has become the biggest producer too.

Oil is also at the heart of Canada-U.S. economic relations. The United States is the market for close to 100 per cent of Canada's oil exports. Our oil exports to the United States have been growing strongly, even as the United States has been reducing its overall reliance on imported oil. As a result, Canadian oil makes up about 40 per cent of U.S. crude oil imports, and that share is expected to grow over the years ahead (**Chart 2**). This trade is evident here in Wisconsin; one example is the terminal of the Alberta Clipper pipeline in Superior and the cluster of industries surrounding it.

### Chart 2: Canada's share of U.S. oil imports is increasing



Source: U.S. Energy Information Administration

Last observation: 2013

As I will discuss, the rapid expansion of oil production in both of our countries has been a real game-changer in the global oil industry.

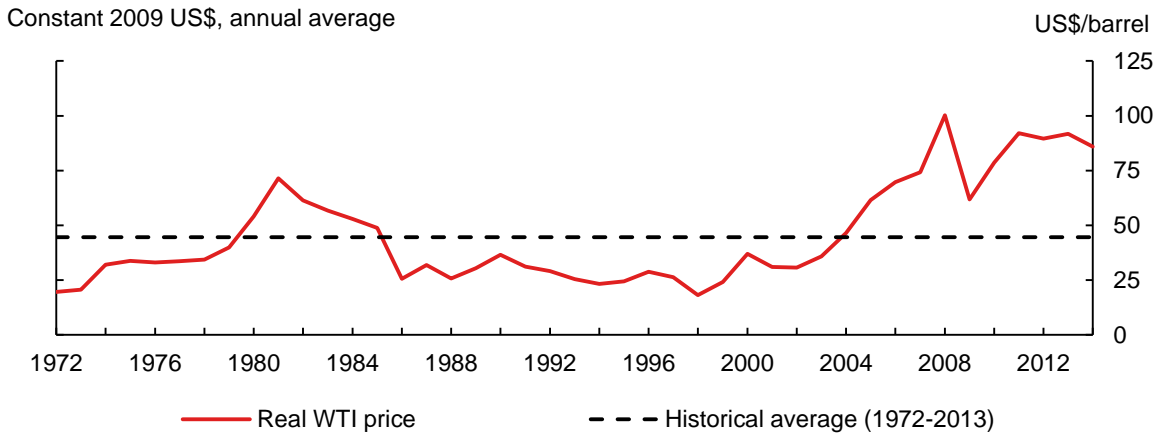
World oil markets have been turbulent over the past several months. In the next few minutes, I will describe the fundamental economic forces that are at play. I will also highlight the uncertainties surrounding both those forces and the other factors affecting oil prices. I will then discuss how lower oil prices affect the global, U.S. and Canadian economies—who wins and who loses?

### The Commodities Super-Cycle

Over the past decade and a half, world oil prices, and commodity prices in general, experienced a sustained upward movement, often called the “super-cycle” (**Chart 3**). By far the most important reason for this long-term trend is the rising demand for these products stemming from rapid economic growth in China and other emerging-market economies.<sup>1</sup>

It would be hard to exaggerate the importance of the integration of China, India and other emerging economies into the world economy. The economy of China alone doubled in size between 2007 and 2013, an expansion built on the production of goods requiring energy to manufacture. With rising living standards, Chinese households have been able to afford cars and other products that consume energy. China's oil consumption followed suit, doubling over the past decade to about 10 million barrels a day and making the country the world's second-largest consumer of crude oil.

**Chart 3: The rise in oil prices since early 2000s is known as a “super-cycle”**



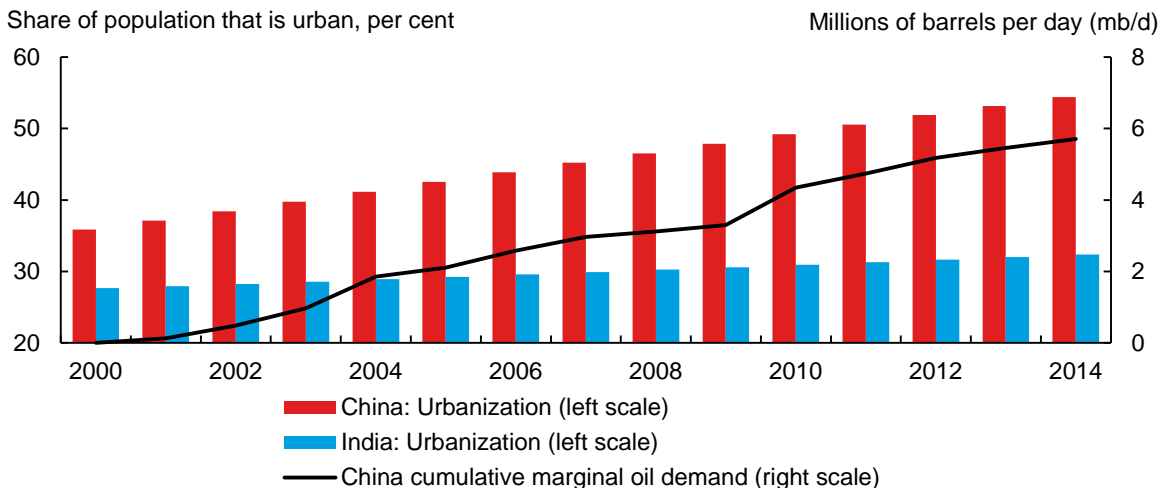
Notes: Nominal WTI prices deflated using the U.S. GDP deflator.  
Sources: U.S. Bureau of Economic Analysis and Bank of Canada calculations

Last observation: 2014

This growing demand for energy put continued upward pressure on oil prices. Over time, the industry responded by stepping up exploration, developing higher-cost sources, and making some major technological breakthroughs.

With the recent drop in oil prices, some commentators have been quick to declare that the super-cycle is finished, but these underlying forces still have a long way to run (**Chart 4**). The urbanization and industrialization of emerging economies and the growth of their middle classes is far from complete. China’s urban population has grown by about 300 million people since 2000 but, even now, only 55 per cent of its people live in urban areas, compared with more than 80 per cent for North America and advanced Asian economies such as Japan and Korea. According to some estimates, another half-billion people in China and India alone will move to cities and likely join a growing middle class over the next two decades. As long as these trends continue, they will add to world demand for oil.

**Chart 4: Urbanization in emerging economies helps explain rising oil demand**



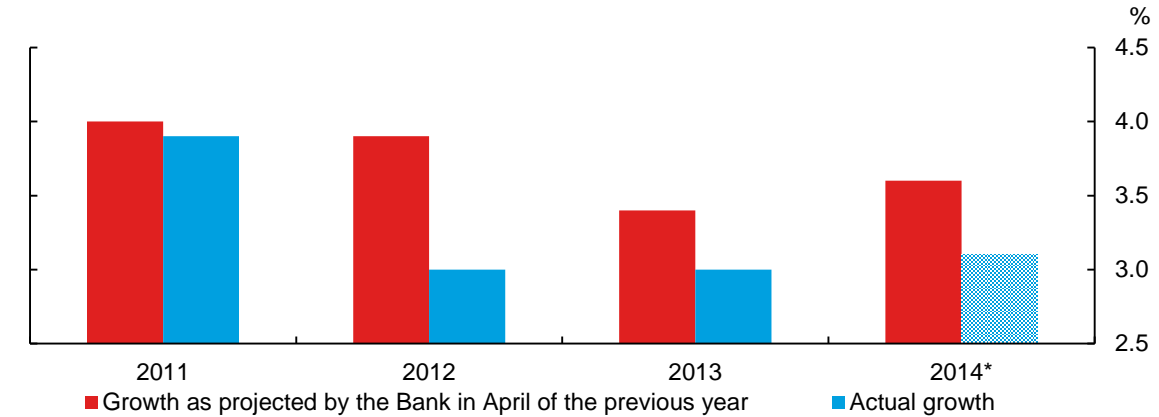
Sources: International Energy Agency, United Nations and Bank of Canada calculations

Last observation: 2014

## The Disappointing Global Economy

Although the forces underlying the commodities super-cycle are still at work, demand for oil is likely to expand on a slower track than in the past.<sup>2</sup> Global economic growth has repeatedly fallen short of expectations in the aftermath of the financial crisis of 2007–08 (**Chart 5**).

**Chart 5: Global economic growth has disappointed**



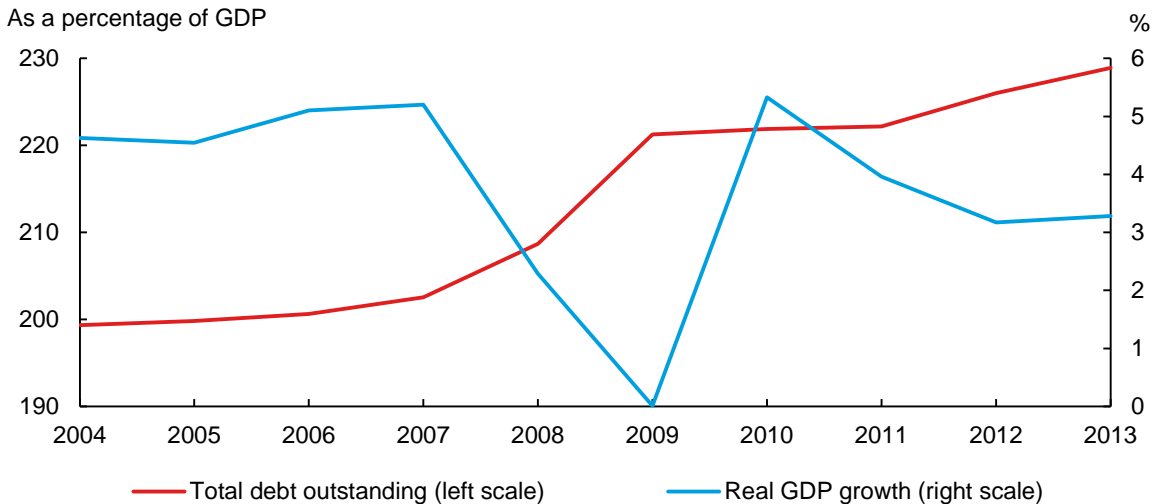
Note: Actual growth for 2014 is a forecasted value.  
Source: Bank of Canada

Last data plotted: 2014

That disappointing pattern, in turn, reflects two sets of factors.

First, the fallout from the global financial crisis turned out to be much more prolonged and severe than most economists expected. Even now—seven years later—there are important headwinds to global economic growth. Public and private indebtedness at a global level is at a historic high, and there is also the lingering uncertainty resulting from the bitter experience of the past few years (**Chart 6**).

**Chart 6: Increased leverage and slowing global growth undermine debt-service capacity**



Note: Total debt outstanding encompasses household, private non-financial corporate and gross government debt as a percentage of nominal GDP. Total debt outstanding and real GDP growth are calculated using GDP shares based on International Monetary Fund (IMF) estimates of the purchasing-power-parity (PPP) valuation of selected countries' GDPs constituting three-quarters of global GDP.

Sources: Bank for International Settlements; IMF, *World Economic Outlook*, October 2014; and Bank of Canada calculations

Last observation: 2013

Still, global economic growth is picking up as progress is being made on deleveraging and as confidence improves. The most recent Bank of Canada projections show a global growth rate of 3 1/2 per cent this year and next, compared with 3 per cent last year. The recovery is particularly robust in the United States, where the policy response to the financial crisis was more timely, aggressive and sustained than in other major advanced economies.

Second, certain important structural factors suggest that, over the longer term, world economic growth will be slower than in the past. One important reason is demographics: aging populations in advanced and some emerging economies. Another is the maturing growth of emerging economies such as China: it is probably impossible for China to sustain economic growth at the double-digit rates of the 2000s—although its growth rate is still expected to stabilize at an enviable annual pace of 7 per cent for the foreseeable future.

Both sets of factors suggest lower global economic growth than before the crisis.

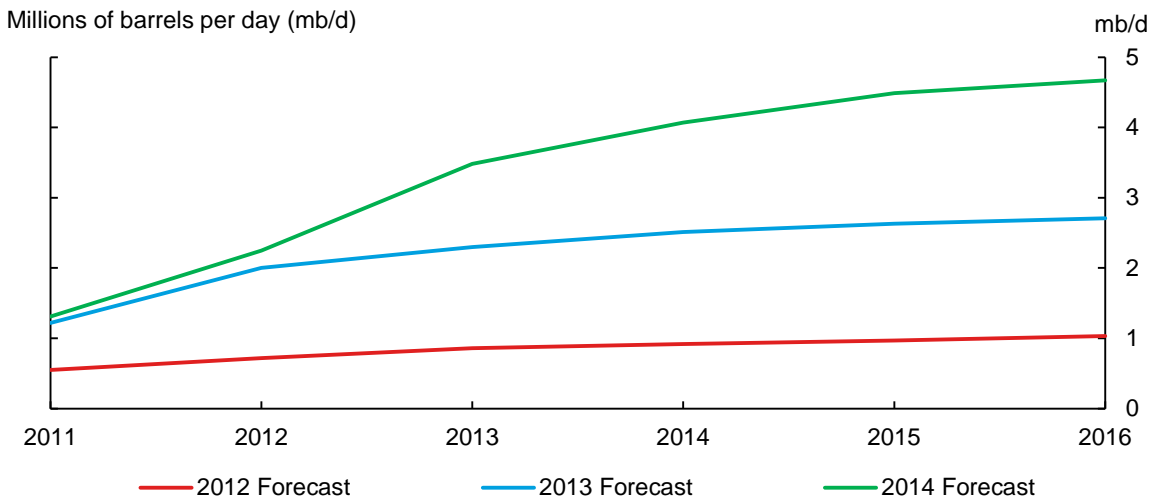
Disappointing global growth, and the resulting slower growth of energy demand, are a significant part of the background to the recent movement in oil prices. But, in our view, increased supply probably played an even greater role.

## The Hog Cycle

It's only a slight exaggeration to say that, when oil is worth \$100 per barrel, there is oil everywhere.

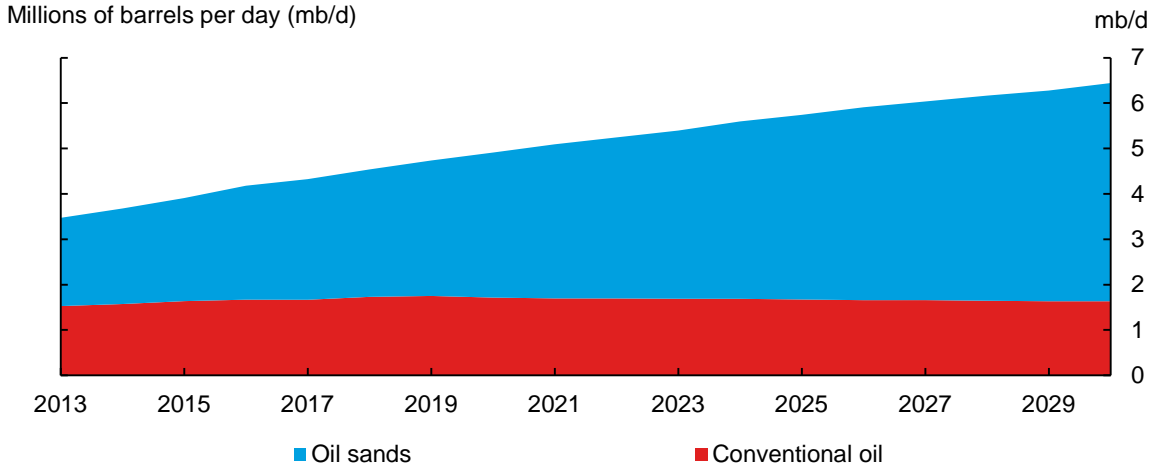
The U.S. oil industry is a case in point (**Chart 7**). The so-called “shale revolution” that started six years ago has been nothing short of astounding. In 2008, the production of shale oil was almost non-existent. Today, the sector produces about 4 million barrels a day and, before the recent drop in prices, was on track to increase its output to almost 4.8 million barrels a day in 2020.

### Chart 7: Forecasts of U.S. shale oil production have consistently been revised upward



We've also seen a powerful supply response to high prices in Canada. Oil sands production rose fivefold between 1993 and 2014, to 2.3 million barrels per day, and now accounts for more than 60 per cent of Canada's crude production. Between 2006 and 2013, investment in the oil sands more than doubled to over \$30 billion (Chart 8).

**Chart 8: Canadian production of crude oil is projected to rise**

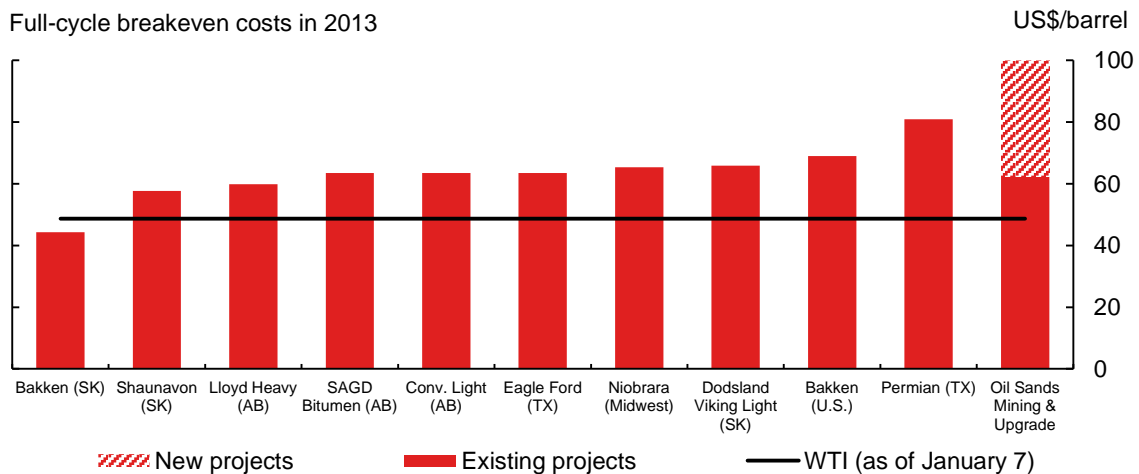


Source: Canadian Association of Petroleum Producers

Forecast made: June 2014

Two distinguishing features of unconventional oil affect the dynamics of the market. First, the extraction cost of most of the new oil is relatively high. A barrel of shale oil costs between \$40 and \$80 to extract, depending on the project; oil from Canada's oil sands costs closer to \$60 to \$100 a barrel (Chart 9). In many cases, this is mainly a reflection of the upfront cost of investment and exploration, rather than the continuing cost of keeping oil flowing from existing installations. Of course, these costs may also vary over time with changing technology and competitive forces.

**Chart 9: Total costs per barrel over the life of a project determine its viability**



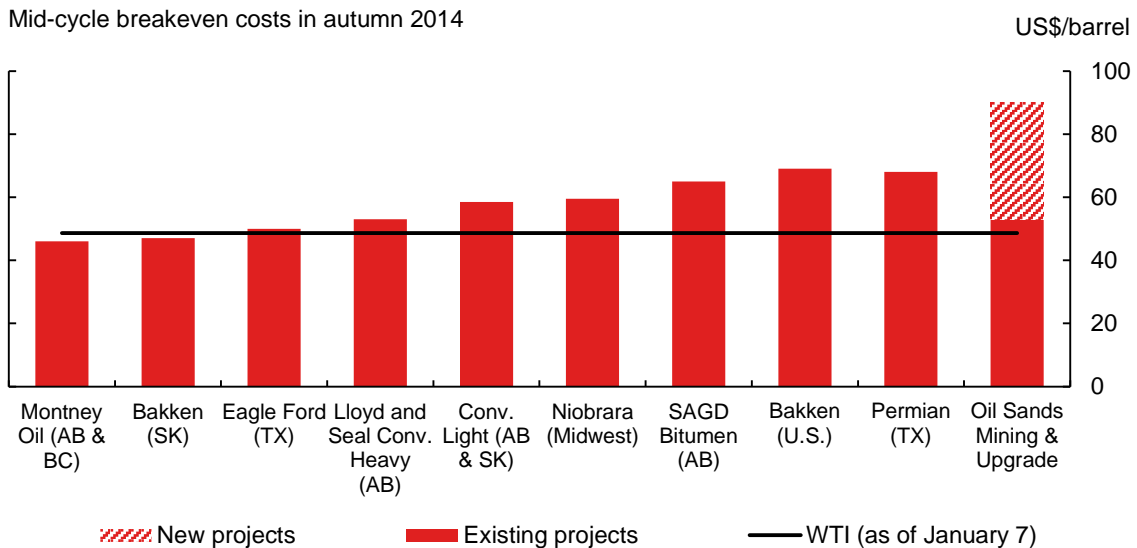
Source: Scotiabank Economics

Second, it takes time and, in some cases, major investments, to bring a new supply of oil on stream. When demand increased over the past several years, supply could not be expanded right away. Instead, prices shot up, creating incentives to explore, innovate with extractive technology and invest in new facilities. Over time, these activities have delivered an outsized supply response, which has been driving prices down.

So what happens next? When the price drops below the all-in cost of production, and is expected to stay there, that discourages further exploration and investment. Indeed, in recent weeks, a number of oil companies have announced that they are scaling back investment. This is important, since new investment is needed to offset naturally occurring declines in production in existing fields.

But before existing production is actually taken off stream, the price would have to drop a lot further—below the short-run marginal cost (sometimes referred to as the “cash cost”) (Chart 10). Except for some smaller companies that may cut output more quickly as their access to financing is restricted, producers are likely to take time to adjust, especially if they have hedged against price movements. In all, it may take quite some time before supply and demand are brought back into balance—although technological change may enable some suppliers to adjust their production more quickly than in the past.

**Chart 10: Short-run marginal costs determine current production**



Note: Mid-cycle breakeven costs exclude "up-front" costs such as initial land acquisition, seismic and infrastructure costs.  
Source: Scotiabank Economics

It should not be surprising, then, if oil prices overshoot their trend in one direction or the other. Cycles like this are typical of markets where both supply and demand are inelastic in the short run, and where it takes time for the long-run supply response to materialize.

Indeed, the basic forces at work are the same as in the hog cycle—a cycle that economists learned to analyze about 80 years ago.<sup>3</sup> When hog prices are high, producers rush to increase their herds. As the pigs reach maturity, producers bring their increased supply to the market all at the same time, causing a glut.

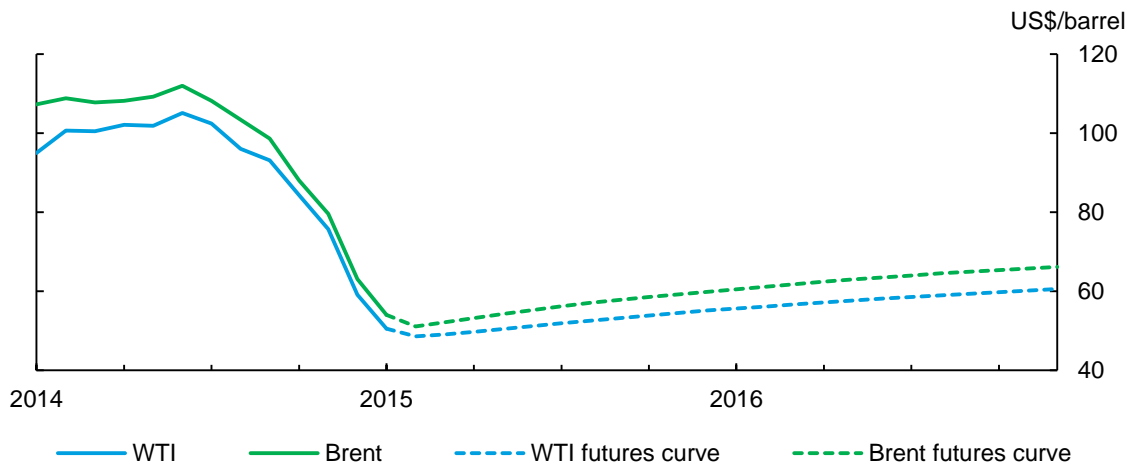
Prices fall, and producers cut back their production. This leads to a shortage. Prices start rising, and the cycle starts anew.

What does this tell us about where oil prices are likely to end up and how low they can go in the meantime?

First, with current expectations for global economic growth, the demand for oil will continue to rise—and the world is likely to require some higher-cost oil to satisfy that demand. Barring major changes to technology or a large shock to the global outlook, today's oil prices are unlikely to be high enough to balance supply and demand. This is consistent with what both the futures curve and our own model of oil prices are telling us.<sup>4</sup>

Of course, there is considerable uncertainty around the equilibrium level—both because all the risks to global growth translate into risk to oil demand and because new technology is bringing costs down all the time (**Chart 11**).

### Chart 11: Oil futures suggest that prices will recover some of their losses



Sources: Intercontinental Exchange and New York Mercantile Exchange.

Last observation: 7 January 2015

Second, prices can be subject to large overshoots in the short run, in either direction. The only true floor to prices in the short term is the short-run marginal cost, at which point producers would lose more money by continuing to pump oil from existing installations than by shutting it in.

### OPEC, Geopolitics and Financialization

So far, I've been focusing on the fundamentals of supply and demand, which, in my view, go a long way toward explaining the recent plunge in prices. But in the short run, there are a number of other important influences that are more difficult to predict. I would like to say a few words about three other pieces of the story.

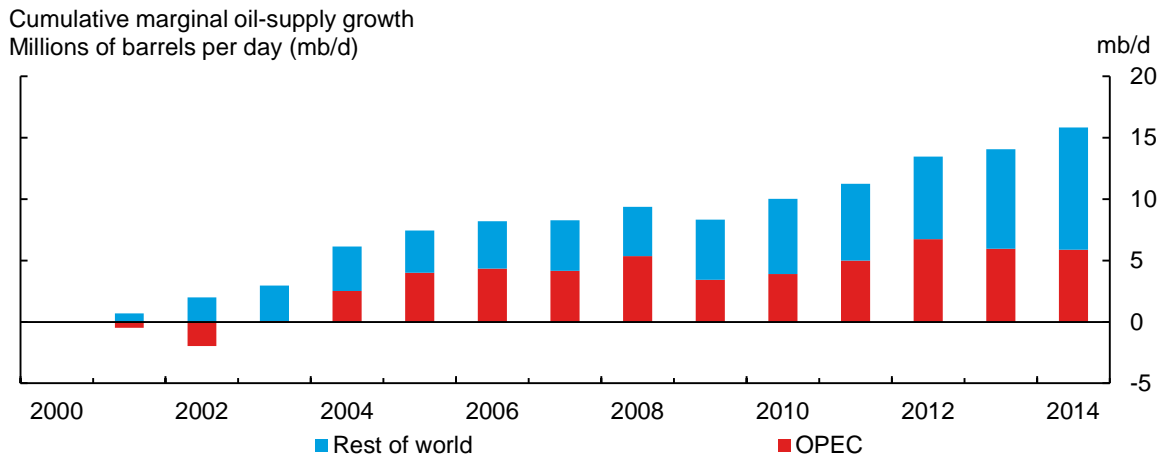
First, geopolitical developments often have a major impact on oil prices—since they can affect oil supply directly and since the threat of future supply disruptions can also build a risk premium into oil prices. As a notable example, in the early part of 2014, conflicts in Libya and Iraq led to temporary outages in their oil production, keeping world prices high, even as supply elsewhere in the world continued to ramp up. When production from those two countries came back on



stream, that was an important trigger for the plunge in oil prices later in the year. Of course, such conflict situations and other geopolitical events can change very quickly in one direction or the other, and continue to pose an important source of risk.

Second, the Organization of the Petroleum Exporting Countries (OPEC) has had an important influence on the dynamics of world oil markets, and this influence may be changing over time. The drop in oil prices was accelerated in early December by OPEC’s decision to leave its production target unchanged, even as prices were falling. In effect, OPEC members were allowing the price to fluctuate so that more supply adjustment would come from other producers, rather than acting as the “swing producers” as they had in some other episodes. This changing role may reflect, in part, the decline in OPEC’s share of world production—which, at about 40 per cent, is 10 percentage points lower than in its heyday (**Chart 12**). It is too early to tell whether and how OPEC’s behaviour will change as its market share continues to decline.

**Chart 12: OPEC’s share of global oil production is declining**



\*The 2014 data point is the average from January to November 2014.  
Sources: International Energy Agency and Bank of Canada calculations

Last observation: 2014\*

Third, financial linkages. With the run-up in commodity prices during the past couple of decades, much attention was paid to the “financialization” of commodities—including investor flows into commodity-based mutual funds and exchange-traded funds, increased involvement by global investment banks in commodity-backed lending and physical commodity trading, and the prominent role of large commodity-trading houses.<sup>5</sup> Financialization has gone into reverse in recent years, owing to a combination of moderating trends in commodity prices and regulatory changes. The research we have done at the Bank of Canada on the role of investment flows in commodities markets shows that these flows may amplify or accelerate price movements, but do not create trends on their own.<sup>6</sup>

There is still a question of whether financial flows may have accelerated some of the price movements that we have seen—for instance, if investors who had been drawn to the oil market by rising prices faced margin calls and decided to pull out after suffering losses. At this point, data on speculative positioning in oil markets do not suggest that such effects were driving recent market movements, but we

cannot rule out that they may have been either a contributing or a mitigating factor. Moreover, we remain alert to the possibility that financial linkages could transmit stress from oil markets to the financial system.

Putting all the pieces together, we conclude that there are two-sided risks around current oil prices: sizable short-run movements in either direction are quite possible. Despite some promising research at the Bank of Canada on forecasting oil prices, the range of uncertainty around even the best forecasts is very wide.<sup>7</sup> In view of this uncertainty, the Bank's baseline economic projections are constructed on the assumption that oil prices remain constant over the projection period.<sup>8</sup> We use information from our models and other sources to understand and highlight the risks around that baseline.

## **Global Economic Impact**

What will the drop in oil prices mean for the world economy? We are still finalizing our complete forecast of the global and Canadian economies, which the Bank of Canada will release next week in our *Monetary Policy Report*, but here is how we approach the question.

For the world as a whole, the decline in oil prices is beneficial. If it is caused by new sources of supply, the price drop spreads the benefits of a favourable shock; if it is partly the result of slower demand growth, it mitigates the effects of an unfavourable shock.

It is no surprise that lower oil prices benefit consumers and hurt producers. For the users of oil, a lower price is like a tax cut. The positive effect will work its way through the economy via two channels: first, it will give consumers more disposable income, which they can spend on goods and services; second, it will reduce input costs and encourage production in sectors other than oil, especially energy-intensive sectors.

The United States, as a net importer, will benefit from the drop in oil prices. Our October forecasts were for U.S. growth to average around 3 per cent over the next couple of years, and the positive oil shock adds an upside risk to our projection.

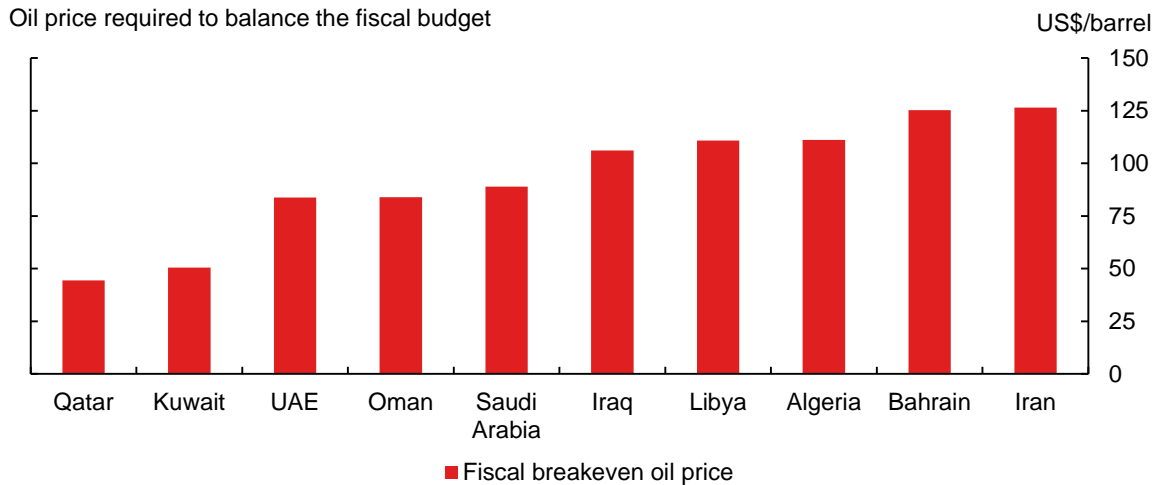
Other economies that are large net importers of oil, such as China, Japan and Europe, will also get a boost to their economic growth.

The decline in oil prices has clear adverse effects, however, on oil-exporting emerging economies. Some of these countries, which have relied on high oil prices to balance their budgets, could face financial stress (**Chart 13**).

While lower oil prices will undoubtedly depress headline inflation, this is a temporary effect that central banks will look through in setting monetary policy. Provided that consumers and businesses understand that the drop in oil prices is a one-time change, it should not slow the pace of underlying inflation.

In Europe and Japan, which have been grappling with slow economic growth and low underlying rates of inflation, the situation could be more problematic. There is a risk that lower oil prices could add to deflationary pressures or even trigger a generalized downward price spiral, but that is not our base case.

### Chart 13: Many countries have assumed high oil prices



Source: International Monetary Fund

### Implications for Canada

Canada, like other countries, has been trying to regain its economic footing since the global financial crisis. From the outset of the Great Recession, the Bank of Canada has been providing significant monetary stimulus. But we have yet to reach the point where growth is self-sustaining. For that to happen, the sources of growth will have to rotate away from consumption and toward increased exports, which are our traditional economic engine.

Signs of a broadening recovery have been emerging during the past year. Stronger U.S. growth and a weaker Canadian dollar have boosted non-energy exports. Investment spending and job creation have also begun to pick up, although significant slack remains in the labour market.

In that context, we see important risks to Canada's economic outlook stemming from the recent decline in the price of oil and other commodities. As a net oil exporter, Canada will be affected by the lower prices, operating through several channels.

The most immediate impact will be positive: a boost to consumers' disposable incomes and spending. Lower oil prices will also benefit many sectors, such as manufacturing, by reducing production costs. Our latest *Business Outlook Survey*, which was published yesterday, showed that more firms than in previous surveys are anticipating declines in their input costs, thanks in good part to cheaper oil and cheaper commodities in general.

The positive effect on the world economy and the resulting stronger growth would also be positive for Canada. A buoyant global economy would increase Canada's non-energy exports, boost confidence and lead to improved business investment.

However, these gains will be more than reversed over time as lower incomes in the oil patch and along the supply chain spill over to the rest of the economy. The decline in Canada's terms of trade will also reduce the country's wealth.

The lower prices, if they are expected to persist, will significantly discourage investment and exploration in the oil sector. As I mentioned earlier, we are already seeing signs of this.

Lower oil prices are also typically accompanied by a weaker Canadian dollar, and this time is no exception. The dollar's depreciation by over 10 per cent against the U.S. dollar in the past six months will help cushion the economy from the impact of lower oil prices.

Despite the mitigating factors I enumerated, lower oil prices are likely, on the whole, to be bad for Canada. Estimating the magnitude of that overall impact requires carefully analyzing the interplay between the various effects as they work through the economy. That is what we are doing as we prepare next week's forecast.

For the Bank of Canada, there are two main takeaways from the drop in oil prices. First, we will look through its immediate and temporary negative effect on total consumer price inflation. Second, we will closely monitor its broader impacts on growth and the delay it may cause to the economy's return to its production potential. We will also watch for any impacts on the rotation of demand that we have begun to witness.

## **Conclusion**

Allow me to conclude.

The recent movements in oil prices have been dramatic, but they are not random. Once we sort through the different economic forces at play, we see that underlying the recent drop in oil prices is a surge in unconventional oil supply against the backdrop of slower growth of global demand. Over time, higher-cost oil is still likely to be needed to satisfy growing global demand, but prices could go lower, or remain low, for a significant period before those medium-term forces do their work.

These developments are among the most important that the Bank of Canada takes into account in making monetary policy. We will continue to work to bring the Canadian economy back to its potential and return inflation sustainably to our 2 per cent target. However things play out, we have the tools to respond.

## ENDNOTES

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<sup>1</sup> Researchers Kilian and Lee estimate that demand shocks accounted for about 60 per cent of the increase in oil prices during the run-up from US\$30 a barrel to US\$140 a barrel. See L. Kilian and T.K. Lee, “Quantifying the speculative component in the real price of oil: The role of global oil inventories,” *Journal of International Money and Finance*, 42 (April 2014): 71–87.

<sup>2</sup> For example, since July 2014, the International Energy Agency has revised down its estimates for 2014 global oil demand by 0.3 million barrels a day and 2015 demand by 0.8 million barrels a day.

<sup>3</sup> N. Kaldor, “A Classificatory Note on the Determinateness of Equilibrium,” *The Review of Economic Studies* 1, no. 2 (February 1934): 122–36.

<sup>4</sup> C. Baumeister, “The Art and Science of Forecasting the Real Price of Oil,” *Bank of Canada Review* (Spring 2014): 21–31.

<sup>5</sup> T. Lane, “Financing Commodities Markets,” (speech to the CFA Society of Calgary, Calgary, Alberta, 25 September 2012).

<sup>6</sup> R. Alquist and O. Gervais, “The Role of Financial Speculation in Driving the Price of Crude Oil,” Bank of Canada Discussion Paper No. 2011-6, 2011.

<sup>7</sup> C. Baumeister, “The Art and Science of Forecasting the Real Price of Oil,” *Bank of Canada Review* (Spring 2014): 21–31. This work also shows that a no-change assumption is more accurate than one based on the futures curve.

<sup>8</sup> Bank of Canada, *Monetary Policy Report*, April 2014