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The Great Plunge in Oil Prices: Causes, Consequences, and Policy Responses

John Baffes, M. Ayhan Kose, Franziska Ohnsorge, and Marc Stocker

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Approved for distribution by Kaushik Basu

Policy Research Notes (PRNs) are prepared under the direction of the World Bank Chief Economist and Senior Vice President for Development Economics. PRNs combine and distill existing and new research to inform discussion on topical policy issues. They are aimed at a broad audience interested in economic policy. This is the first note in the PRN series.

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The Great Plunge in Oil Prices:
Causes, Consequences, and Policy Responses

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EXECUTIVE SUMMARY

New debates. Following four years of relative stability at around $105 per barrel (bbl), oil prices have declined sharply since June 2014 and are expected to remain low for a considerable period of time. The drop in prices likely marks the end of the commodity supercycle that began in the early 2000s. Since the past episodes of such sharp declines coincided with substantial fluctuations in activity and inflation, the causes and consequences of and policy responses to the recent plunge in oil prices have led to intensive debates. This paper addresses four questions at the center of these debates, with particular emphasis on emerging market and developing economies:

- How does the recent decline in oil prices compare with previous episodes?
- What are the causes of the sharp drop and what is the outlook for oil prices?
- What are the economic and financial consequences?
- What are the main policy implications?

A significant drop. The sharp fall in oil prices since June 2014 is a significant but not unprecedented event. Over the past three decades, five other episodes of oil price declines of 30 percent or more in a seven-month period occurred, coinciding with major changes in the global economy and oil markets (Figure 1). The latest episode has some significant parallels with the price collapse in 1985-86, which followed a period of strong expansion of supply from non-OPEC countries and the eventual decision by OPEC to forgo price targeting and increase production.

Multiple causes. The recent plunge in oil prices has been driven by a number of factors: several years of upward surprises in the production of unconventional oil; weakening global demand; a significant shift in OPEC policy; unwinding of some geopolitical risks; and an appreciation of the U.S. dollar. Although the relative importance of each factor is difficult to pin down, OPEC's renouncement of price support and rapid expansion of oil supply from unconventional sources appear to have played a crucial role since mid-2014. Empirical estimates also indicate that supply (much more than demand) factors have accounted for the lion's share of the latest plunge in oil prices. Although the supply capacity of relatively high-cost and flexible producers, such as the shale oil industry in the United States, will need to adjust to lower prices, most of the underlying factors point to lower oil prices persisting over the medium-term, with considerable volatility in global oil markets.

Wide ranging consequences. The decline in oil prices will lead to significant real income shifts from oil exporters to oil importers, likely resulting in a net positive effect for global activity over the medium term. A supply-driven decline of 45 percent in oil prices could be associated with a 0.7-0.8 percent increase in global GDP over the medium term and a temporary decline in global inflation of around 1 percentage point in the short term. Activity in oil importers should benefit from lower oil prices since a drop in oil prices raises household and corporate real incomes in a

manner similar to a tax cut. While the positive impact for oil importers could be more diffuse and take some time to materialize, the negative impact on exporters is immediate and in some cases accentuated by financial market pressures.

However, several factors could counteract the global growth and inflation implications of the lower oil prices. These include weak global demand and limited scope for additional monetary policy easing in many countries. The disinflationary implications of falling oil prices may be muted by sharp adjustments in currencies and effects of taxes, subsidies, and regulations on prices.

While falling oil prices would support activity and reduce inflation globally, some oil-exporting countries may come under stress as falling oil-related revenues put fiscal balances under pressure and exchange rates depreciate on deteriorating growth prospects. Oil price developments may also add to volatility in financial and currency markets and affect capital flows. Investment in the oil industry may fall sharply, not just in oil-exporting countries but also in currently oil-importing countries with potential for oil extraction.

Since food production tends to be energy intensive, falling oil prices would likely be accompanied by declining agricultural prices. A 45 percent decline in oil prices could be expected to reduce agricultural commodity prices by about 10 percent. Passed through into domestic food prices, the decline in commodity prices would benefit the majority of the poor.

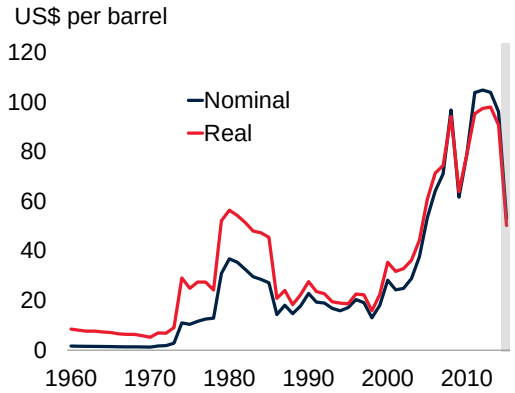
Policy challenges and opportunities. Falling oil prices affect monetary and fiscal policies differently depending on whether a country is an oil importer or exporter. For importers, the pass-through into slowing inflation may ease pressure on central banks and could provide in some cases room for policy accommodation. However, in a generally weak global growth environment and with policy interest rates constrained by the zero lower bound in major economies, monetary policy might need to respond to deflation risks. In the Euro Area and in Japan, several months of outright deflation could contribute to inflation expectations becoming de-anchored from policy objectives. For exporters, central banks will have to balance the need to support growth against the need to contain inflation and currency pressures.

Regarding fiscal policy, the loss in oil revenues for exporters will strain public finances, while savings among oil importers could help rebuild fiscal space. Lower oil prices also present a window of opportunity to implement structural reforms. These include, in particular, comprehensive and lasting reforms of fuel subsidies—which tend to have adverse distributional effects and tilt consumption and production toward energy-intensive activities and less environmentally-friendly energy sources—as well as energy taxes more broadly. Fiscal resources released by lower fuel subsidies could either be saved to rebuild fiscal space lost after the global financial crisis or reallocated towards better-targeted programs to assist poor households and support critical infrastructure and human capital investments. In oil-exporting economies, low oil prices reinforce the need to redouble efforts to diversify activity.

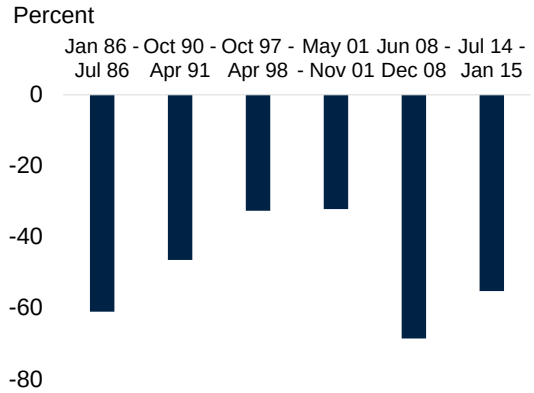
Figure 1. The great plunge in oil prices

Following on steady declines in other commodity prices, the drop in oil prices in the second half of 2014 was one of six episodes of significant oil price declines over the past three decades. It reflected predominantly rising supply but also weak global demand. Oil prices are expected to remain soft over the next few years.

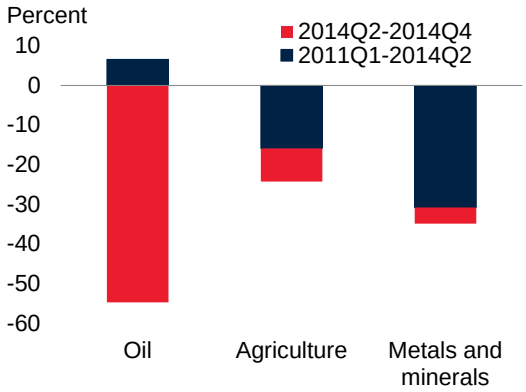
Oil price supercycle[1]



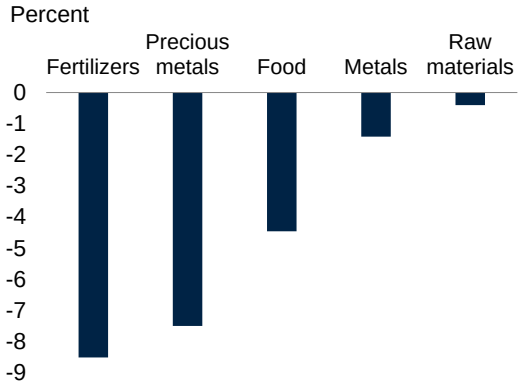
Magnitude of significant oil price drops[2]



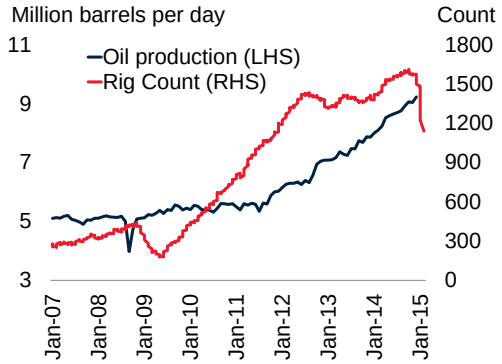
Cumulative changes in commodity prices[3]



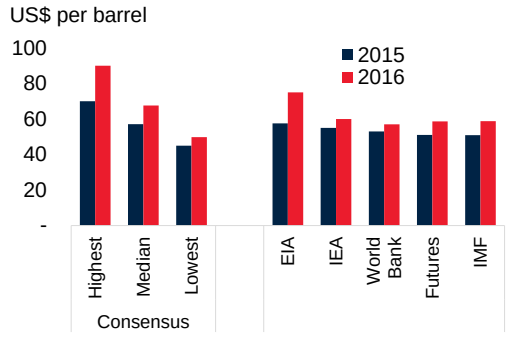
Effect of a 45 percent decline in oil prices on the prices of other commodities[4]



U.S. oil production and rig count[5]



Oil price forecasts, 2015-16[6]



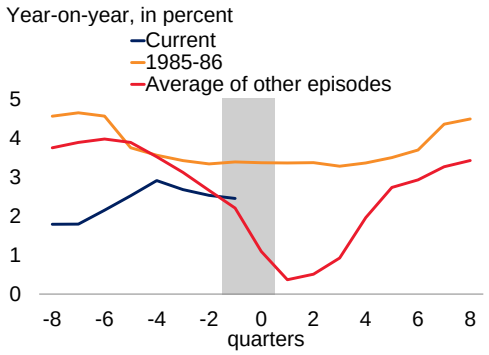
Source: Baker Hughes, Baffes (2007), IEA, EIA, Consensus Economics, IMF (2014b), BP Statistical Review, and World Bank.

1. Annual data for equally weighted average of WTI, Dubai and Brent oil prices. Real price is deflated by the MUV index.
2. Non-consecutive episodes of six-months, in each year, for which the unweighted average of WTI, Dubai, and Brent oil prices dropped by more than 30 percent.
3. Includes unweighted average of WTI, Brent, and Dubai oil prices, 21 agricultural goods, and 7 metal and mineral commodities. Latest data of oil prices is for January 2015.
4. These results are based on Baffes (2007).
5. Crude oil production only. Latest observation of U.S. production for November 2014. "Tig count" is U.S. total oil rig amount (EOP).
6. Consensus forecasts and EIA forecasts for Brent price, as of January 2015; IEA forecast of unweighted average prices of Brent, WTI, and Dubai, as of January 2015, from IEA (2015b); IMF forecast of unweighted average prices of Brent, WTI, and Dubai, as of January 2015, from IMF (2014b); World Bank forecast of unweighted average prices of Brent, WTI, and Dubai, as of January 2015, from World Bank (2015b).

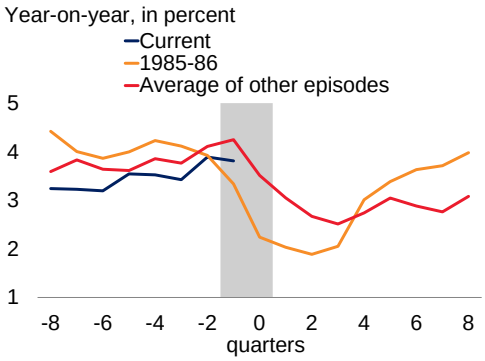
Figure 2. Implications of the great plunge

The recent oil price drop is likely to support global growth and reduce global inflation. Past episodes of significant oil price declines have often been associated with a weak global economy and followed by a sharp reduction in inflation. The decline in inflation will likely pose monetary policy challenges in countries with already uncomfortably low inflation. The plunge in oil prices also presents an opportunity for energy subsidy and tax reforms and for structural measures to diversify oil-producing economies.

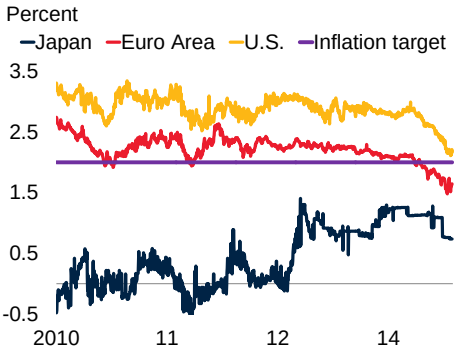
Global GDP growth around significant oil price declines[1]



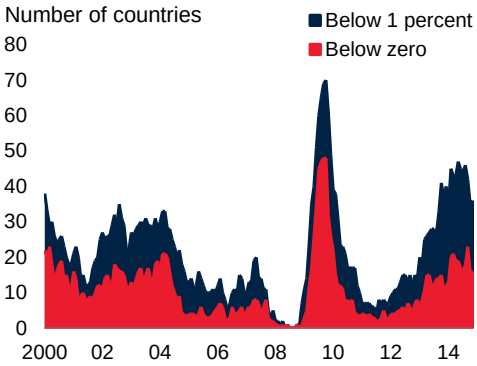
Global CPI inflation around significant oil price declines[1]



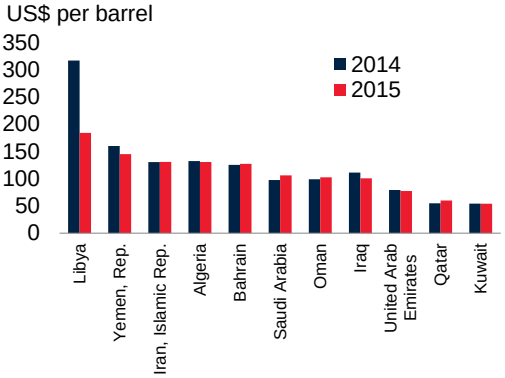
Inflation expectations: Euro Area, Japan and U.S.[2]



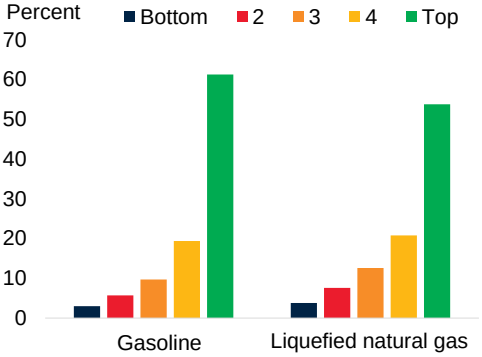
High-income and developing countries with low inflation[3]



Oil producers fiscal break-even prices[4]



Fuel subsidy benefits by consumption levels[5]



Sources: Bloomberg, Central Bank Rates, IMF, Haver Analytics, FRB of St. Louis, Arze del Granado et al (2012), World Bank.

1. Time "0" is the quarter of the trough in significant oil price decline episodes (30 percent drop over a seven-month period which is the shaded region.). "-8" corresponds to 8 quarters (2 years) before the trough and "8" corresponds to 8 quarters after.

2. 10-year ahead inflation expectations are derived from 5 year-5 year swap rates.

3. Number of high-income countries with year-on-year inflation below 1 percent and below 0. Sample includes 55 high-income and 121 developing countries with populations above 1 million. Latest data is for November 2014.

4. Fiscal break-even prices are oil prices associated with a balanced budget.

5. Share of the total benefit from different fuel price subsidies for households grouped by consumption level quintiles.

I. INTRODUCTION

Oil prices have halved since June 2014, likely bringing an end to a four-year period of high and stable prices and, perhaps, to the commodity supercycle that began in late 1990s. Largely driven by the rising demand from emerging markets and underinvestment in various commodity markets, the supercycle brought double-digit annual inflation-adjusted price increases for most commodity prices until the financial crisis in 2008.[2] Recent developments in oil markets and moderate growth prospects in emerging and developing economies suggest that prices could remain soft over the next few years.

Given that the past episodes of such sharp declines coincided with substantial fluctuations in activity and inflation, the causes and consequences of and possible policy responses to the recent plunge in oil prices have generated intensive debates. This paper presents an assessment of the recent oil price drop to address four major questions that have been at the center of recent debates:

- How does the recent decline in oil prices compare with previous episodes?
- What are the causes of the sharp drop and what is the outlook for oil prices?
- What are the macroeconomic and financial consequences?
- What are the main policy implications?

The cumulative oil price decline between June 2014 and January 2015 was the third largest of the past 30 years (when oil began trading in futures exchanges) and was driven by a "perfect storm" of conditions that exerted strong downward pressure on prices. Although changes in supply and demand expectations played a key role, these revisions were neither unique nor unusually large. However, they coincided with three other major developments: a significant shift in OPEC's policy objectives, less-than-expected spillovers from geopolitical risks, and a significant appreciation of the U.S. dollar. Empirical estimates suggest that supply (much more than demand) factors have accounted for the lion's share of the latest plunge in oil prices. Since both supply and demand related factors underlying the recent decline in oil prices are expected to persist over the near- to medium-term, oil prices are likely to remain soft but volatile, with a gradual recovery over the next decade.

Sustained low oil prices are likely to have significant implications for growth and inflation. If driven largely by supply factors, historical estimates suggest that the 45 percent decline in oil prices—as currently expected for 2015 on an annual average basis—would likely lift global GDP by up to 0.7-0.8 percent over the medium term and reduce global inflation by a full percentage point in the short term. However, several factors may change the effects on growth and inflation. Weak global demand and acute pressures on oil exporters, combined with lingering post-crisis uncertainties and policy challenges among large importers, could limit some of the expected benefits for the global economy in the short-term. Sharp currency adjustments, varying taxes, subsidies or other price regulations could imply different effects on inflation patterns across countries.

Weak oil prices will also lead to significant real income shifts from exporting to importing countries, affect fiscal and current account dynamics, and translate into lower prices for non-oil commodities. These forces may constrain macroeconomic policies in some dimensions while opening up opportunities to address long-standing reform needs in other areas.

In oil-importing developing economies, the decline in oil prices should support stronger growth, reduce inflation, and improve external and fiscal balances, which should lower macroeconomic vulnerabilities

[2] For additional information about the commodity price supercycle, see World Bank (2009), Canuto (2014), Erten and Ocampo (2013), and Cuddington and Jerrett (2008).

and, therefore, widen policy room. In contrast, growth in oil-exporting economies will likely be negatively affected, as lower oil prices cause significant losses in export and fiscal revenues. A precipitous adjustment in oil-exporting countries could be forced by sudden reassessment of credit and sovereign risks by investors and made more difficult by limited sectoral diversification. The sharp decline in oil prices has already been accompanied by substantial capital outflows, reserve losses, and sharp depreciations in some oil exporters, with potentially negative cross-border spillover effects.

Low oil prices also put downward pressure on other commodity prices, especially those of natural gas, fertilizers, and food commodities. Based on historical elasticities, a 45 percent decline in oil prices could be expected to reduce agricultural commodity (including food) prices by about 10 percent. Food constitutes the most important component of the poor's consumption basket—hence, lower food prices should benefit the majority of the poor.

Lower oil prices will have significant implications for monetary and fiscal policies. In oil-importing countries, declining inflation and current account improvements could allow central banks to maintain accommodative policies. In the Euro Area and Japan, however, disinflation is less an opportunity than a challenge: since inflation is already uncomfortably low, further disinflation risks de-anchoring inflation expectations and calls for additional monetary stimulus. Lower oil prices could also provide additional fiscal space that could be used to stimulate activity if needed. In oil-exporting countries, the room for maneuver will be more limited. Central banks in those countries will have to balance the need to support growth against the need to maintain stable inflation and investor confidence. In most cases, fiscal policy will have to be tightened to make up for the loss of oil-related revenues.

Finally, the plunge in oil prices affects the design of structural policies. For both importers and exporters, lower oil prices provide a good opportunity to reconsider fiscally draining energy subsidies and reform tax policies in view of ongoing budgetary and environmental challenges. Although the effectiveness of energy subsidies in reducing poverty and improving access to high-quality energy sources have long been questioned, reforms are often politically difficult to implement. Falling oil prices provide favorable conditions for such reforms with limited impact on the final price paid by consumers.

II. RECENT DECLINE IN OIL PRICES: DIFFERENT YET SIMILAR?

Compared to previous episodes of price declines during the past 30 years, the fall in oil prices between June 2014 and January 2015 is a significant but not unprecedented event (Figure 3). Five other episodes of oil price declines of 30 percent or more in a seven-month period occurred since trading in futures exchanges started in 1984. These coincided with major changes in the global economy and oil markets. The first one, in 1985-86, was mostly associated with a significant shift in OPEC policy, while subsequent episodes were primarily driven by weakening global demand following U.S. recessions (1990–91 and 2001); the Asian crisis (1997–98); and the global financial crisis (2008-09). The latest episode (June 2014-January 2015) constitutes the third largest price drop, only surpassed by the price collapses in 2008 and in 1985-86.

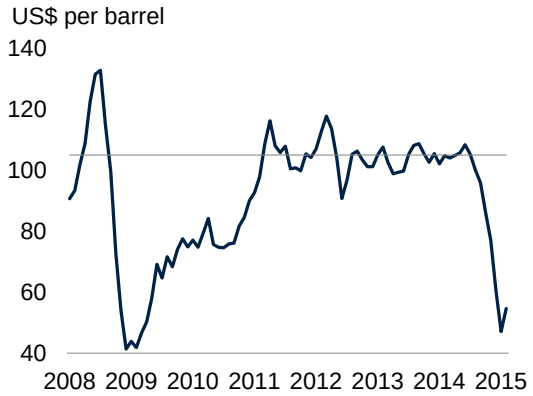
The oil price drop of 2014-15 has two key parallels to that of 1985-86, as both episodes followed a period of rapid growth in the supply of oil from non-OPEC countries and an eventual shift in OPEC policy:

- **Rapid growth in unconventional oil.** In many respects, the recent oil boom from unconventional sources resembles the expansion of oil supply from the North Sea and the Gulf of Mexico in the 1970s and early 1980s. The technology to extract oil from the sea had been available but the

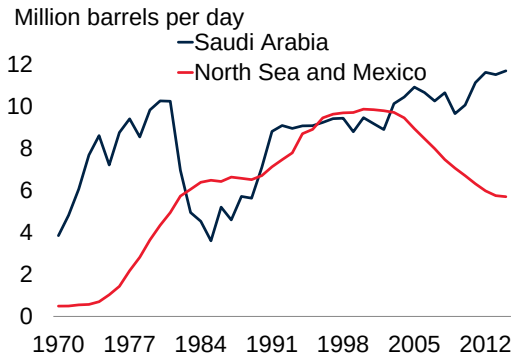
Figure 3. Developments in commodity markets

Oil prices dropped sharply between June 2014 and January 2015, bringing to an end a four-year period of relative price stability. The decline was the third largest over the past 30 years, has particularly interesting parallels with the episode in 1985-86, which followed a period of strong expansion of supply from non-OPEC countries and sudden change in OPEC policy. The decline in oil prices has been much larger than that of other commodity prices from their early-2011 peaks.

Oil price: recent developments[1]



Oil Production: Saudi Arabia and North Sea and Mexico[2]



Source: World Bank.
1. Monthly average of WTI, Dubai, and Brent oil prices. Horizontal line denotes $105 per barrel, the average for January 2011-June 2014. Last observation as of February 23, 2015.
2. 2014 observations are World Bank estimates.

high oil prices of the 1970s made the use of such technology profitable. During 1973-83, North Sea and the Gulf of Mexico together added some 6 mb/d to global markets—as much as unconventional sources added to the global oil market during 2004-14.

- **Change in OPEC policy.** OPEC's decision to abandon price targeting in November 2014 also has important similarities to its actions during the 1985-86 episode. Following the 1979 peak in oil prices, OPEC reduced its supply to maintain high prices. Upholding its price target necessitated the cartel slashing its oil supply over the following six years, from 30 mb/d in 1979 to 16 mb/d in 1985. However, despite such a drastic supply cut, real oil prices declined 20 percent during this period. In response, OPEC began increasing supplies (to 18 mb/d by December 1985 from 13.7 mb/d in June 1985). Partly because of this policy change, oil prices collapsed and remained low for almost two decades (World Bank, 2009). In response to the new lows in prices reached after the East Asian financial crisis, OPEC started setting a target price range of $25-35/bbl. The range was changed to $100-110/bbl before the 2008 financial crisis.

In contrast, the 2008-09 drop in oil prices differs from the recent episode in several ways. In particular, the recent fall in the price of oil was considerably sharper than the decline in the price of other commodities, whereas virtually all commodity prices declined by similar magnitudes in 2008-09 as a result of a severe global recession (with most recovering just as quickly afterward).[3] Other price and

[3] While oil prices declined 55 percent from June 2014 to January 2015, the largest price declines among other commodity prices during the same period were half as much (iron ore fell by 29 percent, U.S. natural gas by 26 percent, cotton by 20 percent, and natural rubber and palm oil by 18 percent).

market developments also suggest that the recent episode was driven by a range of mostly sectoral factors, whereas the 2008-09 episode was due to common factors—a severe collapse in demand following the global financial crisis, global uncertainty and liquidity constraints. First, returns in futures markets for oil were less correlated with those for other commodities in late 2014 than in 2008-09. Second, daily oil price changes are less correlated with global equity returns during the latest episode than they were during the global financial crisis.

Even after the recent plunge, real oil prices remain high compared to levels reached even during the oil price spikes of the 1970s. They also continue to exceed levels in the early 2000s, when demand from emerging economies started accelerating at a rapid pace.

III. CAUSES OF THE SHARP DROP IN OIL PRICES AND OUTLOOK

The decline in oil prices since mid-2014 was partly a catching up to a broader trend of commodity price declines that had been well underway. After reaching deep lows during the global financial crisis, most commodity prices, including oil prices, peaked in the first quarter of 2011. Since then, prices of metals, agricultural and raw materials have declined steadily as a result of weak global demand and robust supplies. In contrast, oil prices fluctuated within a narrow band around $105/barrel (bbl) until June 2014. Through much of 2012 and 2013, the impact of softening global demand on oil markets was offset by concerns about geopolitical risks and pricing policies exercised by OPEC. As some of these factors unwound, oil price started to drop steeply in June 2014. By February 2015, the cumulative fall in oil prices was significantly larger than that in other commodity prices since their peaks in 2011.

Underlying demand and supply conditions for oil determine long-run trends in prices, but short-run movements in market sentiment and expectations can play a major role in driving price fluctuations. In the recent oil price plunge, revisions of supply and demand expectations, while noticeable, were neither exceptional nor unusually large. However, the recent episode is unique in the sense that these changes in expectations coincided with three other major developments: a significant shift in OPEC's objectives, receding geopolitical risks, and significant U.S. dollar appreciation (Figure 4). These factors together formed a "perfect storm" that was reinforced by longer-term shifts in supply and demand dynamics (Figure 5).

This section first presents a brief discussion of each of the factors driving the change in oil prices. It concludes with an analysis of their relative contribution to the oil price drop of 2014 and implications for the oil price outlook.

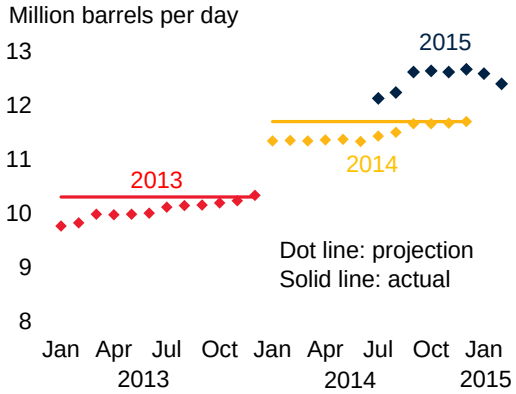
A. Developments in Supply and Demand

Recent developments in global oil markets have taken place against a long-term trend of greater-than-anticipated supply, especially from unconventional sources of oil production in the United States, and, to a lesser degree, Canadian oil sands and the production of biofuels (Figure 5). If oil prices stay around $60 per barrel, roughly one-third of current oil production and more than two-thirds of the expected increase in global oil production could become uneconomical (Bank of Canada 2015). Over time, cost of unconventional oil production is likely to decline as new technologies will reduce the cost of exploration and extraction (Benes et al. 2012).

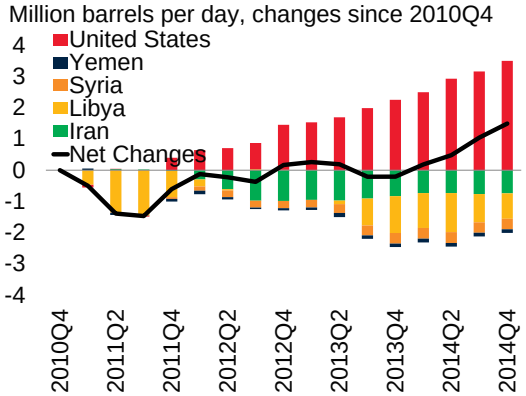
Figure 4. Short-term drivers of oil price decline

Notwithstanding concerns about geopolitical risk, oil supply has repeatedly surprised on the upside, especially in the United States, while oil demand has surprised on the downside, partly reflecting weaker-than-expected global growth. The recent decline in oil prices has coincided with a strengthening U.S. dollar.

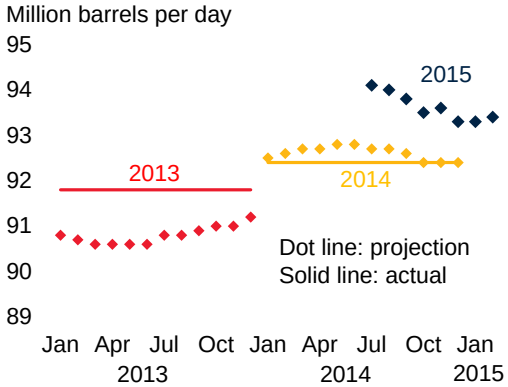
U.S oil supply[1]



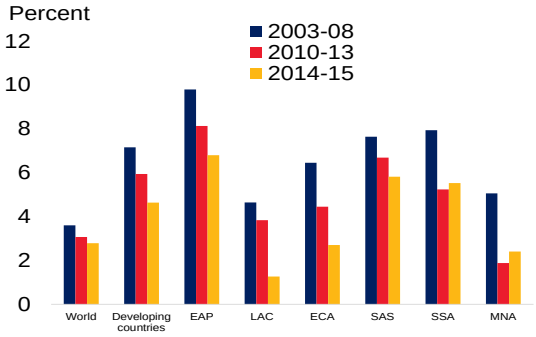
Changes in global oil production[2]



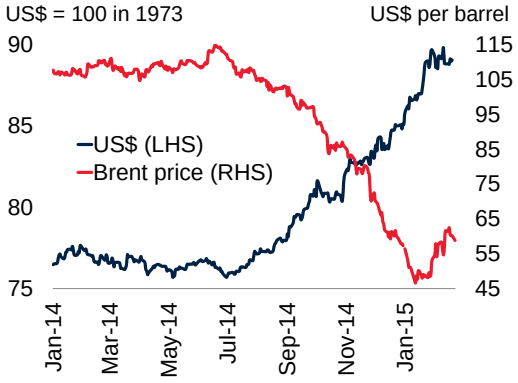
Global oil demand[3]



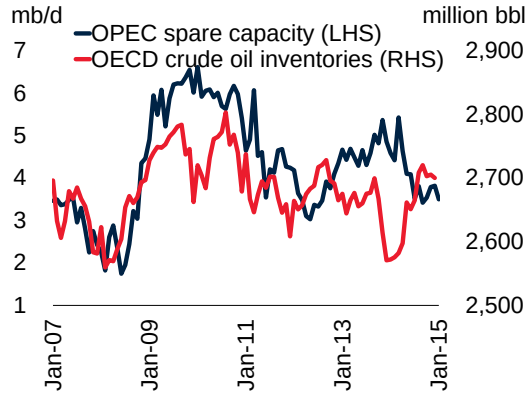
GDP growth[4]



Oil prices and U.S dollar[5]



Spare capacity and inventories



Source: World Bank, IEA, Bloomberg, FRED, and Google Trends.

1. All oil supply, including crude oil, biofuels and liquids, by OPEC and non-OPEC.
2. Crude oil supply for OPEC and non-OPEC producers.
3. All oil demand, including crude oil, biofuels, and liquids.
4. Weighted average of real GDP growth rates for developing countries in each region.
5. "US$" is the nominal effective exchange rate of the U.S. dollar against a trade-weighted basket of major currencies. Latest data for December 26, 2014.

- **Shale oil.** During the second half of 2014, the U.S. oil production outlook for 2014-15 was repeatedly revised upwards (IEA 2014a and 2014b). In part, this was because the post-2009 rise in oil prices and exceptionally favorable financing conditions made extracting oil from tight rock formations and tar sands profitable, using hydraulic fracturing and horizontal drilling.[4] These "unconventional" oil projects differ from conventional ones in that they have a shorter life-cycle (2.5-3 years from the start of development to full extraction) and relatively low capital costs. As a result, oil supply from these sources tends to be significantly more elastic to price changes than from conventional sources, even in the short term (Krane and Agerton 2015; McCracken 2015). For example, by end-January 2015, the total oil rig count in the U.S., a rough measure of capacity of shale oil, had already dropped to 1,223 from a high of 1,609 in October 2014 (Baker Hughes 2015).
- **Oil sands.** The cost of extracting oil from the Canadian oil sands is perhaps the highest of any source such that it is often used by the oil industry as the long-run marginal cost of oil production (estimated until recently to be $80-90/bbl in 2014 real terms). Nevertheless, Canada's oil output reached almost 4 mb/d in 2014, up from 3 mb/d in 2004, mostly reflecting expanding extraction from oil sands.
- **Biofuels.** Biofuel production has risen sharply since the mid-2000s. Accounting for about 3 percent of arable land, production reached almost 1.4 mb/d of oil equivalent in 2014, corresponding to 1.5 percent of global oil consumption. The largest producers of biofuels are the United States (44 percent of global biofuel production, mostly from maize-based ethanol), Brazil (24 percent, mostly from sugarcane-based ethanol), and the European Union (17 percent, mostly from edible oil-based biodiesel). The profitability of biofuels has been questioned, however, even at oil prices above $100/bbl (De Gorter et al. 2013)

Oil demand forecasts have been downgraded on several occasions as global growth repeatedly disappointed since 2012. This has reflected slowdowns in large emerging markets, since their economic activity tends to be more oil-intensive than that in developed countries. For example, while a 1 percent increase in real GDP among OECD countries is estimated to raise oil demand by 0.5 percent, a similar increase in non-OECD countries could raise oil demand twice as much (Fournier et al. 2013). Underneath these short-term growth disappointments runs a longer-term trend decline in the average oil intensity of global GDP, which has almost halved since the 1970s. As a result of both these short-term and long-term factors, projected oil demand for 2015 was revised downwards by 0.8 mb/d (IEA, 2014a and 2015a) between July 2014 and January 2015 alone.

B. Changes in OPEC Objectives

With production of about 36 mb/d—of which 30 mb/d subject to quotas – OPEC still accounts for 40 percent global oil supply and continues to have the potential to be the swing producer in global oil market if it chooses. Especially its largest producers have used spare capacity to adjust oil supply and stabilize prices within a desired price range (Box 1). Through the early 2010s, OPEC's "desired" crude oil price range increased gradually to $100-110/bbl, up from $25-35/bbl during the early 2000s.

However, as a result of this policy and rising unconventional oil production, OPEC's share of global oil supply has been steadily eroded. To stem further losses of market share, several OPEC members began in the third quarter of 2014 to offer discounts to Asian oil importers, thus signaling OPEC's intentions to abandon price targeting. In its meeting in November 2014, OPEC "… decided to maintain the production level of 30 mb/d, as was agreed in December 2011" (OPEC 2014). This change in policy implies that OPEC

[4] Shale (or tight) oil is among so-called unconventional oils. Other types of unconventional oil include oil sands (in Canada); deep sea oil (with the largest known reservoirs in Mexico and Brazil); oil in Antarctica; and coal liquefaction.

will no longer act as the swing oil producer. Instead, the marginal cost unconventional oil producers may play this role (Kaletsky 2015; Basu and Indrawati 2015).

C. Geopolitical Developments

Geopolitical tensions typically cast a long shadow over oil prices. In the second half of 2014, it became apparent that conflict in the Middle East and Eastern Europe weighed less heavily than expected on oil supply. Libya, despite internal conflict, added 0.5 mb/d of production in the third quarter of 2014.

In Iraq, as the advance of ISIS stalled, it became apparent that oil output would not be disrupted. Markets placed considerable weight on developments in Iraq because the country was expected to account for 60 percent of the increase in OPEC's capacity during 2015-19 (IEA 2014). Iraq's oil output turned out to be stable, at 3.3 mb/d during 2014, the highest average since 1979, when it reached 3.5 mb/d. Finally, the sanctions and counter-sanctions imposed after June 2014 as a result of the Russia-Ukraine conflict have had little impact on European oil and natural gas markets.

D. Appreciation of the U.S. Dollar

Between June 2014 and January 2015, the U.S. dollar appreciated by more than 10 percent against major currencies in trade-weighted nominal terms (Figure 4). Typically, a broad-based appreciation of the U.S. dollar raises the local currency cost of oil in countries using currencies not linked to the U.S. dollar. The effect of a stronger dollar, then, is weaker oil demand in those countries and stronger supply from non-U.S. dollar producers. Empirical estimates of the size of the U.S. dollar effect cover a wide range: the high estimates suggest that a 10 percent appreciation is associated with a decline of about 10 percent in the oil price, whereas the low estimates suggest 3 percent or less (Zhang et al. 2008; and Akram 2009). Frankel (2014) argues that the role of U.S. dollar appreciation—triggered by diverging monetary policies in the United States, Euro Area, and Japan—was an important contributor to the latest decline in commodity prices.[5]

E. Speculative Demand and Inventory Management

Speculation in oil markets typically takes three forms: (i) changes in inventories on expectations of changing market conditions; (ii) financialization of commodities as assets under management of commodity-based funds grew from $40 billion in the early 2000s to $300 billion in 2012 (Baffes and Haniotis 2010; Verleger 2009; Smith 2012; Soros 2008; and Masters 2008); and (iii) outright market manipulation.[6]

Between January and September 2014, crude oil inventories in OECD countries increased by almost 6 percent. While large inventories are typically associated with surplus market conditions (in turn leading to lower prices), sometimes they may be associated with speculative demand. For example, oil price increases of $5-14 per barrel just before the 2008 crisis (Kilian and Lee 2014) and up to one-quarter of the forecast error variance in oil prices during 2003-12 (Beidas-Strom and Pescatori 2014a) have been attributed to speculative demand. Speculative demand shifts also played a role during oil price shock episodes in 1979, 1986 and 1990 (Kilian and Murphy 2014). However, there is not yet broad agreement on the role of speculation and changes in inventories in the 2014-15 oil price drop (Beidas-Strom and Pescatori 2014b; Baumeister and Kilian 2015).

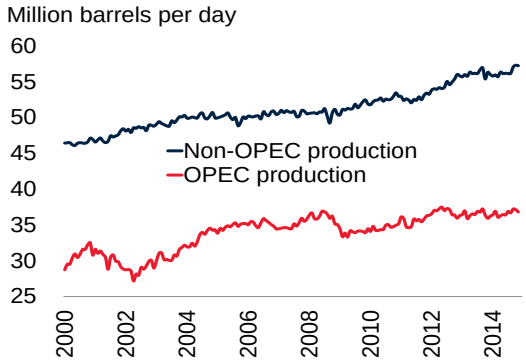
[5] Baumeister and Kilian (2015) argue that movements in the U.S. dollar have no independent impact on the oil price.

[6] There is thus far little consensus in the literature on the degree to which financialization of oil markets affects prices, with Soros (2008) and Masters (2008) arguing that it does and Verlerger (2009) and Smith (2012) claiming the opposite.

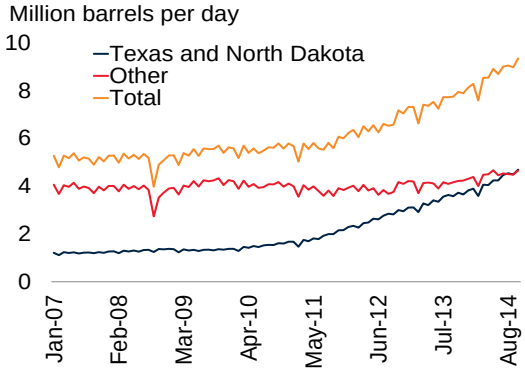
Figure 5. Long-term drivers of oil price decline

OPEC's share of global oil supply has fallen, partly as a result of rising oil production from unconventional sources in the United States and Canada as well as biofuel production. The oil intensity of global activity has steadily declined. Oil consumption by non-OECD economies has risen rapidly since the early 2000s.

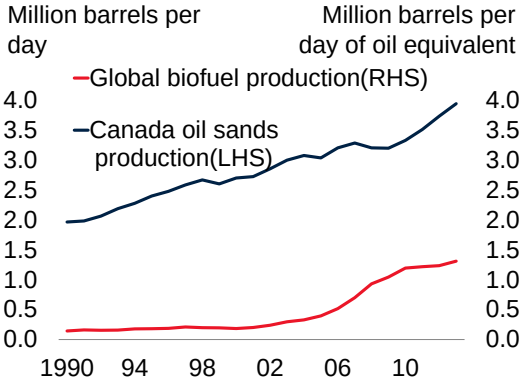
OPEC and non-OPEC oil production[1]



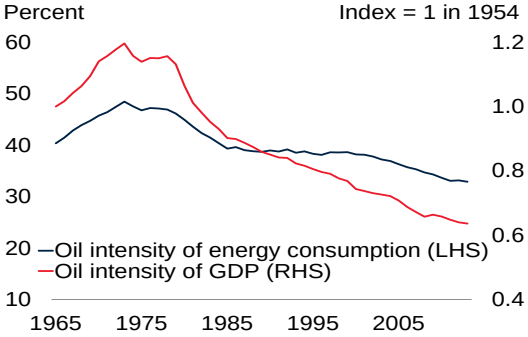
U.S. oil production[2]



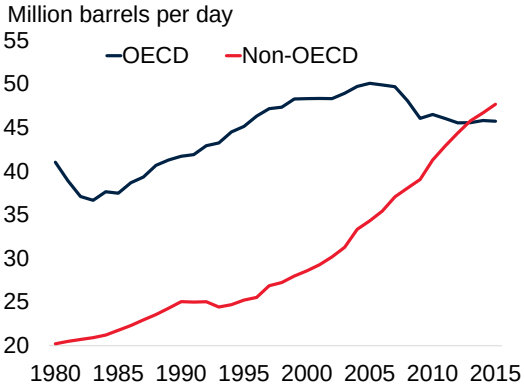
Canada oil sands and biofuel production



Oil intensity of GDP and energy consumption[3]



Oil Consumption: OECD and non-OECD



Contribution of non-OECD countries to global growth[4]

Source: IEA, BP Statistical Review, U.S. Energy Information Agency, and World Bank.

1. Includes all types of oil, including crude, biofuel-based, and liquid-based oil. Latest observation for November, 2014.
2. Crude oil production only. Texas and North Dakota are the U.S. states with the largest shale oil production. Latest observation for October, 2014.
3. Oil intensity of real GDP measures as oil consumption relative to real GDP, index at 1 in 1954. Oil intensity of energy consumption measured as oil consumption in percent of total energy consumption. Latest observation for 2013.
4. Non-OECD countries plus Mexico and Turkey.

Box 1. Cartels in Commodity Markets: A Brief History

Recent developments in oil markets have led to intensive debates about the viability of OPEC as a cartel. However, efforts to manage world commodity markets in order to achieve price objectives are not unique to the oil market. A number of commodity agreements, often negotiated among producing and consuming nations in order to stabilize prices at levels deemed fair to both, were put in place right following World War II and included wheat, sugar, tin, coffee, and olive oil (Swerling 1968). A renewed effort took place after the 1970s price boom, with the agreements typically backed by the United Nations and extended to other commodities, including cocoa and natural rubber (Gilbert 1996). These agreements had legal clauses regarding the tools to manage the corresponding markets, which were export restrictions and inventory management. But over the long term, the price and trade restrictions imposed by some of the agreements on global market conditions either encouraged the emergence of competitor products (e.g. for tin) or the entry of new producers (e.g. for coffee). As a result, all of these agreements (except crude oil) eventually collapsed.

Tin. First negotiated in 1954 with the objective of maintaining tin prices within a desired range through the management of buffer stocks, the International Tin Agreement (ITA) collapsed in 1985 following several years of insufficient funds to maintain stocks (Chandrasekhar 1989). Because tin prices under the agreement were higher and more stable than before, new tin producers outside the Agreement entered the market: Brazil, for example, increased its market share from 1 percent in the 1960s to 10 percent in the 1980s. Higher tin prices under the ITA encouraged the development of a substitute product, aluminum, which gained market share by capturing the growing demand from the beverage can producers. Between the 1950s and 2000s, global tin output grew by 65 percent while that of aluminum grew by 125 percent.

Coffee. In 1962, coffee-producing countries accounting for 90 percent of global coffee output and almost all developed coffee-consuming countries signed the International Coffee Agreement (ICA) with the objective of stabilizing world coffee prices through mandatory export quotas. Elevated coffee prices encouraged the emergence of new producers. For example, during the course of successive ICAs (until 1989, when the final iteration collapsed), two non-ICA members, the USSR and the German Democratic Republic, provided Vietnam with technical and financial assistance to develop its own coffee industry (Baffes, Lewin, and Varangis 2005). In 1970, Vietnam produced just 0.7 percent of the 59 million bags of global production. By the early 2000s, it had overtaken Colombia as the world's second-largest coffee producer after Brazil. It now accounts for 20 percent of global coffee production.

Rubber. The last of such arrangements, covering natural rubber, collapsed during the Asian financial crisis due to currency developments of three key producers, Indonesia, Malaysia, and Thailand. A buffer stock of rubber was used to maintain rubber prices within a desired range. The buffer stock manager was authorized to buy or sell rubber when its price (indexed into the domestic currencies of the above three producers) dropped or exceeded a certain level. Because of weak global demand (partly due the Asian crisis), U.S. dollar- denominated rubber prices declined and should have triggered production cuts. However, the currencies of the three main rubber-producing countries devalued sharply during the Asian crisis and raised the local-currency prices of rubber, triggering a production expansion in the rubber pricing mechanism. This inconsistency eventually led to the collapse of the agreement.

Crude oil. The largest player in the global crude oil market is the Organization of Petroleum Exporting Countries (OPEC), which was founded in 1960 to "coordinate and unify petroleum policies among member states" (OPEC 2015). At present, the organization has 12 active member countries (Iran, Iraq, Kuwait, Saudi Arabia, Venezuela, Qatar, Libya, United Arab Emirates, Algeria, Nigeria, Ecuador, and Angola). OPEC began playing an important role following its decision to impose an embargo on oil exports in 1973, which resulted in a quadrupling of oil prices, from $2.70/bbl in September 1973 to $13.00/bbl in January 1974. It was also instrumental in the tripling oil prices in 1978/79, from $12.85 in October 1978 to $40.75 in November of 1979. Efficiency gains and new oil suppliers, along with disagreements among various OPEC members (especially during the Iran-Iraq and First Gulf Wars), reduced the cartel's role for the next two decades. It intervened actively again following the Asian financial crisis when oil prices dropped to less than $10/bbl by setting targets within price bands. A key difference between OPEC (the only surviving commodity organization seeking to actively manage markets) and the earlier commodity agreements is that OPEC does not have a legal clause on how to intervene when market conditions warrant, thus, allowing it to respond flexibly to changing circumstances.

F. Relative Contributions of Supply and Demand Factors

The exact contribution of each of the factors listed above to the recent plunge in oil prices is difficult to quantify for at least two reasons. First, elevated prices until mid-2014 have been, to an uncertain degree, supported by OPEC policy. Second, even if it is possible to determine the exact contribution of each factor, typical elasticity estimates—usually derived from longer-term price series—may not be applicable since these elasticities have been changing over time and underestimated for particularly sharp declines such as that of 2014.

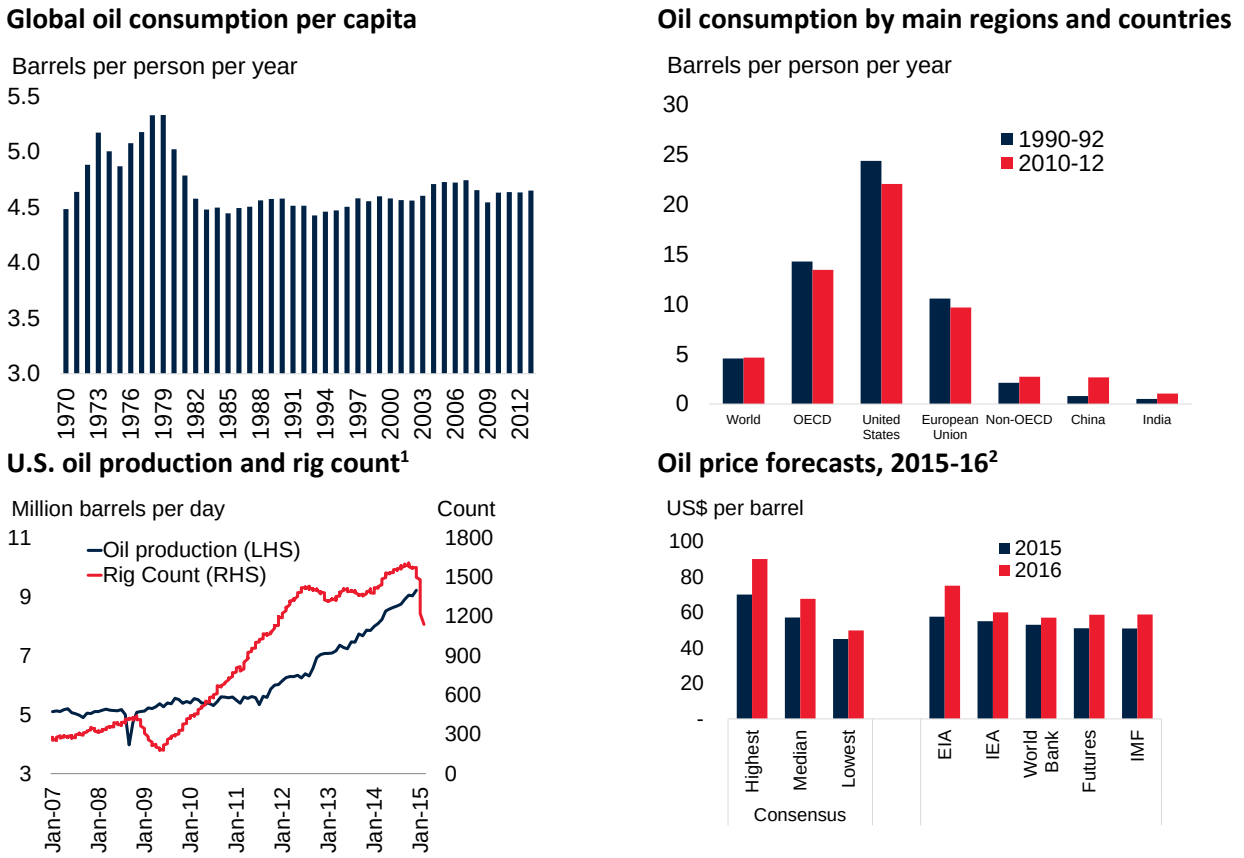
That said, overall, changes in supply conditions stemming from the expansion of oil production in the United States, receding concerns on supply disruptions, and OPEC's policy shift have likely played a dominant role in explaining the recent plunge in prices. Empirical estimates indeed suggest that the lion's share of the recent plunge in prices has been due to supply shocks (Box 2). These findings are also consistent with those in some recent studies. For example, Arezki and Blanchard (2014) document that demand related factors contributed only 20-35 percent to the decline; instead, supply related factors and OPEC's decision not to cut supplies were more important in driving the decline in oil prices. Hamilton (2014a) argues that only two-fifths of the decline in oil prices in the second half of 2014 was due to weak global demand. Baumeister and Kilian (2015) report that more than half of the oil price decline reflects the cumulative effects of earlier oil supply and demand shocks and, among the remaining half, the most influential shock was associated with the weakening global economy while positive oil supply shocks were limited between June and December 2014.

G. Price Outlook

Looking ahead, recent developments that led to the plunge in prices have appeared to affect the dynamics of oil markets in a lasting way. Unconventional oil supplies are likely to continue to be a highly elastic source of oil supplies (Basu and Indrawati 2015). This could transform unconventional oil producers into the new swing producers in oil markets, especially if OPEC maintains its current policy stance over the near-term—as it did in the period following the 1985-86 plunge. A long-standing trend towards less oil-intensive production technologies will persist, exerting continuing pressure on oil prices.

Figure 6. Global oil consumption and price outlook

Global per capita oil consumption has remained broadly stable at 4.7 barrels per year over the past three decades, with diverging trends between advanced and developing countries. Oil prices have recently recovered somewhat from their lows partly because of a sharp decline in rig count in the United States but they will likely remain low during the next two years.



Source: BP Statistical Review, UN, and World Bank.

1. Crude oil production only. Latest observation of U.S. production for November 2014. "Tig count" is U.S. total oil rig amount (EOP).

2. Consensus forecasts and EIA forecasts for Brent price, as of January 2015; IEA forecast of unweighted average prices of Brent, WTI, and Dubai, as of January 2015, from IEA (2015b); IMF forecast of unweighted average prices of Brent, WTI, and Dubai, as of January 2015, from IMF (2014b); World Bank forecast of unweighted average prices of Brent, WTI, and Dubai, as of January 2015, from World Bank (2015b).

These trends point to continued soft oil prices. Most recent oil price forecasts envisage oil prices to range between $60 and $70 per barrel in the medium term. Over time, a slow pickup in growth should gradually lift global oil prices further as per capita oil consumption remains broadly stable at 4.7 barrels per year, as it did over the past three decades (Figure 6).

Oil prices could increase more rapidly than anticipated if the U.S. shale industry responds to falling oil prices with investment and production cuts more quickly than currently envisaged. Indeed, following reports of a sharp decline in rig count in the United States, between mid-January and early February 2015, oil prices already recovered somewhat from their lows. Since unconventional oil production can expand quickly upon a modest increase in oil prices, the risks around the baseline outlook are to the downside.

Box 2. Recent Oil Price Plunge: Supply or Demand?

Like other commodities, oil prices move endogenously in response to changes in supply and demand conditions. For instance, a reduced demand for oil due to a weak economy can drive down oil prices. A decline in oil prices can also be due to an increase in oil production that increases oil supply. Understanding the underlying driving force of oil price dynamics is important because the macro implications of oil price shocks depend on the underlying driving force, whether supply or demand (Barsky and Kilian, 2004). This box addresses two questions:

- What distinguishes supply and demand shocks?
- How important are supply and demand shocks in explaining the recent plunge?

What distinguishes supply and demand shocks?

Earlier studies have evaluated the role of supply and demand shocks in explaining oil price movements. Using a structural vector autoregressive (SVAR) model estimated with monthly data during 1970-2007, Killian (2009) decomposes oil prices into three components: oil supply shocks; global demand shocks; and oil-specific demand shocks which reflect "precautionary demand" associated with market concerns about the availability of future oil supplies. He finds that oil price shocks historically have been driven mainly by a combination of global aggregate demand shocks and precautionary demand shocks, rather than oil supply shocks, as is commonly believed. Furthermore, oil-specific demand shocks have been responsible for fairly sharply defined movements in oil prices which suggests that precautionary demand shocks may reflect rapid shifts in the market's assessment of the uncertainty about future oil supply shortfalls. Killian and Murphy (2014) extend this study by including speculative demand for oil using data on oil inventories. They report that speculative demand shifts played an important role during earlier oil price shock episodes including 1979, 1986 and 1990 while increases in world oil consumption driven by the global business cycle explained the 2003–2008 oil price surge.

To decompose the recent oil price drop into demand and supply factors, an SVAR model identified with sign restrictions is estimated using daily data.1/ In relation to the above papers, using daily data has the advantage that it yields enough observations to estimate the model using most recent observations. We assume that adverse demand shocks reflect a weakening global economy and therefore simultaneously reduce oil and equity prices. In contrast, favorable supply shocks are assumed to reduce oil prices but raise equity prices by lowering input cost and, more generally, supporting activity. 2/ For example, equity and oil prices generally both rose between 2005 and 2007, suggesting that strong demand was the main driver. During the Great Recession when economic activity clearly declined, both oil and stock prices fell which points to demand factors. During the second half of 2014, oil prices plummeted but equity prices generally increased, suggesting that supply factors were the key driver.

1/ A similar approach is deployed in Stehn (2015) and Arezki and Blanchard (2014). The model includes oil prices, equity prices, and US exchange rates at the daily frequency during 2005-2015. For oil prices, we use WTI and for equity prices, S&P 500. The variables are transformed into daily growth rates for estimation. Our results are robust to alternative measures of oil prices (Brent) and equity prices (FTSE Global Index and FTSE Global Index that excludes US stocks).

2/ An additional experiment was conducted including equity prices for oil companies (FTSE Oil & Gas) in the model and further imposing the restriction that a favorable supply shock is associated with a decline in equity prices of oil companies. This restriction captures the idea that an oil price decline due to a favorable supply shock can hurt profitability of oil companies, thus reducing their equity prices. This experiment led to similar results.

How important are supply and demand shocks in explaining the recent plunge?

The estimated shocks (Figure 2.1) indicate that both supply and demand factors played a role in explaining the recent oil price drop, but supply factors were the dominant factor. Adverse demand shocks (that reduce oil prices) peaked around end-2014 whereas favorable supply shocks kept mounting until February. Both favorable supply shocks and, to a lesser extent, adverse demand shocks started long before the sharp drop in oil prices. Thus, the recent oil price drop also reflects the cumulative effects of earlier supply and demand shocks (Baumeister and Kilian 2015).

In addition, the recent oil price drop has been attributed to expected, rather than actual, demand and supply conditions. Badel and McGillicuddy (2015) argue that during the second half of 2014, oil prices declined mostly because of negative oil-specific demand shocks—in anticipation of expected abundant oil supply—as well as aggregate demand shocks. Baumeister and Kilian (2015) report that negative demand shocks associated with the global business cycle and shocks to the demand for oil inventories contributed to the recent oil price drop.

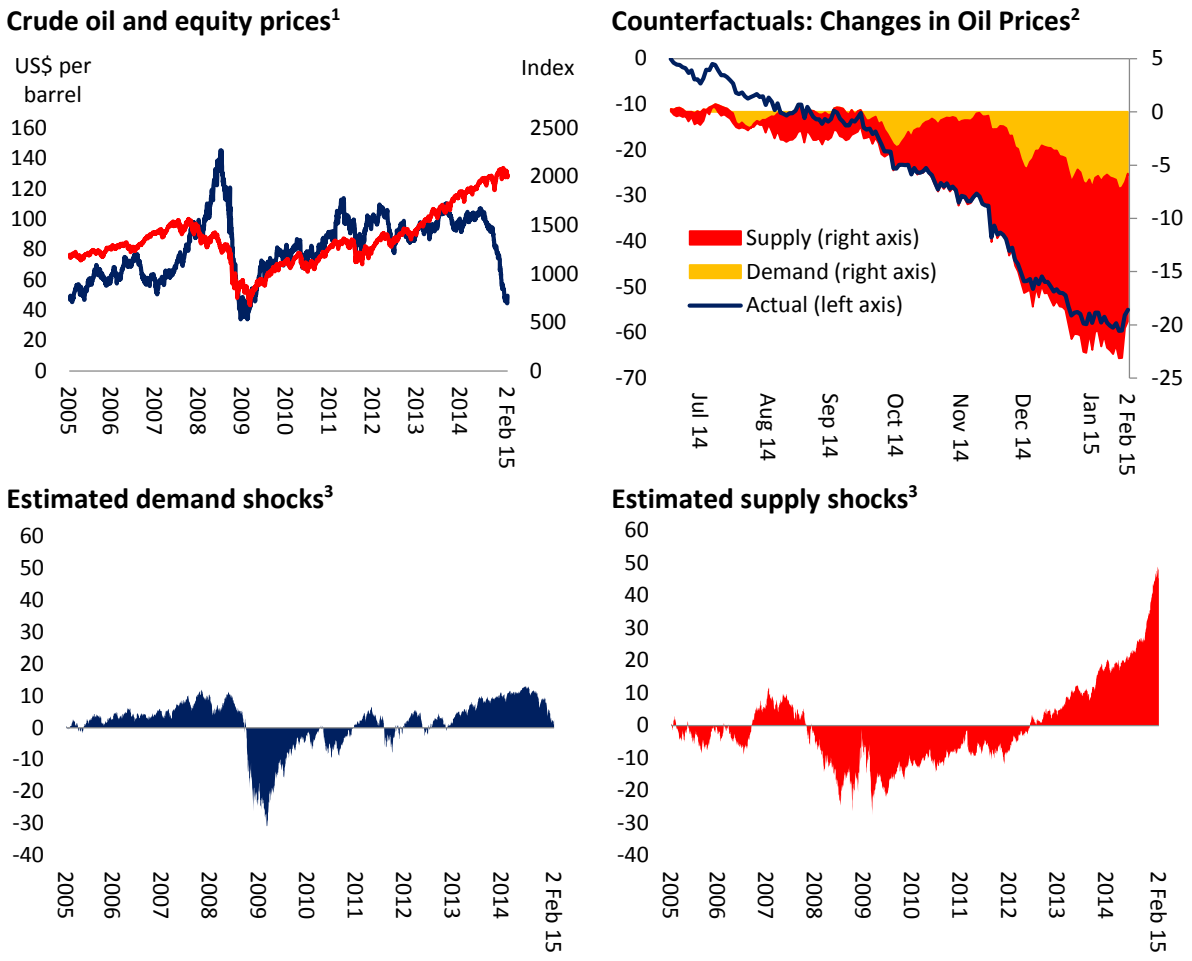
Counterfactual simulations show how oil prices would have evolved during the second half of 2014 in the presence of only one estimated shock – supply or demand.3/ With supply shocks only, oil prices would have declined more than in the case of demand shocks only operating. Specifically, supply shocks roughly accounted for twice as much as demand shocks in explaining the drop in oil prices during the recent episode.

_____

3/ For the counterfactual with the supply shocks, we only include the estimated supply shocks in tracing out oil prices while shutting down the estimated demand and other unidentified shocks in the VAR system. The demand counterfactual is implemented in a similar fashion.

Figure 2.1. Supply and demand factors in the oil price shock

Supply shocks have explained a much larger portion of the recent decline in oil prices than demand shocks.



Source: Bloomberg, FRED, Haver Analytics, World Bank estimates.
1. Crude oil price is the WTI index from Boomberg. Equity price is the S&P 500 index from Haver Anaytics.
2. Based on estimates from the model, identifying the demand and supply shocks using sign restrictions. All shocks except the shock of interest are shut off by setting them to zeros and the model is used to trace out the counterfactual oil price. This exercise is performed separately for supply and demand shocks. The red (blue) counterfactual shows how much oil prices would have declined during the second half of 2014 only with the estimated supply (demand) shocks. Numbers shown are in cumulative percentages.
3. These are the time series of demand and supply shocks as estimated from the model. Numbers shown are in cumulative percentages. The signs of the shocks are such that whenever positive, they result in a decline of oil prices.

IV. ECONOMIC AND FINANCIAL CONSEQUENCES

A. Key Channels

Oil prices impact growth and inflation through various channels: direct effects on prices and activity for both importers and exporters; indirect effects via trade and other commodity markets; monetary and fiscal policy responses; and investment uncertainty. Through these channels, oil prices can also have immediate repercussions—even absent discretionary policy responses—on fiscal and external balances.

The shift in real income from net oil-exporting economies, which tend to have higher average saving rates, to net oil-importing countries, where the propensity to spend tends to be higher, should generally result in stronger global demand over the medium term. However, the effects could vary significantly across countries and over time: while some exporting economies may be forced by financial constraints to adjust both government spending and imports abruptly in the short term, benefits for importing countries could be diffuse and offset by higher precautionary savings if confidence in growth prospects remains subdued. Second-round effects of low energy prices on other commodity markets could generate additional terms of trade changes for a range of commodity exporters.

In oil-importing countries where declining oil prices may reduce medium-term inflation expectations below target and reduce external financing pressures, central banks may respond with additional monetary policy loosening, which, in turn, can support growth. In oil-exporting countries, however, lower oil prices might trigger sharp currency adjustments, re-pricing of credit and sovereign risk, and contractionary fiscal policy measures, unless buffers are available to protect expenditures from the decline in tax revenues from the oil sector.

Abrupt changes in oil prices, by increasing uncertainty, can also reduce investment and durable goods consumption. To the extent that the return from an irreversible physical investment project depends on the price of oil, increased uncertainty about the future price of oil could cause firms to delay investment and reduce capital expenditures (Kilian 2014; Bernanke 1983; Pindyck 1991). Similarly, uncertainty generated by sharp movements in oil prices can also hinder the consumption of durable goods (Kilian 2014). In addition, rising uncertainty of future oil price can also lead to more precautionary demand of crude oil, with second-order impacts on activity (Anzuini, Patrizio, and Pisani 2014).

Falling oil prices also reduce overall energy costs as prices of competing energy products are forced down and oil-fired electrical power becomes cheaper to produce (Figure 6). For energy-intensive sectors, this should lead to higher profit markups and more supportive conditions for investment and employment. In addition, since oil is feedstock for various sectors, including petrochemicals, paper, and aluminum, the decline in prices directly impacts a wide range of processed or semi-processed inputs. The transportation, petrochemicals, and agricultural sectors, and some manufacturing industries, are thus usually major beneficiaries of lower oil prices as discussed later in this section. For consumers, lower energy costs and declining inflation more generally, increase real disposable income and support consumption.

The channels above operate with different strengths and lags depending on the source of the oil price change, its direction, and the oil-intensity of countries.

- **Sources of price movements.** Oil price movements driven by supply shocks in oil markets are often associated with significant changes in global output and income shifts between oil-exporters and importers. In contrast, changes in prices driven by demand shocks have tended to lead to weaker effects (Cashin, Mohaddin, and Raissi 2014; Kilian 2009; Peersman and Van Robays 2012).

- **Asymmetric effects.** Oil price declines generally appear to have smaller output effects on oil-importing economies than oil price increases (Jimenez-Rodriguez and Sanchez 2005; Hoffman 2012). This asymmetry could be caused by uncertainty, frictions and varying monetary policy responses to different types of movements in oil prices.

- **Advanced and developing economies.** Since energy and food represent a larger share of consumption baskets in developing countries (and production in developing countries tends to be more energy-intensive), developing countries may end up benefiting more than in advanced countries from a decline in oil prices. Inflation expectations in developing economies could also be more responsive to changes in fuel prices. This is reflected in stronger effects of commodity price shocks on inflation in developing countries than in advanced economies (Gelos and Ustyugova 2012).

Annex 1 provides an overview of the literature on the implications of changes in oil prices for growth and inflation.

B. Global Activity

The literature summarized in Annex 1 offers a range of estimates of the impact of a sustained, supply-driven oil price decline (although all estimated are for oil price hikes). They suggest that a 45 percent oil price decline (as expected, on an annual average basis, between 2014 and 2015) would be associated with an increase in world GDP of about 0.7-0.8 percent in the medium-term (World Bank 2013; IMF 2014a; OECD 2014). This is broadly in line with simulations using a large-scale macroeconomic model, and assuming that three-fifths of the about 50 percent oil price drop in the second half of 2014 was caused by expanding supply, which should raise global activity up to 0.7 percent in 2015 (Arezki and Blanchard 2014).

The expected positive impact of an oil price decline on the global economy reflects the benefits from lower oil prices for some of its largest economies, although there is a substantial uncertainty around existing estimates.

- **In the United States**, standard model simulations point to a net positive effect from declining oil prices, that could be further reinforced in an environment of improving labor markets and rising consumer confidence. Empirical estimates suggest that a supply-driven, sustained 45 percent drop in oil prices could lift U.S. real GDP by more than 1¼ percent over one or two years (Annex 1). However, these are likely to be upper bounds of the impact of the most recent oil price drop since they do not reflect the by now substantial share of energy production in the U.S. economy.[7] By 2013, energy production represented around 3 percent of U.S. GDP and 1.7 of U.S. employment, and capital expenditure in oil- and gas-producing structures amounted to around 20 percent of private non-residential investment. The energy sector also had a disproportionately large footprint in capital markets, accounting for more than 7 percent of stock market capitalization, 10 percent of investment grade credit and 16 percent of

[7] Most estimates point to a lower impact on the Euro Area and Japanese economies than the U.S. economy because of their lower energy-intensity. These estimates, however, precede the period of strong growth in U.S. shale oil production and thus are likely to overstate the gap in impacts.

outstanding high-yield bonds (Deutsche Bank 2014). The more low oil prices discourage U.S. oil production, the less their likely beneficial growth impact on the U.S. economy.

- **The European Union** should be a net beneficiary from low oil prices, as imports of crude oil from non-EU countries represent almost 3 percent of nominal GDP (in 2013, when oil prices averaged $109/bbl). Historical estimates suggest that a 45 percent drop in oil prices could lift Euro Area GDP by more than 1 percent (Carabenciov et al. 2008; European Commission 2012; ECB 2010; Peersman and van Robays 2009; Alvarez and others 2011). However, the impact of the recent oil price decline on GDP is likely to be smaller because of deflation concerns that currently weigh on investment decisions (European Commission 2015). Should a prolonged period of negative inflation set in—perhaps triggered by the oil price decline against the backdrop of a fragile recovery—rising real interest rates could reduce the expansionary impact of the oil price decline.
- In 2013, **Japan** imported oil and LNG amounting to about 4½ percent of its GDP, with contracts indexed to oil prices. Real income gains from low oil prices could therefore be significant, even though the effects will be observed only gradually as utility companies' contracts adjust slowly. Declining oil and LNG prices will particularly benefit energy companies, which have been unable to fully pass on to consumers rising costs of energy imports following the closure of nuclear reactors in the Fukushima accident. Hence, corporate profits and eventually investment should be positively affected (Bank of Japan 2015). While lingering deflationary pressures continue to affect households' propensity to consume and corporates' willingness to invest, aggressive stimulus measures by the Bank of Japan and fiscal relief for households should ensure that low oil prices lift domestic demand and lead to significant gains for the Japanese economy.
- In **China**, the impact of lower oil prices on growth is expected to boost activity modestly by 0.1-0.2 percent (World Bank 2015a) because oil accounts for only 18 percent of energy consumption, whereas 68 percent is accounted for by coal (Figure 8). The sectors most dependent on oil consumption—half of which is satisfied by domestic production—are transportation, petrochemicals, and agriculture. Since regulated fuel costs are adjusted with global prices (albeit with a lag), CPI inflation could fall over several quarters. The overall effect would be small, however, given that the weight of energy and transportation in the consumption basket is less than one-fifth. The fiscal impact is also expected to be limited since fuel subsidies are only 0.1 percent of GDP (IEA, 2013). Despite significant domestic oil production and the heavy use of coal, China remains the second-largest oil importer. Therefore, the 45 percent annual average decline in oil prices in 2015 is expected to widen the current account surplus by some 0.5-0.9 percentage point of GDP (World Bank, 2015a).
- Similarly, in **Brazil, India, South Africa and Turkey**, the fall in oil prices will help lower inflation and reduce current account deficits—sources of vulnerability for several of these countries. The precise impact will depend on the oil-intensity of consumption and production, the extent to which global price declines are transmitted into local ones, the flexibility of local economies to respond to falling oil prices, and the policy response.

Notwithstanding these estimated benefits, past episodes of oil price declines have been associated with a wide divergence of growth paths (Box 3). In particular, in several instances, oil price declines were associated with or followed by periods of financial stress in large advanced or emerging economies and growth failed to pick up strongly.

With a confluence of cyclical and structural forces at work in the global economy, the expected gains for growth from the drop in oil prices could be lower than suggested by the standard model simulations. Indeed, these forces help explain why global growth forecasts (World Bank 2015a; IMF 2015a) continued to be downgraded since mid-2014, despite the decline in oil prices and signs of a strengthening U.S. recovery. Conversely, the possibility remains that these headwinds prove weaker than expected and global growth surprises on the upside.

- *Weak global demand.* Disappointing global growth prospects and weak oil demand are likely to be responsible in some part for the price drop as documented above. Demand-driven changes in oil prices tend to have a smaller impact on growth, as these are outcomes rather than sources of economic fluctuations (Kilian 2009).
- *Crisis legacies.* Uncertainties associated with financial vulnerabilities, rapid household debt growth, elevated unemployment, and slowing long-term growth potential may encourage households and corporations to save real income gains from falling oil prices, rather than to invest or consume.
- *Limited monetary policy room.* The monetary policy loosening typically associated with demand-driven declines in oil prices in the past is unlikely to materialize and the accompanying decline in inflation may prove a mixed blessing. Specifically, with policy interest rates of major central banks already at or near the zero lower bound, the room for additional monetary policy easing is limited should declining oil prices lead to a persistent undershooting of inflation expectations.
- *Reduced investment in the energy sector.* A sharp decline in oil prices is associated with rising uncertainty, potentially causing investments in new oil exploration and development to adjust abruptly. Leveraged and higher production cost investments in shale oil (United States), tar sands (Canada), deep sea oil fields (Brazil, Mexico), and oil in the Arctic zone could be particularly sensitive to abrupt changes in prices. Planned new oil exploration and development, especially in East and Southern Africa (e.g., in Kenya, Uganda, Zambia), are also likely to be affected.
- *Sharp adjustments for exporters.* The sudden decline in oil prices is straining both private and public sector balance sheets among major oil exporters, causing in some cases sharp slowdowns with significant cross-border spillovers.
- *Changing relationship between oil and activity.* Evidence suggests that the impact of oil prices on activity has significantly declined since the mid-1980s as a result of the falling oil-intensity of GDP, increasing labor market flexibility, and better-anchored inflation expectations. The weaker relationship also points to a smaller response of activity to price changes at present.[8]

[8] For the changing nature of the relationship between oil prices, and activity and inflation, see Blanchard and Galí (2008), Blanchard and Riggi (2013), and Baumeister and Peersman (2013).

Box 3. Implications of Oil Price Drops: A Historical Perspective

The previous five episodes of significant oil price drops were often followed by weak growth, lower inflation, and significant monetary policy accommodation (Figure 3.1 below). Most episodes were preceded by a period of weakening global growth, which contributed to the observed decline in oil prices and were followed by relatively slow recoveries. Although virtually all episodes of significant oil price drops since 1984 were accompanied by monetary policy loosening in the United States and some other major advanced economies, several were accompanied or followed by financial market strains.

1985-96. The 1985-86 oil price slump was the episode most closely associated with changing supply conditions as OPEC reverted to its production target of 30 mb/d despite rising unconventional oil supply from the North Sea and Mexico. Following the price slump, the U.S. Federal Reserve embarked on a series of interest rate cuts to fend-off slowing activity and declining inflation. The lack of improvement in global activity despite these supportive conditions was tightly connected to a period of weak growth and significant debt problems in some large developing countries, slow growth in Japan and many European countries, and, at the end of 1987, the impact of a significant downward correction in US and global stock-markets.

1990-91. The oil price decline of 1990-91 reversed an earlier spike triggered by the first Gulf War. Despite being accompanied by monetary policy loosening, global growth failed to strengthen significantly. Instead, it slowed in 1992 before recovering modestly in 1993, as a recession in Europe ran its course, the recovery in the United States remained hesitant, and Japan entered a period of prolonged stagnation. In advanced countries, a process of debt reduction and balance sheet restructuring, elevated long-term real interest rates, financial and exchange rate stress especially in Europe, and weak confidence hampered the global upturn. In contrast, growth in many developing countries was resilient, with significant capital inflows helping commodity exporters offset negative terms of trade effects from weakening prices.

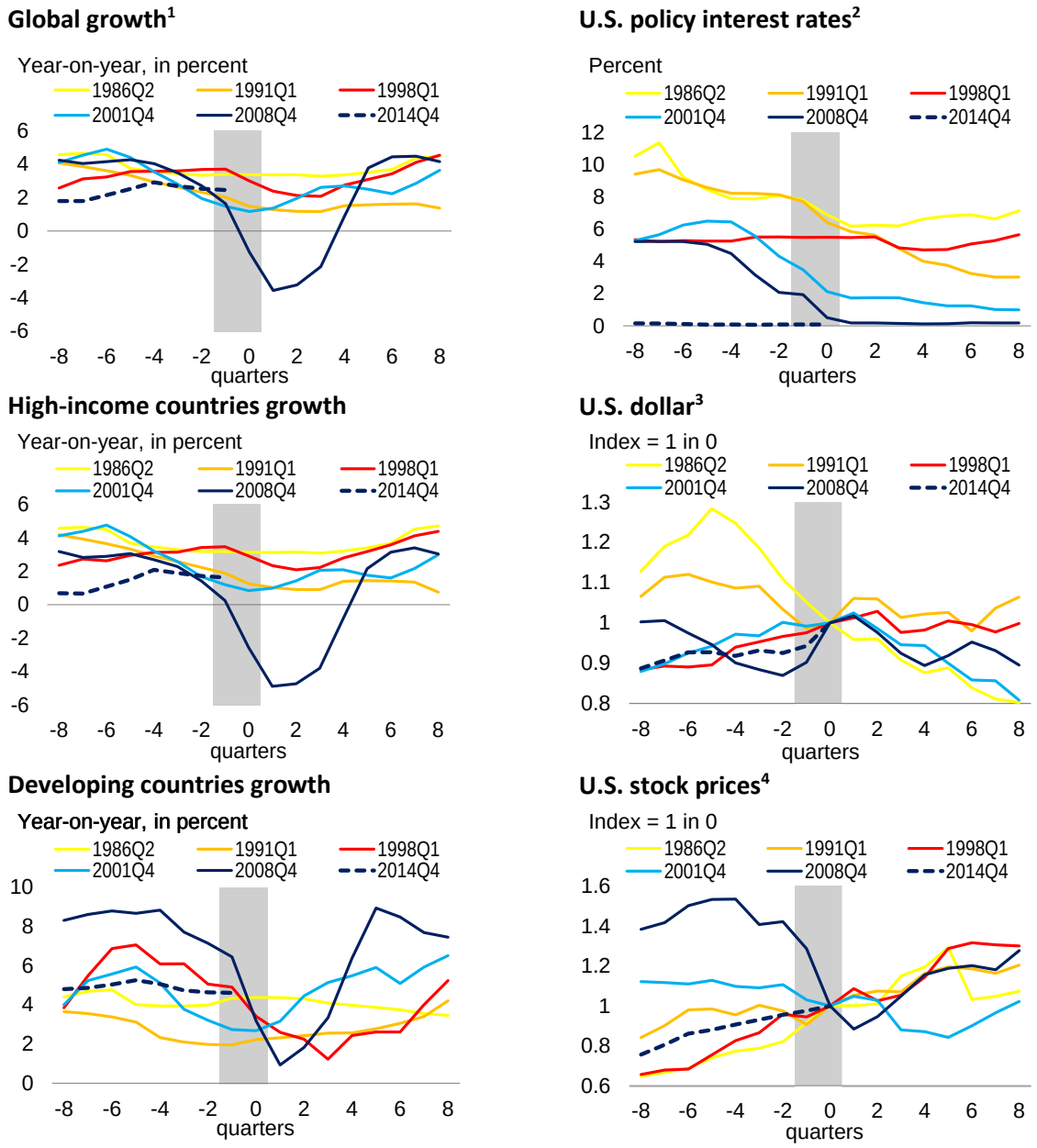
1998. A sharp decline in oil prices was associated mostly with weakening demand as a result of the 1997 Asian crisis, while the continued expansion of OPEC production until mid-1998 might have played a role as well (Fattouh 2007). Despite low oil prices, the global recovery remained tepid for most of 1998, partly as a result of financial market stress in the United States and major emerging markets. It gathered momentum only in 1999-2000, as growth in the United States, Euro Area, and a number of large developing economies rebounded.

2001. The disruptions and uncertainty caused by the September 11 terrorist attacks in the United States intensified a growth slowdown already underway as the “dotcom” bubble deflated. Softening global activity and rising uncertainty were the main triggers behind a sharp decline in oil prices around that period. However, aggressive monetary policy easing by the Federal Reserve and other major central banks propped a rapid rebound in activity, while lower oil prices might have provided some further support.

2008-09. A severe contraction in global demand sent all commodity prices tumbling during the Great Recession of 2008-09. Wide-ranging central bank and government interventions, together with resilient growth in major developing countries, gradually stabilized global activity. However, the recovery remained sluggish, constrained by financial sector restructuring, large asset price losses and widespread deleveraging pressures in high-income countries. The combined impact of a rapid rebound in commodity prices and declining interest rates supporting capital flows to developing countries created particularly favorable conditions for commodity exporting developing countries over the period 2010-12.

Figure 3.1. Global growth and financial developments around oil price declines

Past episodes of significant oil price declines were often preceded by global growth slowdowns and followed by relatively weak recoveries in both high-income and developing countries, mostly as a result of financial market stress. U.S. monetary policy eased but equity markets remained somewhat weak around most of these past episodes.



Source: World Bank and Federal Reserve Bank of St. Louis.

1. Global growth computed on the basis of a weighted average (using 2010 USD GDP weights) of countries for which quarterly national accounts data is available. Time "0" is the quarter of the trough of a significant oil price decline episode (30 percent drop over a seven-month period which is the shaded region). "-8" corresponds to 8 quarters before the trough and "8" corresponds to 8 quarters after.

2. Effective U.S. nominal federal funds rate.

3. Nominal effective exchange rate of the U.S. dollar against a trade-weighted basket of major currencies. An increase denotes a nominal effective appreciation.

4. U.S. equity market index in U.S. dollars.

C. National Activity and Income Shifts

Developments in global oil markets are accompanied by significant real income shifts from oil-exporting to oil-importing countries. Yet, the ultimate impact of lower oil prices on individual countries depends on a wide range of factors, including the share of oil in their exports or imports, their reliance on the oil sector for tax revenues, their cyclical positions, and monetary and fiscal policy room to react (Figure 7). While the negative impact on exporters is immediate and in some cases accentuated by financial market pressures, the positive impact for oil importers could be more diffuse and take some time to materialize. Sharp slowdowns in oil-exporters could spillover to activity in neighboring countries, including oil-importing ones.

Oil-importing countries

Activity in oil importers should benefit from lower oil prices since a drop in oil prices raises household and corporate real incomes in a manner similar to a tax cut. A 10 percent decrease in oil prices could raise growth in oil-importing economies by some 0.1–0.5 percentage points, depending on the share of oil imports in GDP (World Bank 2013; Rasmussen and Roitman 2011). Oil-importing countries' current accounts could also see substantial improvements (Kilian, Rebucci, and Spatafora 2009) but the impact might vary depending on the underlying drivers of oil price developments (IMF 2005; Buetzer et al. 2012). The exact magnitude of the growth benefits and external improvements largely depends on country-specific circumstances.

In **Turkey**, for example, lower oil prices would relieve current account pressures. Since 2012, net energy imports have been in the range of 6-7 percent of GDP (World Bank 2015d). A 45 percent decline in oil prices would improve the current account balance by some 1.7 percent of GDP and, taking into account fuel taxes, could reduce headline inflation by 1.4 percentage point. If energy prices were to adjust more broadly—as can be expected following the introduction of a cost-based pricing mechanism in 2008—inflation could fall further. The boost to real incomes and downward pressure on input costs associated with a sustained 45 percent decline in oil prices could lift GDP in Turkey by more than 1 percent.

Oil-exporting countries

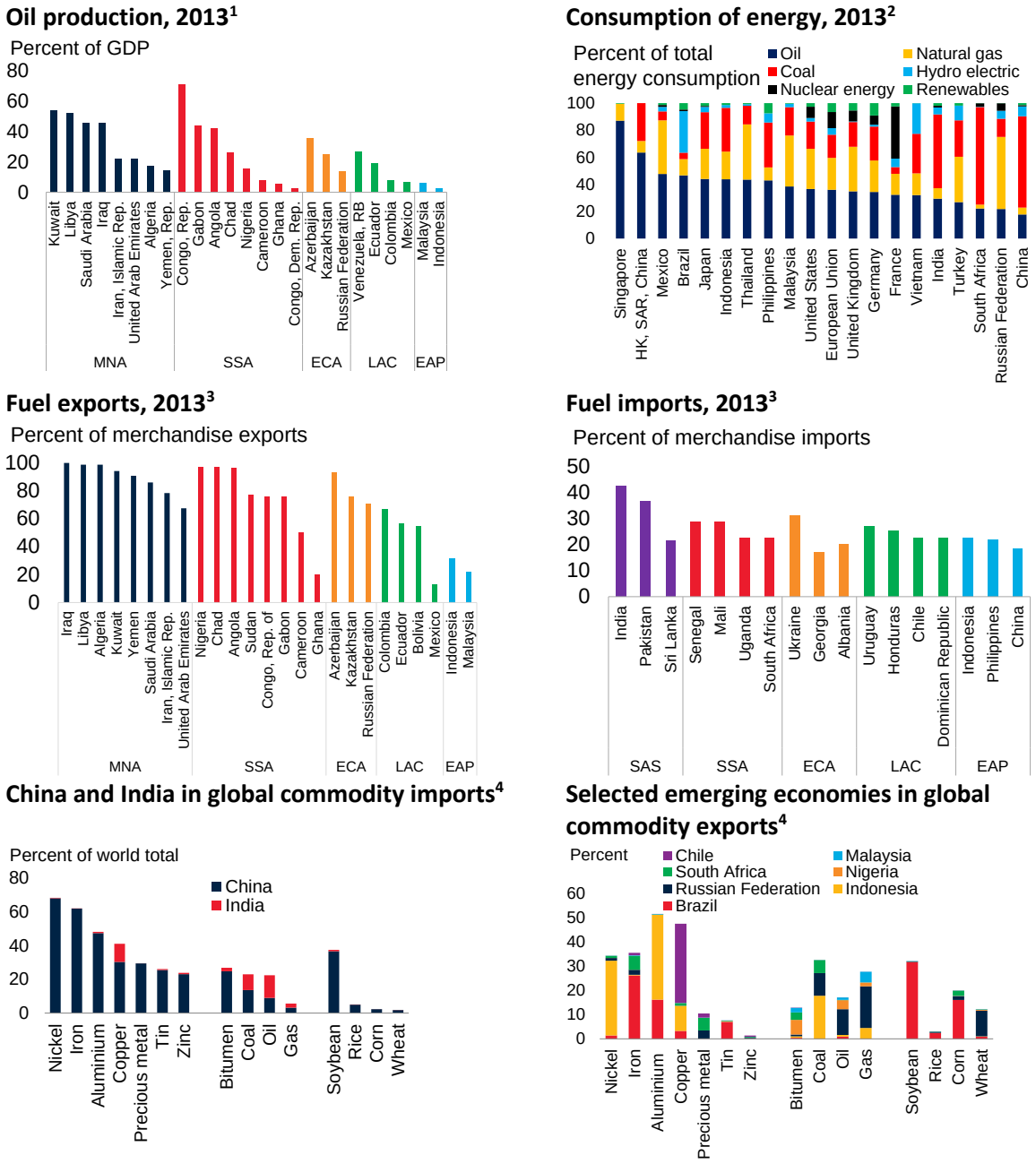
In addition to a contraction of the oil sector, falling oil prices can have a number of indirect effects on oil-exporting economies. In many, government finances rely heavily on taxing the oil sector. For example, in oil exporters in the MENA region, oil-based revenues account for more than half of overall fiscal revenues (World Bank 2015c). Fiscal strains in oil exporters may be amplified by corporate sector weakness, especially in oil companies. Many of the largest oil companies are state-owned (Smith 2009) and some publicly traded ones have elevated debt-to-asset ratios.

Unless governments have ample buffers to safeguard spending, a significant loss of revenues may trigger a sharp fiscal consolidation. In addition, a decline in oil prices generally deteriorates their current account and precipitates currency depreciations.[9] Such currency adjustments are an important mechanism through which opportunities in non-oil tradable goods sector might arise over the medium term; however, financing pressures could be significant in the short term.

[9] IMF (2015b) estimates that a permanent increase in real oil prices of $10 per barrel was on average associated with an increase in fuel exporters' current account surplus of about 2 percent of own GDP, with the effect fading out within three years.

Figure 7. Oil production and consumption for selected countries

Oil production accounts for a significant proportion of activity and exports in several countries in the Middle East and North Africa as well as Subsaharan Africa, but also a few countries in Central Asia, Central and South America, and East Asia. Conversely, several countries in South Asia and parts of Africa are highly dependent on oil imports whereas others, including China, rely on non-oil fuel commodities such as coal to meet fuel demand.



Sources: World Development Indicators, BP Statistical Review, CEIC, U.S. Energy Information Agency.

1. Oil production is estimated as oil rents which are defined as the difference between the value of crude oil production at world prices and total costs of production. Estimates based on sources and methods described in World Bank (2011).

2. Oil consumption is measured in million tons; other fuels in million tons of oil equivalent.

3. The world aggregation represents the sum of reporting and non-reporting countries. For non-reporting countries data is based on the partner reported data (mirror data).

4. Average over 2008-13. Including exports of ores (e.g. bauxite) and oil products.

Empirical estimates suggest that output in some oil-exporting countries, including **Russia** and some in the Middle East and North Africa, could contract by 0.8–2.5 percent in the year following a 10 percent decline in the annual average oil price.[10] **Canada**, as a net exporter of oil, is also likely to experience slowing activity as a result of falling oil prices. If oil prices are sustained around $50-$70 per barrel—well below the break-even cost for many projects—investment in the oil and gas sector could swiftly drop by some 30 percent, thus lowering overall business investment by some 10 percent. Although consumer would benefit from lower pump prices, the terms of trade deterioration would trickle through to lower incomes, which would worsen household balance sheets and may slow the housing market. Overall, lower oil prices could depress real GDP by 1 percent in 2015 and an additional 0.4 percent in 2016 (Bank of Canada 2015).

The deterioration of current account balances could be attenuated by well-developed financial systems (Allegret et al. 2014). Over the medium- to long term, FDI flows to the energy and extractive sector, which contributed significantly to dynamic capital inflows to Sub-Saharan Africa and other developing regions in recent years, may decline if new oil and gas projects become unviable at current oil price levels. This could add financing pressure in countries with current account deficits.

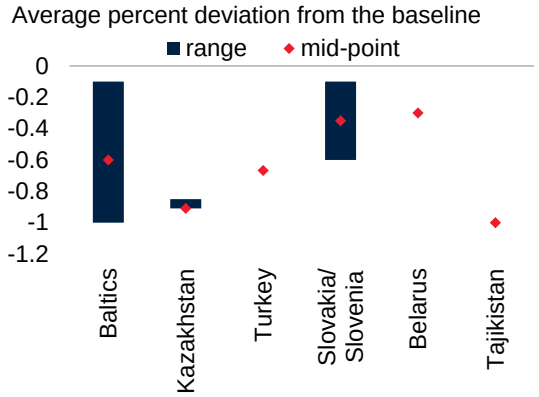
Spillovers: impact on trade, tourism, and finance

Sustained low oil prices will weaken activity in exporting countries, with adverse implications for trade, tourism, remittances or official support. A sharp recession in Russia would dampen growth in Central Asia (Figure 8). Weakening external accounts in Venezuela or the Gulf Cooperation Council (GCC) countries may put at risk external financing support they provide to neighboring countries. Russian and GCC tourists, who accounted for the bulk of tourist arrivals in Egypt, could slow significantly as a result of growth slowdowns (World Bank 2015c).

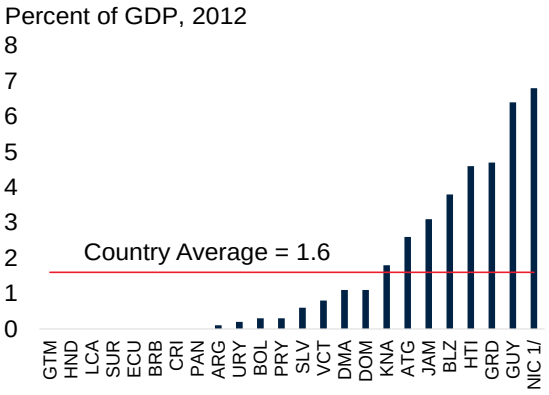
Figure 8. Spillovers from oil-exporting countries: Russia and Venezuela

Sharp slowdowns in Russia or Venezuela could have significant regional repercussions.

Impact of 1ppt decline in Russian growth on growth in neighboring countries



External financing provided by Venezuela



Source: World Bank and IMF (2014).
Note: Developing CIS data is GDP-weighted average of World Bank client countries in Central Asia.

[10] For details, see World Bank (2013), Berument, Ceylan, and Dogan (2010), and Feldkirchner and Korhonen (2012).

D. Inflation

Oil price declines have been followed by temporary falls in global inflation (Figure 9). Although the decline in inflation has been quite pronounced in high-income countries, the impact across countries has varied significantly, reflecting in particular the importance of oil in consumer baskets, exchange rate developments, the stance of monetary policy, the extent of fuel subsidies and other price regulations.

In general, the pass-through from oil prices to inflation appears to have declined over time (De Gregorio, Landerretche, and Nielson 2007; Blanchard and Gali 200) owing in part to the reduced oil dependence of production and consumption and a better anchoring of inflation expectations. This has significantly reduced the second round effects of oil price fluctuations on core-inflation. The dynamics of the propagation of commodity price shocks across a sample of 46 countries studied in Pedersen (2011) also confirm a limited impact of oil price changes on core-inflation, contrasting with the more lasting effect of food price shocks, particularly in emerging and developing economies.

In order to gauge the likely impact of changes in oil prices on inflation, two simple econometric models are estimated using data for G20 countries.[11] First, the change in the price of oil is added to a standard Phillips curve model, in which inflation is a function of inflation expectations and economic slack. Second, a simple vector autoregression (VAR) model is estimated to study the dynamic interactions between headline consumer prices, producer prices, output gap, exchange rate and the price of oil.[12] All regressions are country-specific and estimated at a monthly frequency over the period 2001-14.

Results indicate that the pass-through to headline inflation in most cases is modest, with a 10 percent decline in the oil price reducing inflation by up to 0.3 percentage point at its peak impact (Annex 2). This is in line with other estimates in the literature. For example, De Gregorio, Landerretche, and Nielson (2007) find, in a sample of 23 countries for 1980-2005, that a 10 percent decrease in oil prices (in local currency) would lower inflation by around 0.2 percentage point.

Country-specific circumstances could in some cases influence the impact of oil prices on domestic inflation. For example, for economies that import large volumes of oil, currency appreciation (depreciation) would reinforce (mitigate) the deflationary impact of the oil price decline. In countries where the government subsidizes household energy consumption, the pass-through of global oil prices to local energy prices may be dampened (Jongwanich and Park, 2009). Our results indicate that among high-income countries, the estimated impact of oil price developments on consumer price inflation is more marked in the United States than in the Euro Area or Japan, and among developing countries, more significant in India, Indonesia and Turkey than in China or Brazil, owing in part to different mixes of energy consumption, price regulations and exchange rate patterns.

The impact of oil price movements on global inflation is estimated to be essentially one-off, peaking after three to five months, before fading gradually. In particular, a 45 percent decline in oil prices, if sustained, would reduce global inflation by about 0.7-1.2 percentage point through 2015. In the course of 2016, however, inflation would return to levels observed prior to the plunge in oil prices.

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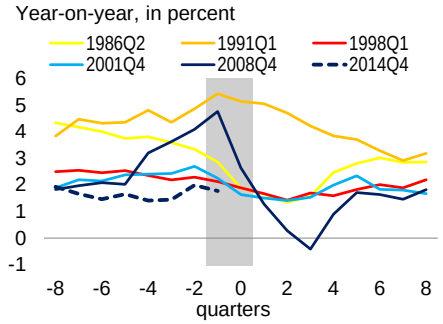
[11] The approach here closely follows the one in De Gregorio, Landerretche and Nielson (2007). The sample consists of 16 members of the G20 (Brazil, Canada, China, Germany, Euro Area, Spain, France, United Kingdom, India, Indonesia, Italy, Japan, Mexico, Turkey, United States, and South Africa). Oil prices are measured in local currency to account for potentially offsetting exchange rate movements. Economic slack is proxied by the deviation of industrial production from its Hodrick-Prescott-filtered trend.

[12] The sample is the same as for the Phillips curve model estimations. Variables included are the year-on-year growth rate of the consumer price index, the producer price index, the nominal effective exchange rate, the oil price (denominated in local currency), and the deviation of industrial production from its Hodrick-Prescott-filtered trend.

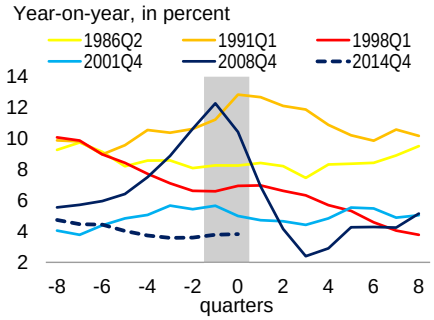
Figure 9. Oil prices and inflation

Historically, oil price drops have been followed by temporary declines in inflation, especially in high-income countries. The pass-through from oil prices to core inflation is generally muted. The projected 45 percent decline in oil prices in 2015 is likely to temporarily lower inflation by up to 1.2 percentage point, but the impact will dissipate in 2016.

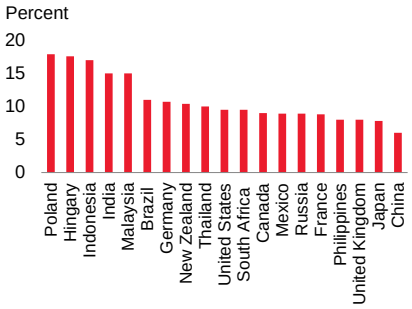
High-income country CPI inflation around significant oil price declines[1]



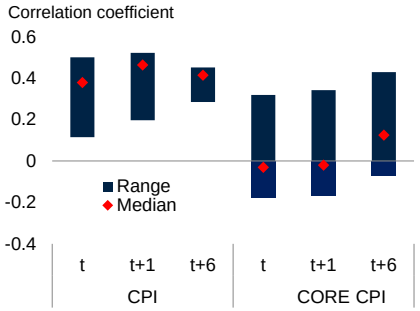
Developing country CPI inflation around significant oil price declines



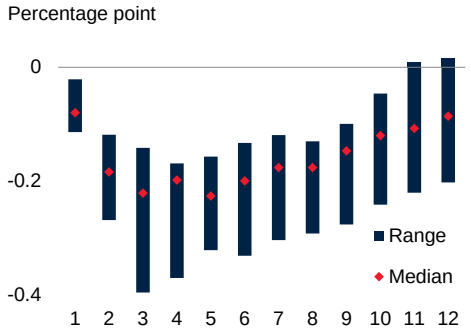
Weight of energy in national CPI baskets[2]



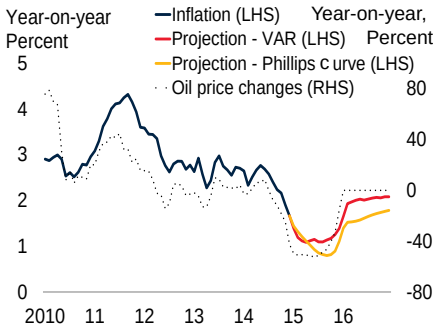
Correlation of oil price growth and inflation[3]



Inflation response to a 10 percent decline in oil prices[4]



Evolution of oil price and inflation, 2010-16[5]



Source: World bank, OECD, Morgan Stanley, IMF, Capital Economics.

1. Time "0" is the quarter of the trough in significant oil price decline episodes.

2. Compiled from OECD (for high-income countries, Hungary, Mexico and South Africa); Morgan Stanley (for China); IMF (for India, Indonesia, Malaysia, Thailand and the Philippines); and Capital Economics (Brazil and Russia). Excludes transport.

3. Correlation computed for monthly headline and core CPI inflation in 2001-14 for 16 G20 countries. "t+1" and "t+6" refer to correlation of oil price changes with the first and sixth lead of inflation indicators (one month and six months ahead), respectively.

4. Impulse response of year-on-year CPI inflation to a one standard error (approximately 10 percent) decline in year-on-year oil price changes, estimated from individual monthly VAR models for 16 countries, using year-on-year growth in consumer prices, oil prices (in local currency), the nominal effective exchange rate and the deviation of industrial production from its Hodrick-Prescott-filtered trend, estimated with 8 lags. Impulse responses derived from a Cholesky decomposition, with CPI inflation last in the ordering. The range of impulse responses across countries is defined by the first and third quartiles of the distribution of individual country responses. Time "1" is the first quarter of the modelled oil price decline.

5. Inflation refers to a consumption weighted average of inflation rates of 16 members of the G20. Inflation projections are based on country specific VAR models and Phillips curve models.

E. Non-Oil Commodity Prices

The recent decline in oil prices could also lead to significant declines in other commodity prices.

- Decline in oil prices will likely translate into lower **natural gas prices** in Europe and **liquefied natural gas (LNG)** prices in Asia (Figure 10). LNG prices in Japan already declined 11 percent from June 2014 to January 2015. If low oil prices persist, the price of LNG, mostly destined to Asian markets, will drop further given tight linkages in pricing contracts. Low oil prices will also put downward pressure on European natural gas prices, since they are partly linked to oil prices. Prices in the United States will be affected less because they are determined by domestic supply and demand conditions.
- Natural gas, in turn, is a key input into **fertilizer** (especially nitrogen-based) production. Already, fertilizer prices are down 45 percent since 2011 and more than 50 percent lower since their all-time high in 2008. Following the post-2005 collapse of natural gas prices in the United States due to the shale gas and oil boom, many fertilizer companies began moving their production plants to the United States in order to capitalize on the "energy premium" (IFIA 2014). This trend, however, may be reversed if low oil (and, hence, natural gas) prices persist.
- Lower oil prices will also impact **agriculture**, which is 4-5 times more energy intensive than manufacturing, through several channels. Most importantly, falling fuel prices are expected to reduce production and transportation, including cost of chemicals and fertilizers, some of which are crude oil byproducts or directly made from natural gas. Lower oil prices could also reduce the opportunity cost of biofuel production. However, the declining attractiveness of biofuels production in an environment of low oil prices will likely to be mitigated by current policies. Because most diversion of food commodities to biofuels is policy mandated, the increase in oil consumption triggered by low oil prices may, in fact, increase diversion of grains and oilseeds to the production of biofuels.

The changes in non-oil commodity prices also affect activity in various countries. For example, lower agricultural commodity prices would generate a second round effect on commodity-dependent countries. Developing countries have large market shares for various other commodities and, conversely, many are heavily dependent on the exports of a few raw materials.

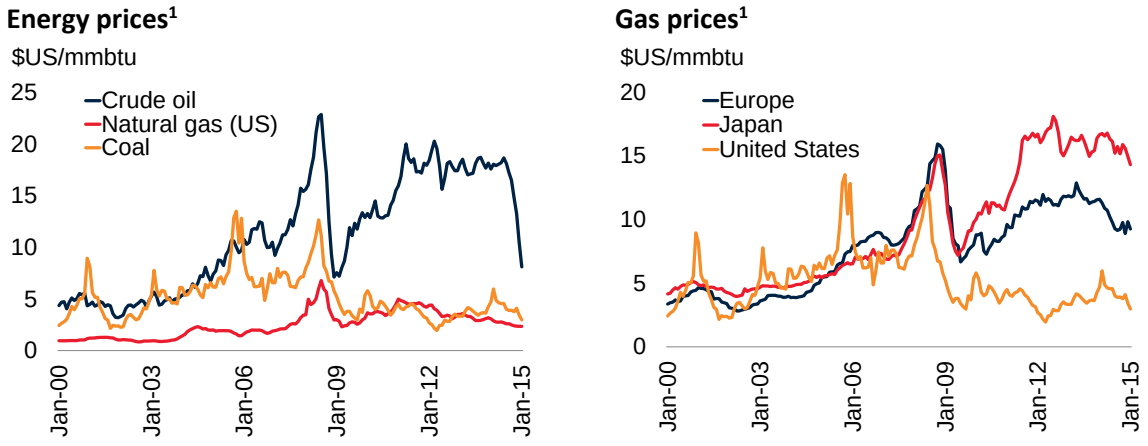
The broad-based commodity price declines of 2013–14 have already helped improve current account deficits in many countries in East and South Asia but caused a significant deterioration of terms of trade for Latin American and Sub-Saharan African countries which export agricultural produce and metals. Across Sub-Saharan Africa, a 30 percent decline across all commodity prices could reduce GDP by 0.5 percent (IMF 2013b), with commodity exporters being affected the most.

Because of the dependence of low income countries on agriculture, the link between oil and agricultural commodities has especially important growth and poverty implications. The transmission elasticity from energy to non-energy, and agricultural commodities has been estimated at 0.11-0.25.[13] Based on these estimates, a 45 percent decline in oil prices is associated with an almost 10 percent decline in the prices of agricultural commodities.

[13] A number of studies report strong linkages between the prices of energy and non-energy commodities in the context of different commodities using a variety of methodologies (Gilbert 1989; Hanson, Robinson, and Schluter 1993; Borensztein and Reinhart 1994; Chaudhuri 2001; Baffes 2007 and 2010; Moss, Livanis, and Schmitz 2010). Some others find no direct causal link between the prices of energy and non-energy commodities (Saghaian 2010; Gilbert 2010; Zhang et al. 2010; Reboredo 2012. The diverging findings may reflect the rising importance of biofuels that may have weakened the link between oil and food commodity price (de Gorter and Just 2009) or methodological differences (Zilberman et al. 2013).

Figure 10. Links between oil and other energy prices

The oil price decline can be expected to affect natural gas prices, especially in Asia and, to a lesser extent, in Europe.



Source: Baffes (2007), World Bank,
[1] mmbtu is million of British thermal units, a measure of energy content.

F. Fiscal Balances

Oil exporters. Movements in oil prices affect oil and energy-related revenues and hence government budgets of oil-exporting countries, in some cases significantly (Figure 11). In oil exporters in the Middle East and Africa, oil-related revenues account for more than half of government income (World Bank, 2015c). Fiscal break-even prices, which range from $54 per barrel for Kuwait to $184 for Libya, exceed current oil prices for most oil exporters. The loss in oil revenues resulting from falling oil prices can strain government budgets and require spending cuts unless fiscal buffers are available for use.[14] In some countries, fiscal pressures can partly be mitigated by large sovereign wealth fund or reserve assets. In contrast, several fragile oil exporters, such as Libya and the Republic of Yemen, do not have significant buffers, and a sustained oil price decline may require substantial fiscal and external adjustment, including through depreciation or import compression.

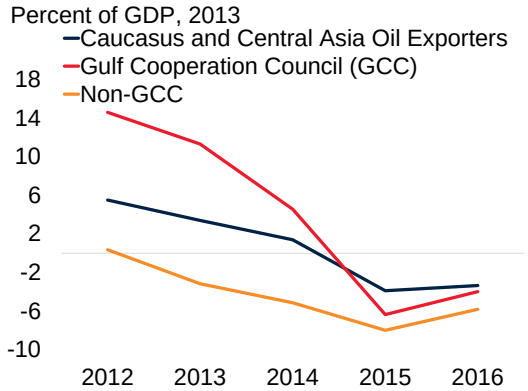
Oil importers. In oil-importing countries, savings from oil import bills can relax government budgets. Pre-tax subsidies, which arise when energy consumers pay less than the supply cost of energy, are high in many developing and emerging economies (IMF 2013a; Clements et al. 2014). The high real oil prices prevailing before the crisis contributed to mounting fiscal pressures in some countries as they responded to increasing global oil prices by raising price subsidies on domestic fuels (Baig et al. 2007). A decline in oil prices, therefore, presents an opportunity for many of these countries to reduce these subsidies and in the process remove long-standing distortions associated with them. We discuss these issues in section V.

[14] In the case of oil-exporting developing countries, such effects on government spending were more pronounced before the 2000s when fiscal policy was more strongly procyclical (World Bank, 2015a).

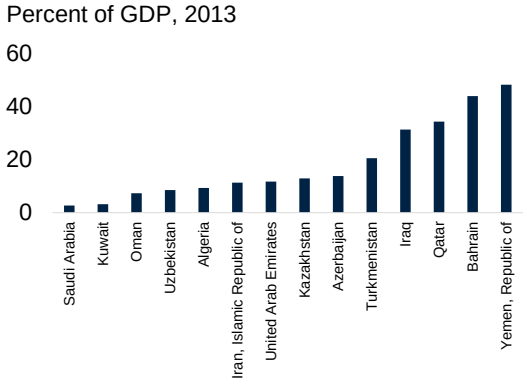
Figure 11. Fiscal balances and oil prices

Fiscal balances are expected to deteriorate significantly among oil exporters. In some cases, large sovereign wealth fund assets can be deployed to mitigate the fiscal impact of oil prices falling below fiscal break-even levels. Declining oil prices will ease fiscal pressures from high energy subsidies and present an opportunity to raise environmentally-motivated fuel taxation.

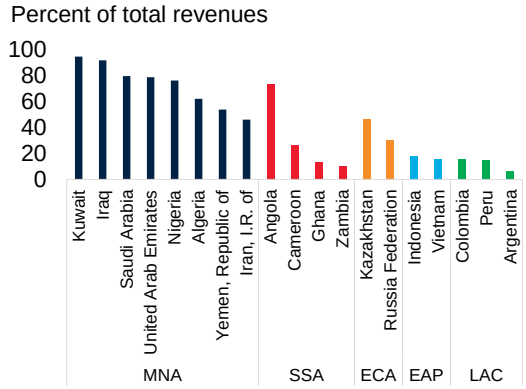
Fiscal balances of oil exporters



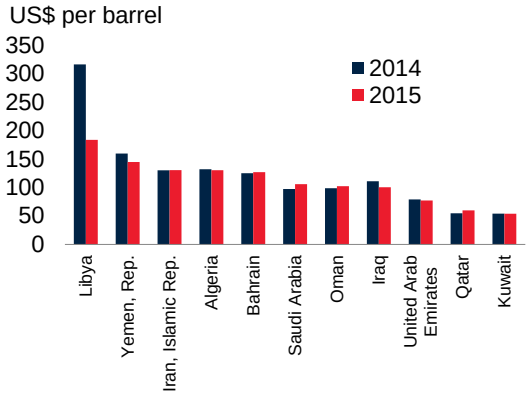
Gross central government debt



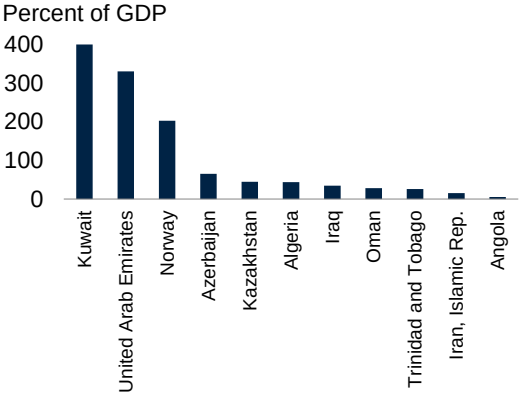
Commodity-related revenues, 2013[1]



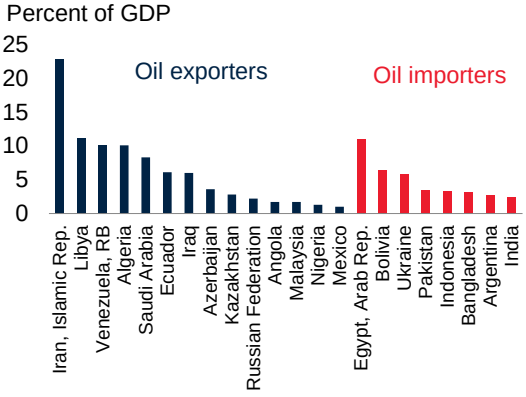
Oil producers fiscal break-even prices[2]



Sovereign wealth fund assets, 2013[3]



Fiscal cost of fossil fuel subsidies, 2013[4]

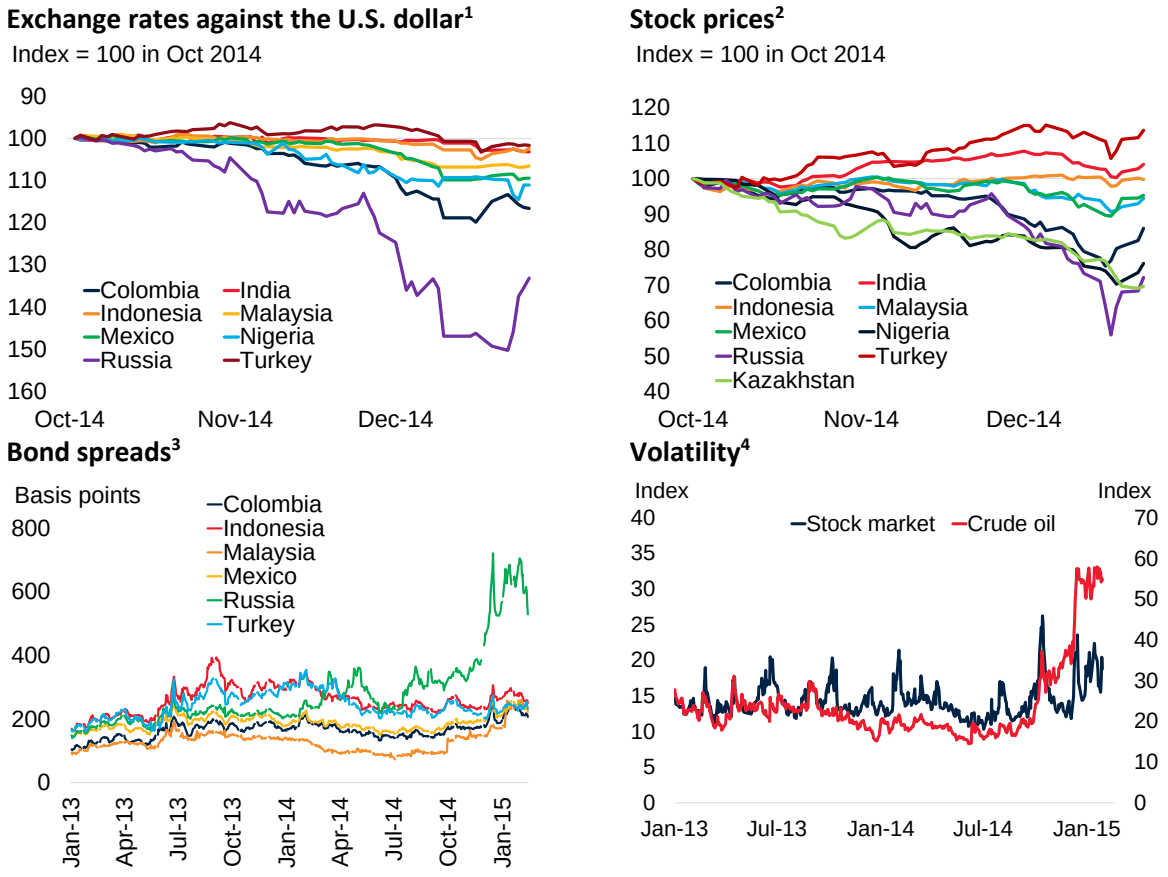


Source: IMF, Bloomberg, JP Morgan Chase, IEA Fossil Fuel Database.

1. Includes revenues from all commodities, including oil.
2. Fiscal break-even prices are oil prices associated with a balanced budget.
3. Countries with sovereign wealth fund assets below 5 percent of GDP not shown.
4. Countries where the fiscal cost of fossil fuel subsidies is below 1 percent of GDP are not shown.

Figure 12. Exchange rates and stock market indices for selected countries

Currencies have depreciated against the U.S. dollar and stock markets have declined in oil-exporting countries. Bond spreads of some oil exporters have increased and volatility of oil prices has spiked.



Sources: CBOE, JP Morgan, Haver Analytics.
1. U.S. dollars per local currency unit. An increase denotes an appreciation against the U.S. dollar.
2. Stock market index in national currency.
3. JP Morgan EMBI bond spreads.
4. Stock market volatility: future 30-day expected stock market volatility based on VIX Index option prices on the S&P 500. Crude oil volatility: expectation of 30-day volatility of crude oil prices applying the VIX methodology to options spanning a wide range of strike prices.

G. Financial Markets

Several oil-exporting countries are exposed to global financial markets. A reassessment of growth prospects of oil-exporting countries has already contributed to capital outflows, reserve losses, sharp depreciations, or rising sovereign CDS spreads in several oil-exporting countries, including Russia, Venezuela, Colombia, Nigeria, and Angola (Figure 12). Through second-round effects, growth slowdowns in oil-exporting countries could also strain balance sheets of corporates and, by raising nonperforming loans, those of banks. Although banking systems in most oil-exporting countries have been considered resilient to oil price changes (Arezki and Blanchard 2014), financial strains could eventually intensify. Financial problems in large oil-exporting emerging markets could have adverse contagion effects on other emerging and frontier economies.

In addition, oil-exporters have channeled surplus savings from oil revenues into a broad array of foreign assets, including government bonds, corporate bonds, equities, and real estate. The flow of so-called "petro-dollars" supported financial market liquidity, and helped keep borrowing costs down over the past decade. If oil prices remain low, repatriation of foreign assets, e.g. to protect fiscal spending, could generate capital outflows and financial strains. However, this process has been ongoing for some years, with the recycling of "petro-dollars" in global financial markets peaking before the global financing crisis in 2008, and slowing significantly since 2012 according to some estimates (Spegel 2014).

H. Poverty

While the direct impact of falling oil prices on poverty are likely to be limited, the indirect effects may be substantial and largely beneficial. Energy consumption by the poor is low: households in the poorest quintile of the income distribution typically spend well below 10 percent of their income on fossil fuel-sourced energy (Vagliasindi 2012). As a result, the direct impact of falling oil prices on the poor is expected to be small.

However, indirect effects would work through growth and falling food prices. More than 70 percent of the world's poor live in oil-importing countries, where low oil prices (to the extent they are transmitted into local fuel prices) will support growth and real incomes. This will benefit the poor as well as the more prosperous. The poor could gain further if falling oil prices allowed expenditures on subsidies to be reallocated to better-targeted pro-poor programs. However, in oil-exporting countries, easing growth and, in some cases, tightening fiscal policy could weaken prospects for the poor.

Falling oil prices also pass through into other commodity prices, in particular food prices: a 45 percent decline in global oil prices could reduce agricultural commodity prices by about 10 percent as discussed above. Changes in global food commodity prices will also be reflected in most countries' domestic food prices—even if only with a lag and muted by transport cost and local supply and demand conditions (World Bank 2014c; Cudjoe, Breisinger and Diao 2010).[15]

Falling food prices may benefit the majority of the poor but harm the very poorest, despite an adjustment in household behavior. Many poor households are net food buyers--and would thus benefit from lower food prices. In low-income countries, however, about half of the poor households are only marginal net food buyers and the poorest households tend to be net food sellers (Aksoy and Isik-Dikmelik 2008). Hence, while the bulk of the poor may benefit from low food prices, the poorest may see net real income losses. However, poor households will likely mitigate some of the impact of falling food prices by adjusting the hours worked or the number of household members working in employment outside the family farm (Ivanic and Martin 2014).

V. POLICY IMPLICATIONS

A. Monetary Policy

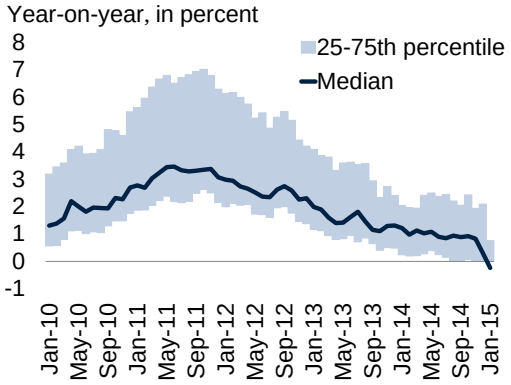
The recent sharp fall in oil prices will significantly reduce global inflation in the course of 2015, increasing the number of countries with low or even negative inflation (Figure 13). This disinflationary impact should be mostly temporary, dissipating by the end of 2016, but the coincident fall in inflation

[15] The passthrough of global food prices into local food prices has been particularly studied for the 2010 food price spike For example, in the second half of 2010, global wheat prices spiked by 68 percent; over the subsequent 6 months, this was followed by 16-45 percent increase in domestic wheat prices in Bangladesh, Pakistan, Sri Lanka, and Tajikistan. During the same period, a 21 percent rise in global rise prices was followed by a broadly similar rise in domestic rice prices in these countries (Ivanic, Martin, and Zaman 2012).

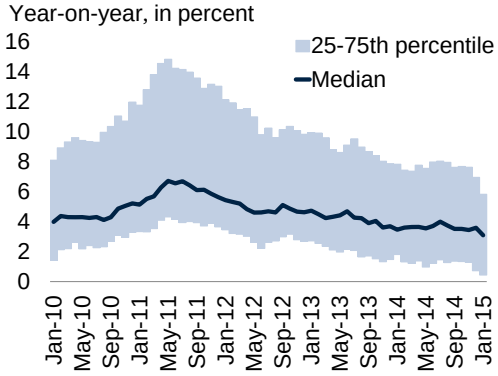
Figure 13. Monetary policy accommodation

Slipping commodity prices and negative output gaps have dampened inflation in many high-income and developing countries. The drop in oil prices also coincided with drifting inflation expectations with important implication for monetary policy. Several emerging and developing countries have cut policy rates since end 2014.

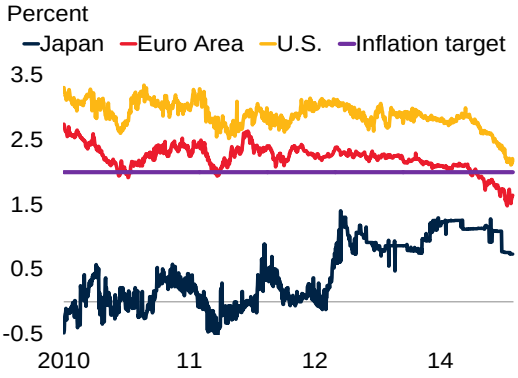
High-income countries: inflation[1]



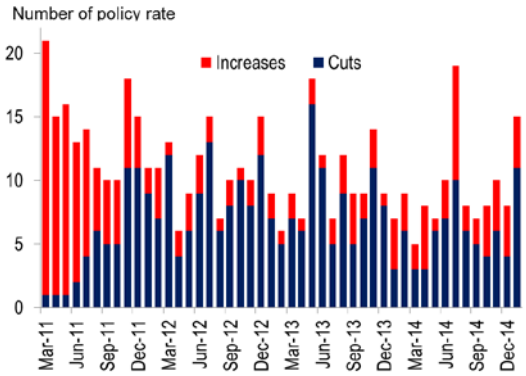
Developing countries: inflation[2]



Inflation expectations: Euro Area, Japan and U.S.[3]



Central bank decisions across developing countries



Source: World Bank, Haver Analytics, Bloomberg, Central Bank Rates .

1. The sample includes 55 high-income countries.
2. The sample includes 121 developing countries.
3. 10-year ahead inflation expectations derived from 5 year-5 year swap rates.

expectations in high-income countries and reduced price pressure in some large oil importing emerging economies has impacted the debate on monetary policy.

Central banks might react with more accommodative policies to the extent that lower oil prices reduce inflation over the policy-relevant horizon. Monetary policy should in fact react to all factors and shocks that could lead to a deviation of forecasted inflation from medium-term policy objectives (De Gregorio 2012). This puts particular emphasis on the likelihood of second-round effects on other prices and expected impact of the oil shock on aggregate demand.

On the first aspect, energy being a key intermediate good, its price effect could be widespread across sectors and over time, especially in the presence of sticky price and wage formation. However, most

studies and the empirical results reported above indicate that the impact of oil price changes on headline inflation peaks after few months and remains muted over the medium term.

On the second aspect, optimal policy rules for central banks tend to dictate a forceful response to shocks affecting aggregate demand and the level of slack in the economy. Stabilizing the output gap appears a key objective for central banks, not only from a welfare perspective, but also because it can contribute to lower volatility of price and wage inflation (Bodenstein, Guerrieri, and Kilian 2012). The response of monetary policy could therefore be vastly different depending on the source of the oil shock (supply or demand driven) and its impact on aggregate demand and labor market conditions across countries.

This makes it essential for policy makers to balance the immediate effect of oil price fluctuations with more medium-term considerations (Blanchard and Galí 2008; Bernanke, Gertler, and Watson 1997; Adjemian and Paries 2008; Natal 2009). Moreover, in a generally weak global growth environment and with policy interest rates constrained by the zero lower bound in major economies, monetary policy might become more sensitive to downside risks to price stability. In the Euro Area and in Japan, where several months of outright deflation could contribute to inflation expectations becoming de-anchored from policy objectives, central banks have considerably loosen policy since mid-2014 and provided forward guidance to fend-off medium-term deflation risks.

Among large oil-importing developing countries, the combined effect of declining current account deficits and inflation moving back in line with policy targets has allowed several central banks to cut interest rates in recent months.

In oil-exporting countries, however, policy considerations are very different, with central banks having to balance the need to support growth against the need to maintain stable inflation and investor confidence in the face of significant currency pressures. Orderly exchange rate depreciations can help oil exporters adjust to a negative terms of trade shock and limit the effect on aggregate demand, but disorderly movements can put significant strain on balance sheets and lead to a challenging combination of above target inflation and declining activity. Monetary policies that stabilize the real exchange rate or the domestic-currency price of exports are seen as delivering higher welfare gains and stability among oil exporting countries than those targeting strictly consumer price inflation (Frankel 2010; Catão and Chang 2013).

B. Fiscal Policy, Subsidy and Tax Reforms

A number of developing countries provide large fuel subsidies to their populations. In some cases, the cost of subsidies exceeds 5 percent of GDP (IEA, 2014c). However, these subsidies often tend to have adverse distributional effects and tilt consumption and production towards energy-intensive activities.

- **Savings on subsidies.** When imposed in a non-targeted fashion, the economic benefits of subsidies are concentrated on higher income households, as these consume more subsidized energy than poor ones. For example, a study of 20 developing countries showed that subsidies on gasoline and LPG are strongly regressive (Arze del Granado, Coady, and Gillingham 2012).[16] In addition, the actual benefits in terms of access to good quality, and clean energy sources are a subject of intense debate. Rationing and shortages often accompany subsidized forms of energy consumption. In the case of networked utilities such as electricity, power outages resulting from lack of investment may

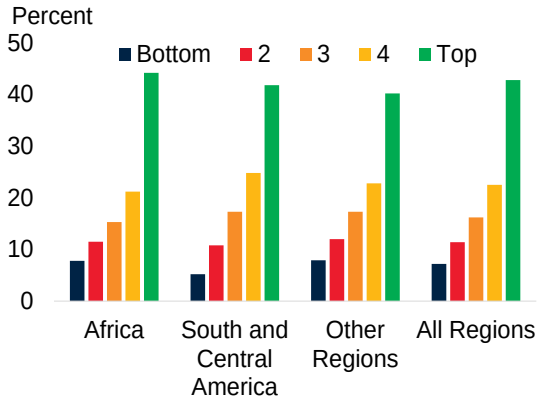
[16] Studies reviewed by the World Bank (IEG, 2008) across developing countries find that only 15-20 percent of subsidies benefited the poorest 40 percent of the population, a result that confirms findings by Coady (2006).

lead richer households to rely on private generators, leaving poorer households either cut off from electricity or forced to rely on more expensive alternatives.

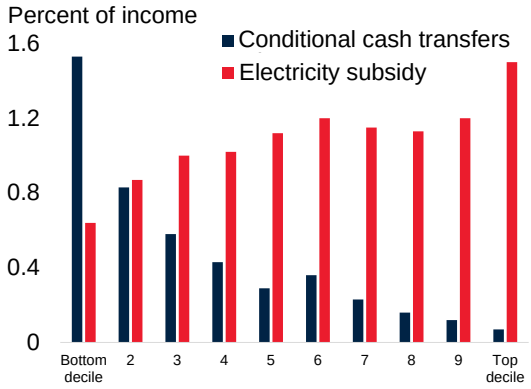
Figure 14. Impact of energy subsidies across income categories

Energy subsidies typically benefit higher-income and higher-consumption households more than lower-income and lower-consumption households. In contrast, cash transfers and near-cash transfers tend to be progressive.

Subsidy benefits by consumption quintile: comparison across regions[1]



Benefit electricity subsidy vis-à-vis cash transfer payments: the case of Mexico[2]



Source: Arze del Granado, Coady, and Gillingham (2012), Vagliasindi (2012).
1. Share of the total benefit from different fuel price subsidies for households across grouped by consumption levels.
2. *Conditional Cash Transfers (*previously *Opportunidades*, now *Prospera*) is a Mexican government social assistance (welfare) program founded in 2002. It was designed to target poverty by providing cash payments to families in exchange for regular school attendance, health clinic visits, and nutritional support.

- **Incentives for energy use.** Energy subsidies can also crowd out priority public spending and private investment, encourage excessive energy consumption, reduce incentives for investment in renewable energy, and accelerate the depletion of natural resources. In fact, the low energy cost associated with subsidized or low oil prices may encourage a move towards production which is more intensive in fossil fuels or energy more generally. This runs counter to broader environmental goals in many countries. To offset the medium-term incentives for increased oil consumption, while at the same time building fiscal space, policymakers could modify tax policies on the use of energy, especially in countries where fuel taxes are low.

Falling oil prices reduce the need for fuel subsidies, and provide an opportunity for subsidy reform with limited impact on the prices paid by consumers. Such subsidy reform should lead to a comprehensive and permanent shift towards more market-based fuel pricing. This should in turn prevent rising fuel subsidies when oil prices start increasing again. Egypt, India, Indonesia, the Islamic Republic of Iran, and Malaysia implemented such reforms in 2013 and 2014, removing some of the distortions and inefficiencies associated with subsidies. Fiscal resources released by lower fuel subsidies could either be saved to rebuild fiscal space lost after the global financial crisis or reallocated towards better-targeted programs to assist poor households, and support critical infrastructure and human capital investments.

A broad spectrum of measures can be used to provide more effective means of supporting the poor. For example, cash transfers and near-cash transfers are progressive in the great majority of cases—supporting lower income households more than higher income ones—in contrast to energy subsidies (Komives et al. 2007; Vagliasindi 2012). The effectiveness of such measures depends in particular on careful targeting and administrative capacity.[17]

Subsidy reform should be combined with energy tax reform. The fall in oil prices has been such that, even after subsidy cuts, local fuel prices have fallen. This could be offset by raising energy taxation, as has been done in India on diesel fuels in 2015. An acceleration of fuel subsidy and tax reforms is both timely and fully aligned with G20 objectives set in the Pittsburgh summit in 2009 to "rationalize and phase out over the medium term inefficient fossil fuel subsidies that encourage wasteful consumption" (G20 2009). The resolution was reaffirmed in St. Petersburg in 2013 and in Brisbane in 2014.[18]

C. Structural Policies

For oil exporters, the sharp decline in oil prices is also a reminder of the vulnerabilities inherent in a highly concentrated reliance on oil exports and an opportunity to reinvigorate their efforts to diversify. These efforts should focus on proactive measures to move incentives away from activities in the non-tradable sector and employment in the public sector, including encouraging high-value added activities, exports in non-resource intensive sectors, and development of skills that are important for private sector employment (Gill et al. 2014; Cherif and Hasanov 2014a and 2014b). The diversification experience of the few successful oil exporters (e.g. Mexico and Malaysia) suggests that diversification usually takes place amid dwindling oil revenues and relies on both vertical diversification in oil, gas and petrochemical sectors and horizontal diversification beyond these sectors, with an emphasis on technological upgrade and competitiveness. The incentive structure for workers and firms, and a change in social attitudes towards investment in human capital, entrepreneurship and employment in the private sector, must be fostered in the non-oil tradable sector.

VI. CONCLUSION

Following four years of relative stability at around $105/bbl, oil prices fell sharply between June 2014 and January 2015. Compared to the early 2011 commodity price peaks, the decline in oil prices was much larger than that in non-oil commodity price indices. The decline in oil prices was significant compared with other episodes of oil price drops during the previous three decades, but not unprecedented.

Both long- and short-term factors are behind the recent plunge in oil prices: several years of large upward surprises in oil supply, downward surprises in demand, unwinding of geopolitical risks that had threatened production, change in OPEC policy objectives, and an appreciation of the U.S. dollar. Changes in supply conditions appear to have played a dominant role, with the OPEC strategy aimed at supporting its market share announced in November 2014 significantly deepening the drop in prices that was already underway.

The decline in oil prices has significant macroeconomic, financial and policy implications. If sustained, it will support growth and reduce inflationary, external, and fiscal pressures in a large number of oil-

[17] In Mexico, cash transfers are provided in parallel with subsidies accruing to lower consumption households. *Oportunidades,* Mexico's main anti-poverty government cash-transfer program, has been quite successful in targeting the poor, in contrast to electricity subsidies.

[18] On the request of G20 leaders, the World Bank released a report in September 2014 providing a roadmap for transitional policies to assist the poor while phasing out fossil fuel subsidies (World Bank 2014b).

importing countries. On the other hand, sharply lower oil prices will weaken fiscal and external positions and reduce economic activity in a few oil-exporting countries. These adjustments could be abrupt in some cases. The decline in oil prices has significantly dampened investor sentiment about oil-exporting emerging market economies, and could lead to substantial volatility in financial markets, as was observed in a number of countries in the last quarter of 2014. However, declining oil prices also present a significant window of opportunity to reform fuel subsidies, which are substantial in several developing countries, and energy taxes, and to reinvigorate reforms to diversify oil-reliant economies.

Over the medium term, oil prices are projected to recover from their current lows, but will remain below recent peaks and witness considerable volatility for a couple of years. The pace of the recovery in prices will largely depend on the speed at which supply will adjust to weaker demand conditions. Given that OPEC, for now, appears to have relinquished to its role as swing producer, US shale oil producers, with their relatively short production cycles and low sunk costs, may see the greatest adjustments in the short term. In the longer term, adjustment will take place from both conventional and unconventional sources through cancellation of projects. While supply is likely to be curtailed, demand is expected to pick up, along with the expected recovery in global activity and in line with broader demographic trends.

However, predictions on the evolution of oil markets remain highly uncertain. Commodity prices, including oil, tend to be volatile, making forecasting prone to errors. For oil, the unpredictability is further amplified by the possibility of heightened geopolitical tensions and a sudden change in expectations regarding OPEC's policy objectives. Over the long run, physical (geological) constraints should put upward pressure on the real price of oil, although technological advances could slow the increase. Sharply diverging judgments on recoverable reserves and on future price elasticities of oil demand and supply imply that oil price forecasts over the long run are subject to wide error bands (Benes et al. 2012).

Annex 1. Impact of Oil Prices on Activity and Inflation: A Brief Survey

Large movements in oil prices have historically been followed by sharp fluctuations in activity and inflation in many countries.[19] This basic observation has led to a voluminous literature analyzing the complex linkages between movements in oil prices and activity and inflation. This box presents a brief review of the literature to address the following questions:

- Which key channels transmit changes in oil prices to activity and inflation?
- How large is the impact of oil price movements on activity?
- How large is the pass-through of changes in oil prices to inflation?

Which key channels transmit oil price changes to activity and inflation?

Falling oil prices often affect activity and inflation by shifting aggregate demand and supply and triggering policy responses. On the supply side, lower oil prices lead to a decline in the cost of production (Finn 2000). The lower cost of production across a whole range of energy-intensive goods may be passed on to consumers and hence, indirectly, reduce inflation (Blanchard and Galí 2008). The lower cost of production can also translate in higher investment. On the demand side, by reducing energy bills, a decline in oil prices raises consumers' real income and leads to an increase in consumption (Edelstein and Kilian 2007; Kilian 2014; Hamilton 2009).[20]

If falling oil prices ease inflation—especially, core inflation or inflation expectations (Alvarez et al. 2011)—central banks may respond with monetary loosening which, in turn, can boost activity (Bernanke, Gertler and Watson 1997).[21] However, if core inflation or inflation expectations do not ease with falling oil prices, central banks may refrain from a monetary policy response such that the impact on real activity could be small (Hunt, Isard and Laxton 2001). Lower oil prices can also lead to adjustments in fiscal policies that can in turn affect activity.

How large is the impact of oil price movements on activity?

The literature mostly focuses on estimating the impact of oil price increases on real activity in major economies.[22] These estimates vary widely, depending on the oil intensity of the economy, oil exporter/importer status, data samples, and methodology (Annex Table 1). For example, for OECD countries, a 10 percent increase in oil prices has been associated with a decline in real activity of 0.3-0.6

[19] Hamilton (2005) documents that nine out of ten recessions in the U.S. were preceded by sharp oil price increases. De Gregorio, Landerretche, and Neilson (2007) report a strong correlation between oil price shocks and subsequent high inflation in many countries.

[20] For example, a $10 per barrel oil price decline may reduce U.S. consumers' gasoline bills by as much as $30 billion (0.2 percent of GDP; Gault 2011). However, the uncertainty associated with oil price swings can have a negative impact on investment (Elder and Serletis 2010).

[21] The impact of endogenous monetary responses to oil price movements on aggregate activity is contested in the literature. For instance, Kilian and Lewis (2011) argue that, once the endogeneity of oil price movements is taken into account, there is no empirical support for a significant role of the monetary policy in amplifying the effects of oil price shocks on the U.S. economy.

[22] For the global economy, as mentioned in the text, Arezki and Blanchard (2014) report estimates of model simulations that the current oil price slump could increase global output by 0.3 – 0.7 percentage points. Similar estimates are also available from other sources (World Bank 2013; IMF 2014a; OECD 2014).

percent in the United States and 0.1-0.3 percent for the Euro Area (Jimenez-Rodriguez and Sanchez 2005).[23] Studies for developing countries have reported a wide range of findings.[24]

The recent literature has established that the effects of oil prices on activity and inflation depend on the underlying source and direction of the changes in prices. Also, the impact has declined over time.[25]

Source of the oil price movements. The impact of oil prices on activity depends critically on their source. Oil supply shocks would be expected to generate an independent impact on activity. In contrast, oil demand shocks would themselves be the outcome of changing real activity with limited second-round effects (Kilian, 2009). Indeed, oil price changes driven by oil supply shocks are often associated with significant changes in global output and income shifts between oil exporters and importers. Changes in prices driven by demand shocks, on the other hand, tend to lead to weaker and, in some studies, insignificant effects (Cashin, Mohaddin, and Raissi 2014; Kilian 2009; Peersman and Van Robays 2012).

Asymmetric effects. The failure of the 1986 oil price collapse to produce an economic boom has sparked a literature on the asymmetric impact of oil price movements on activity. Such an asymmetric effect may result from costly factor reallocation, uncertainty, and an asymmetric monetary policy response. In particular, the U.S. Federal Reserve has typically chosen to respond vigorously to inflation increases triggered by higher oil prices but has responded less to unexpected declines in inflation following oil price declines (Kilian 2014; Bernanke, Gertler, and Watson 1997).[26] While oil price increases—especially large ones—have been followed by significantly lower output in the United States, some studies report that oil price declines have been associated with much smaller, and statistically insignificant, benefits to activity (Hamilton 2003; Jimenez-Rodrıguez and Sanchez 2005).[27]

Declining energy intensity. Several studies have documented that the impact of oil prices on output has fallen over time. For example, Hamilton (2005) estimates that a 10 percent oil price spike would reduce U.S. output by almost 3 percent below the baseline over four quarters in 1949-80 but less than 1 percent in a sample that extends to 2005. The literature has offered a variety of reasons for the declining impact of oil prices on the economy (Blanchard and Gali 2008): structural changes such as falling energy-intensity of activity, and more flexible labor markets which lowered rigidities associated with price-markups.[28] In addition, stronger monetary policy frameworks have reduced the impact of oil price shocks by better anchoring inflation expectations, thus dampening firm pricing power (Taylor 2000) and helping create a regime where inflation is less sensitive to price shocks.

How large is the pass-through of changes in oil prices to inflation?

Historically, oil price swings and inflation have been positively correlated, even though this relationship has varied widely across countries. Large increases in oil prices during the past forty years were often followed by episodes of high inflation in many countries (De Gregorio, Landerretche, and Neilson 2007). As in the case of output, the impact of oil price swings on inflation has, however, declined over the

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[23] Jimenez-Rodriguez and Sanchez (2005) derive these estimates from a variety of different methodologies. Their results are broadly in line with Abeysinghe (2001), Reifschneider, Tetlow and Williams (1999), and Mork (1994), Cashin, Mohaddes and Raissi (2014), and Peersman and Van Robays (2012).

[24] See Tang, Wu, and Zhang (2010) and Allegret, Couharde and Guillaumin (2012). In addition to changes in the level of oil prices, their volatility has been associated with a decline in investment in some developing countries, for example in Thailand (Shuddhasawtta, Salim, and Bloch 2010).

[25] Hamilton (2005), Kilian (2008, 2014) provide comprehensive surveys of the literature on these issues.

[26] Kilian and Vigfusson (2011) presents a survey of the literature on the nonlinearities and asymmetries in oil price-output relationship.

[27] Similar estimates are also found in the earlier literature (Mork et al. 1994; Smyth 1993; Mory 1993).

[28] Barsky and Kilian (2004) and Blanchard and Gali (2008) argue that the impact of oil prices on the U.S. stagnation in the 1970s is overestimated in the earlier literature.

years. For instance, Hooker (2002) showed that oil prices contributed substantially to U.S. inflation before 1981, but since that time the pass-through has been much smaller. Similar results have been found for other advanced economies (Cologni and Manera 2008; Alvarez et al. 2011) and for some emerging market economies (De Gregorio, Landerretche, and Neilson 2007; Cunado and Gracia 2005). The decline in pass-through is attributable to the reasons above that explain the decline in the impact on activity, in particular improvements in monetary policy frameworks that resulted in better anchoring of long-run inflation expectations.

Annex Table 1. An overview of the literature

Authors	Country	Period	Methodology	Results
Cashin, Mohaddes, Raissi and Rassi (2014)	38 countries	1979Q2-2011Q2 (quarterly)	Global VAR with sign restriction	Impact of one standard deviation **supply-driven** increase (+12%) in oil price on **output** within one year (%): China (0.12), Euro Area (-0.15), Japan (0.05), USA (-0.12), Algeria (0.2), Ecuador (0.7), GCC Countries (0.1), Indonesia (-0.3), Iran (0.7), Nigeria (2.3), Venezuela (0.6), Canada (0.2), Mexico (0.4), Norway (-0.3), UK (-0.18).
				Impact of one standard deviation **supply-driven** increase (+12%) in oil price on **inflation** within one year (%): China (0.04), Euro Area (0.04), Japan (0.08), USA (-0.04), Algeria (0.32), Ecuador (-0.6), GCC Countries (0.1), Indonesia (-0.1), Iran (-1.0), Nigeria (-0.1), Venezuela (-0.4), Canada (0.06), Mexico (0.5), Norway (0.06), UK (-0.01).
				Impact of one standard deviation **demand-driven** increase (+12%) in oil price on **output** within one year (%): China (0.3), Euro Area (-0.2), Japan (0.4), USA (0.15), Algeria (0.6), Ecuador (0.5), GCC Countries (0.4), Indonesia (0.3), Iran (0.7), Nigeria (2), Venezuela (0.6), Canada (0.4), Mexico (0.6), Norway (-0.1), UK (0.07).
				Impact of one standard deviation **demand-driven** increase (+12%) in oil price on **inflation** within one year (%): China (0.05), Euro Area (0.08), Japan (0.13), USA (0.1), Algeria (0.32), Ecuador (-0.6), GCC Countries (0.18), Indonesia (-0.1), Iran (-1.4), Nigeria (-0.3), Venezuela (-0.5), Canada (0.08), Mexico (0.15), Norway (0.1), UK (0.04).

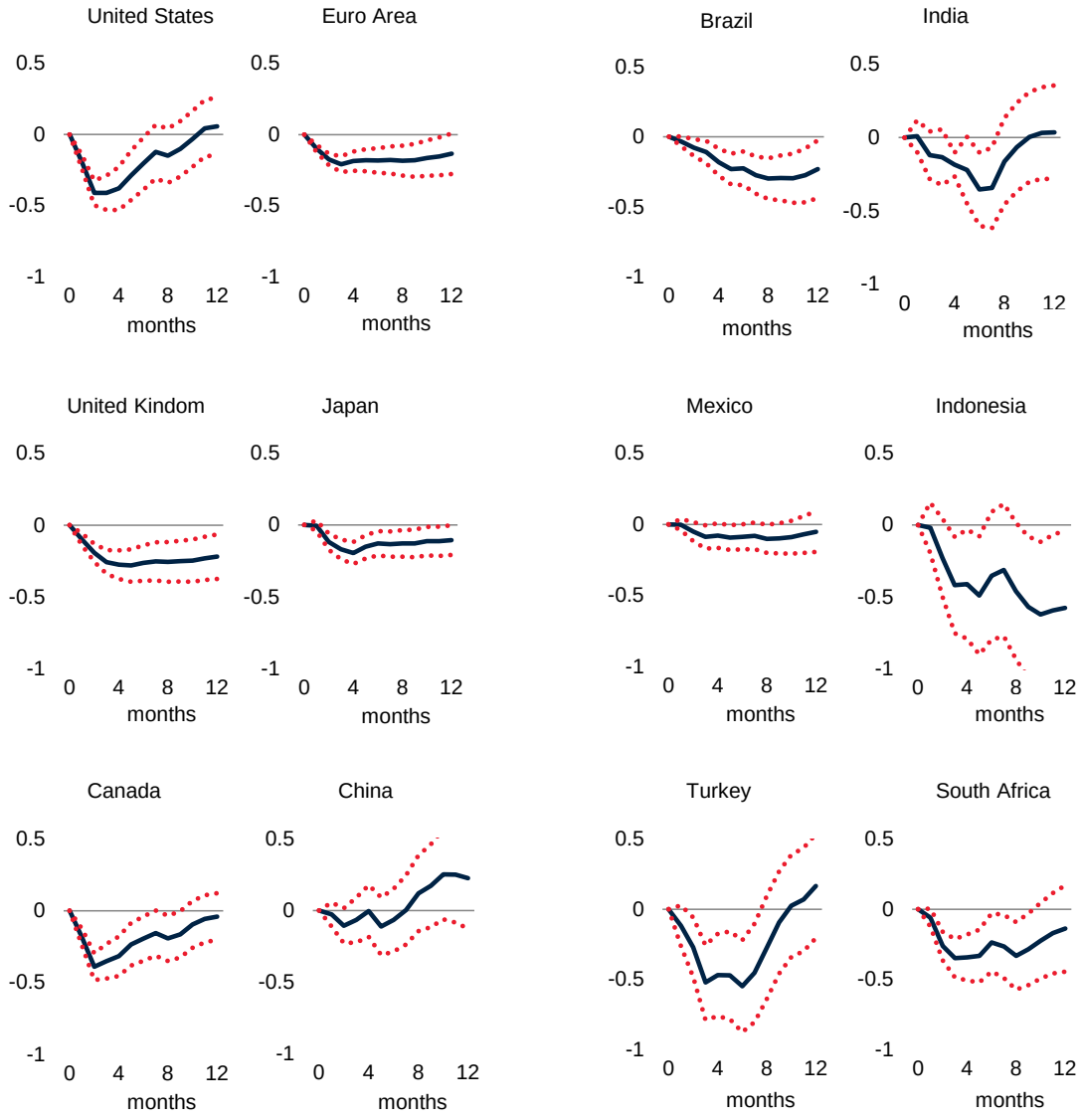
Authors	Country	Period	Methodology	Results
Peersman and Robays (2011)	USA, Japan, Switzerland, France, Germany, Italy, Spain, UK, Canada, Australia, Norway	1986Q1–2010Q4	SVAR	Impact of 10% **supply-driven** long-run rise in oil prices on **output** within two years (%): USA (-0.4), Japan (-0.4), Switzerland (-0.1), France (-0.2), Italy (-0.7), Spain (0.1), UK(-0.1), Canada (0.2), Australia (-0.1), Norway (0.3)
				Impact of 10% **supply-driven** long-run rise in oil prices on **inflation** within two years (percentage point): USA (0.3), Japan (0.2), Switzerland (0.6), France (0.1), Germany (0.2), Italy (0.5), Spain (0.1), UK (0.1), Canada (0.1), Australia (-0.5), Norway (-0.2)
				Impact of +10% **demand-driven** oil prices shock (caused by economic activity) on **output** after one year (%): USA (0.3), Japan (0.3), Switzerland (0.15), France (0.3), Germany (0.4), Italy (0.4), Spain (0.4), UK(0.2), Canada (0.3), Australia (0.1), Norway (0.2)
				Impact of +10% **demand-driven** oil prices shock (caused by economic activity) on **inflation** after one year (%): USA (0.6), Japan (0.5), Switzerland (0.4), France (0.4), Germany (0.3), Italy (0.3), Spain (0.6), UK(0.4), Canada (0.3), Australia (0.3), Norway (0.3)
Cologni and Manera (2008)	G7 countries	1980Q1 to 2003Q4 (quarterly)	Structural Cointegrated VAR model	Impact of one standard deviation increase in oil prices on **output** after one year (%): USA (-0.48), Japan (0.01), UK(0.08), Italy (-0.17), Germany (0.04), France (-0.22), Canada (-0.41)
				Impact of one standard deviation increase in oil prices on **inflation** after one year (%): USA (0.77), Japan (0.39), UK(0.50), Italy (0.42), Germany (-0.11), France (-0.09), Canada (0.41)
Anzuini, Pagano and Pisani (2014)	USA	1986 to 2008, spot and future oil price (daily), CFNAI, CPI (monthly)	Two-stage identification procedure (linear regression and VAR)	1% oil price increase (associated with precautionary oil demand driven by uncertainty about future supplies) leads to -0.38% accumulative decline in **Chicago Federal Reserve National Activity Index (CFNAI)** after 20 months, and 0.8% increase in **CPI**.
Jimenez-Rodriguez and Sanchez (2005)	OECD countries	1972Q3 to 2001Q4 (quarterly)	VAR (models with various assumptions in literature)	Impact of 10% **increase** in oil prices on **output** after one year (%): USA (-0.3 to -0.6), Euro Area (-0.1 to -0.34).
				Impact of 10% **decrease** in oil prices on **output** after one year (%): USA (-0.14), Canada (-0.18), UK (0.02). Other countries not significant.

Authors	Country	Period	Methodology	Results
Cologni and Manera (2009)	G7 countries	1970Q1 to 2005Q1 (quarterly)	Markov Switching VAR	Impact of one unit increase in real oil price on GDP (%): Canada (-0.026), France (-0.003), UK (-0.005), Germany (-0.009), USA (-0.048).
Killian (2009)	USA	1968:1-2007:12 (monthly)	SVAR	One standard deviation oil-market specific demand shock (causing 6% increase in oil price) after one year lead to 0.8% decline in GDP and 1% increase in CPI
				One standard deviation crude oil supply shock after one year lead to 1% decline in GDP and little impact on CPI.
				One standard deviation aggregate demand shock (causing 6% increase in oil price) after one year lead to little change in GDP and 3% increase in CPI.
Tang, Wu and Zhang (2010)	China	June 1998 to August 2008 (monthly)	SVAR	Impact on **inflation:** one standard deviation temporary increase of net oil price will increase Chinese CPI by 0.03% in the short run.
				Impact on industrial output: one standard deviation temporary increase of net oil price will reduce China's industrial value-added by around 0.3% in the short run.
Feldkirchner and Korhonen (2012)	52 economies	1995Q1 to 2011Q4 (quarterly)	Global VAR model	Cumulative impact of +50% permanent hike in oil prices on **output** over the long run (%)**:** China (-4.5), Russia (6).
Libo Wu, Jing Li, ZhongXiang Zhang (2013)	China	2007-08 (monthly) and 2007 Input-Output table	Partial transmission input–output model	Impact on **inflation:** 100% increase in oil prices increases the general consumer price level by 1.39%.
Limin Du, Yanan He, Chu Wei (2010)	China	M1 2002 to M12 2008 (monthly).	VAR model	Impact on **output**: a 100% increase in oil price leads to a higher output. The largest positive impact happens in the second month (4%); the impact diminishes gradually and becomes very small after six months, and disappears completely after about one year.

Authors	Country	Period	Methodology	Results
Abeysinghe (2001)	Indonesia, Malaysia, Philippines, Thailand, Hong Kong, South Korea, Singapore, Taiwan province of China, Japan, USA, OECD	1982Q1–2000Q2 (quarterly)	Structural VAR models with exogenous variables (VARX)	Impact of a **50% increase** in oil price on **GDP growth** after one year (%): Indonesia (0.2), Malaysia (0.1), Phillipines (-2.8), Thailand (-4.0), Hong Kong SAR (0.5), South Korea (-2.3), Singapore (-1.6), Taiwan province of China (-1.5), China (0.1), Japan (-0.8), USA (-0.3), Rest of OECD (-0.1)

Annex 2. Pass-Through of Oil Prices to Inflation

Response of inflation to a 10 percent decline in oil prices (in local currency)[1]



[1] The above charts plot impulse responses of year-on-year CPI inflation to a one standard error (approximately 10 percent) decline in year-on-year oil price changes, estimated from individual monthly VAR models for 12 countries. VAR models include year-on-year growth in consumer prices, oil prices (in local currency), the nominal effective exchange rate and the deviation of industrial production from its Hodrick-Prescott-filtered trend. Models were estimated with 8 lags (based on a selection of information criteria) and impulse responses derived from a Cholesky decomposition, with CPI inflation last in the ordering and therefore affected contemporaneously by shocks to all other variables. The ordering of the VAR is as following: oil price in local currency, the deviation of industrial production, nominal effective exchange rate and inflation. The selection of information criteria refers to Akaike information criterion and final prediction error.

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