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Contents

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Can Cheap Oil Hurt Net Importers? Evidence from the Philippines

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ABSTRACT

Conventional wisdom suggests that oil price increases have a negative effect on the output of oil-importing countries. This is grounded on the experience of the United States between the 1940s and the late 1980s, where recessions were generally preceded by oil price increases. This paper evaluates the impact of oil price shocks on the Philippines—a developing country and a net oil-importing economy. Following Kilian's (2008) structural decomposition of real oil price change, we find indications that the 2008–2009 and 2014–2015 oil price drops may have lowered the Philippine economy's output growth, potentially due to the economy's reliance on remittances from abroad and the export market.

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INTRODUCTION

With its history of ups and downs, oil price has been in its deepest decline in 2014–2015 since the 1990s. Brent crude oil generally increased from about USD 20 per barrel in 1991 to more than USD 110 per barrel by mid-2008, before it slid down to less than USD 50 per barrel at the end of the year. It stabilized at USD 110 per barrel from 2010 to mid-2014 before it plunged by more than 50 percent by mid-2015. As with any other major economic phenomena, the sharp declines in the global crude oil price will create winners and losers.

Conventional wisdom suggests that unanticipated oil price increases have a positive effect on the output of oil-exporting economies while reducing that of oil-importing economies. Assuming the effect is symmetric, an unanticipated drop in the price of oil should be seen as a boon for net oil-importing economies and a bane to net oil exporters. This notion is supported by a number of studies, including the recent study by Oxford Economics (Bulloford and Sterne 2015), which postulates that the recent decline in oil prices increases gross domestic product (GDP) growth for most importing countries, with the Philippines gaining the most of the oil price slump, while Russia suffers at the bottom.

A major limitation of earlier studies was that they considered oil price shocks as exogenous. Modern literature recognizes that price shocks are symptoms of more fundamental economic developments that drive demand and supply of oil (Barsky and Kilian 2002, 2004; Kilian 2009), with different drivers having different effects. For example, when oil and gas prices fall due to an unanticipated increase in global supply of crude oil, people would have more money to spend on other goods and services. But when the world economy grows faster, for reasons unrelated to the global crude oil market, demand for crude oil grows, driving prices up including nonenergy goods. This inflationary effect may reduce consumption, thus dampening the earlier positive effect of an oil price drop. This complex dynamics of the global crude oil market makes it extremely difficult to assess the causal effect of an oil price change on macroeconomic aggregates without disentangling the factors that drive oil price movement.

The notion that an unanticipated increase in oil price can have serious negative impact on an oil-importing economy can also find basis from the experience of the United States (US) and other advanced countries. In a series of contributions, Hamilton (1983, 2009a, 2009b) provided empirical evidence for the negative relationship between oil price and the US macroeconomy. Meanwhile, Jimenez-Rodriguez and Sanchez (2005) and Jimenez-Rodriguez (2008) contributed to the literature by analyzing select Organisation for Economic Co-operation and Development countries, with results being generally the same with that of the US and only differing in magnitude. Surprisingly, only a few studies look into the effect of oil price shocks on emerging and developing economies, with limited focus on oil-importing economies. For example, Berument et al. (2010) analyzed the effect of oil price shocks on Middle East and North African countries and found that oil price increases have (1) a positive impact on output in most exporting countries but (2) an ambiguous effect on oil importers, depending on whether the price shock is driven by demand or supply factors.

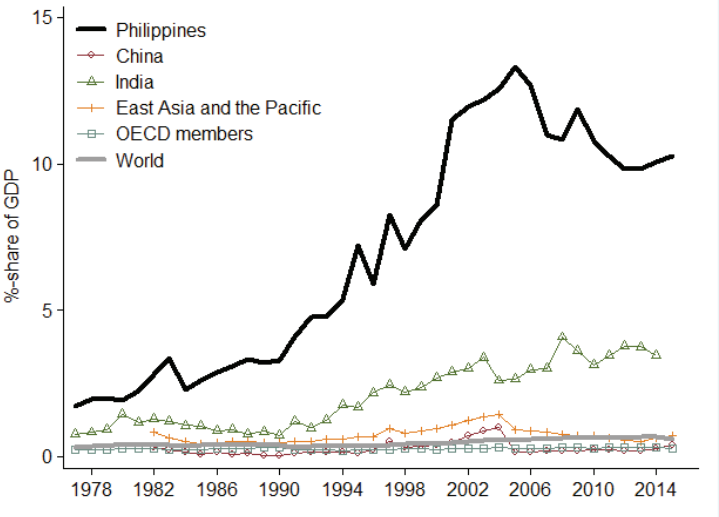
Recent developments in the crude oil market reignited interest in providing a global perspective to the macroeconomic impact and influence of oil price shocks. By using a two-country dynamic stochastic general equilibrium model, Bodenstein et al. (2011) illustrated that although oil importers experience a deterioration in the oil component of their trade balance, an improvement in the nonoil trade balance substantially dampens the effects on the overall trade balance. Kilian et al. (2009) empirically validated this theory by using a structural vector autoregressive (VAR) model of the global crude oil market. They found that the overall effect of an oil price shock on the current account

depends critically on the response of the nonoil trade balance, with oil-importing economies tending to experience an improvement in this balance and the opposite being the case for oil-exporting countries. Meanwhile, Rasmussen and Roitman (2011) found that the correlation of GDP and oil prices is positive. They also found that imports and exports move in the same direction as oil prices, which may be an indication that petrodollars gained by oil exporters during oil booms are likely to be recycled in the global economy through international trade. At the country-specific level, Mohaddes and Raissi (2013) found that oil price increases drive Jordan's output growth through their impact on external income and, in turn, on capital accumulation.

In this paper, we evaluated the dynamic impact of oil price shocks on the Philippine economy. Studying the Philippine economy in the context of an oil shock–macroeconomy relationship offers a number of advantages. First, the Philippines is among the top developing economies in terms of share of imported energy (i.e., oil, coal, and natural gas) to total energy use (Bulloford and Sterne 2015). Second, the Philippines has become increasingly reliant on external markets to boost its economy since the 1980s. For instance, in 2015, the country's exports make up more than 27 percent of its GDP, which is higher than the average share of middle-income countries. In 2014, the country ranked third in terms of the amount of personal remittances received from abroad, next to China and India. More interestingly, the share of personal remittances to total output is highest in the Philippines and significantly higher than the world and regional averages (Figure 1). Third, the top destinations of most overseas Filipino workers (OFWs) are oil-exporting countries, such as Saudi Arabia, United Arab Emirates, Qatar, and Kuwait. Thus, one can expect that any disturbance to global crude oil that affects these oil-exporting economies would have influence on the growth of the Philippine economy through remittances.

The country's energy dependence on oil imports and its reliance on external markets, particularly on remittances from oil exporters, make the Philippines an interesting case to empirically investigate the net effect of oil price shocks to a developing economy. For example, the 2008–2009 and

Figure 1. Personal remittances, 1976–2015



GDP = gross domestic product; OECD = Organisation for Economic Co-operation and Development
Source of raw data: World Development Indicators, World Bank

2014–2015 oil price drops are believed to have lowered the cost of fuel imports, which increased vehicle purchases or consumption of oil-dependent commodities, but at the same time, cut down total OFW remittances thus lowering total output. Moreover, it is not clear what was driving the oil price decline. As previously mentioned, different factors drive oil price movements, with each factor potentially having different implications on the country's macroeconomic aggregates.

Our major results can be summarized as follows: First, contrary to recent popular views that supply shocks cause oil prices to fall, we found strong evidence to suggest that these oil price shocks have been predominantly driven by a combination of aggregate and precautionary demand shocks. Second, the magnitude, duration, and direction of response of the Philippine economy to oil price shocks highly depend on whether changes in oil price are driven by supply or demand factors. Third, the oil price decline, which was primarily driven by demand shocks, may have lowered the growth of the Philippines' services and goods exports and, ultimately, its output, which suggests that not all oil price drops are beneficial to net oil importers.

EMPIRICAL STRATEGY

Historically, a number of researchers consider oil price shocks as exogenous. This is possibly because most of these shocks concurred with war-driven oil production shortfalls and geopolitical uncertainties in oil-exporting countries (Hamilton 1983; Guo and Kliesen 2005; Rahman and Serletis 2010; Melichar 2013). However, there is an increasing recognition that oil price shocks are associated not only with shocks on the current physical availability of oil but also with: (1) unanticipated changes in the aggregate demand and (2) shocks driven by uncertainties about the expected supply relative to the demand for oil (Barsky and Kilian 2004; Kilian 2009; Kilian and Murphy 2014). Another evidence suggests that, since the 1970s, exogenous changes in oil production are significantly less important in influencing global oil price compared to changes in precautionary demand for oil and global demand fluctuations (Kilian 2008). Macro aggregates may also have influence on oil prices. One channel is through monetary conditions, which may result in changes in the demand for oil and, eventually, in oil price (Barsky and Kilian 2002).

The endogeneity of oil price changes has implications on how researchers evaluate the influence of crude oil price changes on macroeconomic aggregates. Identifying the underlying demand and supply shocks in the global crude oil market helps us understand what is driving oil price changes and determine how macroeconomic aggregates are affected by different shocks influencing oil price changes (Kilian 2009). Hence, it is important to recognize the extent to which oil price changes are driven by one shock or another because it is plausible that different oil price shocks may have different effects on the Philippine macroeconomy.

In order to account for the potential endogeneity of crude oil prices, we used the VAR model proposed by Kilian (2009) to extract the underlying structural innovations behind each oil price shock (see equation 1). We updated the sample period up to 2015 to cover oil price changes. The model uses monthly data of $z_t = (prod_t, rea_t, rpo_t)$, where $prod_t$ refers to global crude oil production from the Energy Information Administration (EIA); rea_t denotes the index of real economic activity derived from the bulk dry cargo shipping rate index developed by Kilian (2009); and rpo_t is the

$$A_0 z_t = \alpha + \sum_{i=1}^{24} A_i z_{t-i} + \varepsilon_t \qquad (1)$$

refiner's acquisition cost of imported crude oil provided by EIA and deflated by the consumer price index from the US Bureau of Labor Statistics, which serves as proxy to global crude oil price.[2] Except for rea_t, which is stationary by construction (Kilian 2009), all of the series are period-to-period log-transformed differences. The sample period is 1974.1–2015.10.[3] We removed seasonal variation by including monthly dummies in the specification.

As in Kilian (2009), the following exclusion restrictions are imposed to the reduced form errors, e_t, in order to estimate the structural shocks underlying oil price changes:

$$e_t = \begin{pmatrix} e_t^{prod} \\ e_t^{rea} \\ e_t^{rpo} \end{pmatrix} = \begin{bmatrix} \alpha_{11} & 0 & 0 \\ \alpha_{21} & \alpha_{22} & 0 \\ \alpha_{31} & \alpha_{32} & \alpha_{33} \end{bmatrix} \begin{pmatrix} \varepsilon_t^{oil\ supply\ shock} \\ \varepsilon_t^{aggregate\ demand\ shock} \\ \varepsilon_t^{oil\text{-}specific\ demand\ shock} \end{pmatrix}$$

where $\varepsilon^k t$ denotes the serially and mutually uncorrelated structural shocks in each VAR equation $k=1,2,3$. The exclusion restriction implies the following: *Oil supply shocks* denote unanticipated changes in global crude oil production and are assumed not to respond to any change in the demand for oil within the same month. Kilian (2009) justifies this assumption by stating that adjustments in oil production are costly and the future state of the crude oil market has a lot of uncertainties, making oil production slow in responding to any demand shock. Shocks to global real economic activity are referred to as *aggregate demand shocks*.[4] The exclusion restriction assumes that oil-specific demand shocks, which increase oil price, will not lower real economic activity within the same month but only with a delay of at least one month. This assumption is consistent with the sluggish response of the major economies to major oil price increases observed in the sample period and in previous studies (e.g., Hamilton 1983). Finally, unanticipated oil price changes, here referred to as *oil-specific demand shocks*, denote shocks to changes in demand for crude oil not already captured by instantaneous shifts in aggregate demand for industrial commodities and supply of oil. These shocks include changes in precautionary demand for oil due to shifts in expectations about future demand relative to supply of oil. For example, crude oil price started to escalate in 1979, even though there was no significant disruption in the global crude oil production. The increase in crude oil price in 1979 was associated with the looming Iran-Iraq War which occurred in 1980 (Kilian 2009).[5] While the residual shocks in the model may also include other shocks (e.g., unexpected weather patterns and changes in preferences), there is evidence to support that the residual shock largely represents exogenous shifts in precautionary demand for oil.[6]

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[2] Some studies use monthly price data of Western Texas Intermediate crude oil while others use Brent crude oil as proxy to world oil price. We are agnostic as to which price data should be used, although these prices are highly correlated within the sample period.

[3] We recognize that the first oil embargo occurred between 1973 and 1974. Nonetheless, data on US refiner acquisition cost of crude oil start in 1974. While there are ways to estimate oil prices prior to 1974 (Barsky and Kilian 2002), we believe that this is beyond the scope of this paper.

[4] Kilian (2009) clearly distinguishes aggregate demand for industrial commodities in this context as opposed to aggregate demand for overall goods and services.

[5] The 1978–1979 Iranian revolution brought insignificant change in the global production of oil as Iranian cutbacks were more than offset by increased production elsewhere (Kilian 2009; Hamilton 2013).

[6] For detailed discussion, see Kilian (2009).

Figure 2 plots the historical evolution of the structural shocks implied by the VAR model. The shocks are expressed in annual averages for better readability. The spikes and drops in the figure notably capture the important oil price shocks in history as documented by Kilian (2009) and Hamilton (2013), and based on recorded US recessions from the National Bureau of Economic Research. For example, there was a global oil supply disruption in 1980, which was associated with the outbreak of the Iran-Iraq War. Meanwhile, the years 1978, 1979, and 1980 experienced large positive economic shocks attributed to the growing global economy. There was also an unanticipated increase in oil-specific demand in 1979, which was consistent with the increased uncertainties on the future supply of oil attributed to the geopolitical conflicts in the Middle East. These estimated structural shocks also capture the 2008 unanticipated fall in aggregate demand following the Great Recession, which also coincided with a drop in oil-specific demand due to low expectation on future demand for oil. In 2014, US oil production increased, causing a slight unexpected uptake in global oil production.

After estimating the monthly structural shocks in the global crude oil market, we performed historical decomposition of price changes over the same period following Burbidge and Harrison (1985). This technique decomposes observed oil price change at any period as a linear function of past orthogonal shocks. Historical decomposition thereby allows us to isolate the specific contributions of past oil supply shocks, aggregate demand shocks, and oil-specific shocks to the observed history of oil price changes. We then took the quarterly average of the estimated contribution of the shocks to oil price change in order to have the same frequency with the quarterly GDP estimates of the Philippines provided by the Philippine Statistics Authority for the period 1981.q1–2015.q4, as follows:

$$\hat{\zeta_{jt}} = \frac{1}{3}\sum_{i=1}^{3} v_{j,i,t}, \quad j = 1,2,3 \tag{2}$$

where $v_{j,i,t}$ refers to the estimated contribution of past orthogonal shocks to the oil price change in the *j-th* equation in the VAR model in the *i-th* month of the *t-th* quarter of the sample.

We can examine the influence of these structural shocks on Philippine macroeconomic aggregates based on the specification:

$$\Delta y_t = \alpha_j + \sum_{i=0}^{12} \phi_{ji}\hat{\zeta}_{jt-i} + Qtr_k + \epsilon_t, \quad j = 1,2,3 \tag{3}$$

where y_t is a *nx1* vector denoting growth rates of each macroeconomic variable at period *t*, ζ_{jt} refers to the quarterly averaged contribution of structural shocks to oil price changes, *Qtr* are quarter dummies to account for potential seasonality in the macroeconomic variables, and ε is the usual model residual. Following Kilian (2009), the impulse response coefficient at horizon *h* in this regression model corresponds to ϕ_{jh}, which captures the transmission of the worldwide oil demand- and supply-related shocks to the local macroeconomy.[7]

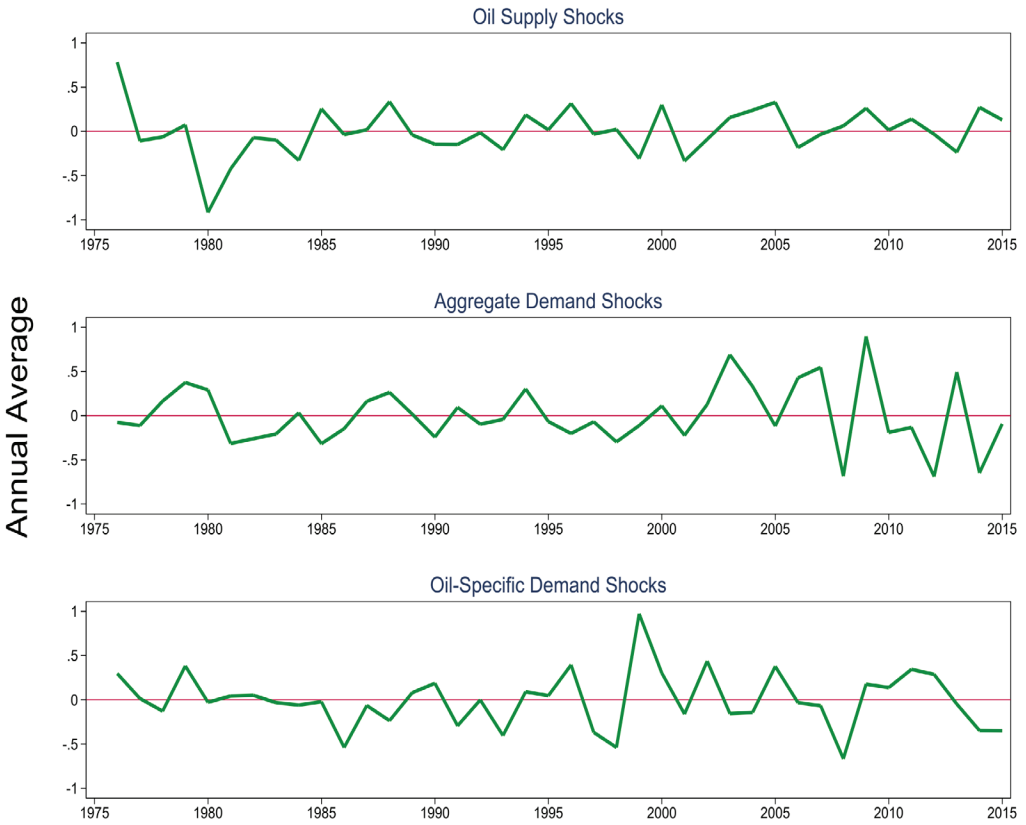
[7] We also estimate the impact of each oil shock on the Philippine macro aggregates following the estimation of impulse response function by local projections developed by Jorda (2005). We find that the qualitative results remain the same using a different estimation method.

In Kilian's (2009) original formulation, the impulse responses are based on raw structural innovations rather than the historical decomposition of oil price shocks. In this paper, we wish to highlight the influence on the local economy of the factors that constitute oil price shocks, thus the use of the decomposed series. In any case, the qualitative results when using structural innovations like those used in Kilian (2009) do not differ from the results we present here as more recent shocks receive greater weight in the historical decomposition.

RESULTS AND DISCUSSION

Figure 3 plots the relative contribution of each oil demand and supply shock to the movement of the real price of oil. Historically, the biggest contributions are due to aggregate demand shock and oil-specific demand shocks, consistent with Kilian (2009). Oil supply shocks are relatively stronger

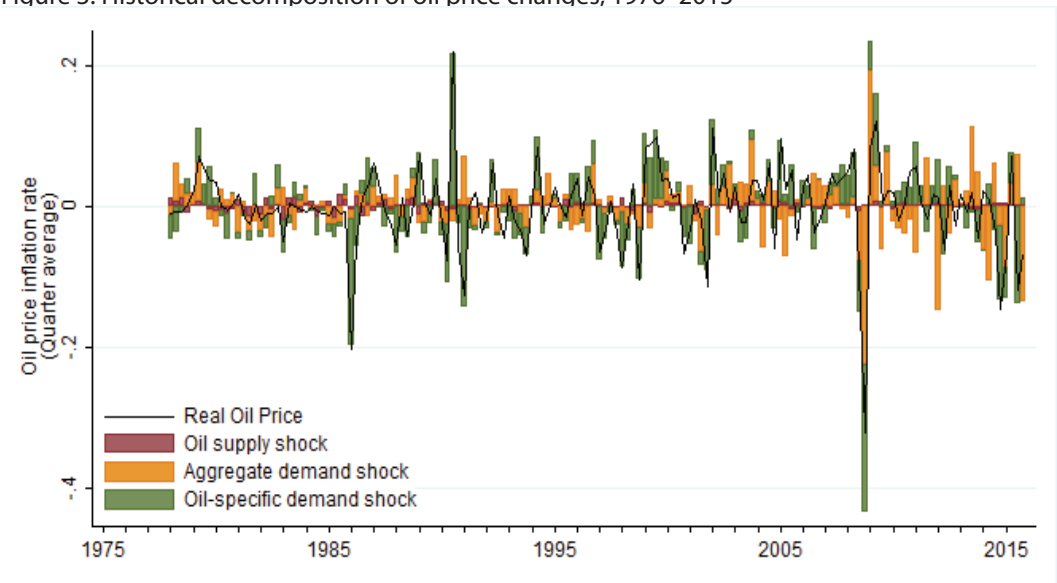
Figure 2. The historical evolution of the structural shocks, 1976–2015



Note: The figure illustrates the estimated structural residuals from the VAR model, averaged to annual frequency. The starting data is dictated by the availability of price data (proxied by refiner's acquisition cost of imported crude oil) from the US Department of Energy. While data are available from 1974.1, the VAR model allows for lags up to 24 months, which makes estimated shocks only available starting 1976.1.
Source of raw data: Energy Information Administration [EIA] (n.d.), Kilian (2009)

pre-1980s. Thereafter, these shocks only serve either to amplify oil price surges or lower oil prices at other times. Oil-specific demand shocks are relatively stronger in the late 1980s up to the early 2000s. The biggest drops, which were around 2008–2009 and 2014–2015, were mostly driven by both aggregate demand and oil-specific market demand shocks. This is in contrast with the popular view that the 2014–2015 oil price collapse was a manifestation of the unprecedented increase in US domestic crude production.

Figure 3. Historical decomposition of oil price changes, 1976–2015



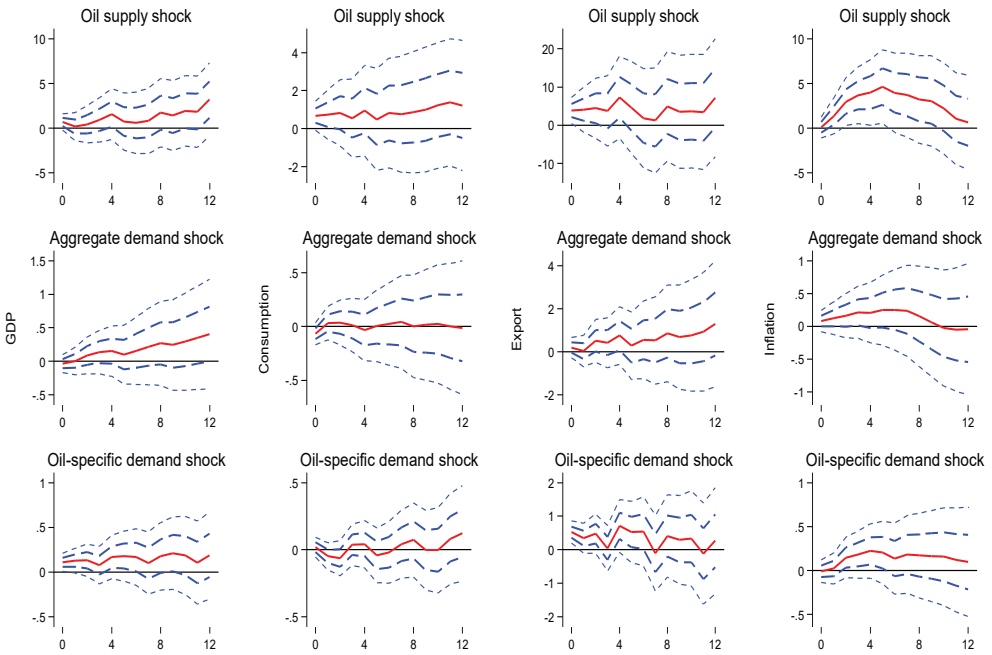
Sources: Authors' calculations

Figure 4 (first column) summarizes the cumulative response of the GDP growth rate of the Philippines, along with consumption, exports, and inflation.[8] Results show significant differences in how each structural shock in oil demand and supply underlying oil price changes influences the movement of key macroeconomic aggregates. Our estimates suggest that a 1-percent decrease in the price of oil driven by an unanticipated increase in the global supply of oil increases GDP growth by about 1 percent on impact, and its cumulative effect is increasing over time. The response of GDP growth is positive at all horizons, although one-standard error bands imply that the impact is mostly statistically insignificant. An unanticipated increase in aggregate demand, which increases oil price, induces a positive but statistically insignificant effect on GDP growth. The effect is generally increasing up to three years.

Meanwhile, a 1-percent increase in the world crude oil price, due to unanticipated increase in oil-specific demand, increases output growth by 0.11 percent. This result is striking because oil-specific demand shocks can be driven by uncertainties in the future demand for oil relative to supply of oil, which appears to benefit the Philippine economy in the short run (at the very least). The effect is also nontrivial given that the crude oil price declines are quite significant.

[8] It should be noted that the response is cumulated across the horizon, which means that the current oil price increases include the effect of previous oil price increases.

Figure 4. Cumulative responses of Philippine macroeconomic aggregates to each structural shock point estimates with one- and two-standard error bands



GDP = gross domestic product

Note: The figure shows point estimates (solid line) with one- and two-standard error bands (short- and long-dashed lines, respectively). Export includes earnings from both exports of goods and services.

Source of raw data: EIA (n.d.)

We also looked at the subcomponents of the economy's output to determine how each underlying structural shock to oil price changes influences output growth. For consumption (second column), only unanticipated supply shock influences consumption. This is fairly intuitive since, holding demand constant, a price decline driven by exogenous increase in global crude oil production (e.g., discovery of fracking) increases the purchasing power of consumers. This is supported by the significant decline (at two-standard error bands) in the consumer price index (last column) brought about by the supply shock-driven oil price decline. Meanwhile, a positive aggregate demand shock, in contrast, has two opposing effects: (1) the short-run stimulating effect of higher global demand which increases domestic consumption and (2) the growth-retarding effect of higher inflation due to higher oil prices. Our results imply the two effects generally offset each other, although none satisfies conventional statistical significance. The effect of oil-specific demand shock is generally small and statistically insignificant at all horizons.

Exports, which include earnings from sale of goods and services abroad, gain from any unanticipated increase in the global production of oil, which lowers global oil price, with a statistically significant (one-standard error) positive uptake after a year. Aggregate demand shocks have (if there is any) positive effect on exports and it is increasing up to one year. Interestingly, unanticipated increase in oil-specific demand, which increases crude oil price, significantly increases exports on

impact and is sustained up to two quarters, followed by a decline below an initial level in the third quarter, then rising again after a year. The effect after a year is statistically significant.

The key results can be summarized as follows: First, an unanticipated increase in oil supply, which brings down oil price, has immediate, short-lived, and statistically significant effect on output, consumption, and exports of the Philippines. This is fairly intuitive because oil supply shocks in this context are seen as a rightward shift in the aggregate supply curve of the economy, and are expected to drive down price, thus, reducing both the cost of production and consumption, holding other things constant. The findings for positive aggregate demand shocks are consistent with earlier findings in the literature, which suggest two opposing effects on output: (1) the short-run stimulating effect of higher global demand and (2) the growth-retarding effect of higher inflation due to higher oil (and presumably other commodities) prices. Finally, unanticipated increases in precautionary demand appear to be beneficial to the Philippine economy. This finding is consistent with other studies that look into the direct and indirect effect of oil price shocks through factor mobility (Mohaddes and Raissi 2013) and international trade linkages (Kilian et al. 2009; Bodenstein et al. 2011; Rasmussen and Roitman 2011).

Based on the above results, we can surmise that the recent oil price decline, which is primarily driven by demand shocks, may have slowed down the output growth of the Philippines. Lower oil price is a result of lower demand for industrial commodities and a gloomy outlook of future global economy. Both low actual and perceived global demand significantly reduced demand for Philippine exports, with stronger negative impact on service exports that are concentrated in oil-producing economies in the Middle East. This negative effect on output outweighs the increase in consumption, thus ultimately reducing total output of the economy.

CONCLUSION

Conventional wisdom suggests that oil price declines are generally good for oil importers. Previous studies, particularly those focusing on advanced oil-importing economies, provide empirical basis for why oil price increases are traditionally seen as boon to exporters and bane for importers. Quite surprisingly, literature on oil price–macroeconomy relationship applied to developing countries remains thin. Moreover, only a few looked into net oil-importing countries. In this paper, we took the Philippine economy as a test case to empirically assess how oil price shocks can influence an oil-importing developing economy and determine other potential mechanisms by which global crude oil price changes can benefit or harm an economy.

This study is far from being perfect. First, the uniqueness of the Philippine economy in terms of its reliance on foreign remittances can cast doubts on the ability of the study to generalize its results. Future research can improve on this study by looking at other labor-exporting countries, such as India, China, and the Pacific Islands. Second, we are agnostic on how much of the influence is due to exchange movement associated with oil price fluctuations. Presumably, exchange rates are also affected by oil price movements (and vice versa for the US case), which may greatly influence exports. How correlated is Philippine foreign exchange to crude oil price, and its implications on export and output growth, are questions that are beyond the scope of this study.

Despite these limitations, this study provided results that appeal to conventional wisdom, which makes it relevant both at the theoretical and policy fronts. In particular, we found evidence suggesting that recent oil price declines, which were largely driven by demand shocks, may have harmed the Philippine output growth. This is due to the fact that the economy is not only dependent

on oil imports but also on remittances and earnings from external markets. That said, the indirect (negative) effect on trade appears to outweigh the (positive) effect of lower crude oil and gas prices on the economy.

The central message of this paper is simple: Not all oil price shocks are alike and not all economies would respond similarly to the same underlying shock. Like any other economic phenomenon, oil price movements produce winners and losers. However, it is also probable that gainers are compensating losers in some ways through increased demand for cross-border goods or service exports. The net effect on a certain economy is ambiguous and largely dependent on the relative strength of the direct and indirect effects of oil price shocks.

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