

Oil Price Volatility, Climate Change Uncertainty, and Macroeconomic Policy

Kamiar Mohaddes
University of Cambridge and ERF
@KamiarMohaddes

**The New Normal in the Global Economy:
Challenges and Prospects for MENA**

July 9, 2018

Outline

- ▶ **Volatility** is a major problem in the MENA region and macroeconomic policy has not helped!
- ▶ A **new oil order (low oil price environment)**? Maybe not!
- ▶ The costs associated with **climate change volatility** in the MENA region are potentially substantial. Macroeconomic policy could make a big difference!
 - ▶ **stranded assets**, which clearly needs to be taken into account when it comes to macroeconomic policy;
 - ▶ **water/environmental crisis**, which has been exacerbated by economic policy (i.e. energy subsidies); and
 - ▶ direct effects of climate change volatility in terms of **long-run growth**, and the role of **mitigation** and **adaptation** policies.

Volatility is a Major Problem in the MENA Region

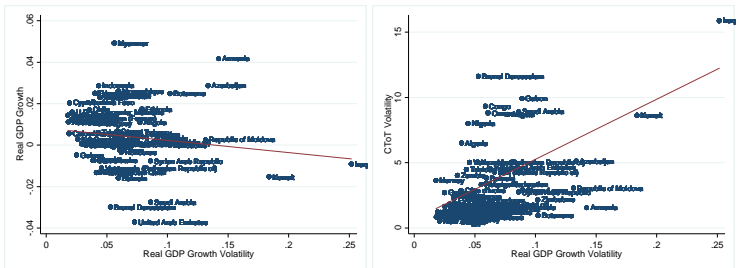
- ▶ It is clear from the MENA region that if commodity price volatility is **not managed properly**, it can result in higher GDP growth volatility and **disappointing long-term economic performance**.
- ▶ GDP growth volatility in the GCC countries has been **at least three times higher** than that of Chile and Norway.
- ▶ We need strong **institutions** and better **macroeconomic policies**.



dependent countries, there appears to be a positive association between CToT volatility and GDP growth volatility—which in turn has a negative effect on output growth.

Resource Wealth and Volatility

Figure 1: Scatter Plots of GDP Growth and Volatility of CToT against Volatility of GDP Growth, 1981-2014

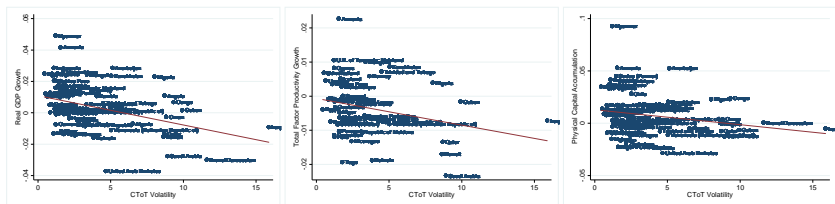


Source: Authors' calculation based on data from *Penn World Table Version 9.0* and International Monetary Fund *International Financial Statistics* databases. These are cross-sectional averages over 1981-2014.

- ▶ Figure 2 depicts a simple bivariate relationship between CToT volatility and the growth of real GDP per capita (as well as the growth rate of TFP and physical capital accumulation) **affects it negatively** (for more details see Mohaddes and Raissi, 2017). They suggest that CToT volatility exerts a negative impact on economic growth operating mainly through lower productivity
- ▶ **Fiscal and current account balances of commodity-exporting countries are affected by swings in resources revenues with destabilizing effects on the macroeconomy.** The rest of the paper uses the US-ARDL approach for estimation in order to investigate whether the above indicative results continue to hold up once we deal with, for instance, possible endogeneity problems, dynamics, cross-

Resource Wealth and Volatility

Figure 2: Scatter Plots of CToT Volatility against Real GDP growth, TFP Growth and Capital Accumulation, 1981-2014



Source: Authors' calculation based on data from *Penn World Table Version 9.0* and International Monetary Fund *International Financial Statistics* databases. These are cross-sectional averages over 1981-2014.

3.1 The Long-Run Effects of Volatility

► Do natural resource abundant countries have **fewer possibilities for technological progress**?
 To examine the long-run effects of CToT volatility on output growth, we estimate the following panel CS-ARDL model:

► Is the **capital accumulation** and/or important channel through which volatility affects GDP per capita growth

$$\Delta \ln y_{it} = \sum_{l=0}^p \alpha_l \Delta \ln y_{it-l} + \sum_{l=0}^q \beta_l \ln k_{t-l} + \epsilon_{it}$$

of these SWFs (19 out of 29) were established using exports of crude oil and gas.

A large portion (10 out of 29) was established in countries that are major oil exporters and are members of the Organization of the Petroleum Exporting Countries (OPEC), denoted by * in Table 2. We also provide the inception year of the funds in the same table. However,

- ▶ SWFs have been established for a variety of reasons, ranging from **fiscal stabilization** (that is to help smooth the impact on government spending of price fluctuations in the price of the fund's main asset, typically oil and gas revenues that are large and volatile) to **long-term saving** for future needs of the economy, or for **specific groups** such as pensioners or for future generations. note that it usually takes years (if not a decade) to set-up a SWF, as prior to inception, governments need to build the infrastructure of the fund, in practice, this is done by setting up revenues that are large and volatile) or for long-term saving for future needs of the economy, or for specific groups such as pensioners or for future generations.
- ▶ One of the main short-term objectives of SWFs is to counter the adverse macroeconomic effects of commodity price volatility. endowment for the budget. Nevertheless, the fact that a country has established a SWF provides a valuable signal, as it indicates that the government and the legislature would like to counter the main short-term objectives of SWFs is to counter the adverse macroeconomic effects of commodity price volatility.

Table 2: Sovereign Wealth Funds by Origin and Inception

Country	Origin	Inception	Country	Origin	Inception
Algeria*	Oil and Gas	2000	Mongolia	Minerals	2011
Angola*	Oil	2012	New Zealand	Non-Commodity	2003
Australia	Non-Commodity	2006	Nigeria*	Oil	2012
Azerbaijan	Oil	1999	Norway	Oil	1990
Bahrain	Oil	2006	Oman	Oil and Gas	1980
Bolivia	Non-Commodity	2012	Panama	Non-Commodity	2012
Botswana	Minerals	1994	Peru	Non-Commodity	1999
Brunei Darussalam	Oil	1983	Qatar*	Oil and Gas	2005
Chile	Copper	2006	Russia	Oil	2008
Gabon*	Oil	1998	Saudi Arabia*	Oil	1952
Ghana	Oil	2011	Senegal	Non-Commodity	2012
Indonesia	Non-Commodity	2006	Trinidad and Tobago	Oil and Gas	2000
Iran*	Oil and Gas	1999	United Arab Emirates*	Oil	1976
Kazakhstan	Oil	2000	Venezuela*	Oil	1998
Kuwait*	Oil	1953			

Notes: Some countries have more than one fund, here we have taken the inception year to be that of the first fund, which tends to be the main one. * indicates that the country is a member of the Organization of the Petroleum Exporting Countries (OPEC). Source: Sovereign Wealth Fund Institute.

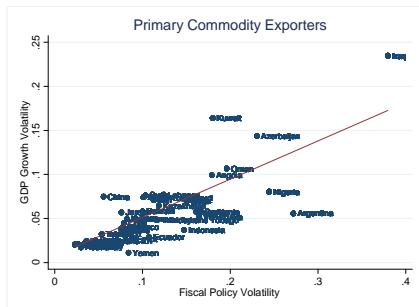
Figure 1 plots a simple bivariate relationship between real GDP per capita growth and

The Role of SWFs and Institutional Quality

- ▶ Mohaddes and Raissi (2017) show that countries that have a SWF have, on average, performed better when it comes to **mitigating the negative growth effects of CToT volatility** and managed to sustain a higher level of capital accumulation in the face of the extreme volatility in resource revenues.
- ▶ This suggests that one is better able to dampen the negative long-run growth effects of commodity price volatility with a well-functioning SWF that can **effectively deal with the adverse effects of (excess) commodity price volatility**—add to the fund when commodity prices are high and transfer less to it or even withdraw from it when prices are low to smooth expenditure.
- ▶ To give a concrete example, since 1976 the Kuwaiti government has by law transferred a minimum of 10% of all state revenues to the Future Generation Fund (FGF). However, with oil prices having been high for almost a decade it was announced in March 2013, following an Amir budgetary decree, that the minimum contribution is to be increased to 25%. But the following year oil prices fell sharply and remained low, and so the decision was reversed and the contribution to the FGF was cut back to 10% from fiscal year 2015/16.

The Role of SWFs and Institutional Quality

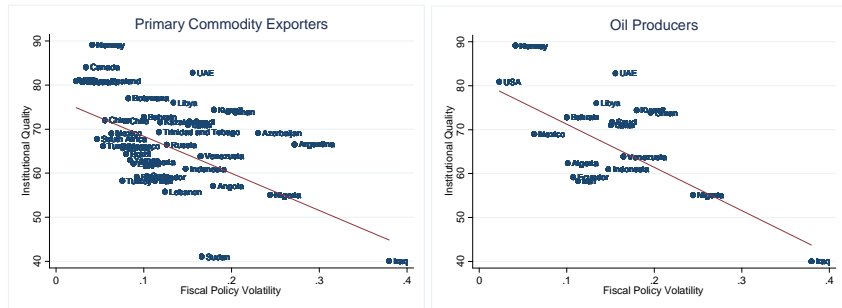
- ▶ A follow-up question is the potential **role of institutions and policy frameworks**, and in particular **fiscal policy**, in dampening the negative effects of commodity price volatility.



Source: K. Mohaddes, J.B. Nugent, and H. Selim (2018), *Institutions and Macroeconomic Policies in Resource-Rich Arab Economies*, Oxford University Press.

Notes: This volatility is interpreted as the component of discretionary policy which is not related to smoothing the business cycle, such as changes in political preferences or the decision by the politicians to generate a short-term boom so as to keep the population happy—as was seen in the GCC following the Arab Spring.

Scatter Plots of Institutional Quality against Fiscal Policy Volatility, 1961-2013



Source: K. Mohaddes, J.B. Nugent, and H. Selim (2018), *Institutions and Macroeconomic Policies in Resource-Rich Arab Economies*, Oxford University Press.

Notes: This volatility is interpreted as the component of discretionary policy which is not related to smoothing the business cycle, such as changes in political preferences or the decision by the politicians to generate a short-term boom so as to keep the population happy—as was seen in the GCC following the Arab Spring.

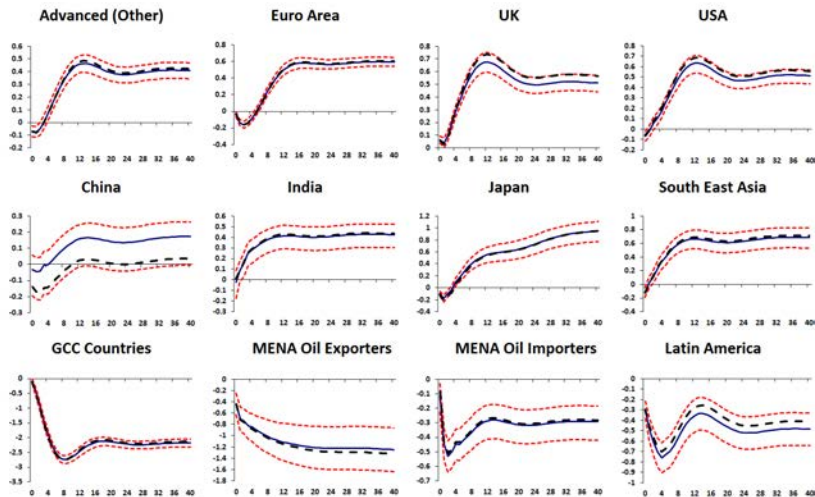
Policy Implications

- ▶ The undesirable consequences of commodity price volatility can be avoided if resource-rich countries are able to improve the **management of volatility in resource income** by setting up forward-looking institutions such as Sovereign Wealth Funds, or adopting short-term mechanisms such as stabilization funds with the aim of saving when commodity prices are high and spending accumulated revenues when prices are low.
- ▶ The government can also intervene in the economy by increasing public capital expenditure when private investment is low, using proceeds from the stabilization fund.
- ▶ Alternatively the government can use these funds to **increase the complementarities of physical and human capital**, such as improving the judicial system, property rights, and human capital. This would increase the returns on investment with **positive effects on capital accumulation, TFP, and growth**.
- ▶ **Improving the functioning of financial markets** is also a crucial step as this allows firms and households to insure against shocks, decreasing uncertainty and therefore **mitigating the negative effects of volatility on investment and economic growth**.

A New Global Oil Order?

- ▶ The technological advancements over the last decade have not only reduced the costs associated with the production of unconventional oil, but they have also made **extraction of tight oil resemble a manufacturing process** in which one can adjust production in response to price changes with relative ease.
- ▶ This is in stark contrast to other extraction methods such as offshore extraction, which requires **large capital expenditure and lead times**, and more importantly, once the process is up and running changing the quantity produced can be difficult.
- ▶ Therefore, one of the implications of the recent oil revolution is that U.S. production **can play a significant role** in balancing global demand and supply, and this in turn implies that we have potentially entered a **low oil price environment**.

Impact of the U.S. Oil Supply Revolution on Real Output (Mohaddes and Raissi, 2018)



Notes: Figures are median (blue solid) and median target (black long-dashed) impulse responses to a one standard deviation fall in the price of oil, equivalent to an annualized drop of 51% in year 1 and 45% in year 2, together with the 5th and 95th percentile error bands. The impact is in percentage points and the horizon is quarterly.

A New Oil Order?

- ▶ With oil prices being 50% higher than last year, are we in a low oil price environment?
- ▶ Will the US oil revolution take off anytime soon (again)?



The Trump Factor!

- ▶ President Trump is the new “swing factor” in global oil markets.
- ▶ What are the effects of the **competing policy objectives** of the Trump administration on the oil market?



Shale Oil, OPEC or the Trump Factor?

- ▶ Geopolitical agenda: **sanctions on Iran**;
- ▶ Domestic political agenda: lowering **American petrol prices** before the November mid-term elections; and
- ▶ **Trade wars** with China and the EU.



Donald J. Trump
@realDonaldTrump

Following

Looks like OPEC is at it again. With record amounts of Oil all over the place, including the fully loaded ships at sea, Oil prices are artificially Very High! No good and will not be accepted!

3:57 AM - 20 Apr 2018



Donald J. Trump
@realDonaldTrump

Following

The OPEC Monopoly must remember that gas prices are up & they are doing little to help. If anything, they are driving prices higher as the United States defends many of their members for very little \$'s. This must be a two way street. **REDUCE PRICING NOW!**

1:46 PM - 4 Jul 2018

A New Oil Order?

- ▶ President Trump might **flood the oil market** by releasing oil from the SPR. Will there be an **oil war**?

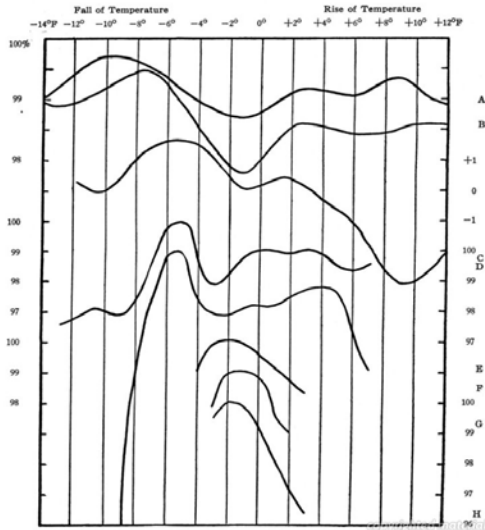
- ▶ One thing is for sure: more and more **uncertainty**....
.....and more **volatility**!

- ▶ The new oil order is **not so new after all**, but have different players...!

- ▶ Bottom line: policy makers should think about **volatility** as opposed to (just) **sustained low or high prices**.

Climate Change Uncertainty

- ▶ The **climate-economy relationship** has been discussed for many centuries and goes back to at least Ibn Khaldun's 14th Century *Muqaddimah*, in which he attributed **poverty** to the **climate**.
- ▶ In fact Montesquieu came to the same conclusion in the *Spirit of Laws* (1750):
 - ▶ "There are countries where the excess of heat enervates the body, and renders men so slothful and dispirited that nothing but the fear of chastisement can oblige them to perform any laborious duty..."
- ▶ A few centuries later Huntington's (1915) *Civilization and Climate* aims to quantify the effects of climate on economic activity using data.



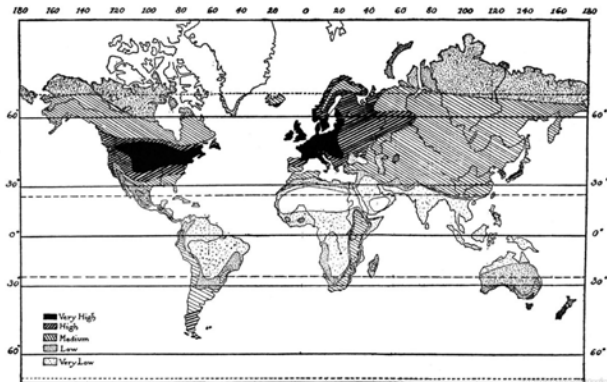
Notes: A. 300 Men in Two Connecticut Factories, 1910-13. B. 256 Girls in Two Connecticut Factories, 1911-13. C. 460 Students in Mathematics and English at West Point and Annapolis, 1909-1913. D. 760 Cigar-makers at Tampa, Fla., in Winter (October-March), 1912 and 1913. Factory A. E. 400 Cigar-makers at Tampa in Winter, 1913. Factory B. F. 400 Cigar-makers at Tampa in Summer (April-September), 1913. Factory B. G. 380 Cigar-makers at Tampa in Summer, 1912. Factory A. H. 380 Cigar-makers at Tampa in Summer, 1913. Factory A.

Climate Change Uncertainty

- ▶ Economists used to (and some still do) ask the question: Can **climate and/or the weather** explain why some countries are poor and others rich?

8/27/2018

<https://www.questia.com/read/image/9043508b34905p0142/view>



<https://www.questia.com/read/image/9043508b34905p0142/view>

1/1

Climate Change Uncertainty

- ▶ The question that more and more economists are now attempting to answer is: do **weather events and climate change** have consequences for **economic growth**?
- ▶ This is important as a careful understanding of the climate-economy relationship is essential to the effective design of **appropriate institutions and macroeconomic policies**, as well as enabling forecasts of how future changes in climate will affect economic activity.
- ▶ This is not about **stranded assets** (which in itself can be substantial), but whether **climate change** has long-run growth effects.
 - ▶ labour productivity?
 - ▶ labour supply?
 - ▶ which sectors?
 - ▶ which regions?

Climate Change Uncertainty and Macroeconomic Policy

- ▶ The Paris Agreement represents an important milestone for the international community's coordination efforts in reducing greenhouse gases and controlling the global average **temperature to less than 2°C above pre-industrial levels**.
- ▶ MENA countries need to act proactively by identifying the related risks to be able to design proper **climate policies** incorporated into their **development strategies** and **fiscal planning** in general.
- ▶ However, designing relevant policies to address climate change challenges largely depends on the understanding of the effect of climate change on economic activity at the macro level.
- ▶ Evidence from our recent study (Kahn et al., 2018: *Climate Change Uncertainty, Adaptation, and Growth*) based on a panel of 48 U.S. states over the period 1963-2016, suggests that the **costs associated with climate change volatility in the MENA region can be substantial!**

Adaptation (IMF SDN, 2015)

- ▶ **Adaptation** and **development strategies** are closely interlinked.
- ▶ Many aspects of **development** (better education, health care, and infrastructure) **facilitate adaptation**.
- ▶ Some **adaptation strategies** (efficient water use, climate-resilient housing, robust crops) **facilitate development** even without climate change.
- ▶ **Close policy integration** is needed.