

# Chapter 2. A Repeat of the Past? Fiscal Implications of Commodity Price Surges in the Middle East and North Africa

## Online Annex

To estimate the role of country-specific socioeconomic conditions on the impact of a relatively large rise in oil prices on government subsidies and transfers, and their persistence over time, we follow the method proposed by Jordà (2005), which consists of estimating impulse response functions directly from local projections. An analysis of the impulse response function permits the assessment of the persistence of a commodity price shock on subsidies and transfers. This approach has been advocated by, among others, Stock and Watson (2007) and Auerbach and Gorodnichenko (2013) as a flexible alternative that does not impose the dynamic restrictions embedded in vector autoregressive (autoregressive distributed lag) specifications.

Specifically, for each period  $k$ , the following reduced-form equation is estimated

$$y_{i,t+k} = \alpha_i^k + \sum_{j=1}^l y_{i,t-j} + \sum_{j=1}^k \gamma_j (x_{i,t+j} * s_{i,t+j}) + \beta x_{i,t} * s_{i,t} + \sum_{j=0}^l \delta_j z_{i,t-j} + \varepsilon_{i,t} \quad (1)$$

where, for country  $i$ ,  $y_{i,t+k}$  represents the change of subsidies and transfers as a percent of GDP between time  $t-1$  and  $t+k$ .  $s_{i,t}$  is a dummy variable that identifies years in which global oil prices are above the median of the distribution of positive price changes (annual percentage change above 26 percent).<sup>1</sup> Thus,  $s_{i,t}$  is defined as follows:

$$s_{i,t} = 1 \text{ if } \Delta \% p_t > \text{median}(\Delta \% p_t^*); \quad s_{i,t} = 0 \text{ otherwise}$$

The change in oil prices in year  $t$  is multiplied by the country-specific relative share of oil (fuel) imports (for oil importer countries)

For each country  $i$ ,  $x_{i,t}$  represents a variable measuring country-specific socioeconomic conditions, proxied by a measure of the targeting of social protection programs and the Gini coefficient. The coefficient of interest is  $\beta$ , measuring the impact of these country-specific characteristics on the impact of a relatively large oil price shock on subsidies and transfers. Our measure of low targeting of social protection programs is a dummy variable that takes the value of 1 when the beneficiary incidence for the lowest quartile of the income distribution (that is, the percentage of program beneficiaries in the lowest quartile of the income distribution relative to the total number of beneficiaries in the population for a given country) is below 27.5 percent, which corresponds to the median beneficiary incidence across Middle East and North Africa (MENA) countries.

The term  $z_{i,t}$  contains a list of control variables including the growth rate and lags of the country-specific commodity price shocks. The specification also includes the forward leads of the interactions between

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<sup>1</sup> These are 2004, 2005, 2008, 2010, 2011, 2018, and 2021 for oil prices.

time 0 (the date of the oil price shock) and the end of the forecast horizon ( $k$ ) to correct for the bias in the impulse response inherent in local projection methods (Teulings and Zubanov 2014). The number of lags ( $l$ ) included in the model is 1, but the results are robust to different lag length. Since fixed effects are included in the regression, the dynamic impact on subsidies and transfers should be interpreted as relative to a country-specific trend.

Estimation is performed on an unbalanced panel of MENA oil-importing countries on an annual frequency from 2000 to 2020. In regressions including beneficiary incidence of social assistance, the country sample is restricted by limited data availability to only few countries (Table A1).

**Table A1. Country and Year Coverage for the Indicator Measuring Beneficiary Incidence of Social Assistance**

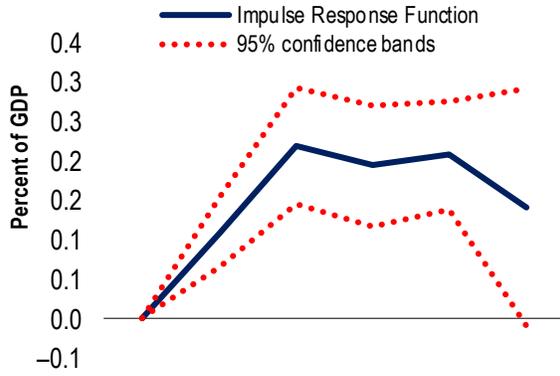
Country	DJI	EGY	IRQ	JOR	LBN	MAR	MRT	PAK	SDN	TUN	YEM
year	2002	2008	2006	2006	2004	2009	2008	2007	2009	2010	2005
	2012		2012	2010			2014	2009			
								2013			
								2015			
								2018			

The oil price corresponds to the percentage change of the Brent spot market price in US dollars (month average). Subsidies and transfers and real GDP growth are obtained from the *Regional Economic Outlook: Middle East and North Africa* data set. Beneficiary incidence of social protection programs are from World Bank's ASPIRE database.

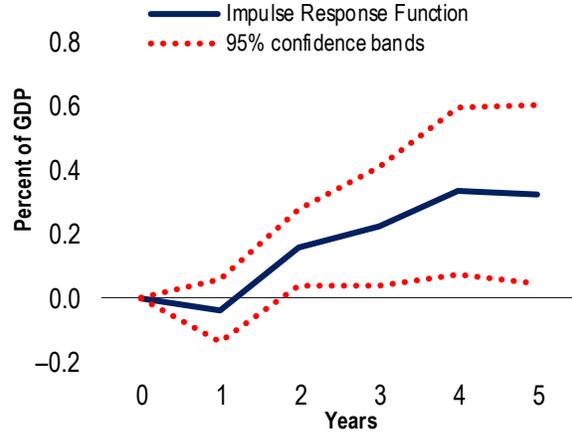
Empirical estimates of the dynamic response of price subsidies and transfers following a large positive shock to oil prices suggest a statistically significant stronger increase in subsidies in MENA countries with lower targeting of social protection programs. Similar evidence is found for countries where inequality, as measured by the Gini coefficient, is above the regional median (Figure A1).

**Figure A1. Impact of Selected Social Variables on the Response of Subsidies and Transfers to an Increase in Oil Prices**  
(Percent)

**1. Lower Targeting of Social Protection**



**2. Higher Gini coefficient**



Source: IMF staff calculations.

Note: The figure shows cumulative impulse response functions for the interaction term between a positive (above the median) oil price shock and panel 1: a dummy variable identifying low targeting of social protection programs (beneficiary incidence for the first quartile of the income distribution below the MENA median) and panel 2: higher Gini coefficient (above the MENA median). Dependent variable = subsidies and transfers, percent of GDP. MENA = Middle East and North Africa.

## References

Auerbach, Alan J., and Yuriy Gorodnichenko. 2013. "Output Spillovers from Fiscal Policy." *American Economic Review* 103 (3): 141–46.

Jordà, Òscar. 2005. "Estimation and Inference of Impulse Responses by Local Projections." *American Economic Review* 95 (1): 161–82.

Stock, James H., and Mark W. Watson. 2007. "Why Has US Inflation Become Harder to Forecast?" *Journal of Money, Credit and Banking* 39: 3–33.

Teulings, Coen N., and Nikolay Zubanov. 2014. "Is Economic Recovery a Myth? Robust Estimation of Impulse Responses." *Journal of Applied Econometrics* 29 (3): 497–514.