Fiscal Limits in the MENA Region: A Structural Analysis of Debt Sustainability[*]

Online Appendix

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A Simulation Procedure for Fiscal Limits

The state-dependent fiscal limit represents the maximum level of debt that a government can service. It is defined as the present discounted value of all future possible fiscal surpluses, where the distribution of surpluses depend on the exogenous states of the economy (productivity A_t, government expenditures G_t, oil revenues OR_t and transfers regime rs_t^Z), their future realizations, and the parameters of the model. The conditional distribution of the fiscal limit can be obtained using Markov Chain Monte Carlo simulation.

1. For each simulation i, randomly draw the shocks for productivity A_{t+j}, government spending G_{t+j}, the transfer regine rs_{t+j}^Z (and oil revenues OR_{t+j}) for 200 periods, conditional on the starting states.

2. Then compute the path of all other variables and the fiscal limit:

    Non-Oil-Exporting Countries

    $$B^*(A_t, G_t, rs_t^Z) = E_t \sum_{j=0}^{\infty} \beta^j \frac{U_c^{max}(A_{t+j}, G_{t+j})}{U_c^{max}(A_t, G_t)} \left(T^{max}(A_{t+j}, G_{t+j}) - G_{t+j} - Z(rs_{t+j}^Z) \right) \quad (1)$$

    Oil-Exporting Countries

    $$B^*(A_t, G_t, OR_t, rs_t^Z) = \sum_{j=0}^{\infty} \beta^j \frac{U_c^{max}(A_{t+j}, G_{t+j}, OR_{t+j})}{U_c^{max}(A_t, G_t, OR_t)} \left(T^{max}(A_{t+j}, G_{t+j}, OR_{t+j}) + OR_{t+j} - G_{t+j} - Z(rs_{t+j}^Z) \right)$$
    $$(2)$$

3. Repeat the simulation for 100,000 times and obtain the conditional distribution B^* using the simulated B_i^* ($i = 1, \cdots 100,000$)

4. Repeat the above steps for all possible exogenous states (A_t, G_t, rs_t^Z, OR_t) within the discretized state space.
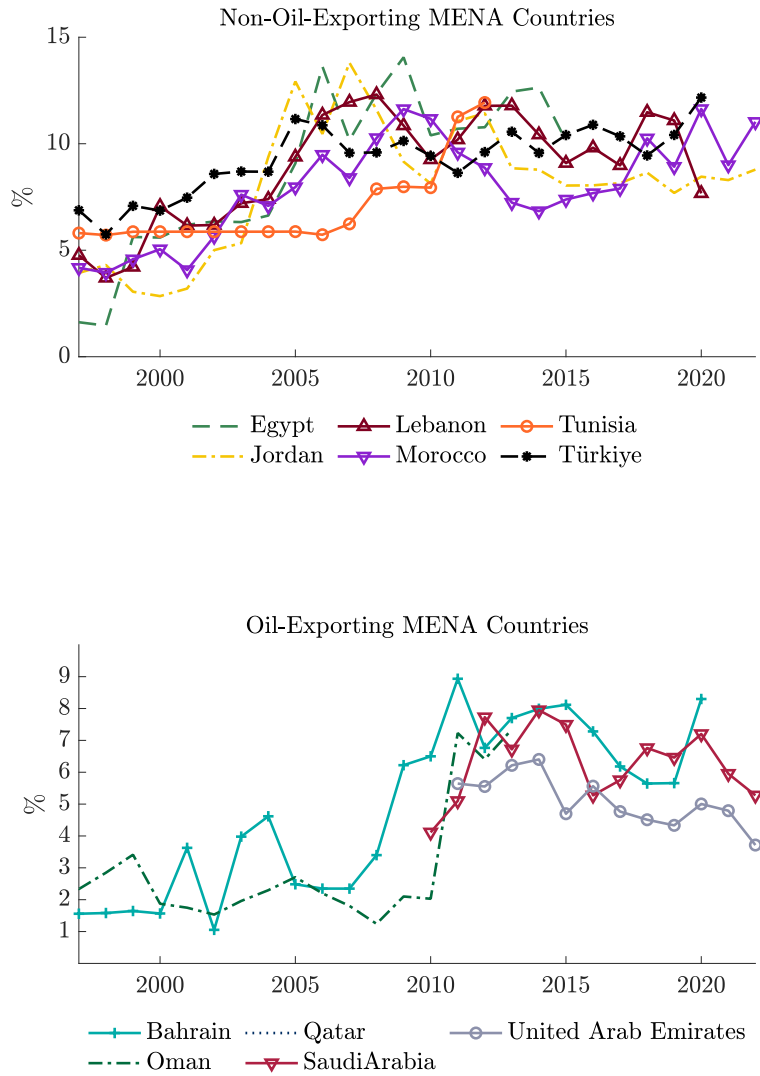
B   Data Sources

This section describes the data used to calibrate the model.

- **Real GDP per capita**: Computed as Real GDP at constant 2017 national prices (Penn World Table *rgdpna*) divided by population (Penn World Table *pop*).

- **Tax revenues-to-GDP**: Computed as Tax revenues, defined as compulsory transfers to the central government for public purposes, as a percent of GDP (World Bank World Development Indicators GC.TAX.TOTL.GD.ZS).

- **Government Transfers-to-GDP**: Computed as subsidies and other transfers as a percent of government expenditures (World Bank World Development Indicators GC.XPN.TRFT.ZS) multiplied by general government final expenditure as a percent of GDP (World Bank World Development Indicators NE.CON.GOVT.ZS).

- **Government purchases-to-GDP**: Computed as general government consumption expenditure (World Bank World Development Indicators NE.CON.GOVT.ZS) less government transfers-to-GDP.

- **Oil rents-to-GDP**: Computed as oil rents, defined as the difference between the value of crude oil production at regional prices and total costs of production, as a percent of GDP (World Bank World Development Indicators NY.GDP.PETR.RT.ZS).

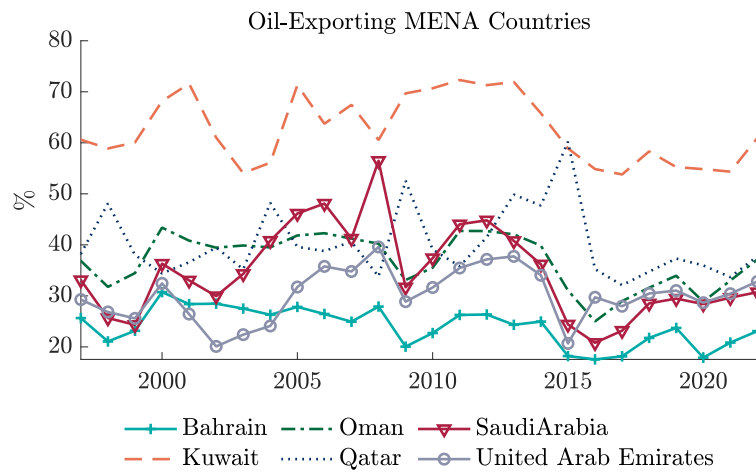- **Discount rate**: Annual discount rate (IMF International Financial Statistics).
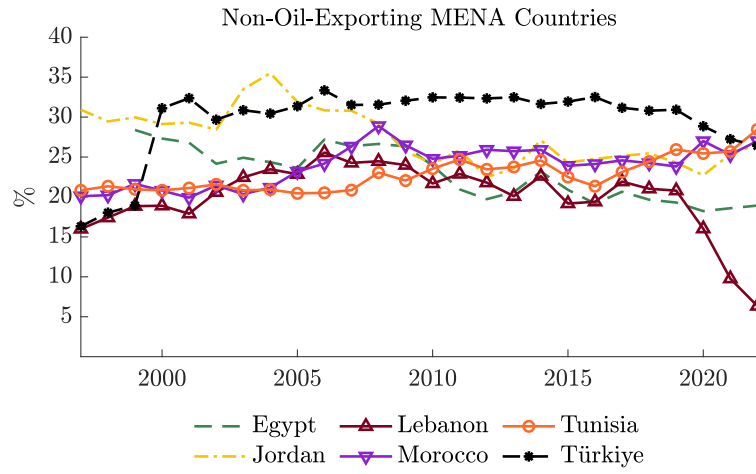
C Additional Figures

Figure C.1: Government Transfers as a Share of GDP
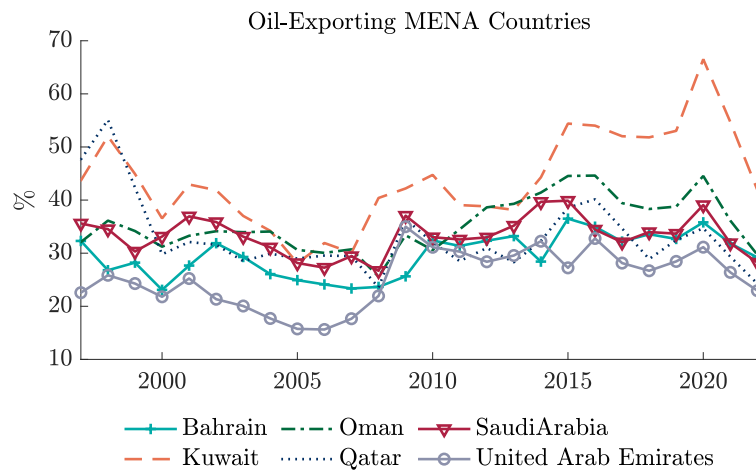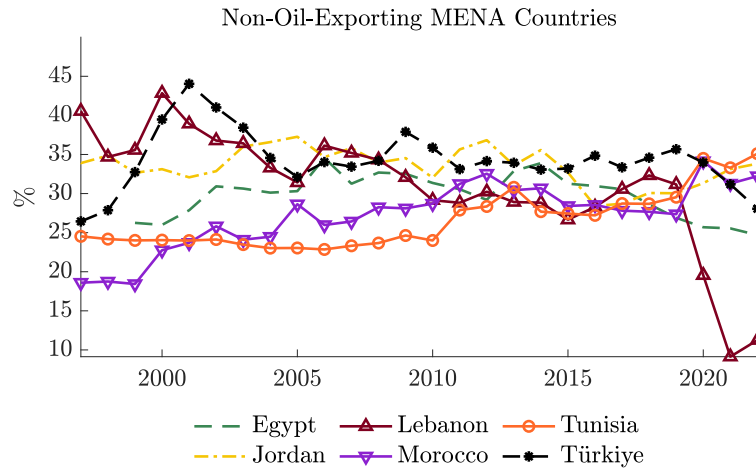

Non-Oil-Exporting MENA Countries

Legend: Egypt, Lebanon, Tunisia, Jordan, Morocco, Türkiye

Oil-Exporting MENA Countries

Legend: Bahrain, Qatar, United Arab Emirates, Oman, SaudiArabia

Source: IMF Government Finance Statistics

Figure C.2: Government Revenues as a Share of GDP

Non-Oil-Exporting MENA Countries

Legend: Egypt, Lebanon, Tunisia, Jordan, Morocco, Türkiye

Oil-Exporting MENA Countries

Legend: Bahrain, Oman, SaudiArabia, Kuwait, Qatar, United Arab Emirates

Source: IMF Fiscal Monitor

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Figure C.3: Government Expenditures as a Share of GDP

Non-Oil-Exporting MENA Countries

Legend: Egypt, Jordan, Lebanon, Morocco, Tunisia, Türkiye

Oil-Exporting MENA Countries

Legend: Bahrain, Kuwait, Oman, Qatar, SaudiArabia, United Arab Emirates

Source: IMF Fiscal Monitor