



# Yemen: Economy-wide impact of conflict and alternative scenarios for recovery

Amir M. Althibah, Tarek Al Kebsi, Clemens Breisinger, Wilfried Engelke, Sharad A. Tandon, Mariam Raouf, and Manfred Wiebelt

## Overview of the economic impact of the conflict in Yemen

In addition to the unprecedented humanitarian crisis and the creation of space for militant groups, the conflict in Yemen is also taking a heavy toll on the economy. According to estimates from the International Monetary Fund (IMF 2018), the Yemeni economy may have contracted by about 40 percent between end-2014 and 2018. Sector-specific information on physical damages from the World Bank's Yemen Dynamic Needs Assessment (World Bank 2018) suggests that damage was worst in the housing sector, where 33 percent of housing units have been either partially damaged or completely destroyed. The education, health, transport, and water, sanitation and hygiene (WASH) sectors have also been severely affected, with overall damage ranging from 27 percent (transport) to 31 percent (WASH). The power and ICT sectors have been somewhat less affected, with estimated damage levels of 13 percent and 11 percent, respectively.

The destruction of physical infrastructure, the loss of productive factors, and damaged economic networks and supply chains have severely reduced incentives to pursue productive activities (Moyer et al. 2019). Hydrocarbon exports have been substantially reduced throughout the conflict period, which has resulted in a severe shortage of foreign exchange and restricted imports of food, fuel, and other goods. Private consumption has been hard hit by the economic decline, foremost through increased food prices, delayed public-sector salary payments (the civil service employs 25 percent of the workforce), and soaring unemployment. In addition, almost all investment has been either halted or withdrawn. As a result of this economic and social decline, the World Bank estimates that the poverty headcount in Yemen may have increased to now stand between 71 and 78 percent (World Bank 2017).

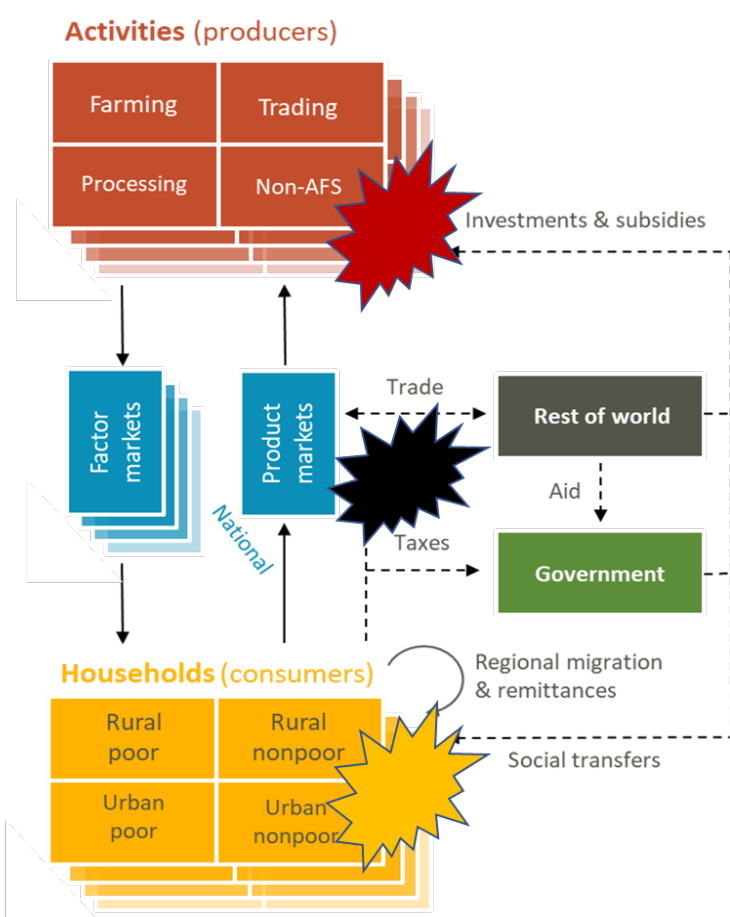
## Modeling conflict and reconstruction

In order to analyse the economy-wide impact of conflict and possible reconstruction options, existing economic, social, and other information is used within a recursive dynamic computable general equilibrium (DCGE) model that offers a consistent analytical framework (Diao and Thurlow 2012; Breisinger and Ecker 2012; World Bank 2012; Wiebelt et al. 2013; Breisinger et al. 2016). The DCGE model is based on a detailed, pre-conflict social accounting matrix (SAM) constructed in collaboration with the Yemeni Central Statistical Organisation. The SAM is based on the latest

available data for 2014, including national accounts, the balance of payments, and the 2014 household budget survey (Raouf et al. 2019). The model captures the main channels for the economic impact of conflict in Yemen – the destruction of physical and human capital; reductions in trade and in inflows of foreign direct investment (FDI), foreign aid, and remittances; changes in government revenues; and institutional factors.

The last element comprises all factors that lead to reduced productivity or idleness in factors of production, including, but not limited to, losses in network access and connectivity, which may reduce access to input and marketing opportunities, reduced participation in economic activity arising from security concerns, and any other intangible capital that may have been destroyed in the conflict. Methodologically, these institutional factors provide a residual category for model calibration that takes into account capital destruction, human capital losses, and significant levels of economic disorganization. These conflict-related economic impacts are transmitted to households mainly through income and price channels (Figure 1). For a more detailed description of the model and how the scenarios have been constructed, please refer to the Technical Appendix.

**Figure 1: Economy-wide conflict impact channels**



Source: Own illustration.

Two basic scenarios are used with the DCGE model to assess several recovery and reconstruction options for the Yemeni economy:

1. The **Stagnation (2019 to 2025)** scenario assumes non-availability of foreign assistance and can be interpreted as a worst-case scenario. In this case, the Yemeni economy stagnates at the current economic level until 2025, and recovery is on hold.

2. The **Recovery (2019 to 2025)** scenario assumes recovery of physical capital in the affected sectors and assumes TFP growth increases in all sectors to match the pre-conflict average annual growth rate of about 3 percent. This basic recovery scenario does not assume an inflow of foreign aid, as the reconstruction of capital stocks is assumed to be financed by domestic sources. Such a reconstruction mechanism will have a positive impact on total factor productivity in all sectors and reflects a strong policy commitment factor contributing to economic recovery.

In addition, two related recovery sub-scenarios are formulated that include foreign aid inflows over the period 2019 to 2025:

- a. **Recovery – LowAid** simulates foreign aid inflow of USD 1.9 billion per year in addition to domestic spending. This would allow for the reconstruction of physical capital stock in conflict-affected sectors to the pre-conflict level of 2014 (World Bank 2018). Under this scenario, government expenditures, transfers, and remittances are assumed to increase at the pre-conflict growth rates of 3 percent, annually.
  - b. **Recovery – HighAid** simulates a higher foreign aid inflow of USD 3.9 billion per year. This level of assistance would allow for reconstruction of physical capital stock in conflict-affected sectors by 2025 to levels that would have been achieved if there had been no conflict (equal to the result of counterfactual hypothetical BASE scenario). This sub-scenario reflects a relatively rapid “undoing” of the economic impact of the conflict. It assumes a high absorptive capacity of the Yemeni state, entailing significant post-conflict improvements in local institutions and governance in order to be able to effectively absorb this high level of external aid.
3. **Base** – The results of all scenarios are compared to a counterfactual projection, a base simulation, which assumes the hypothetical case of no conflict having occurred in Yemen. Under this scenario, the Yemeni economy would have continued the average annual growth of 3 percent that it realized during the decade prior to the conflict.

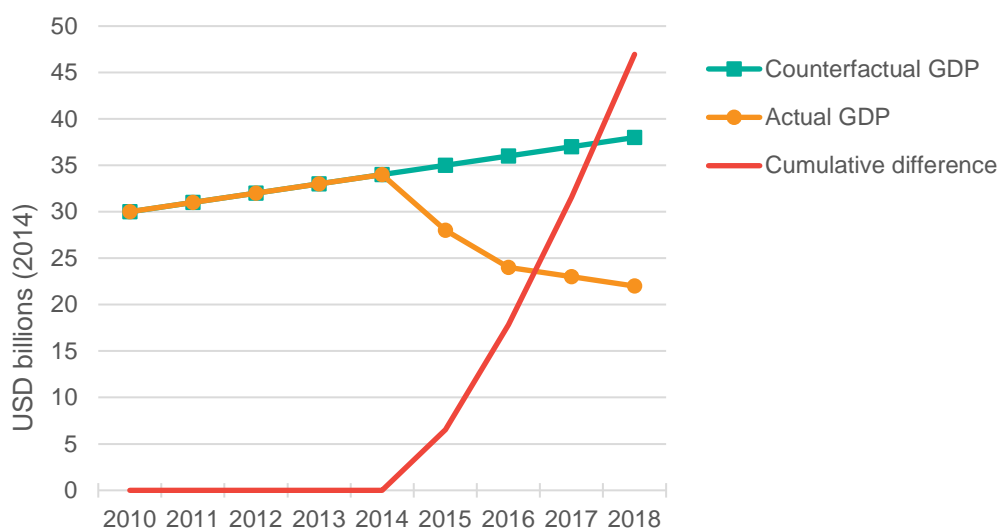
## Conflict impact estimates

To simulate the economic decline during the conflict period from 2015 through 2018, which forms the starting point for the Stagnation and all three Recovery scenarios, the following shocks are imposed on the model:

- an average annual decrease of physical capital stock of between 2.9 percent (ITC) and 18.1 percent (electricity);
- a reduction of total factor productivity (TFP) growth between 2.7 percent (all agricultural sectors in 2017) and 18.7 percent (all industrial sectors in 2015),
- a reduction of government spending on public goods and employees,
- and a reduction in transfers, remittances, and development aid consistent with government and other reports (e.g., IMF 2018).

The DCGE model estimates confirm the dramatic impact of conflict on the Yemeni economy and its citizens. The accumulated impact of the conflict from 2015 to 2018 translates into a loss of USD 47 billion (in 2014 prices), equivalent to nearly one and a half times of Yemen’s pre-conflict GDP in 2014 (Figure 2) and more than double the (upper) amount of recovery and reconstruction needs over five years estimated by the World Bank’s Yemen Dynamic Needs Assessment of between USD 19 billion and 23 billion. This higher outcome reflects the fact that the DCGE estimates include the indirect and cumulative losses incurred to the Yemeni economy since 2015, whereas the Dynamic Needs Assessment has a focus on physical recovery requirements.

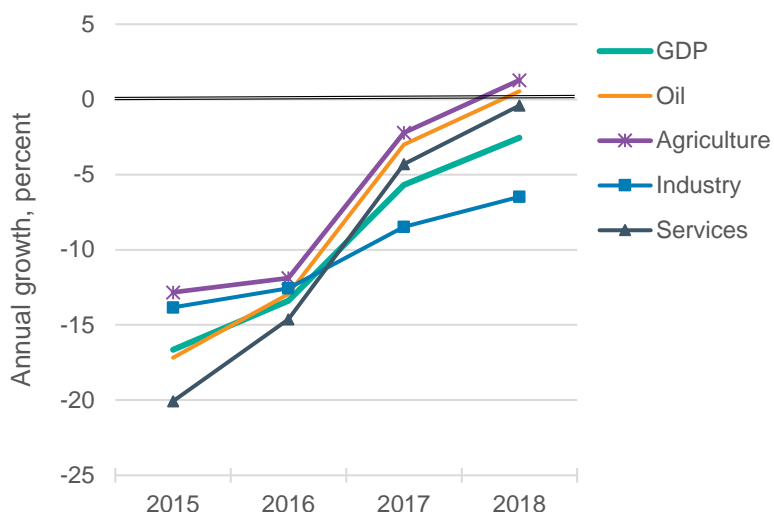
**Figure 2: Yemeni economy: Actual and counterfactual GDP and cumulative GDP losses, 2010 to 2018**



Source: Yemen DCGE model.

Sector-specific damages and reductions in agriculture, industry, and services productivity led to negative overall annual growth of between -16.7 to -2.6 percent during the conflict period from 2015 to 2018 (Figure 3). Electricity, transport, housing, public services, and the oil sector have been hardest hit by the direct impact of the conflict. These sectors experience the largest losses of physical capital. Moreover, education and health services suffer from the strong reduction in government spending.

**Figure 3: Contraction of the Yemeni economy by sector, 2015 to 2018, annual growth rates**



Source: Yemen DCGE model.

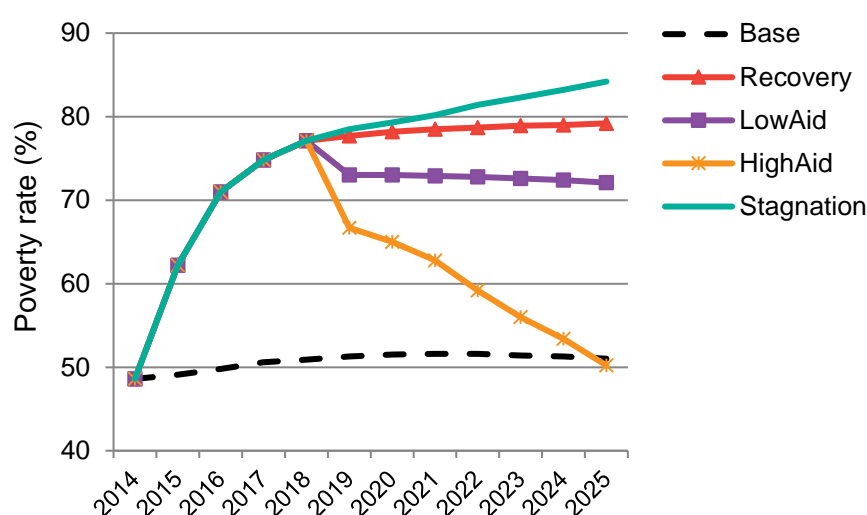
While the direct impact of the conflict on agriculture is limited, the agricultural sector suffers from indirect impacts of the conflict. Reduction in agricultural output is driven by sharp reductions in returns on land, reflecting a situation in which the lack of inputs and access to markets substantially influences production and economic returns. Nonetheless, overall agriculture seems to be the most resilient sector with the lowest negative growth rates over the conflict period (Figure 3). As such,

agriculture and the agri-food system<sup>1</sup> has played an important role for the Yemeni economy during the conflict and is expected to play a leading role during the recovery and reconstruction period.

The services sector, by contrast, was hardest hit over the first two years of the conflict, and slowly recovered subsequently, while the opposite pattern is seen for industry (Figure 3). The reason is that, with the continuation of the conflict, capital is becoming increasingly scarce in the economy. This hurts capital-intensive activities in industry, while it (relatively) benefits labor-intensive sectors, such as agriculture and services. As a result, the services sector is somewhat more resilient than the industrial sector against the impacts of the conflict.

Results from the simulation of the conflict period in the DCGE model suggest that national poverty headcount has increased from 49 percent of the population in 2014 to 77 percent in 2018 (Figure 4). Although not shown in Figure 4, the urban poverty headcount is estimated to have more than doubled from 24 percent in 2014 to 55 percent in 2018, while rural poverty increased by one third from 59 to 87 percent.

**Figure 4: Alternative reconstruction scenarios and impact on poverty**



Source: Yemen DCGE model.

## Post-conflict reconstruction scenarios

If no action is taken and stagnation follows conflict, Yemen is likely to suffer from low growth for years to come – the economy-wide growth rate is projected at only between 0.2 and 0.3 percent annually, well below recent population growth of 3 percent. All sectors would perform below their baseline levels. The model results show the agricultural sector to be the most resilient sector with projected growth of between 1.1 and 1.3 percentage points below the baseline values (2.1 and 2.3 percent) in the periods 2019 to 2022 and 2023 to 2025, respectively, compared with 2.0 percentage points and between 4.3 and 5.1 percentage points below baseline values for the industry and service sectors, respectively.

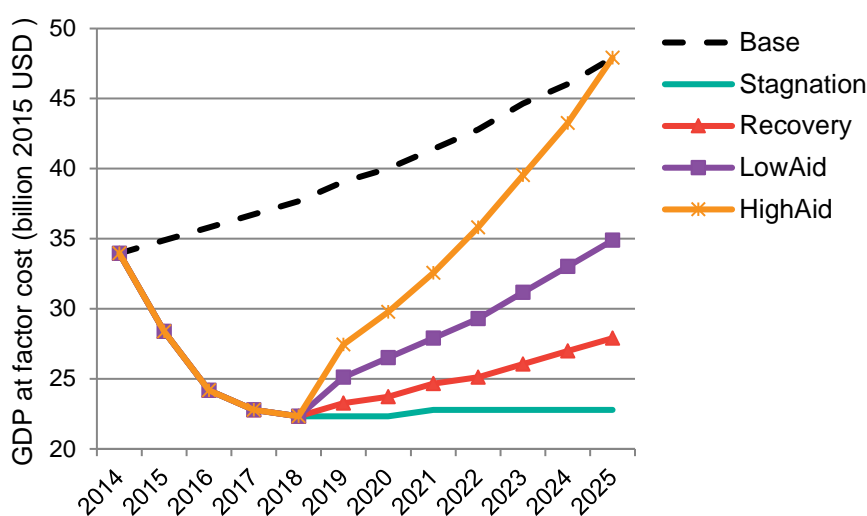
Even if the economy recovers by its own means and bounces back to pre-conflict-level growth rates of 3 percent annually from 2019 on under the basic recovery scenario, it would take until 2028 for Yemen to reach its pre-conflict output (GDP) levels. Thus, the conflict from 2015 to 2018 would

<sup>1</sup> Food systems are defined as "the entire range of actors and their interlinked value-adding activities involved in the production, aggregation, processing, distribution, consumption, and disposal of food products" (FAO 2013).

have thrown the country back more than a decade in terms of economic development. If no additional action is taken and a business-as-usual approach is applied comparable to the one prevailing before the crisis, then Yemen's recovery will be drawn out, taking 10 years or more to recover to pre-conflict levels of production.

Thus, growth acceleration supported by external financial and other support as well as adequate policies in support of inclusive growth would be needed. However, moderate foreign aid inflows (Recovery-LowAid scenario; Figure 5) that may suffice for reconstructing the damaged or destroyed capital stocks in sectors such as electricity, transport, oil production, and public services sectors by 2025 will *not be sufficient* to compensate for the total direct and indirect economic losses of the conflict, nor will these be sufficient to lower poverty to pre-conflict levels by 2025. Simply rebuilding initial capital stocks in conflict-affected sectors will not generate sufficient income to induce a sustainable process of rising private savings and investment that leads to a convergence towards baseline income by 2025. Rather, such an investment strategy will induce a reallocation of private investment and of complementary production factors from other more efficient sectors, such as agriculture or manufacturing towards targeted sectors. As a result, both income generation and poverty reduction are likely to be hampered.

**Figure 5: Alternative reconstruction scenarios and impact on GDP**



Source: Yemen DCGE model.

Only if the international community is able to substantially increase foreign aid to Yemen to around USD 3.9 billion per year, the value of aid modeled in the Recovery-HiAid scenario, will it be possible to reach an economic output level by 2025 that Yemen would have been reached in the absence of conflict (Recovery-HighAid Scenario, Figure 5). However, delivery of such a high level of aid is likely to test the absorption capacity of the country, especially at a time when its capacity can be assumed to have been severely eroded by the conflict. Special and innovative arrangements are required to overcome this constraint. Furthermore, to spur the recovery and the economic growth effects expected from this additional high foreign aid inflow, the government would need to introduce policies that allow for the private sector to operate and innovate more broadly and enhance market functions to foster increased competition. It therefore would be important that government focuses on its core functions in this Recovery-HighAid scenario.

Poverty outcomes by 2025 under the alternative reconstruction scenarios range between a national poverty headcount rate of 84 percent in the worst-case scenario of Stagnation and 50 percent in the best-case Recovery-HighAid scenario (Figure 4). Under the stagnation and basic recovery scenario, both rural and urban poverty would continue to increase up to 2025 compared with the hypothetical

Base scenario. Under the Recovery-LowAid scenario, poverty is projected to fall, but only modestly. Only under the Recovery-HighAid scenario are poverty levels projected to fall to pre-conflict levels by 2025.

## Summary

Economy-wide analyses of the Yemeni economy suggests that the accumulated economic losses caused by the ongoing conflict in Yemen amount to nearly one and a half times Yemen's pre-conflict GDP. One effect of this economic collapse is that the share of Yemen's population living below the poverty line is estimated to have reached 77 percent in 2018. Even when the conflict ends, Yemen's GDP is projected to stay well below its 2014 levels for many years to come if any conflict resolution scenario is not accompanied by extraordinary external financial and other development support by Yemen's partners.

Under the Recovery-LowAid scenario examined using the DCGE model of the Yemeni economy, Yemen's economy is projected to again reach the GDP level of 2014 by 2025, but poverty levels are likely to remain very high. This high poverty will pose risks to societal healing and to the formation of a new social contract post-conflict. Only under the Recovery-HighAid scenario, if accompanied by substantial improvements in absorptive capacity, will Yemen's GDP reach the economic and poverty levels that it would have reached in 2025 without the conflict having arisen (the hypothetical Base model scenario). Under such a HighAid scenario, poverty levels will reach pre-conflict levels by 2025. To reach such a positive outcome, aside from the core work of conflict resolution, critical massive efforts will also be needed in the years to come to replace and upgrade the capital stock, rebuild economic institutions, and restore economic networks.

## Technical Appendix: Model and methodology

The model described here is used to quantify the economic and social impact of the conflict in Yemen and to evaluate alternative future scenarios for the Yemeni economy.

### *Dynamic Computable General Equilibrium model for Yemen*

Table 1 presents the equations of the basic version of the dynamic computable general equilibrium (DCGE) model illustrating how changes in factor endowment, including physical capital and labor of different qualifications, affect employment, output, and household incomes.<sup>2</sup> Producers of each commodity  $c$  produce a level of output  $Q$  by employing the factors of production  $F$  under constant returns to scale (and given productivity  $\alpha$ ) and fixed production technologies (fixed factor input shares  $\delta$ ) (equation [1]). In the case of Yemen, there are 22 agricultural activities, including 14 crops sectors, one fishery, one forestry, and 6 livestock sectors; 20 manufacturing sectors; and 12 service sectors. Other industry sectors besides manufacturing included in the model are mining, which includes oil and gas (3 sub-sectors); electricity and water (2); and construction (1). Services include trade and transportation (2); hotels and restaurants (2); communications (1); financial and business services (2); real estate (1); public administration, education and health (3); and other services.<sup>3</sup>

The Yemen DCGE model includes three main factors of production: labor, capital, and land. Labor is disaggregated into unskilled, semiskilled, and skilled labor for both the private and public sectors. To capture their distinctive natures, capital is split into four capital types: capital that is specific to mining sectors, including oil and gas production; capital that is specific to agricultural crops production or livestock; and other capital used in the industrial and services sectors of the economy, respectively. Within the DCGE model, profit maximization implies that factor payments  $W$  are equal to average production revenues (equation [2]). Total supply of land and skilled labor is determined exogenously and assumed to be fully employed and mobile across agricultural crops sectors and all sectors, respectively, while the use of unskilled labor and unemployment is determined by demand. Capital is assumed to be fixed and sector-specific in the short term, i.e., within individual periods, but new capital from past investment is allocated to sectors according to profit rate differentials under a “putty-clay” specification.

While this general specification is used for most sectors, capital stock growth in those sectors affected by the conflict – crude oil, electricity, construction, transportation and storage, information and communication, real estate, education, and health and social work – are set exogenously according to damages observed by the Yemen Dynamic Needs Assessment. Besides the destruction of capital stocks, the conflict induces functional damages. The latter comprises all factors that lead to reduced productivity or idleness in factors of production, including, but not limited to, losses in network access and connectivity, which may reduce access to input and marketing opportunities; reduced participation in economic activity arising from security concerns; and any other intangible capital that may have been destroyed. Methodologically, this component provides a residual category in calibrations: given capital destruction and human capital losses, the level of “economic disorganization” was chosen to target observable outcomes, such as changes in GDP, as also reported by the IMF and other sources.

---

<sup>2</sup> The model description draws on Breisinger, Engelke, and Ecker (2011) and Diao and Thurlow (2012).

<sup>3</sup> For a detailed list of production activities and commodities, factors of production, household types, and other accounts of the social accounting matrix, see Raouf et al. (2019).

**Table 1: Core model equations of the dynamic computable general equilibrium model**

Production function	$Q_{ct} = \alpha_{ct} \cdot \prod_f F_{fct}^{\beta_c}$	(1)
Factor payments	$W_{ft} \cdot \sum_c F_{fct} = \sum_c \delta_{fc} \cdot P_{ct} \cdot Q_{ct}$	(2)
Import supply	$P_{ct} \leq E_t \cdot W_c^m \perp M_{ct} \geq 0$	(3)
Export demand	$P_{ct} \geq E_t \cdot W_c^e \perp X_{ct} \geq 0$	(4)
Household income	$Y_{ht} = \sum_{fc} \theta_{hf} \cdot W_{ft} \cdot F_{fct} + r_t \cdot E_t$	(5)
Consumption demand	$P_{ct} \cdot D_{hct} = \beta_{hc} \cdot (1 - v_h) \cdot Y_{ht}$	(6)
Investment demand	$P_{ct} \cdot I_{ct} = \rho_c \cdot (\sum_h v_h \cdot Y_{ht} + E_t b)$	(7)
Current account balance	$w_c^m \cdot M_{ct} = w_c^e \cdot X_{ct} + \sum_h r_h + b$	(8)
Product market equilibrium	$Q_{ct} + M_{ct} = \sum_h D_{hct} + I_{ct} + X_{ct}$	(9)
Factor market equilibrium	$\sum_c F_{fct} = s_{ft}$	(10)
Land and labor expansion	$s_{ft} = s_{t-1} \cdot (1 + \varphi_f)$	<i>f</i> is land and labor (11)
Capital accumulation	$s_{ft} = s_{t-1} \cdot (1 - \eta) + \sum_c \frac{P_{ct-1} \cdot I_{ct-1}}{k}$	<i>f</i> is capital (12)
Technical change	$\alpha_{ct} = \alpha_{ct-1} \cdot (1 + y_c)$	(13)

**Notes:**

**Subscripts**

Commodities or economic sectors  
 Factor groups (land, labor, and capital)  
 Household groups  
 Time periods

**Endogenous variables**

Household consumption demand quantity  
 Exchange (local/foreign currency units)  
 Factor demand quantity  
 Investment demand quantity  
 Import supply quantity  
 Commodity price  
 Output quantity  
 Average factor return  
 Export demand quantity  
 Total household income

**Exogenous variables**

*b* Foreign savings balance (foreign currency units)  
*r* Foreign remittances  
*s* Total factor supply  
*w* World import and export prices

**Exogenous parameters**

*α* Production shift parameter (factor productivity)  
*β* Household average budget share  
*γ* Hicks neutral rate of technical change  
*δ* Factor input share parameter  
*η* Capital depreciation rate  
*θ* Household share of factor income  
*κ* Base price per unit of capital stock  
*ρ* Investment commodity expenditure share  
*υ* Household marginal propensity to save  
*φ* Land and labor supply growth rate

Source: Diao and Thurlow (2012).

Consequently, declining sectoral capital stocks and total factor productivities cause production to fall [equation (1)], which in turn lowers economy-wide factor returns [equation (2)] and affects relative prices and production in other sectors as well.

Foreign trade is determined by comparing domestic and world prices, where the latter are fixed under a small country assumption. The simple model implements trade as a complementarity problem. If domestic prices exceed world import prices  $W^m$  (adjusted by exchange rate  $E$ ), then the quantity of imports  $M$  increases (equation [3]). Conversely, if domestic prices fall below world export prices  $W^e$ , then export demand  $X$  increases (equation [4]). To capture that relationship, the Yemen model uses trade elasticities as given by the GTAP data set. To ensure macroeconomic consistency, a flexible real exchange rate adjusts to maintain a fixed current account balance  $b$  (measured in foreign currency units) (equation [8]). Total factor productivity (TFP) growth and capital stock growth determine the growth of gross domestic product (GDP), the macro economy, and the interactions between the economy's agents of production and consumption. If a negative shock should occur, for example in the Yemen case, a conflict situation, TFP growth will be negative. The negative growth shock is translated into reduced sectoral production, reductions in the use of factors of production, and, through the model's linkages, impacts on factor income and household income, possibly falling exports, and possibly rising imports.

Factor incomes are distributed to households using fixed income shares  $\theta$  based on households' initial factor endowments and are combined with foreign remittances  $r$  adjusted by the exchange rate (equation [5]) and government transfers (not shown in Table 1). Incomes  $Y$  are then saved (based on marginal propensities to save  $\nu$ ) or spent on consumption  $C$  (according to marginal

budget shares  $\beta$ ) (equation [6]). The budget shares were calculated using detailed sectoral data from the Central Statistics Organization and the 2014 Household Budget Survey (HBS) for Yemen.

Domestic savings and foreign capital inflows are collected in a national savings pool from which investment demand  $I$  is financed – that is, a savings-driven investment closure (equation [7]). Finally, prices  $P$  equilibrate product markets such that demand for each commodity equals supply (equation [8]). The model thereby links production and trade to household incomes via changes in market prices, employment, and factor returns. Thus, if production falls, two mechanisms work together: factor income will fall as a result of reduced factor demand at the same time that supply falls, leading to an increase in prices, which in turn raises consumption expenditure and, in addition to reduced income from factors, reduces demand, which may then reduce prices. The interactions between all the agents used in the model will eventually reach a stable equilibrium where, depending on the relationships specified, reduced output, wages, demand, and, ultimately, GDP may be the result.

The model's variables and parameters are calibrated to empirical data from a social accounting matrix (SAM) that captures the initial structure of Yemen's economy in 2014. The 2014 SAM is updated from the 2012 Yemen SAM using various national and international datasets (Raouf et al 2019).

After the calibration, the parameters are then adjusted over time to reflect demographic and economic trends, and the model is re-solved for a new equilibrium each year. The model is recursively dynamic, with the dynamics occurring from 2015 to 2025. Between periods, the model is updated to reflect exogenous rates of labor expansion  $\phi$  (equation [11]). The rate of capital accumulation is determined endogenously with previous period investment converted into new capital stocks using a fixed capital price  $\kappa$  (equation [12]). This is added to previous capital stocks after applying a depreciation rate  $\pi$ . For conflict-affected sectors, capital stocks are updated exogenously. Finally, the model captures TFP through the production function's shift parameter  $\alpha$ , with the rate of technical change  $\gamma$  determined exogenously. Together with changes in sectoral capital stocks, changes in TFP are the main driver of changes in output for the simulations conducted in this paper. In addition, capital accumulation and capital depletion are affected by changes in foreign remittances and government transfers, which affect private savings and investment; by changes in multi- and bilateral development aid, which affects public savings and indebtedness; and by changes in capital inflows from abroad.

### ***Microsimulations of poverty impacts***

The DCGE model links to a microsimulation model, which allows for the endogenous estimation of changes in economic output on poverty. All HBS sample households are included in the microsimulation model, and their total expenditures are linked to each of the fifteen representative households included in the DCGE model according to their rural/urban residence and rural activities. The linkages between the DCGE and microsimulation models allow for the analysis of micro impact of the changes in representative households' consumption induced by changes in their real expenditures. The endogenous changes derived from the DCGE model for the respective household groups are used to recalculate consumption expenditures of their corresponding households in the survey dataset. New levels of total consumption expenditures are recalculated based on individual households' budgets, and the new poverty rates for each region, rural and urban, and the national total are obtained by comparing expenditure levels (in real terms) with the official poverty line defined for the HBS.

## References

- Breisinger, C., and O. Ecker. 2014. "Simulating Economic Growth Effects on Food and Nutrition Security in Yemen: A Macro-Micro Modeling Approach." *Economic Modelling* 43: 100-113.
- Breisinger, C., O. Ecker, R. Thiele, and M. Wiebelt. 2016. Effects of the 2008 Flood on Economic Performance and Food Security in Yemen: A Simulation Analysis. *Disasters* 40(2): 304-326.
- Breisinger, C., W. Engelke, and O. Ecker. 2011. *Petroleum Subsidies in Yemen: Leveraging Reform for Development*. Policy Research Working Paper WPS5577. Washington, DC: World Bank.
- Diao, X. and J. Thurlow. 2012. "A Recursive Dynamic Computable General Equilibrium Model." In *Strategies and Priorities for African Agriculture: Economy-wide Perspectives from Country Studies*, edited by X. Diao, J. Thurlow, S. Benin, and S. Fan. Washington DC: International Food Policy Research Institute.
- FAO (Food and Agriculture Organization of the United Nations) 2013. *Sustainable food systems: Concept and framework*. Rome. Italy.
- IMF (International Monetary Fund) 2018. Aide Memoire Yemen. Washington DC: IMF.
- Moyer, J.D., D. Bohl, H. Taylor, B.R. Mapes, and M. Rafa. 2019. *Assessing the impact of war on development in Yemen*, Sana'a: United Nations Development Programme.
- Raouf, M., J. Randriamamonjy, W. Engelke, T. Al Kebsi, S.A. Tandon, M. Wiebelt, and C. Breisinger. 2019. *A Regionalized Social Accounting Matrix for Yemen. A 2014 Nexus Project SAM*. IFPRI MENA Working Paper. Cairo: International Food Policy Research Institute.
- Wiebelt, M., C. Breisinger, O. Ecker, P. Al-Riffai, R. Robertson, and R. Thiele. 2013. "Compounding food and income insecurity in Yemen: Challenges from climate change." *Food Policy*, 43, 77-89.
- World Bank 2017. *Poverty Notes Yemen*. Washington, DC: World Bank.
- World Bank 2018. *Yemen Dynamic Needs Assessment: Phase 3*. Washington, DC: World Bank.
- World Bank. 2012. *Yemen – Joint social and economic assessment for the Republic of Yemen*. Washington, DC: World Bank.

---

## ABOUT THE AUTHORS

**Amir M. Althibah**, **Wilfried Engelke**, and **Sharad Tandon** are Economists at the World Bank. **Tarek Al Keksi** is Deputy Chairman for Economic Statistics, Central Statistical Organization, Yemen. **Clemens Breisinger** is Program Leader of the Egypt Strategy Support Program (EgSSP) and a Senior Research Fellow in the Development Strategy and Governance Division (DSGD) of the International Food Policy Research Institute (IFPRI), based in Cairo. **Mariam Raouf** is a Research Associate in the EgSSP of IFPRI, based in Cairo. **Manfred Wiebelt** is a Senior Research Fellow and Professor of Economics at the Kiel Institute for the World Economy.

---

## ACKNOWLEDGMENTS

The authors gratefully acknowledge funding for this study from the World Bank.

### INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

1201 Eye St, NW | Washington, DC 20005 USA  
T. +1-202-862-5600 | F. +1-202-862-5606  
Email: [ifpri@cgiar.org](mailto:ifpri@cgiar.org) | [www.ifpri.org](http://www.ifpri.org) | [www.ifpri.info](http://www.ifpri.info)

### IFPRI-EGYPT

World Trade Center, 1191 Corniche El Nile, Cairo, Egypt  
T: +20(0)22577612  
<http://egyptssp.ifpri.info>

The Middle East and North Africa Regional Program is managed by the Egypt Strategy Support Program of the International Food Policy Research Institute (IFPRI). The research presented here was conducted as part of the CGIAR Research Program on Policies, Institutions, and Markets (PIM), which is led by IFPRI. This publication has been prepared as an output of the Egypt Strategy Support Program. It has not been independently peer reviewed. Any opinions expressed here belong to the author(s) and do not necessarily reflect those of IFPRI, PIM, or CGIAR.

Copyright © 2019, Remains with the author(s). All rights reserved. This publication is licensed for use under a Creative Commons Attribution 4.0 International License (CC BY 4.0). To view this license, visit <https://creativecommons.org/licenses/by/4.0>.