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Petroleum Subsidies in Yemen

Leveraging Reform for Development

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Abstract

Petroleum subsidy reform is increasingly seen as an opportunity for consolidating public finances and fostering sustainable economic development. Yemen, as the country with the lowest per capita income in the group of countries with a high level of energy subsidies, started to reduce subsidies in 2010 and is discussing further options for reform. The results of this paper support a comprehensive petroleum subsidy reform in Yemen. Economic growth is projected to accelerate between 0.1 and 0.8 percentage points annually as a result of reform. Yet, the design of the reform is critically important, especially for the poor. Outcomes of alternative reform scenarios range from an increase in poverty of 2 to 6 percentage points. A promising strategy combines subsidy reduction with direct transfers of 13,800 to 19,700 Yemeni rials annually to the poorest 30 percent of households and enhanced public investments. Investments should focus on the utilities, transport, trade, and construction sectors to integrate economic spaces and create the platform for a restructuring of agricultural, industrial, and service value chains, which should encourage private sector led and job creating growth in the medium term.

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Petroleum Subsidies in Yemen: Leveraging Reform for Development

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1. Introduction

Petroleum subsidies strain public finances, distort markets, and provide only a blunt tool in the fight against poverty.[3] In many countries, such as Azerbaijan, Bolivia, Ecuador, Egypt, Indonesia, and Jordan, petroleum subsidies account for more than 3 percent of GDP and are comparable in size to public spending on health and education combined (World Bank 2008; Coady et al. 2006). In addition to diverting resources away from more productive uses, fuel price subsidies have many negative side-effects that create welfare reducing policy trade, or simply undermine the original policy objective. Energy subsidy induced distortions lead to misguided price information and ensuing investment decisions. The welfare price for re-adjustment needs to be borne by the society as a whole. Energy subsidies lead to unnecessary waste, are likely to slow adaptation of new energy saving technologies, and as result, have often negative environmental effects (von Moltke, McKee, and Morgan 2004; Ellis 2010). On the consumer side, it is usually the better-off households that disproportionally benefit most from petroleum subsidies, thus undermining social equity. For the reasons mentioned above it is also a very inefficient policy tool for poverty reduction (Coady et al. 2006; Bacon and Kojima 2006). Additional challenges related to fuel subsidies often include fuel adulteration, smuggling and an inefficient petroleum processing sector, given the premiums involved in the shadow market.

Notwithstanding economic arguments, the global size of subsidies and the number of countries with petroleum subsidies has increased, mainly due to higher world fuel prices and newly imposed subsidies by governments. The International Monetary Fund (IMF) estimates that the absolute size of global pretax petroleum subsidies has increased eightfold between 2003 and 2010, to about 0.7 percent of global gross domestic product (GDP; Coady et al. 2010). Out of a sample of 38 developing countries, at least 14 countries have suspended market-based pricing between 2004 and 2006, joining 12 others that had already controlled prices (ESMAP 2006; Bacon and Kojima 2010). Yet for both temporarily introduced and more permanent subsidy schemes, reform becomes more urgent given increasing budget constraints and evidence of the negative economic and social impacts. In fact, several governments have launched substantial reforms lately, including Chile, Ghana, Indonesia, Iran, Syria and very recently Yemen.

Governments have begun to question existing energy subsidy schemes, yet there is often uncertainty about the impact of potential reform. The economic and social impact of subsidy reform differs from country to country.[4] Many studies find that petroleum subsidy reforms raise overall economic growth, mostly explained by economic efficiency gains over time (Clements et al. 2007; Jensen and Tarr 2002; Burniaux 2009; von Moltke, McKee, and Morgan 2004). Hope and Singh (1995) show that in three of six countries studied in the years after reforming the petroleum subsidy, GDP grew faster than before, and growth in the other three countries quickly accelerated in the years after the implementation of the

[3] Petroleum subsidies can broadly be differentiated into consumer and producer subsidies. This paper focuses mainly on consumer subsidies, which often come in the form of price controls (IEA 2007).

[4] In this paper we focus on economic and social impacts of subsidy reform. Environmental impacts, especially through GHG emission reductions, are expected to be positive (Ellis 2010).

reform.[5] The social impact of fuel subsidy reform has been less widely studied, yet there are indications that the poor may be the main losers from reform. Coady et al. (2006) find in their six-country study that real incomes of the poorest household groups decline between 1.8 percent in Mali up to 9.1 percent in Ghana. This is consistent with empirical evidence from Hope and Singh (1995), who find decreases in real household incomes of 1–3 percent due to subsidy reform. These findings are further confirmed by the experience of the 2007/2008 global food and fuel crisis, where rising prices for petroleum products and food have led to an increase in poverty (Breisinger et al. 2010; Ivanic and Martin 2008).

Past experience with subsidy reform suggests that protecting the poor from the negative impact of reform is most important for success. The immediate negative effect on real household incomes, especially those of the poor, may explain why petroleum subsidy reform is often accompanied by social tensions or even riots. However, reform experience from other countries shows that social unrest can be mitigated, if targeted compensation is provided, accompanied by effective publicity campaigns that raise awareness of the social inequality created by subsidies (Bacon and Kojima 2010) and the removal of obstacles to sustainable growth created by subsidies. Several countries have successfully applied direct cash transfers to protect the most vulnerable household groups from the negative consequences of reforms. For example, Chile used several rounds of cash transfers to the poorest 1.4 million households, China compensated the poor with monthly payments to offset rising fuel costs, and Indonesia installed quarter-annual payments of US$30 during one year for 15.5 million poor households, or 28 percent of the population. Ghana used a more indirect approach and abolished fees for all public primary and secondary schools and a program to improve public transportation (Bacon and Kojima 2010).

Yemen is among the countries that most recently reduced its petroleum subsidies. A combination of declining oil revenues and the high fiscal costs to sustain the subsidy in combination with a resulting large budget deficit in 2009, estimated at about 10 percent of GDP (IMF, 2010), which led policy makers in Yemen to reconsider the future of the petroleum subsidy. Yemen is the country with the lowest per capita income in the group of high subsidizers; there are only a few other countries in the world with lower fuel prices than Yemen, among them Libya, Saudi Arabia, Bahrain, Qatar, and Kuwait, which all have a significantly higher per capita income (Figure A.1 in the Appendix) and higher oil or gas reserves per capita.

Reforming the petroleum subsidy may provide a new impetus for Yemen's ailing economy and may become an important part of a broader effort to tackle Yemen's economic and social development problems. Yemen faces a number of challenges: slow non-hydrocarbon growth, little economic diversification, high population growth, decreasing oil production, unsustainable use of water resources, and high levels of poverty and food insecurity. The economy is dominated by the hydrocarbon sector (oil) and non-tradable services, while manufacturing and export-oriented services make up a relatively small share of the economy. Agriculture contributes about 10 percent to GDP, and about 30 percent of

[5] Clements et al. (2003), Jensen and Tarr (2002), Burniaux (2009), and von Moltke, McKee, and Morgan (2004) are based on economic modeling. Hope and Singh (1995) base their results on simple correlation analysis, which makes isolating growth effects from reform and other factors challenging.

the Yemeni population earn their livelihood from farming. However, about 70 percent of the population lives in rural areas, and 34.8 percent of Yemenis live below the poverty line in 2005/2006 (World Bank 2007). Estimates suggest that poverty and food insecurity (as a measure of extreme poverty) has increased substantially due to the food crisis impact of 2008. Breisinger et al. (2010) estimate that poverty increased to 42.8 percent in 2009. Ecker et al. (2010) and WFP (2010) show consistently that 32 percent of the Yemenis suffer from food insecurity in 2009, with negative implications on current and future generations' health and productivity.

The Government of Yemen has taken some first steps to initiating comprehensive petroleum subsidy reform by increasing the price of fuel by about 25 percent so far in 2010. In order to contribute to the ongoing debate of whether and how to design continued reform, this paper assesses the economic and social impacts of further reform and alternative options for the allocation of resources saved. More specifically, this paper discusses two major scenarios: one accelerated reform path (Reform Option 1) where all subsidies are cut within one year, and one more gradual reform alternative (Reform Option 2) that phases out subsidies over a period of three years. It also considers the impacts of using the savings from reform for budget deficit reduction, direct transfers to households, and investments. The rest of the paper is organized as follows: Section 2 analyzes the role of petroleum subsidies and petroleum products for the government budget, producers, and consumers. Section 3 describes the computable general equilibrium (CGE) model, which serves as analytical tool for assessing the impact and reform options. Section 4 presents the model results, and Section 5 concludes with a summary and policy implications.

2. The Role of Subsidies in the Economy and Options for Reform

The Role of Subsidies

To understand and assess the potential impacts and options for reform, it is important to analyze the linkages between subsidies, the government budget, production, consumption and households.

Petroleum subsidies in Yemen make up more than 20 percent of the government budget, more than total spending on education, health and social transfers in 2007 combined (Table 1).[6] The share of the subsidy within the category of "economic affairs" has increased dramatically over the past years, up from about 45 percent of total economic affairs expenditures in 1999 to 85 percent in 2007. This expansion of cost for the petroleum subsidy comes at the expense of other sectors. For example, fiscal resources for social protection remained fairly low, only 0.2 percent of total government spending was used for social protection and programs.

[6] It is important to note that the overall annual fiscal costs for the energy subsidy depends on international prices for petroleum products, as the domestic price is fixed. In general, the higher the international price for petroleum products, the higher the costs for the subsidy.

Table1. Role of Petroleum Subsidy in the Government Budget

Sector	2007 In bill. YR	2007 in % of total expenditures	2008 in bill. YR	2008 in % of total expenditures	2009 in bill. YR	2009 in % of total expenditures
Economic Affairs	473.5	27.3	827.2	37.1	483.0	27.5
of which:						
Industry/Trade	2.4	0.1	2.7	0.1	3.0	0.2
Trans./Comm.	3.2	0.2	2.6	0.1	4.4	0.2
Agriculture/Fishing	17.6	1.0	19.9	0.9	14.2	0.8
Petroleum Subsidy	401.7	23.2	759.3	34.1	391.0	22.2
Other Econ. Affairs	48.6	2.8	42.7	1.9	70.5	4.0
Health	59.3	3.4	70.2	3.2	61.5	3.5
Education	251.1	14.5	291.7	13.1	286.2	16.3
Social Protection	4.2	0.2	5.1	0.2	47.8	2.7
General Public Services	416.5	24.0	452.9	20.3	320.5	18.2
Defence	272.8	15.7	297.1	13.3	288.2	16.4
Other	256.3	14.8	283.2	12.7	270.3	15.4
Total	**1,733.8**	**100.0**	**2,227.5**	100.0	**1,757.6**	100.0

Source: Ministry of Finance (2010).

The rising cost of the fuel subsidy has an adverse impact on the public investment program in infrastructure, including for transportation and telecommunication. Between 2007 and 2009, less than 1 percent of the economic affairs budget was allocated for infrastructure construction. Investment for development, was largely externally financed (about 2 to 4 percent of GDP). However, there is broad consensus that building and investing in economic infrastructure is a key ingredient for achieving long-term growth, economic diversification and sustainable poverty reduction. In Yemen, for example, road density, especially of asphalted roads, is generally low, and the average travel time by district to the nearest urban center can exceed three hours. Investments into the road network system, especially in rural areas, will therefore have large poverty-reducing effects (Breisinger et al. 2010b). Improvements of road infrastructure are also expected to facilitate people's access to public service facilities such as hospitals, schools, and administration offices and have positive spillover effects on development and commercialization in rural areas. Lowering of transaction costs will directly lead to new economic opportunities and diversification.

The largest share of fuel subsidies goes to diesel, which made up more than two-thirds of all subsidized fuels in 2009 (Table 2): 69 percent of fuel subsidies goes to diesel; 14 percent goes to gasoline; and the remainder is split between LPG, kerosene, and jet fuel. In terms of total domestic fuel consumption, diesel accounted for the largest part, with 3.96 billion liters in 2009, followed by gasoline (2.04 billion), jet fuel (1.34 billion), and kerosene (0.12 billion).

Table 2. Subsidy by Type of Fuel

	2009	2010 Q1	2010 Q2
Diesel			
Share in total subsidy (percent)	69	63	65
Domestic price (PEC & large users)	17	32	74
Domestic subsidized price (small users)	35	38	41
Price at the Yemen border (incl. tax, freight, etc.)	158	123	134
Total annual diesel subsidy (in billion YER)	264	90	95
Gasoline			
Share in total subsidy	14	22	23
Domestic price	60	63	68
Price at the Yemen border (incl. tax, freight, etc.)	87	121	130
Total annual gasoline subsidy (in billion YER)	55	31	33
Total subsidy reduction (savings) YER/liter	0	3	5
LPG			
Share in total subsidy	11	12	8
Domestic price in YER/liter	23	30	42
Price at the Yemen border (incl. tax, freight, etc.)	52	70	64
Total annual LPG subsidy (in billion YER)	41	17	11
Total subsidy reduction (savings) YER/liter	0	7	11
Kerosene			
Share in total subsidy	4	1	2
Domestic price	36	38	41
Price at the Yemen border (incl. tax, freight, etc.)	112	121	134
Total annual kerosene subsidy (in billion YER)	15	1	3
Total subsidy reduction (savings) YER/liter	0	2	3
Jet Fuel			
Share in total subsidy	2	2	2
Domestic price	36	39	43
Price at the Yemen border (incl. tax, freight, etc.)	97	123	136
Subsidy (in billion YER)	9	3	4
Subsidy as a percentage of import prices	63	69	68
Total fuel subsidy (in billion YER)	385	142	146

Sources: Ministry of Finance (2010), IMF (2010), and World Bank (2010).

Subsidies impact economic sectors and households differently, depending on the respective share of fuel in production and in consumption. Households consume about 10 percent of all fuel products (Table 3); most of the fuel is consumed as intermediate inputs in agriculture, industry, and services. About 40 percent of all fuel is used for transportation, followed by the mining sector (mainly oil production) and industries. Agriculture consumes about 12 percent of all fuel, mostly for irrigation. Interestingly, fuel is the single largest expenditure item for agricultural production despite the petroleum subsidy.[7] The transport sector as the biggest consumer of fuel constitutes also an important input for the production of other sectors; industry and services are the most transportation-intensive sectors, with transportation making up 14 and 8 percent of their output, respectively.

[7] This is largely due to the pumped ground water needed to irrigate farms.

Table 3. Role of Fuel Products in the Economy

	Share in total fuel consumption	Fuel intensity in production/ consumption	Fuel import intensity by sector
Agriculture	12.4	19.6	49.8
Fuel products	0.5	7.0	184.6
Industry	29.9	11.6	34.7
Transport	40.0	30.8	—
Other services	7.1	2.3	—
Households	10.1	1.2	—
Urban	*37.1*	*1.1*	—
Rural	*62.9*	*1.2*	—

Source: Based on HBS (2005/2006) and the Social Accounting Matrix of 2009.

In general, direct effects on households from subsidy reform relate to their consumption of fuel products, whereas indirect effects relate to the change in real household incomes because of higher production costs of goods and services. Consistent with evidence from other countries, the direct expenditure for fuel is modest at 1,805 Yemeni Rials (YER) per capita per year, or about 1.2 percent of household expenditure, on average (Table 4). The per capita amount is higher for urban households (2,659 YER) than for rural households (1,363 YER) in absolute terms. However, rural households spend a higher share of their income on fuel: 1.2 percent compared with 1.1 percent for their rural counterparts. Indirect consumption of fuel matters more.[8] To illustrate this point, consider the case of transportation: Household expenditure on transportation (which is fuel intensive, see Table 3) is about eight times higher than expenditure on fuel and accounts for 8.7 percent of household expenditure nationwide, while urban households spend a much higher share on transportation than rural households. In summary, petroleum subsidies make up a significant share of government expenditures and play an important direct and indirect role for real household incomes. Subsidy reform is expected to reduce household welfare and alter the production costs of economic activities in the short run, while freeing up substantial resources that can be used for alternative spending. Therefore, capturing the direct *and* indirect effects of subsidy reform will be the key for meaningful analysis. The next sections will lay out the analytical strategy to capture these effects and assess alternative options for reform

Table 4. The Share of Fuel Products in Household Consumption

	Total	Urban	Rural
Fuel products			
Per capita expenditure (YER/year)	1,805	2,659	1,363
Share in total expenditure	1.2	1.1	1.2
Transport			
Per capita expenditure (YER/year)	13,281	46,130	6,677

[8] Key household characteristics are summarized in Table A.1 in the Appendix.

Share in total expenditure	8.5	12.9	5.8
Fuel plus transport			
Per capita expenditure (YER/year)	15,086	48,790	8,040
Share in total expenditure	9.7	14.0	7.0

Source: Based on HBS (2005/2006) and SAM (2009).

Options for Petroleum Subsidy Reform

This paper analyzes two major scenarios: an accelerated reform path (Reform Option 1) where all subsidies are cut within one year, and a more gradual reform option (Reform Option 2) that phases out subsidies over a period of three years (Table 5). In the accelerated scenario, subsidies would be eliminated from an estimated 391 billion YER in 2009 to zero in 2011.[9] This would, *ceteris paribus*, imply a reduction of the fiscal deficit by one-half, from 6.9 percent to 3.5 percent of GDP, with remaining surplus from reform of 215 billion YER. In the gradual reform scenario, subsidies are phased out by equal amounts (130 billion YER) from 2011 to 2013. *Ceteris paribus*, the total savings from reform are smaller due to continued fiscal costs for subsidies in 2011 and 2012, thus the fiscal deficit is reduced more slowly.

Table 5. Fuel Subsidy Reform Options

		Reform 1, accelerated			Reform 2, gradual		
	2009	2011	2012	2013	2011	2012	2013
Fuel subsidy (change)							
Subsidy (percent)		–100	0	0	–33	–50	–100
Subsidy (billion YER)		–391	0	0	–130	–130	–130
Subsidy (million $US)		–1,777	0	0	–593	–592	–593
Remaining subsidy (billion YER)	391	0	0	0	261	130	0
Remaining subsidy (in million US$)	1,777	0	0	0	1,185	593	0
Fiscal deficit (change)							
Fiscal deficit (percent of GDP)	6.9	3.5	3.5	3.5	5.8	4.6	3.5
Fiscal deficit (in billion YER)	352	176	0	0	293	235	176
Fiscal deficit (in million US$)	1,600	800	0	0	1,333	1,067	800
Surplus from reform/ spending		215	0	0	72	72	72

Sources: IFPRI, based on IMF (2010), MoF (2010), and World Bank (2010).

In both the accelerated and the gradual reform scenarios, we consider three alternative uses of savings from the subsidy: first, total savings are used for deficit reduction, second, we also consider the impact of using part of the savings from reform for direct transfers to the poorest households. Finally, given Yemen's need for infrastructure investment and the expected high returns from such investment, we consider the impact of scaling up infrastructure investment with productivity-spillovers in a third sub-scenario.

[9] It is important to note that 2009 was a year with relatively low international oil prices resulting in lower fiscal costs for the subsidy. Therefore, the following analysis may underestimate the effects of subsidy reduction.

3. Modeling the Impacts of Petroleum Subsidy Reform

Assessing economic and poverty impacts of petroleum subsidy reform requires an economy-wide model that captures the major linkages between subsidy reduction, production, consumption, and households. In addition, given that many of the effects arise from changes in relative prices, social accounting matrix (SAM)–based CGE models are more suitable than SAM-based multiplier models that have previously been used in comparable studies.

The CGE model is used in this paper and is constructed consistently with the neoclassical general equilibrium theory. The theoretical background and the analytical framework of CGE models have been well documented in Dervis, de Melo, and Robinson (1982); the detailed mathematical presentation of a static CGE model is described in Lofgren, Harris, and Robinson (2002). The recursive dynamic version of the CGE model is based on this standard CGE model with the incorporation of a series of dynamic factors. The early version of this dynamic CGE (DCGE) model can be found in Thurlow (2004), and its recent applications include Diao et al. (2007) and Breisinger, Diao, and Thurlow (2009), and Breisinger et al. 2010. A summary of the main equations can be found in Tables A.2 in the Appendix.

To develop the DCGE model for Yemen, we first update a 2007 SAM to represent Yemen's economy in 2009 as the main database for the model. For the updating process we used national accounts data for 2009 provided by the Ministry of Planning and International Cooperation (MOPIC). Major data sources for the 2007 SAM construction include the latest supply-use table from the Central Statistics Organization (CSO), balance of payments from the Bank of Yemen (BoY), government budget data from the Ministry of Finance, the 2008 Agricultural Yearbook from the Ministry of Agriculture and Irrigation, and the latest Household Budget Survey (HBS 2005/2006). These data sources have been complemented with information from the International Monetary Fund and the World Bank. The model is very detailed at the production, commodity, factor, and household levels and includes 65 production activities, 65 commodities, 15 factors of production, and 12 household types.[10] Factors of production include labor according to the skill level (unskilled, semiskilled, skilled) and employment by the public and private sectors.

In addition to the SAM as the main data source to calibrate to a set of parameters in both production and demand functions, a DCGE model also requires several elasticities. The main elasticities include the substitution elasticity between primary inputs in the value-added production function, which determine the ease with which, for example, users of fuel can substitute fuel for other inputs; the elasticity between domestically produced and consumed goods and exported or imported goods; and the income elasticity in the demand functions. The income elasticity with regard to fuel, for example, decides how consumers react to higher prices. We estimated the income elasticity for Yemen from a semi-log inverse function suggested by King and Byerlee (1978) and based on the data of HBS 2005/2006 for rural and urban households separately. These elasticities range from, for example, 0.31 for cereals to 2.2 for transport and 1.95 for fuel, where most elasticities are lower for urban households than for rural.[11] For

[10] For a detailed list of production activities, commodities, factors of production, household types, and other accounts of the 2007 SAM, see Table A.3 in the Appendix.

[11] Table A.4 in the Appendix presents the complete list of imputed income elasticities.

elasticities that could not be estimated econometrically due to lack of data, we use international standards numbers based on IFPRI research: For the substitution between intermediate inputs and value added in the production function, we use a constant elasticity of transformation (CES). For the factor substitution elasticity we choose 1.2, the elastic of transformation is 4.0; and the Armington elasticity is 6.0 for all goods and services.

The model is recursive dynamic; that is, the dynamics occur between 2010 and 2015 in each year. In the baseline scenario as well as in all other scenarios, we assume that the nominal exchange rate is flexible. Exogenous variables in the model include the government consumption, transfers to households, foreign inflows, population growth and hence growth of the workforce—which all grow exogenously according to their trends in recent years. Investments are savings driven, which means that an increase of either private or public savings increases the economy-wide investment rate. The government budget is flexible in the model, which means that the government can adjust to changes in revenues and spending by increasing or decreasing the budget deficit (or its savings). For example, if petroleum subsidies are reduced, the government savings increase. This leads to an overall increase of savings in the economy, and thus to higher investment. It is important to note that real sector CGE models in general cannot capture the long-term benefits of low public debt/GDP levels and related lower interest rates for borrowing capital.

At the sector level, total factor productivity (TFP) increases exogenously to account for the differential growth patterns across sectors. Non-hydrocarbon capital is fully mobile across all sectors, and its inter-temporal allocation follows the highest profitability by sector and period. Capital employed in the hydrocarbon sector is sector specific and cannot move to other sectors. Population growth, land, and productivity growth are all exogenously determined. Baseline growth in the model is driven by population growth (3 percent), supply of labor (3 percent), annual TFP growth changes of 3 percent in all nonagricultural sectors from 2010 to 2015, and an increase in government spending consistent with annual growth rates (3 percent). Changes of growth rates in the different scenarios relative to the base are mainly due to endogenous processes, such as the change of relative prices for factors and commodities from subsidy removal. Changes in public spending from subsidy reform are accounted for by exogenous changes in government transfers to households and sector level changes in TFP. For the size of these changes see Table 6.

To capture the distinct nature of the Yemeni labor market, mainly characterized by public/private employment and different skill levels, the model includes six types of labor. Accordingly, there are different wage rates for labor employed with the government and the private sector. Within each of the groups, workers are fully mobile and wage rates differ among skilled, semi-skilled, and unskilled labor. With this set-up the model can capture some of the distributional effects of growth that has characterized the Yemeni economy over the past years. Growth of the past years has been oil driven and did not trickle down to the poor and rural areas (World Bank 2007). One of the reasons were the segmented labor markets, where only few highly skilled laborers in the oil sector and government employees benefited from oil production and related government revenues.

Finally, the DCGE model links to a micro-simulation model, which allows for the endogenous estimation of growth impact on poverty reduction. All HBS sample households are included in the micro-simulation model, and their total expenditures and expenditures on each commodity or commodity group are linked to each of the six representative households included in the DCGE model. The endogenous changes derived from the DCGE model for the six representative households are used to recalculate consumption expenditure of their corresponding households in the survey dataset. New levels of total consumption expenditures are recalculated based on individual household 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 HBS.

Table 6. Scenario Assumptions

	Government transfers	Subsidy	TFP
Reform 1 (accelerated)			
1A: Use all savings for budget consolidation	as base	100% decrease of subsidy in 2011	as base
1B: Reduce fiscal deficit by 50% and use remainder for direct transfers to households	increase transfers in 2011 between 40% and 380% depending on initial size of transfers and population shares	100% decrease of subsidy in 2011	as base
1C: Reduce fiscal deficit by 50%, compensate only the poorest of the poor, and use remainder for productivity-enhancing investments	increase transfers in 2011 between 22% and 155% depending on initial size of transfers and population shares	100% decrease of subsidy in 2011	22% in construction, electricity, water, trade transport in 2011; from 2013, 1 percent TFP growth in all sectors
Reform 2 (gradual)			
2A: Use all savings for budget consolidation	as base	33%, 50%, 100% reduction from 2011 to 2013	as base
2B: Reduce fiscal deficit by 50% and use remainder for direct transfers to households	increase transfers from 30%–100% in 2011 to 15%–50% in 2013	33%, 50%, 100% reduction from 2011 to 2013	as base
2C: Reduce fiscal deficit by 50%, compensate only the poorest of the poor, and use remainder for productivity-enhancing investments	increase transfers from 20%–74% in 2011 to 20% in 2013	33%, 50%, 100% reduction from 2011 to 2013	7% in construction, electricity, water, trade and transport 2011–2013; from 2014, 1% TFP growth in all sectors

Source: DCGE model results.

With the CGE and micro-simulation models, we quantify the impact of the accelerated (Reform Option 1) and the gradual (Reform Option 2) reform scenarios; within each of these scenarios, we analyze the

potential effects assuming that subsidy savings are used (a) only for budget consolidation, (b) for budget consolidation and direct transfers to households, and (c) for budget consolidation and direct transfers plus productivity-enhancing investments. Results of these six scenarios are reported as relative changes to the baseline scenario. In scenarios 1C and 2C, we assume investment-growth elasticity of 0.5; that is, a 1 percent increase in investment leads to 0.5 percent growth in these sectors. Table 6 summarizes the assumptions of the scenarios.

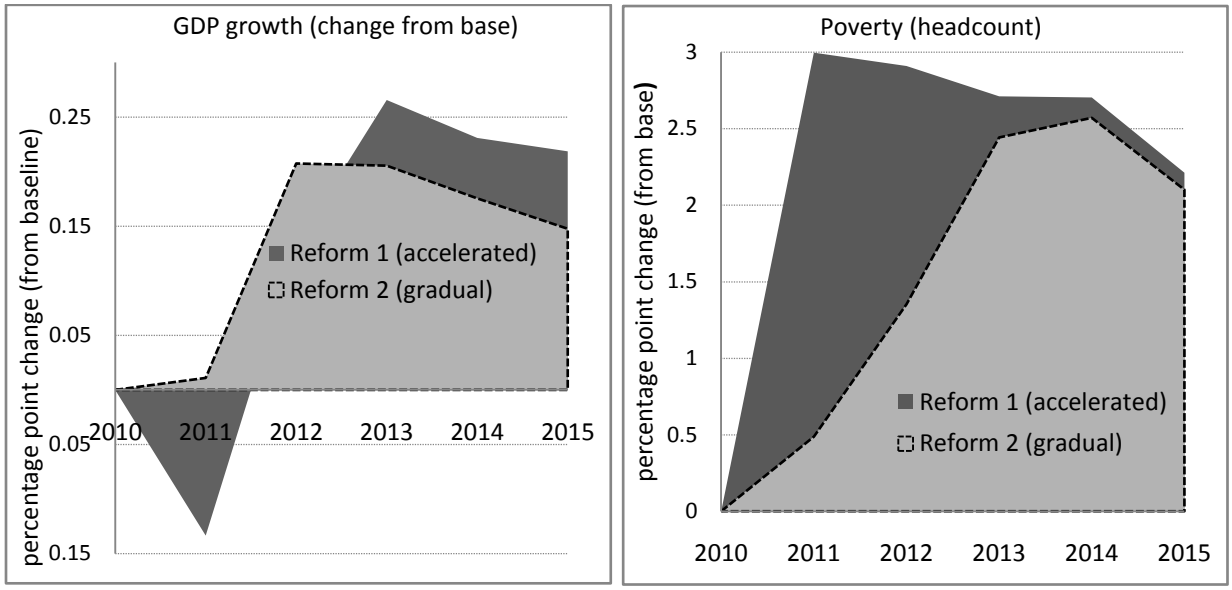
4. Impact of Petroleum Subsidy Reform Options

Accelerated versus Gradual Reform

The first set of simulations (1A and 2A) look at a situation where the government reduces petroleum subsidies without taking further action. Lower petroleum subsidies have essentially two effects. At the sector level, higher prices for petrol and diesel increase intermediate input cost and reduce sectoral profitability and production, particularly in energy-intensive sectors. At the macro level, they lead to a redistribution of income from the private sector to the government, thereby reducing the government's deficit, crowding-in public investment, and increasing the economy's overall capital stock. Thus, this scenario can also be broadly interpreted as a budget-consolidation scenario.[12] While the cost-push effects are felt immediately, the capacity effect sets in with a one period time lag. In a first-round effect, energy price increases lead to rising domestic prices, lowering real household incomes and appreciating the real exchange rate (assuming constant world market prices). Results from the DCGE model show that overall growth drops in the initial year of reform under scenario 1A and is close to zero under 1B but recovers quickly in subsequent years (Figure 1).

[12] It is important to note that if the savings would be used for deficit reduction and budget consolidation, positive medium- to long-term effects can be expected, such as higher credit ratings and lower interest rates (see also section with model description). However, capturing these effects is beyond the scope of this paper.

Figure 1. Growth and Poverty Reduction Effects of Accelerated versus Gradual Reform



Source: DCGE model results. Note: GDP is at market prices, including indirect taxes

Timing and Design of the Reform Matter

Rapid phasing out leads to an initial drop in growth and a sharper spike in poverty, while gradual reductions smoothen the growth and poverty effects. Slow phasing out is therefore preferable from a growth and poverty-reduction perspective; growth shocks, especially in the agricultural sector, are less pronounced, and total household income losses are about 20 percent lower. However, slow reform comes at a higher fiscal cost because subsidies effectively need to be financed for two more years compared with the accelerated one-year phase-out, amounting to additional costs of 391 billion YER (Table 5). Thus, the faster the phasing out of subsidies, the more fiscal space exists for the government to compensate households and to invest.

While the direction of growth and poverty impact is the same, the size of the impact by sector differs depending on their production structure. The agricultural sector would be the hardest hit under both the accelerated and the gradual reforms, mainly due to its strong dependence on diesel for irrigation (Table 7). Even before subsidy reduction, fuel is the most expensive item in crop production, as nearly one-third of crop production expenditure is used for fuel purchase. The output especially of water-intensive crops like qat, fruits, and vegetables drops and hurts household incomes from agriculture and agricultural exports.[13] Given its high profitability, Qat is less affected despite its intensive use of diesel

[13] More than 75 percent of irrigated land uses groundwater for irrigation, contributing to rapidly falling water tables. Most of the land under irrigation is planted with qat, followed by cereals and vegetables. The subsidization of irrigation pumps and the subsidies of diesel have led to a serious overuse of groundwater, resulting in rapidly falling water tables. In addition, cheap fuel has also encouraged traders to extract water and transport it to distant

for groundwater extraction. Compared with the baseline, agricultural growth declines by 4.1 percentage points in 2011 in the accelerated scenario and slows between 1.1 and 1.4 percent annually during the gradual reform scenario. However, in both cases, agricultural growth resumes due to substitution and adjustment effects. The withdrawal of petroleum subsidies also affects the industrial sector relative to the baseline during the early years of reform. But as in the case of agriculture, growth is estimated to quickly recover and accelerate, initially because of the adjustment process and subsequently because of higher productivity and related new investment opportunities arising after reform, which improve competitiveness. Mainly due to the low substitutability and the domestic orientation of most services, the service sector is the least affected sector and continues to grow modestly during reform.[14]

Table 7. Economic Growth and Poverty Impact of the Subsidy Reform

	2009	2010	2011	2012	2013	2014	2015
Baseline		*Annual change*					
GDP (billion YER)	5.090	4.52	4.30	4.27	4.24	4.20	4.18
Poverty	42.8	3.07	3.26	3.22	3.39	3.31	3.22
Reform 1 (accelerated)		*Annual change from base*					
1A							
GDP (share)	100	0.00	–0.13	0.13	0.27	0.23	0.22
Agriculture	8.3	0.00	–4.05	0.21	0.19	0.14	0.09
Industry	38.3	0.00	–1.15	–0.22	0.21	0.17	0.17
Services	53.4	0.00	0.79	0.29	0.40	0.35	0.33
Poverty	42.8	0.00	3.00	2.91	2.71	2.70	2.21
Rural	47.6	0.00	2.91	2.75	2.53	2.61	1.99
Nonfarm	50.4	0.00	2.08	2.32	2.06	2.28	1.41
Farm	42.0	0.00	4.58	3.62	3.48	3.29	3.18
Urban	29.9	0.00	3.23	3.34	3.19	2.94	2.79
Compensation required for poorest one-third of population under 1A							
Per household (YER)	0	0	18,997	20,405	20,200	19,764	18,886
Total (billion YER)	0	1	17	18	18	18	17
1B		*Annual change from base*					
GDP (share)	100.0	0.00	–0.12	0.11	0.24	0.21	0.20
Agriculture	8.3	0.00	–3.56	0.18	0.17	0.11	0.07
Industry	38.3	0.00	–1.20	–0.26	0.17	0.15	0.14
Services	53.4	0.00	0.75	0.26	0.37	0.32	0.31
Poverty	42.8	0.00	1.82	1.66	1.72	1.25	1.15
Rural	47.6	0.00	1.29	0.98	1.17	0.60	0.54
Nonfarm	50.4	0.00	0.34	0.43	0.68	0.15	0.01
Farm	42.0	0.00	3.23	2.10	2.15	1.51	1.62
Urban	29.9	0.00	3.22	3.44	3.18	2.96	2.75
1C		*Annual change from base*					
GDP (share)	100.0	0.00	–0.04	1.15	0.89	0.91	0.88
Agriculture	8.3	0.00	0.26	0.15	–0.16	–0.17	–0.19
Industry	38.3	0.00	2.18	1.88	1.44	1.46	1.39

regions, often to irrigate qat plantations. Water transported by truck is used on 2.3 percent of the total irrigated land, and this share has most likely increased since the time of the census from which these data stem.

[14] Table A.5 in the Appendix gives an overview of the effects of both reform options on the main macroeconomic accounts under each investment option.

Services	53.4	0.00	–0.78	1.46	1.11	1.09	1.01
Poverty	42.8	0.00	–0.03	–1.34	–3.10	–4.72	–6.03
Rural	47.6	0.00	–0.02	–1.65	–3.53	–5.27	–6.76
Nonfarm	50.4	0.00	–0.06	–0.53	–1.98	–3.26	–4.10
Farm	42.0	0.00	–0.24	–2.07	–3.94	–5.60	–7.47
Urban	29.9	0.00	0.44	–0.79	–2.68	–4.58	–5.30

Source: DCGE model results.

Table 7, continued

Reform 2 (gradual)		*Annual change from base*					
2A	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
GDP (share)	100.0	0.00	0.01	0.21	0.21	0.18	0.15
Agriculture	8.3	0.00	–1.07	–1.18	–1.35	0.16	0.12
Industry	38.3	0.00	–0.28	–0.37	–0.46	0.02	0.18
Services	53.4	0.00	0.23	0.31	0.42	0.31	0.35
Poverty	42.8	0.00	0.49	1.35	2.44	2.57	2.10
Rural	47.6	0.00	0.40	1.26	2.24	2.49	1.88
Nonfarm	50.4	0.00	0.73	1.60	2.98	2.78	2.68
Farm	42.0	0.00	0.28	0.94	1.84	2.18	1.39
Urban	29.9	0.00	0.63	1.91	3.05	3.13	2.89
Compensation required for poorest one-third of population under2A							
Per household (YER)	0.0	0.00	3,083	8,687	19,142	19,249	18,601
Total (billion YER)	0.0	0.00	3	8	17	17	17
2B		*Annual change from base*					
GDP (share)	100.0	0.0	0.0	0.0	0.0	0.2	0.2
Agriculture	8.3	0.0	–0.9	–1.0	–1.1	0.1	0.1
Industry	38.3	0.0	–0.3	–0.4	–0.5	0.0	0.1
Services	53.4	0.0	0.2	0.3	0.4	0.3	0.3
Poverty	42.8	0.00	0.22	0.26	0.98	0.76	0.74
Rural	47.6	0.00	0.09	–0.18	0.29	0.00	0.06
Nonfarm	50.4	0.00	0.58	1.42	2.79	2.74	2.55
Farm	42.0	0.00	0.00	–0.54	0.27	–0.08	–0.16
Urban	29.9	0.00	0.27	0.53	0.34	0.18	0.50
2C		*Annual change from base*					
GDP (share)	100.0	0.0	0.0	0.3	0.4	0.7	0.7
Agriculture	8.3	0.0	0.1	0.0	–0.2	–0.2	–0.2
Industry	38.3	0.0	0.6	0.9	0.9	1.1	1.2
Services	53.4	0.0	–0.2	0.2	0.5	0.9	0.9
Poverty	42.8	0.00	–0.33	–0.96	–1.49	–2.82	–4.28
Rural	47.6	0.00	–0.36	–1.24	–2.00	–3.36	–5.00
Nonfarm	50.4	0.00	–0.26	–0.22	–0.14	–1.40	–2.40
Farm	42.0	0.00	–0.35	–1.58	–2.42	–3.79	–5.64
Urban	29.9	0.00	–0.37	–0.55	–1.15	–2.49	–3.70

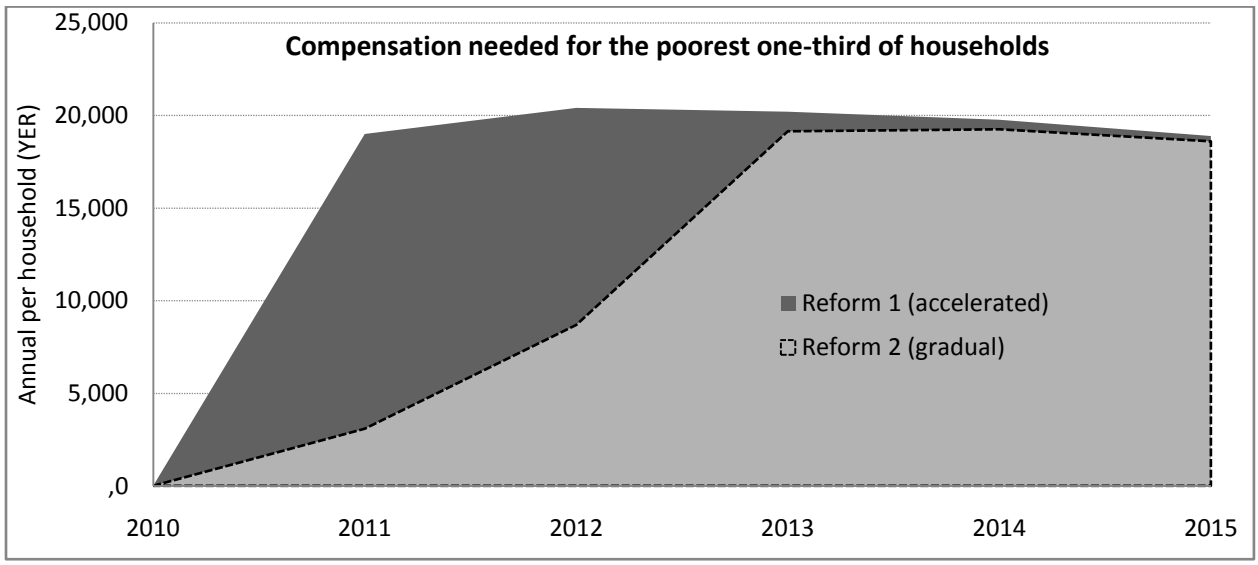
Source: DCGE model results.

Both reform scenarios raise poverty levels up to 3.0 (accelerated) and 2.6 (gradual) percentage points above baseline values during the reform process. Under both scenarios, poverty starts declining after reform, but it is important to note that it may take some years after reform for households to recover, if no additional measures are taken. As an aggregate group, urban households are more affected than rural households, with poverty increases of between 3.3 and 3.1 percentage points, compared with 2.9 and 2.6 percentage points for rural households. However, as a subgroup of rural households, farm households are the most affected, especially those that rely on irrigation-intensive agriculture for their

incomes. However, it is important to keep in mind that rural nonfarm households, which are less affected, are higher in number and have higher initial poverty levels (Appendix, Table A.1).

Given this increase in poverty across all population groups and considering the experience from other countries, the question arises as to how much compensation would be needed for the poorest of the poor. Model results show that this compensation in Reform 1 and Reform 2 will require direct transfer payments of about 19,700 YER and 13,800 YER, respectively, per household and per year for the poorest 30 percent on average (Figure 2 and Table 7). The total annual cost of compensating this group during the period of 2010 to 2015 is estimated at about 17.6 billion YER under the accelerated reform and 12.3 billion YER with under the gradual reform (Table 7). In the accelerated reform, losses in real incomes peak in the second year and steadily decline over time; while in the gradual scenario, real incomes decline in the fourth year before picking up from the fifth year on. However, even several years after reform, real incomes are likely to remain below their baseline levels, indicating that direct transfers are not generating sufficient growth for sustainable fiscal and economic development.

Figure 2. Compensation Required under Accelerated and Gradual Scenario



Source: DCGE model results.

Using the Savings for Budget Consolidation, Direct Transfers, and Investment

Fuel subsidy reform provides the Yemeni government with the financial resources to reduce the budget deficit; to provide transfers; and to invest in generating new growth, employment, and income opportunities. To illustrate this point and to assess the impacts of such measures, the reform scenarios 1B–2B and 1C–2C investigate the trade-offs and synergies between “transfers” and “investments”. Given the urgent need for fiscal deficit reduction, we consider parts of the savings from reform to be used for deficit reduction consistent with Table 5 in both sets of simulations.

Results from 1B and 2B show that using all savings for direct transfers strongly smoothens the negative impacts on households, yet growth impulses for sustainable development are likely to be limited. In addition, the impact of transfers obviously strongly depends on the targeting and the efficiency of service delivery. In our example of this paper we assume a distribution of transfers according to initial poverty status and population size, ergo the biggest beneficiaries will be the rural households. While direct transfers to the poorest cushion some of the negative short-term growth effects due to higher fuel prices, growth acceleration remains limited. Income multiplier effects are low, import intensity of major consumer goods including food is high, and the positive effect on private consumption cannot compensate for the loss in other GDP components, namely exports.

Direct transfers will not be sufficient to alleviate the negative effects of reform in fuel subsidies. While they can mitigate the short-term negative effect on the poorest of the poor, they may not be fiscally sustainable, and their impact on growth is limited. Therefore, additional measures are needed. Productivity-enhancing investments make an important contribution to development and provide the foundation for poverty reduction and growth. Scenarios 1C and 2C reflect the case in which the remaining savings of the fuel subsidy are used to improve infrastructure such as transport and communication. The remainder of the savings, 127 billion YER in scenario 1C and 153 billion YER in 2C, is invested in the electricity, water, transport, trade, and construction sectors. Improved infrastructure lowers transaction costs; offers the opportunity to integrate economic spaces in Yemen; and creates the platform for a restructuring of productive, industrial, and service value chains, which could be exploited by enabling domestic and foreign private investment. Based on the experience of many other countries, it is assumed that after an initial time lag of two to three years this public investment triggers additional growth in all sectors by creating higher economy-wide efficiencies.

Results show that this type of growth has strong poverty-reducing effects and, in addition to its long-term development effect, can more than mitigate the negative short-term effects of subsidy reform. Growth acceleration and the related increase in returns to factors, especially labor, are the main drivers of poverty reduction. During the initial years, investment-related income, for example, from construction jobs, creates additional income for the poor. Then, when investment-induced direct effects phase out and other sectors start benefiting from new infrastructures, growth accelerates economy-wide and boosts the incomes of all households, including the poorest. Overall poverty reduction is higher under the accelerated reform scenario and poverty declines sharply by the end of the six-year period considered here, by 6 (accelerated) and 4 (gradual) percentage points. This can be explained by the fact that under accelerated reform, more resources become earlier available for investment, which then translates earlier into economy-wide growth effects. However, in both cases, investment-induced growth benefits rural and urban households if investments are also spread to rural areas.

The combination of direct transfers *and* investment is therefore a promising strategy for combining subsidy reform with the promotion of sustainable development. Transfers, investments, and resulting long-term productivity effects complement each other and lead to a significant reduction in poverty.

5. Conclusion

There is an urgent need for reforming petroleum subsidies in Yemen. However, lessons from other countries suggest that while efficiency gains are likely to lead to growth acceleration in the medium-term, poverty often increases under reform. To help guiding the reform process in Yemen, this paper has provided an analysis of economic linkages between the existing subsidy and the government budget balance, production, and consumers. It has also assessed the impact of alternative reform scenarios on economic sectors and poverty.

Yemen is among the countries with the lowest fuel-pump prices in the world. The petroleum subsidy makes up 85 percent of all public spending related to economic affairs and is more than the total spending on health, education, and social protection combined. Especially social transfers and investments in infrastructure, key ingredients for growth and poverty-reduction strategies, remain at extremely low levels. Consistent with results found in other countries, we find that the direct impact of petroleum subsidy reform on households' real income is likely to be modest given the low share of fuel in private expenditure. We therefore use an economy-wide DCGE model to also capture the indirect effects of reform.

Results of the model show that poverty will increase for both, rural and urban households, if no additional measures are taken. Considering an accelerated scenario (reform during one year, Reform 1) versus a gradual scenario (reform during three years, Reform 2) shows that the timing and design of the reform do matter: Rapid phasing out leads to an initial drop in growth and a sharper spike in poverty, while gradual reductions smoothen the growth and poverty effects. Slow phasing out is therefore preferable from a growth and poverty-reduction perspective. However, slow reform comes at a higher fiscal expense; thus, the faster the phasing out of subsidies, the more fiscal space exists for the government to compensate households and to invest.

Compensating the poorest of the poor for their losses during reform will be important for success, yet it may not be sufficient. Model results show that this compensation under Reform 1 and Reform 2 will require direct transfer payments of between 19,700 YER and 13,800 YER, respectively, per year and household for the poorest 30 percent of the households on average. In general, using all savings for direct transfers strongly smoothens the negative impacts on households, yet growth impulses for sustainable development are limited. In addition, the impact of transfers strongly depends on the targeting and the efficiency of service delivery.

Therefore, a combination of fiscal deficit reduction, social transfers and investments is the most promising reform strategy. For the short term, social transfers will compensate the poorest from a negative income effect stemming from the reform as well as enhanced income opportunities in construction related to the public investment derived from the subsidy savings. Investments in utilities, transport, trade and construction sectors will lower transaction costs, offer the opportunity to integrate economic spaces in Yemen. Thus, for the medium term, fuel subsidy reform offers to create the platform for a restructuring of productive, industrial and service value chains, which could be exploited by enabling domestic and foreign private investment. The combined short and medium term effects do not only avoid an increase in poverty but also lead to broadened options for pro-poor growth in Yemen.

The Government of Yemen has made a first step to reform the fuel subsidy by increasing fuel prices in 2010. This paper has shown that continuing this reform process offers a great opportunity for development if the transition to higher fuel prices is designed properly and the overall petroleum subsidy reform is integrated in Yemen's overall development strategy.

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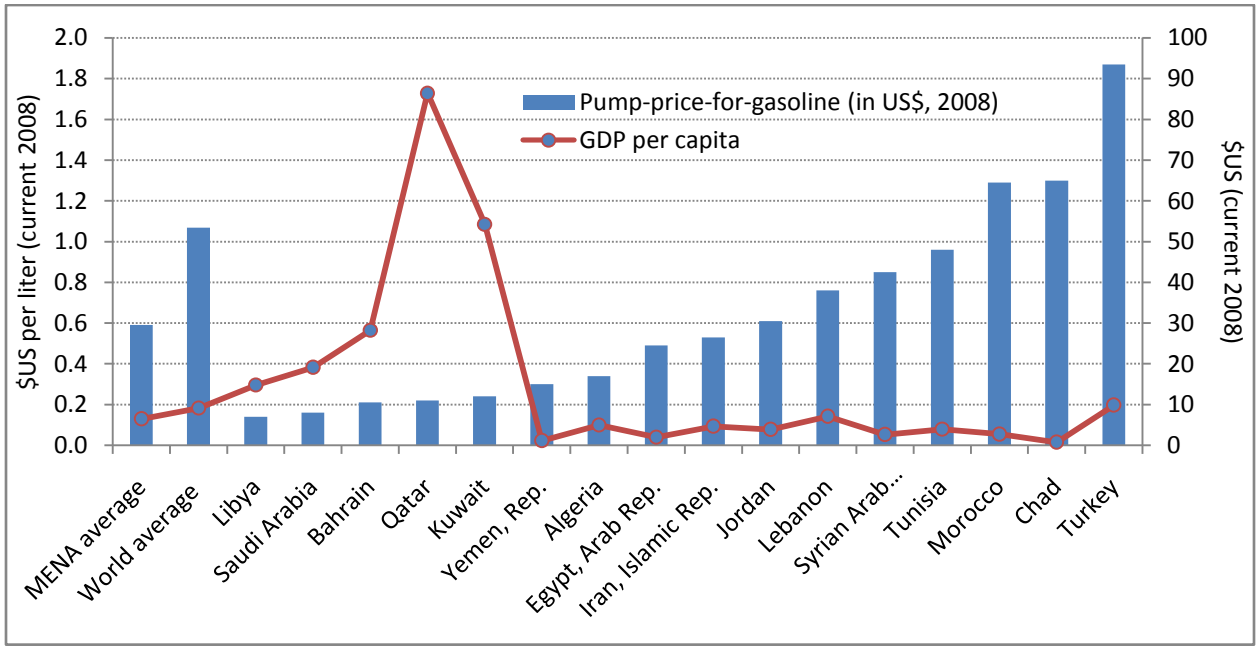
Appendix

Figure A.1. Fuel prices in the Middle East and North Africa region



Source: Based on GTZ (2010).

Table A.1. Summary of key household characteristics, 2009

	Population (in thousands)	Household size (average)	Per capita expenditure (in YER/year)	Public transfer (percent of income)	Poverty (headcount, percent)	Food insecurity (extreme poverty)
Total	23,307	7.8	145,593	4.0	42.8	32.1
Rural	17,086	8.0	122,201	3.3	47.6	37.3
Farm	5,481	8.3	125,791	4.2	50.4	33.4
Nonfarm	11,605	7.9	114,600	2.9	42.0	39.2
Urban	6,221	7.2	209,839	5.0	29.9	17.8
Extreme poor	7,480	8.1	63,979	4.4		

Source: Based on HBS (2005/2006); poverty and food security estimates are taken from Breisinger et al. (2010) and Ecker et al. (2010), respectively.

Table A.2.: Core model equations

Production function	$Q_{ct} = \alpha_{ct} \cdot \prod_f F_{fct}^{\delta fc}$		(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	$Y_{ht} = \sum_{fc} \theta_{hf} \cdot W_{ft} \cdot F_{fct} + r_h \cdot E_t$		(5)
Consumption demand	$P_{ct} \cdot D_{hct} = \beta_{hc} \cdot (1 - v_h) \cdot Y_{ht}$		(6)
Investment demand	$P_{ct} \cdot I_{ct} = \rho_c \cdot \left(\sum_h \nu_h \cdot Y_{ht} + E_t b\right)$		(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	$s_{ft} = s_{t-1} \cdot (1 + \varphi_f)$	*f* is land and labour	(11)
Capital accumulation	$s_{ft} = s_{t-1} \cdot (1 - \eta) + \sum_c \frac{P_{ct-1} \cdot I_{ct-1}}{k}$	*f* is capital	(12)
Technical change	$\alpha_{ct} = \alpha_{ct-1} \cdot (1 + y_c)$		(13)

Notes:

Subscripts

- *c* Commodities or economic sectors
- *f* Factor groups (land, labor and capital)
- *h* Household groups
- *t* Time periods

Endogenous variables

- *D* Household consumption demand quantity
- *E* Exchange (local/foreign currency units)
- *F* Factor demand quantity
- *I* Investment demand quantity
- *M* Import supply quantity
- *P* Commodity price
- *Q* Output quantity
- *W* Average factor return
- *X* Export demand quantity
- *Y* 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 labour supply growth rate

Table A.3. 2009 Yemen SAM disaggregation

Activities/Commodities		Factors of production
Agriculture	***Industry (cont.)***	***Labor***
Sorghum	Other processing	Private sector, unskilled
Maize	Fish processing	Private sector, semiskilled
Millet	Textiles and clothing	Private sector, skilled
Wheat	Leather and shoes	Public sector, unskilled
Barley	Wood	Public sector, semiskilled
Other grains	Paper	Public sector, skilled
Bananas	Printing	***Capital***
Grapes	Oil refining	Capital
Mangoes	Chemicals	Oil capital
Citrus fruits	Fertilizer and pesticides	Gas capital
Other fruits	Nonmetals	***Land***
Potatoes	Metals	**Households**
Onions	Machinery	***Rural***
Tomatoes	Other manufacturing	Farm, food secure
Other vegetables	Electricity	Farm, food insecure
Pulses	Water	Nonfarm, food secure
Coffee	Construction	Nonfarm, food insecure
Sesame	***Services***	***Urban***
Cotton	Trade	Urban, food secure
Qat	Hotels and restaurants	Urban, food insecure
Tobacco	Transport & communication	**Other accounts**
Camel	Business services	Enterprise
Cattle	Health	Government
Chicken	Education	Direct taxes
Goats & sheep	Public services	Sales taxes
Fishery	Other services	Import tariffs
Forestry		Savings & investment
Industry		Rest of world
Oil		
Gas		
Other mining		
Beverages		
Bread		
Other cereal-based food		
Dairy products		
Vegetable oil		
Sugar, processed		
Camel meat		
Beef		
Poultry		
Goat and sheep meat		

Table A.4. Elasticities applied in the model

	Rural	Urban
Cereals	0.31	0.28
Bananas	0.99	0.50
Grapes	0.89	0.79
Mangoes	0.80	0.75
Other fruits	1.58	1.39
Potatoes	0.40	0.40
Vegetables	0.62	0.57
Coffee	1.11	0.81
Sesame	0.62	0.57
Qat	1.25	0.93
Tobacco	1.11	0.81
Meat	1.02	0.49
Wood	0.38	0.28
Fuel	1.95	1.79
Bread	0.19	0.12
Dairy products	0.38	0.36
Textiles	1.31	1.14
Other manufacturing	2.89	1.22
Chemicals	0.83	0.74
Water	0.98	0.43
Electricity	1.03	0.65
Private services	2.18	1.55
Public services	3.22	1.22

Source: Authors' estimates using HBS (2005/2006).

Table A.5. Macro overview table

			Reform 1 (accelerated)			Reform 2 (gradual)		
	Initial (share)	Baseline	1A	1B	1C	2A	2B	2C
Consumption	84.0	168.1	163.2	163.6	203.3	163.5	164.2	191.0
Private	66.4	129.7	124.7	125.2	164.9	125.1	125.7	152.6
Public	17.6	38.4	38.4	38.4	38.4	38.4	38.4	38.4
Investment	28.6	141.5	186.4	184.2	284.9	182.8	180.0	247.5
Exports	29.5	107.4	80.5	80.3	113.8	81.3	81.1	103.5
Imports	42.1	76.2	57.5	57.4	81.4	58.0	57.9	74.0
Real exchange rate	100	7.3	1.9	2.1	7.6	2.4	2.6	7.1

Source: CGE model results.