

Jha, Shikha; Quising, Pilipinas; Camingue, Shiela

Working Paper

Macroeconomic Uncertainties, Oil Subsidies, and Fiscal Sustainability in Asia

ADB Economics Working Paper Series, No. 150

Provided in Cooperation with:

Asian Development Bank (ADB), Manila

Suggested Citation: Jha, Shikha; Quising, Pilipinas; Camingue, Shiela (2009) : Macroeconomic Uncertainties, Oil Subsidies, and Fiscal Sustainability in Asia, ADB Economics Working Paper Series, No. 150, Asian Development Bank (ADB), Manila, <https://hdl.handle.net/11540/1799>

This Version is available at:

<https://hdl.handle.net/10419/109343>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



<http://creativecommons.org/licenses/by/3.0/igo>

ADB Economics Working Paper Series



Macroeconomic Uncertainties, Oil Subsidies, and Fiscal Sustainability in Asia

Shikha Jha, Pilipinas Quising, and Shiela Camingue
No. 150 | March 2009



ADB Economics Working Paper Series No. 150

Macroeconomic Uncertainties, Oil Subsidies, and Fiscal Sustainability in Asia

Shikha Jha, Pilipinas Quising, and Shiela Camingue

March 2009

Shikha Jha is Senior Economist, and Pilipinas Quising and Shiela Camingue are Economics Officers in the Macroeconomics and Finance Research Division, Economics and Research Department, Asian Development Bank. The authors are grateful to Akiko Terada Hagiwara, Donghyun Park and P. V. Srinivasan for helpful comments. The inputs from ADB country economists and Resident Missions on local oil prices are gratefully acknowledged. However, the authors are solely responsible for any remaining errors.

Asian Development Bank

Asian Development Bank
6 ADB Avenue, Mandaluyong City
1550 Metro Manila, Philippines
www.adb.org/economics

©2008 by Asian Development Bank
March 2009
ISSN 1655-5252
Publication Stock No.:

The views expressed in this paper
are those of the author(s) and do not
necessarily reflect the views or policies
of the Asian Development Bank.

The ADB Economics Working Paper Series is a forum for stimulating discussion and eliciting feedback on ongoing and recently completed research and policy studies undertaken by the Asian Development Bank (ADB) staff, consultants, or resource persons. The series deals with key economic and development problems, particularly those facing the Asia and Pacific region; as well as conceptual, analytical, or methodological issues relating to project/program economic analysis, and statistical data and measurement. The series aims to enhance the knowledge on Asia's development and policy challenges; strengthen analytical rigor and quality of ADB's country partnership strategies, and its subregional and country operations; and improve the quality and availability of statistical data and development indicators for monitoring development effectiveness.

The ADB Economics Working Paper Series is a quick-disseminating, informal publication whose titles could subsequently be revised for publication as articles in professional journals or chapters in books. The series is maintained by the Economics and Research Department.

Contents

Abstract	v
I. Introduction	1
II. Fuel Pricing Mechanisms, World Price Transmission, and Subsidies	4
III. Analytical Framework for Debt Dynamics	14
A. Intertemporal Budget Constraint and Fiscal Solvency	14
B. Deficit Reduction to Sustain Steady-state Debt	16
IV. Dynamic Simulation Analysis of Fiscal Sustainability	17
A. Baseline Scenario	17
B. Debt Stress Tests	18
C. Alternative Scenarios: Deficit Reduction to Sustain Debt at the Steady-state Level	22
V. Summary and Conclusions	26
Selected References	29

Abstract

Global oil prices have subsided relative to the peak reached in mid-2008, but compared to historical levels they remain elevated and volatile as economic uncertainties continue to unfold. The likelihood of these prices rising again soon cannot be ruled out. High oil prices can adversely affect growth, employment, external accounts, and fiscal positions of governments. An overwhelming response across Asia as international oil prices spiked in 2008 was to shield domestic consumers more than before through oil subsidies, which are inequitable, economically inefficient, and environmentally unfriendly. These subsidies add directly to the fiscal deficit and public debt, but are generally hidden, making their measurement difficult. Additionally, in combination with lower growth rates, higher spending to rev up demand across Asia is also worsening the fiscal positions of governments.

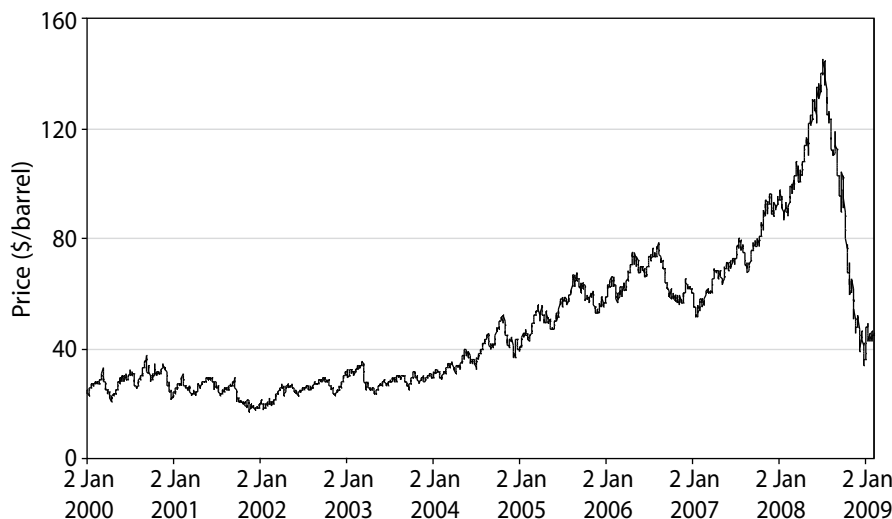
This paper computes the transmission of recent global oil price movements to domestic markets and estimates oil price subsidies in a diverse group of 32 Asian economies. Using data for 18 regional countries and applying a forward-looking methodology for debt dynamics, the paper then examines the potential impact of responses to macroeconomic shocks and a possible rise in oil prices on public debt and estimates the fiscal correction needed to sustain debt at a steady-state level. Based on the findings from the empirical analysis, the paper extracts some guiding principles for fiscal policy responses to the economic shocks depending on country-specific circumstances.

I. Introduction

Global oil prices have subsided relative to the peak reached in mid-2008, but they remain elevated and volatile as economic uncertainties continue to unfold.

By February 2009, Brent crude oil prices were on the rise again after touching bottom in December 2008, a level already much higher than the levels observed in the first half of this decade (Figure 1). Despite softening in the growth of demand, a sharp production cut by Organization of the Petroleum Exporting Countries in December 2008 and stalled investment in new oil production and processing facilities in response to recent price declines are likely to keep supply conditions tight. According to the International Energy Agency, output from the world's existing oil fields is expected to decline at the rate of 6.7% and conventional crude output to peak by 2020 (*The Guardian* 2008). The uncertain market conditions, speculative demand, and political risk factors could put pressures on oil prices to fluctuate widely. If growth rates in major industrial economies start to rebound in 2010, these prices may face an upward force.

Figure 1: Forward Dated Brent Crude



Source: Bloomberg, downloaded 4 February 2009.

High oil prices can adversely affect growth, employment, external accounts, and fiscal positions of governments. These prices have an asymmetric effect—increases in oil prices are far more important for gross domestic product (GDP) growth than oil price decreases (Hamilton 2003). Moreover, oil price shocks are strongly correlated with aggregate output, wages, and employment (Keane and Prasad 1996, Davis and Haltiwanger 2001). These shocks are also a key source of fluctuations in international terms of trade (Backus and Crucini 2000). Larger current account deficits of many oil-importing countries due to higher commodity prices and declining share of international reserves in imports of oil-exporting developing countries have increased the vulnerability of developing countries compared to the recent past (World Bank 2009). The balance of payments impact during January 2007 to July 2008 from higher fuel prices was four times as much as from food prices, reflecting the higher share of fuel in total imports (IMF 2008a). Rising global oil prices directly impact the budgets of the governments that try to shield domestic prices. Moreover, cyclical downturn and increased spending to alleviate the burden of higher commodity prices worsen their fiscal positions further.

Faced with an unprecedented rise in world oil prices, several governments enhanced oil subsidies. As the price crossed \$100 per barrel, fuel subsidies were increased (Baig et al. 2007). This initial response was based on the assumption that the price rise was a temporary phenomenon. But as continued increase in the price of crude oil in 2008 made subsidies unaffordable, governments could no longer sustain nor risk the shock of eliminating them. The mounting fiscal pressure pushed several governments to limit the impact on their budgets by raising consumer prices (ADB 2008, World Bank 2008, IMF 2008b). The fiscal cost of fuel tax decreases and higher fuel subsidies accounted for an average 63% of the total increase in fiscal cost since 2006 (IMF 2008a).

Fuel price subsidies are inequitable, have a pro-rich bias, and are economically inefficient and environmentally unfriendly. Higher-income households consume relatively more fuel than lower-income households and thus benefit more from fuel subsidies (Coady et al. 2006). Moreover, as these subsidies reduce fiscal resources available for social and infrastructure spending, they create a welfare loss. By distorting prices, oil subsidies distort the allocation of resources and encourage wasteful consumption and investment choices that do not reflect relative scarcities. Hence they do not allow consumption to adjust to actual underlying price pressures. If domestic prices are kept low through subsidies, it creates incentives for rent-seeking activities. Indonesia's cheap gasoline is reported to have been smuggled out to the Mekong delta region from Cambodia and Viet Nam to Malaysia and Thailand to be sold at higher prices. In India, subsidized kerosene is mixed with diesel then is priced higher. By encouraging demand, oil subsidies promote environmental pollution created by fuel consumption.

By not fully passing on the world oil price rise to domestic consumers, governments risk incurring large fiscal costs and public debt. Outlays to compensate oil producing or refining companies for selling below cost are typically not reported in the

budget, which makes it hard to measure these subsidies. The potential cost of unfunded public subsidies may undermine long-run fiscal sustainability, which underlies sound macroeconomic fundamentals. Extra-budgetary or off-balance sheet funds can encourage fiscal profligacy by taking expenditure decisions outside the budget process and crowding out private sector development. The consequent fiscal deficit adds to public debt and can impact on growth. Fiscal risks from off-budget items can create deviations between budget forecasts and outcomes.¹ With less transparent budgets, even fiscal rules may leave a margin for creative accounting that could hide the real extent of the fiscal burden (Milesi-Ferretti 2000)². The problem might manifest in a more serious manner in countries that do not follow fiscal rules. It has been argued that the 1997-1998 Asian financial crisis was linked to the lack of transparency concerning guaranteed debt and off-balance-sheet liabilities (Burnside and Rebello 2001, Tirole 2002). The issue has gained added importance in recent times as governments have struggled to insulate domestic prices from the unprecedented rise in global prices of fuel through budgetary and off-budget subsidies.

In combination with lower growth rates, higher spending to rev up domestic demand in the uncertain economic environment is also worsening the fiscal positions of governments across Asia. Macroeconomic shocks have necessitated fiscal stimulus plans in many countries of the region. The packages may contain elements that are not easy to reverse, making long-term dents on the fiscal cushion where available. Policy interventions to address the economic shocks have also included revisions in interest rates, which also influence government deficit.

This paper estimates oil price transmission and subsidies in Asia; examines the potential impact on debt arising from oil subsidies and policy responses to macroeconomic shocks; and calculates the fiscal correction needed to sustain debt. The paper is organized as follows. Section II discusses fuel price controls, the extent of price transmission to domestic markets, and subsidies in selected Asian economies. Section III presents an analytical framework for debt dynamics and links it to the fiscal correction needed for debt sustainability. The next section presents dynamic simulation analyses of fiscal deficit and debt under alternative scenarios of macroeconomic uncertainties and external shocks of global oil prices. This section also estimates the magnitude of fiscal correction needed to sustain debt. Section V concludes.

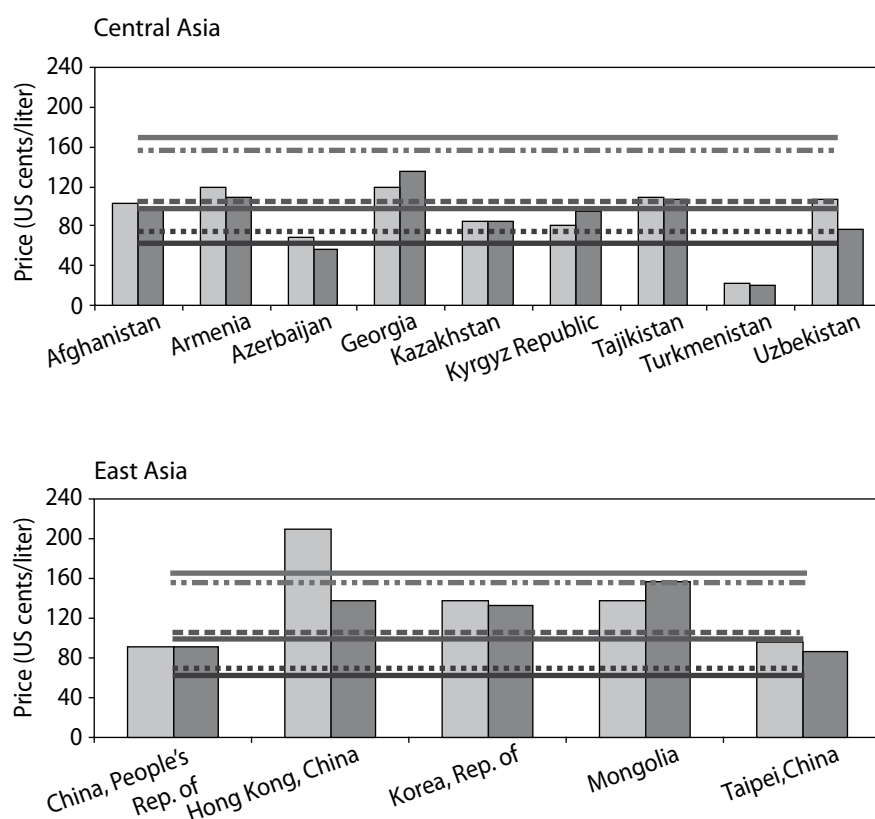
¹ Macroeconomic shocks such as international commodity price changes, exchange rate depreciation, and shortfalls in aid for highly aid-dependent countries may also have significant consequences for fiscal sustainability through supplementary government commitment and higher public debts.

² Fiscal rules are forms of legal restrictions on fiscal policy, which bind governments to specified deficit and debt targets; and induce them to promote fiscal transparency and institutionalize a medium-term perspective into the budgetary process. These rules may require balanced budgets, or may impose limits on borrowing by the government or the pace of growth of public expenditures. In some cases, public borrowing is restricted to the level of public investment (a “golden rule”) or a limit is imposed on the fiscal deficit.

II. Fuel Pricing Mechanisms, World Price Transmission, and Subsidies

Developing economies in the region follow a variety of oil pricing policies. While some countries have liberalized (where the private sector has the freedom to set prices) or automatic (formula-based) fuel pricing regimes, others impose price controls and administer, regulate, or adjust prices on an ad hoc basis. Yet others directly subsidize oil or use fuel tax as a source of revenue. Alternative measures used to increase fuel consumption subsidy include lowering the fixed price charged to consumers, lowering taxes, squeezing the margins of refining and marketing companies, and compensating oil producers for their losses. Figure 2 presents domestic oil prices in Asia by product. These prices vary widely within and across subregions, a feature shared by international markets, such as those at Luxembourg, Singapore, and the United States (US). The highest prices for gasoline and diesel are observed in East Asia followed by Southeast Asia and the Pacific. Central Asia has among the lowest prices for these products while South Asia shows a more mixed picture. Countries in Southeast Asia and the Pacific generally charge high prices for kerosene, whereas South Asia subsidizes it the most. The pattern is mixed in Central Asia.

Figure 2a: Retail Prices of Gasoline and Diesel in Asian Countries, October 2008



continued.

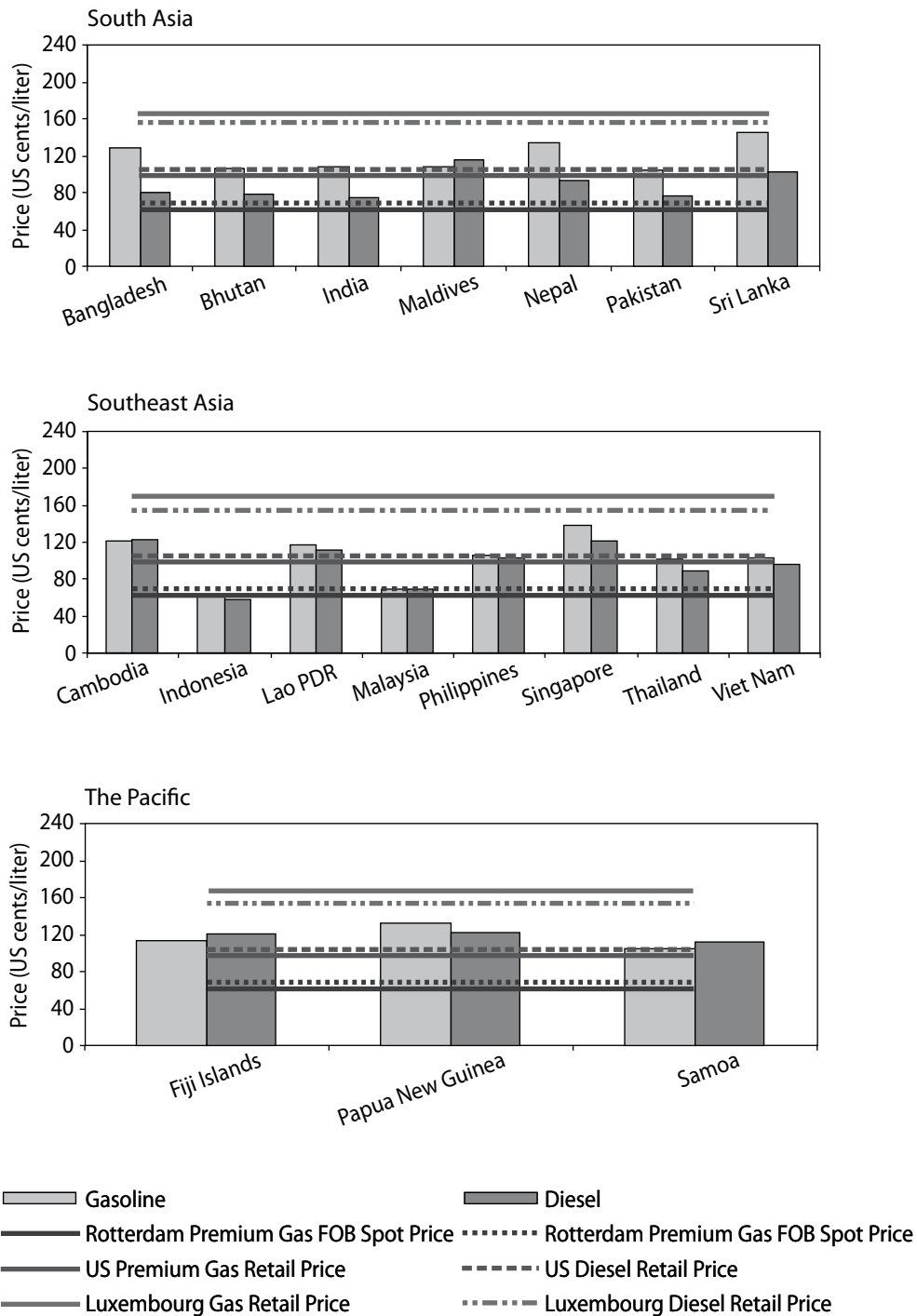
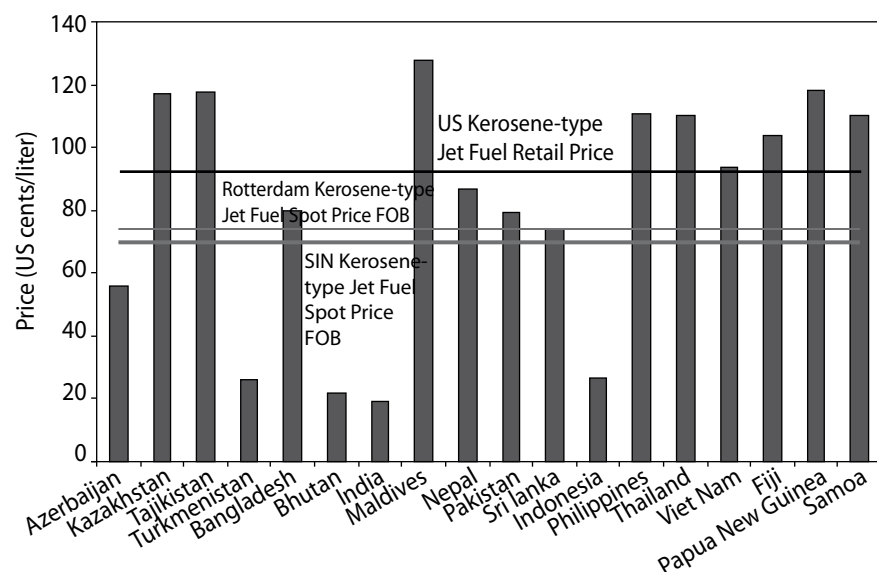
Figure2a: continued.

Figure 2b: Retail Prices of Kerosene in Asian Countries, October 2008



Note: The surveys cover only the capital city in each country.

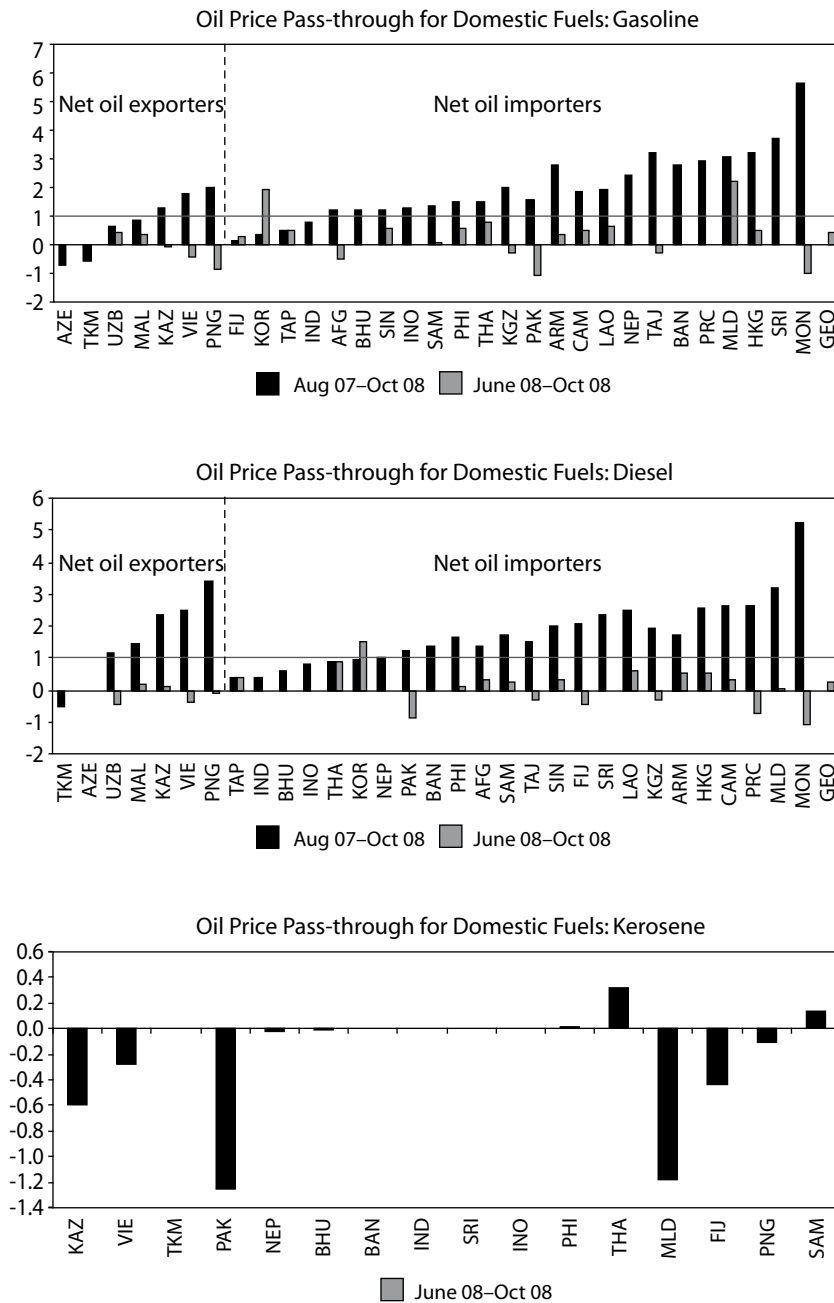
Sources: Authors' calculations based on data from Energy Information Association, available: www.eia.doe.gov, downloaded 27 November 2008; oil surveys of country capitals.

Different pricing regimes mean that not all governments transmit world prices to domestic markets to the same extent. To examine the degree of transmission, following IMF (2008b) we calculate the pass-through of world oil prices between two time points, t and $t+1$, as:

$$\frac{p_{t+1}^d - p_t^d}{p_{t+1}^w e_{t+1} - p_t^w e_t} \quad (1)$$

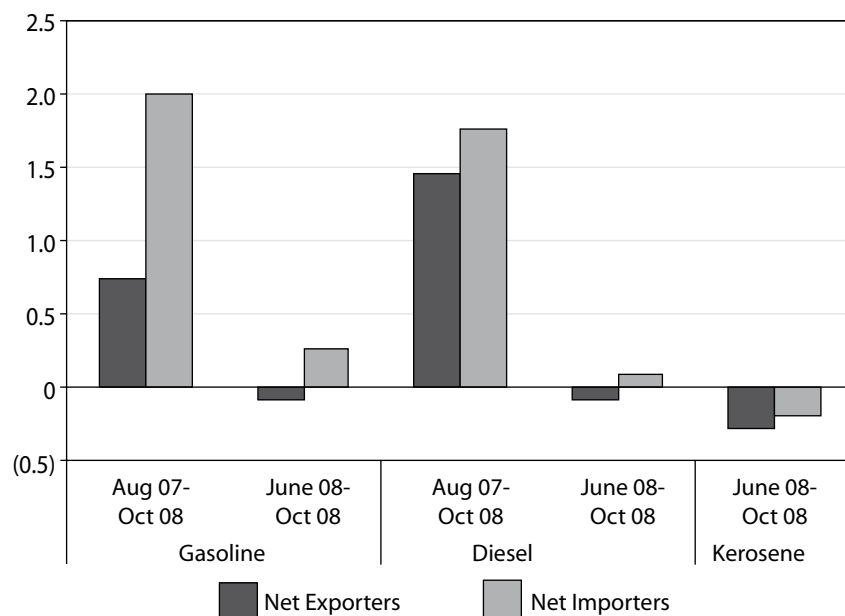
where p^d and p^w are the domestic fuel price in local currency and world price in US dollars, respectively, and e refers to the exchange rate. Defined in this fashion, the pass-through captures both world price and exchange rate movements.

An overwhelming response across Asia as international prices spiked was to shield domestic consumers more than before. This is clear for gasoline and diesel in Figure 3, which presents the pass-through by fuel type over August 2007 to October 2008 and over a more recent period between June to October 2008 when global prices peaked. For kerosene, which is largely consumed by lower-income classes, the recent period saw a general tendency toward a reduction in retail prices. Large and widely varied policy responses in Southeast Asia provide a clear contrast to subdued responses in South Asia and the Pacific islands. A distinct pattern is also observed between net importing and net exporting countries; with the latter keeping their markets more open (Figure 4).

Figure 3: Transmission of World Oil Prices to Domestic Markets

AFG = Afghanistan; ARM = Armenia; AZE = Azerbaijan; BAN = Bangladesh; BHU = Bhutan; CAM = Cambodia; FIJ = Fiji Islands; GEO = Georgia; HKG = Hong Kong, China; IND = India; INO = Indonesia; KAZ = Kazakhstan; KGZ = Kyrgyz Republic; KOR = Republic of Korea; LAO = Lao Peoples' Democratic Republic; MAL = Malaysia; MLD = Maldives; MON = Mongolia; NEP = Nepal; PAK = Pakistan; PHI = Philippines; PNG = Papua New Guinea; PRC = People's Republic of China; SAM = Samoa; SIN = Singapore; SRI = Sri Lanka; TAJ = Tajikistan; TAP = Taipei, China; THA = Thailand; TKM = Turkmenistan; UZB = Uzbekistan; VIE = Viet Nam.

Sources: Authors' calculations based on data from Energy Information Association, available: www.eia.doe.gov, downloaded 27 November 2008; oil surveys of country capitals.

Figure 4: Pass-Through by Country Type and Time Period

Sources: Authors' calculations based on data from Energy Information Association, available: www.eia.doe.gov, downloaded 27 November 2008; oil surveys of country desks.

Lower pass-through is associated with higher subsidies and vice-versa. Subsidies and taxes are implemented in a complex fashion, making them nontransparent.

In oil-exporting countries, domestic prices that are set below world prices represent an opportunity cost to their producers and an implicit subsidy to consumers, which is not reflected in the budget. Governments in importing countries that do not pass on the increase in world prices fully to consumers incur a direct fiscal cost, part of which may be included in the budget. But the rest may be off-budget and financed by cutting the refining and distribution margins of publicly owned refineries and oil marketing companies to keep domestic prices fixed when world prices rise.

Our survey of 32 countries in Asia shows that the recipients of subsidies range from oil consumers and producers to state institutions and public utility providers (Table 1). There is no definite pattern between smaller and larger economies or between net exporters and net importers. Taxes and subsidies vary by product. By and large, explicit subsidies are more prevalent in South and Southeast Asia and to a lesser extent in Central Asia. Countries that directly subsidize one or more of gasoline, diesel, and kerosene seem in general to run relatively higher fiscal deficits (e.g., Bangladesh; Lao People's Democratic Republic; Pakistan; Sri Lanka; and Viet Nam; see Table 2).³ Higher fiscal deficits in turn are associated with higher public debts, their correlation over 15 large countries in the region being 0.68 in 2007 (Figure 5). Ideally, the correlation should be "perfect" and equal 1.0. But empirical analysis of past increases in the stock of government debt

³ There are exceptions such as Azerbaijan (with fiscal deficit) and Turkmenistan and Mongolia (with fiscal surplus).

across about 50 countries shows that these increases cannot be fully explained by the governments' reported budget deficits, implying the presence of a "hidden" or off-budget deficit (Kharas and Mishra 2001). Countries with higher debts are the ones that can least afford to have larger deficits.

Table 1: Prevalence of Oil Taxes and Subsidies in Developing Asia

Region/ Economy	Q. Is there price subsidy on?			Q. Are there other direct or indirect subsidies?	Q. Recipients/sources of subsidy	Q. Are prices regulated?
Central Asia						
Armenia	No	No	No	No		No
Azerbaijan	No	Yes	Yes	Yes		Yes
Georgia	No	No	No	Yes		No
Kazakhstan	No	Yes	No	No		Yes
Kyrgyz Republic	No	No	No	Yes	Emergency stocks of fuels	No
Tajikistan	No	No	No	No		No
Turkmenistan	Yes	Yes		Yes	Subsidy to consumers, state institutions	Yes
Uzbekistan	No	No	No	No		Yes
East Asia						
China, People's Rep. of	No	No	No	Yes	Price controls, tax on refined oil consumption, subsidy to oil companies	Yes
Hong Kong, China	No	No				No
Korea Rep. of	No	No		Yes		
Mongolia	No	Yes	No	No		Yes
Taipei,China	Yes	Yes		Yes	Differential pricing for different economic classes	Yes
South Asia						
Afghanistan	No	No			Imports to supplement excess demand, consumer subsidy for fuel for power	No
Bangladesh	Yes	Yes	Yes	Yes	Vehicle owners and factories	Yes
Bhutan	No	No	Yes	No		Yes
India	No	No	Yes	Yes	Administered retail prices, subsidy to oil companies	Yes
Maldives	No	No	No	Yes		No
Nepal	No	No	No	Yes	No budgetary subsidy but financial support to the oil company	Yes
Pakistan	Yes	Yes	Yes	No	Subsidy to private/public transport, households	Yes
Sri Lanka	No	Yes	Yes	Yes	Subsidy to transport and households	Yes
Southeast Asia						
Cambodia	No	No	No	Yes		No
Indonesia	Yes	Yes	Yes	No	All consumers except industries	Yes
Lao PDR	Yes	Yes	No	Yes	The general public	Yes
Malaysia	Yes	Yes	No	Yes	Petrol rebate for vehicles, diesel subsidy for transport operators, fisheries	Yes
Philippines	No	No	No	Yes	Direct subsidy of 1-2 pesos per liter for diesel from oil companies	No
Singapore	No	No		Yes	No subsidies	No
Thailand	No	Yes	No	Yes	Subsidy for diesel and price caps	No
Viet Nam	Yes	Yes	Yes	Yes	State owned-companies	Yes
The Pacific						
Fiji Islands	No	No	No	Yes	Retail prices regulation, fuel grant to bus industry, concession to fishing industry	Yes
Papua New Guinea	No	No	No	No		Yes
Samoa	No	No	No	Yes	Subsidy to electricity authority equal to the value-added tax paid on its fuel	Yes

Sources: Based on compiled information from Energy Information Association, available: www.eia.doe.gov; country surveys; oil price surveys of country capitals; ADB 2008b; various news articles.

Table 2: Fiscal Indicators

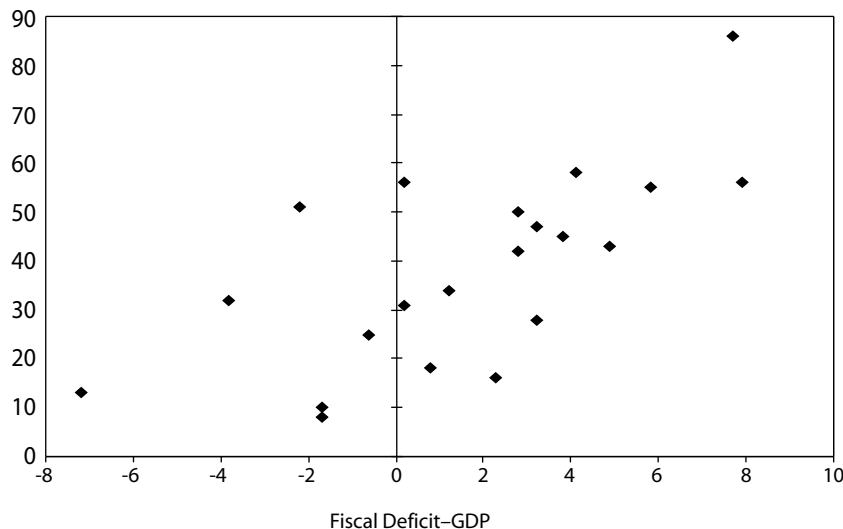
Region/Economy	Central Government Fiscal Balance (% of GDP)			Central Government Debt (% of GDP)		
	2005	2006	2007	2005	2006	2007
Central Asia						
Armenia	-1.9	-1.5	0.1			
Azerbaijan	-1.6	-3.4	-2.1			
Georgia	-1.5	-3.0	-3.1			
Kazakhstan	0.6	0.8	-1.7	10	12	8
Kyrgyz Republic	-3.7	-2.1	-2.2			
Tajikistan	-2.9	1.7	-6.4			
Turkmenistan	0.8	5.1	0.7			
Uzbekistan	1.2	5.2	2.3	28	21	16
East Asia						
China, People's Rep. of	-	-	-0.8	18	17	18
Hong Kong, China	1.0	4.0	7.2	14	13	13
Korea, Rep. of	0.4 ^a	0.4 ^a	3.8 ^a	30	32	32
Mongolia	2.6	3.3	2.2	68	54	51
Taipei, China	-0.6	-0.6	-0.2	31	31	31
South Asia						
Afghanistan	1.0	-3.1	-2.9			
Bangladesh	-3.3	-3.2	-3.2	50	48	47
Bhutan	-6.9	-0.8	-3.4			
India	-4.1	-3.4	-2.8	55	53	50 ^c
Maldives	-10.9	-6.7	-7.9	53	50	56
Nepal	-3.5 ^b	-3.5 ^b	-3.8 ^b	54	47	45
Pakistan	-3.3	-4.3	-5.8	63	58	55
Sri Lanka	-8.5	-8.1	-7.7	91	89	86
Southeast Asia						
Cambodia	-3.4 ^b	-3.0 ^b	-3.2 ^b	-	33	28
Indonesia	-0.5	-1.0	-1.2	44	37	34
Lao People's Dem. Rep.	-5.7 ^b	-4.9 ^b	-4.1 ^b	78	64	58
Malaysia	-3.6 ^b	-3.3 ^b	-2.8 ^b	44	42	42
Myanmar	-4.0	-	-			
Philippines	-2.7	-1.1	-0.2	71	64	56
Singapore	9.0 ^b	6.9 ^b	12.2 ^b	100	95	96
Thailand	0.9	2.0	0.6	26	26	25
Viet Nam	-4.9	-5.0	-4.9	44	44	43
The Pacific						
Cook Islands	2.4	2.5	0.1			
Fiji Islands	-3.3	-2.8	0.4			
Kiribati	-2.6	-5.2	-2.5			
Marshall Islands, Rep. of	-2.6	0.9	-0.7			
Micronesia, Fed. States of	-5.3	-5.4	-2.7			
Nauru	-28.2	-36.2	-17.4			
Palau, Rep. of	-3.3	-1.3	-7.4			
Papua New Guinea	0.1	3.1	1.7	52	46	10
Samoa	0.3	0.3	1.1			
Solomon Islands	2.5	1.5	-1.2			
Timor-Leste, Dem. Rep. of	36.0	120.7	232.9			
Tonga	2.4	-4.7	1.4			
Tuvalu	-6.1	22.5	4.2			
Vanuatu	3.3	0.5	-0.1			

^a Includes social security contributions.^b Excludes grants.^c As of December 2007.

Note: To simplify presentation across countries, data are presented in calendar years, although data for Bangladesh, India, Nepal, Pakistan, and Thailand are by fiscal year.

Sources: ADB 2008a; CEIC Data Company, Ltd.; Economic Intelligence Unit country reports; International Monetary Fund (IMF) country reports; Bank Negara Malaysia; Bureau of the Treasury, Philippines; Central Bank of Sri Lanka; Directorate General of Debt Management, Indonesia; Maldives Monetary Authority Monthly Statistical Report; Ministry of Finance, India; Ministry of Finance, Pakistan; Ministry of Finance, Thailand; Ministry of Strategy and Finance, Korea; National Bureau of Statistics of China.

Figure 5: Relation between Central Government Fiscal Deficit and Public Debt in Asia, 2007



Sources: ADB 2008a; CEIC Data Company, Ltd.; Economic Intelligence Unit country reports; IMF country reports; Bank Negara Malaysia; Bureau of the Treasury, Philippines; Central Bank of Sri Lanka; Directorate General of Debt Management, Indonesia; Maldives Monetary Authority Monthly Statistical Report; Ministry of Finance, India; Ministry of Finance, Pakistan; Ministry of Finance, Thailand; Ministry of Strategy and Finance, Korea; National Bureau of Statistics of China.

Oil subsidies are often hidden, making their measurement a difficult task. In this paper, we estimate consumer price subsidy as the difference between the international reference price and the domestic retail price. If the difference is positive, there is a subsidy. Otherwise there is a tax. The international reference price is the export parity price for net oil exporting countries and the import parity price for net importing countries. The export parity price for the relevant fuel product for net exporting countries is computed as the price at the nearest international hub adjusted for transactions costs, i.e., the price at the hub minus the cost of trade and transport from the country's border to the hub plus domestic distribution and retailing costs. For net importing countries, the import parity price is defined as the price at the nearest international hub plus the cost of trade and transport from the hub to the country's border and the charges for distribution and retailing within the country.⁴ We make two alternative assumptions on transaction costs. First, following IMF (2008b), we use domestic distribution and retailing costs based on the costs in the US, amounting to US\$0.07 per liter, and the cost of shipping the products from the hub to the country, again at US\$0.07 per liter. Thus the international reference price for oil importers is the US dollar price at the nearest hub

⁴ While it is better to use the counterfactual price in the absence of subsidy as the reference price, such a price is not easy to calculate. But the error introduced by using the price in the presence of subsidy is small if the elasticity of demand is low. See Coady et al. (2006) for further discussion of this assumption and on practical difficulties in estimating petroleum subsidies, e.g., appropriate reference prices for calculating price subsidies differ under alternative market regimes.

plus US\$0.14. Since the two costs are identical, for exporters the margins cancel out and the international reference price equals the US dollar price at the hub. The total margin of US\$0.14 averages to about 12–14% of the US retail price during the survey period, across fuel types and hubs. However, since global oil prices have since fallen, and traders and transporters are likely to operate with thinner margins, we consider an alternative total margin of 10% of the domestic retail price, assumed distributed equally between international shipping and local distribution costs. This means that for exporters the margins again cancel out and the benchmark price equals the US dollar price at the hub.

The estimates of consumer price subsidies presented here may not perfectly match the true subsidies and, in interpreting them, the assumptions made are to be noted as caveats. Table 3 reports our estimates that are annualized figures based on available data. For Indonesia, estimates of fuel subsidies are normalized to their 2007 realized total fuel subsidy figures, and for Pakistan, the actual unit subsidy per petroleum product is used. For other countries no comparable data on actual price subsidies is available. To check the robustness of our estimates, we carried out a matching exercise between our results and the indications from the survey as to the presence or absence of oil taxes and subsidies. In more than 50% of the countries, there was a match in the direction (presence of subsidy or tax) for *each* product, namely, gasoline, diesel, and kerosene. Using the total margin of 10% of domestic retail price in estimating unit subsidies, our computations for gasoline and diesel show a match of more than 70% but only around 48% for kerosene. Using the percent share of the total add-on costs of US\$0.14 in the US to total retail prices there, our estimates for gasoline are 75% matched, and for diesel around 67%.

For countries that do not directly tax or subsidize oil prices, our computations may have captured indirect interventions in the market. In cases where we did not find a match, we found consistent replies to other questions. Azerbaijan and Kyrgyz Republic, for instance, do not have direct price subsidies for gasoline but have either provided indirect subsidies or have regulated prices at some point, hence the positive figures for these two countries in Table 3. India, Maldives, Nepal, and Philippines also do not directly subsidize diesel, but showed positive figures as well in our calculations. Our computations may have captured other indirect price interventions in these economies, such as discounts on fuel for agricultural producers during planting and harvest seasons in the Kyrgyz Republic, 1–2 pesos per liter subsidy for public utility vehicles directly provided by oil companies in the Philippines, financial support to national oil companies in India and Nepal, etc. Though partially consistent, our estimates are only indicative; hence, must be treated with caution.

Table 3: Estimates of Consumer Oil Price Subsidies, 2008 (% of GDP)

Economy/Region	Add-on Costs for Net Importing Countries = % of Retail Price as in IMF(2008 ^c)			Add-on Costs for Net Importing Countries = 10% of Retail Price			
	Gasoline	Diesel	Total	Gasoline	Diesel	Kerosene	Total
Central Asia			0.04				-0.2
Armenia	-3.3 ^a	-1.5 ^a	-4.7 ^a	-3.5 ^a	-1.6 ^a	0.0 ^a	-5.0 ^a
Azerbaijan	0.2 ^a	1.5 ^a	1.7 ^a	0.2 ^a	1.5 ^a		1.7 ^a
Georgia	-0.6 ^a	0.0 ^a	-0.6 ^a	-0.7 ^a	-0.1 ^a	-0.3 ^a	-1.1 ^a
Kazakhstan	0.2 ^a	0.4 ^a	0.6 ^a	0.2 ^a	0.4 ^a	0.0 ^a	0.6 ^a
Kyrgyz Republic	1.9 ^a	1.1 ^a	3.0 ^a	1.7 ^a	1.1 ^a		2.8 ^a
Tajikistan	-1.1 ^a	0.5 ^a	-0.6 ^a	-1.9 ^a	0.4 ^a		-1.5 ^a
Turkmenistan	1.1 ^b	1.2 ^b	2.3 ^b	1.1 ^b	1.2 ^b		2.3 ^b
Uzbekistan	-4.7 ^a	3.4 ^a	-1.3 ^a	-4.7 ^a	3.4 ^a		-1.3 ^a
East Asia			-0.6				-0.7
China, People's Rep. of	0.2 ^a	1.6 ^a	1.8 ^a	0.1 ^a	1.5 ^a		1.7 ^a
Hong Kong, China	-0.3 ^a	-1.2 ^a	-1.4 ^a	-0.3 ^a	-1.2 ^a		-1.5 ^a
Korea Rep. of	-0.9 ^a	-2.0 ^a	-3.0 ^a	-1.0 ^a	-2.0 ^a		-3.0 ^a
Mongolia	-0.5 ^a	0.3 ^a	-0.2 ^a	-0.7 ^a	0.2 ^a		-0.5 ^a
Taipei, China	-0.3 ^a	0.2 ^a	-0.1	-0.4 ^a	0.2 ^a		-0.2 ^a
South Asia			0.9				1.3
Afghanistan	0.1 ^b		0.1 ^b	0.1 ^b			0.1 ^b
Bangladesh	0.0 ^b	1.4 ^b	1.5 ^b	0.0 ^b	1.4 ^b	0.5 ^b	2.0 ^b
Bhutan	-0.1 ^a	0.8 ^a	0.7 ^a	-0.1 ^a	0.8 ^a	1.2 ^a	1.8 ^a
India	-0.2 ^a	1.6 ^a	1.4 ^a	-0.2 ^a	1.5 ^a	0.9 ^a	2.3 ^a
Maldives	-1.1 ^a	0.7 ^a	-0.4 ^a	-1.2 ^a	0.4 ^a	0.3 ^a	-0.5 ^a
Nepal	-0.3 ^a	0.4 ^a	0.2 ^a	-0.3 ^a	0.4 ^a	0.7 ^a	0.8 ^a
Pakistan	0.0 ^b	2.7 ^b	2.7 ^b	0.0 ^b	2.7 ^b	0.1 ^b	2.8 ^b
Sri Lanka	0.0 ^b	1.3 ^b	1.3 ^b	0.0 ^b	1.3 ^b	0.2 ^a	1.5 ^b
Southeast Asia			0.7				1.1
Cambodia	-0.2 ^a	-0.1 ^a	-0.3 ^a	-0.2 ^a	-0.1 ^a	-0.1 ^a	-0.4 ^a
Indonesia	1.9 ^b	3.5 ^b	5.3 ^b	1.9 ^b	3.5 ^b	2.2 ^b	7.5 ^b
Lao PDR	0.1 ^b	0.1 ^b	0.2 ^b	0.1 ^b	0.1 ^b		0.2 ^b
Malaysia	0.4 ^b	0.5 ^b	0.9 ^b	0.4 ^b	0.5 ^b		0.9 ^b
Philippines	-0.6 ^a	0.3 ^a	-0.3 ^a	-0.7 ^a	0.3 ^a	0.0 ^a	-0.4 ^a
Singapore	-0.3 ^a	-0.3 ^a	-0.6 ^a	-0.3 ^a	-0.3 ^a		-0.6 ^a
Thailand		0.1 ^b	0.1 ^b		0.1 ^b		0.1 ^b
Viet Nam			0.0 ^c				1.3 ^c
Pacific			-1.5				-1.7
Fiji Islands	-0.8 ^a	-0.9 ^a	-1.7 ^a	-0.9 ^a	-1.0 ^a	0.0 ^a	-1.8 ^a
Papua New Guinea	-0.1 ^a	-0.7 ^a	-0.8 ^a	0.1 ^a	-0.7 ^a	0.0 ^a	-0.7 ^a
Samoa	-1.1 ^a	-1.0 ^a	-2.1 ^a	-1.2 ^a	-1.1 ^a	-0.3 ^a	-2.6 ^a

^a Estimated by taking the difference between the domestic retail price of oil and the international price in the nearest regional hub adjusted for the costs of trade and transport from the hub to the country's border and domestic charges for distribution and retailing.

^b Estimated based on actual price subsidies per liter provided by the country desk.

^c Full year subsidy figure provided by the country desk.

Note: Positive values mean there is subsidy. Otherwise, there is a tax. The estimates are annualized figures based on retail prices in the capital cities during 9-13 June 2008.

Sources: Authors' calculations using data from oil price surveys of the country capitals; ADB 2008b; Energy Information Administration, available: www.eia.doe.gov/; British Petroleum, available: www.bp.com/home.do?categoryId=1; and World Economic Outlook Database October 2008, available: www.imf.org/external/pubs/ft/weo/2008/update/03/index.htm.

III. Analytical Framework for Debt Dynamics

This section presents a framework to examine sustainability of fiscal deficit and public debt under macroeconomic and external shock scenarios. Analysis of fiscal sustainability has become a crucial ingredient of macroeconomic analysis. For a recent review and discussion of approaches that have evolved over time to analyze fiscal sustainability, see Budina and Wijnbergen (2008) and IMF (2008c). Unlike the traditional backward-looking approaches, Budina and Wijnbergen (2008) pool together different strands of literature and develop a unified toolkit for forward-looking fiscal sustainability analysis based on an accounting framework. The toolkit can be applied to individual country cases using data such as on integrated central bank and public sector accounts, structure, composition and risk-profile of domestic and external debt, and real exchange rate. For our purposes, we use a simplified version of their debt-dynamics framework to keep the analysis tractable. This reduces the computational intricacies of a fully specified macro model, requires only parsimonious data across countries, and yet gives meaningful insight.

A. Intertemporal Budget Constraint and Fiscal Solvency

A fiscal stance is sustainable if it satisfies the government's intertemporal budget constraint. Equation (2) presents the government's dynamic budget constraint: this year's debt equals the last year's debt plus interest payments less noninterest current primary surplus.

$$D_t = (1+i) D_{t-1} - P_t \quad (2)$$

where

D = public sector nominal debt
 i = average nominal interest rate on public debt
 P = primary surplus

Dividing the equation through by nominal GDP, Y_t , gives

$$D_t / Y_t = [(1+i) / (1+g)] (D_{t-1} / Y_{t-1}) - P_t / Y_t \quad (3)$$

where

g = nominal GDP growth rate

$$\text{or} \quad d_t = [(1+i) / (1+g)] d_{t-1} - p_t \quad (4)$$

where

d = public sector debt–GDP ratio

p = primary surplus–GDP ratio

The first expression on the right-hand side of equation (4) says that the debt burden rises with interest rate and falls with growth. The equation can also be expressed in terms of fiscal deficit, which equals primary deficit plus interest payments. Fiscal consolidation and tightening of primary deficit can help contain debt dynamics.

Merely satisfying the government's intertemporal budget constraint may not make it fiscally sustainable over an infinite time horizon if, e.g., the government fails to keep its promise to compensate for current deficits through future surpluses. Fiscal solvency requires that over time, government spending must stay within its means. To understand the solvency of the government, define $1+r = (1+i)/(1+g)$, where $r = (i-g)/(1+g)$ is the interest rate adjusted for economic growth. Then equation (4) can be rewritten as

$$d_{t-1} = [p_t / (1+r)] + [d_t / (1+r)]$$

Starting with $t = 1$, and substituting repeatedly for d_t in future periods gives

$$d_0 = [p_1 / (1+r)] + [d_1 / (1+r)]$$

$$\text{or } d_0 = [p_1 / (1+r)] + [p_2 / (1+r)^2] + [d_2 / (1+r)^2]$$

$$\text{or } d_0 = [p_1 / (1+r)] + [p_2 / (1+r)^2] + [p_3 / (1+r)^3] + [d_3 / (1+r)^3]$$

$$\text{or } d_0 = \lim_{t \rightarrow \infty} \sum_{k=1,t} [p_k / (1+r)^k] + \lim_{t \rightarrow \infty} [d_t / (1+r)^t] \quad (5)$$

For solvency to occur,

$$d_0 = \lim_{t \rightarrow \infty} \sum_{k=1,t} [p_k / (1+r)^k]$$

i.e., the discounted value of primary surplus should be sufficient to finance initial debt. In other words, the net present value of the net income stream (excluding interest payments) must cover initial debt.⁵ This in turn requires using equation (5) that

$$\lim_{t \rightarrow \infty} [d_t / (1+r)^t] = 0$$

i.e., the expansion of debt should not exceed the growth-adjusted interest rate.

⁵ This means that the government satisfies the “no-Ponzi game” condition. In a “Ponzi game”, agents borrow to service their debt, which ultimately becomes unsustainable.

B. Deficit Reduction to Sustain Steady-state Debt

Medium-term simulations in a finite time horizon may not ensure the sustainability of debt over an infinite time period. But the debt dynamics would signal as to whether the underlying policies can be continued under conceivable macroeconomic setting without jeopardizing fiscal solvency. A downward medium-term trend in debt would shore up longer-term sustainability of government policies while an upward movement may suggest overshooting the sustainable level of debt. The latter would create the need for fiscal adjustment necessary to control or lower the debt ratio. In practice, equation (4) is the key to determining the sustainability of fiscal policy over a finite time period. The level of fiscal correction required to restore a stable level of debt–GDP ratio can be obtained by stabilizing debt at a steady-state level, i.e., when $d_t = d_{t-1} = d$, say. Equation (4) can then be written as

$$d = [(1+i) / (1+g)]d - p$$

$$\text{or} \quad p = d (i-g) / (1+g) \quad (6)$$

where p is the primary surplus needed to service the debt d in the steady state. If the interest rate exceeds the growth rate ($i > g$), this expression rises with debt. If in addition, the government is running a primary deficit ($p < 0$), this makes the debt dynamics unstable. In such an event the debt–GDP ratio will rise without limit. Eventually, measures would be required to cut the deficit. In contrast, if the interest rate falls short of the growth rate, e.g., in a fast growing economy, this will erode the debt over time. But such a situation may be short-lived as low interest rates supported by high growth will encourage borrowing until the arbitrage benefits reflected in the difference are wiped out. See Fischer and Easterly (1990) for an early discussion on the issue.

Corresponding to equation (6) and the steady-state level of debt, the sustainable level of fiscal deficit is calculated as primary deficit plus interest payments

$$f = -p + id$$

$$\text{or} \quad f = id - \{d (i-g) / (1+g)\}$$

$$\text{or} \quad f = \{dg (1+i)/(1+g)\} \quad (7)$$

Equation (7) captures the interaction between monetary and fiscal measures. We use it to estimate the compression in fiscal deficit necessary to maintain debt at the given target in response to changes in growth and interest rates compared to their projected levels.

IV. Dynamic Simulation Analysis of Fiscal Sustainability

This section lays down baseline debt projections and presents dynamic simulation exercises to capture specific risks to the baseline by considering alternative debt paths under less favorable conditions than the deterministic outcome of the baseline. In the baseline scenario, the macroeconomic projections of growth rate, interest rate, and primary surplus determine the debt dynamics. We first conduct stress tests to evaluate the sensitivity of the baseline debt projections to changes in these exogenous variables. The alternative scenarios are designed to examine the implications for public debt of unforeseen changes in the macroeconomic situation, and external shocks. The scenarios for macroeconomic uncertainties consider separate shocks to these variables. The external shock scenario uses alternative projections of global crude oil prices that influence oil subsidies.

The base year is taken as 2007. Historical data for 18 Asian economies are used and projections made up to 2015. All the 18 economies in our sample display $i < g$ in the base year. There is base-year primary surplus in some economies (People's Republic of China [PRC]; India; Indonesia; Korea; Mongolia; Philippines; Singapore; Taipei, China; and Thailand) and primary deficit in the rest. Nine countries display primary deficit (Bangladesh, Cambodia, Lao PDR, Malaysia, Maldives, Nepal, Pakistan, Sri Lanka, and Viet Nam). Primary deficit is used as a policy variable. This allows for necessary increases in fiscal deficit even beyond those mandated by fiscal policy rules, if any, to reflect realistic possibilities and to throw light on whether the rules might be breached. Exchange rates for 2008 are taken as the average of daily rates from 1 January to 8 December and assumed constant till 2015.

The simulation results presented here are for illustrative purposes only and should not be considered as actual projections at the country level. The analytical framework used and the underlying assumptions made are designed to allow for cross-country comparison. Given the uncertain global environment, the results of the simulation exercise only illuminate the risks and possible policy responses.

A. Baseline Scenario

This scenario reflects basic macroeconomic projections and policy assumptions. It charts out the medium-term path of the debt–GDP ratio based on the budget flow and projections of macroeconomic variables using the debt dynamics in equation (4). The projections of GDP growth rates are taken from the IMF October 2008 forecasts for 2008–2013. Thereafter the growth rate is assumed constant for 2014–2015. It is assumed that the projected levels of primary deficit–GDP ratio and the interest rate are fixed at the 2007 levels. Hence, the baseline scenario does not incorporate risks to debt dynamics, which are considered in the alternative scenarios. Given the growth trajectory, the baseline debt–GDP ratio declines over the projection period in all the countries, as the

other exogenous variables remain unchanged. The “fiscal correction” is obtained as the amount by which the fiscal deficit needs to be altered to bring the debt–GDP ratio to the steady-state level. The target steady-state debt–GDP ratio is taken as the 2015 baseline level. The correction may be positive, implying the need for a reduction in the current deficit; or negative, implying the presence of headroom for an expansionary fiscal policy.

Baseline Scenario		
Nominal GDP growth rate	Projected levels	2008–2013: projections, IMF/WEO October 2008 2014–2015: constant at 2013 level
Primary deficit/ GDP	Constant	2008–2015: constant at 2007 level
Average nominal interest rate on public debt	Constant	2008–2015: constant at 2007 level

B. Debt Stress Tests

The stress tests assess the sensitivity of debt dynamics to changes in key parameters that drive the debt–GDP ratio. Using equation (4), we calibrate the debt ratio by considering permanent adverse shocks—one at a time—in the primary deficit, the interest rate, and the growth rate compared to the baseline projections of these variables under the situation of a deep and prolonged economic slowdown. In doing so, we assume that there is no interaction among the variables, and the initial debt stock remains unchanged. Since there is a large variation across countries in the range of GDP growth, we apply the tests in terms of country-specific historical standard deviations rather than in terms of percentage point changes.⁶

Stress Tests		
Scenario 1	Higher primary deficit/ GDP	2008–2015: increased by 2 standard deviation from baseline levels
Scenario 2	Lower nominal GDP growth rate	2008–2015: reduced by 2 standard deviation from baseline levels
Scenario 3	Higher average nominal interest rate on public debt	2008–2015: increased by 2 standard deviation from baseline levels
Scenario 4	Combined Scenarios 1–3	2008–2015: combined 1 standard deviation shocks of scenarios 1–3

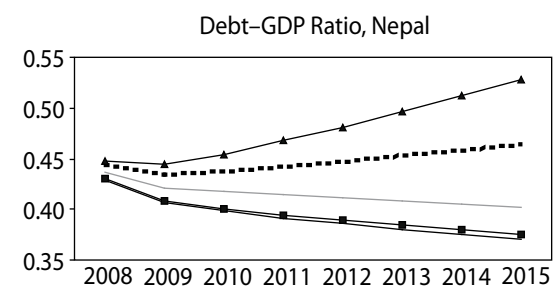
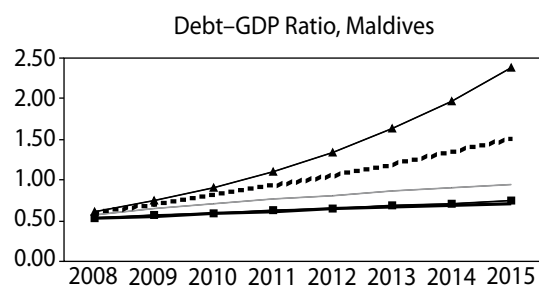
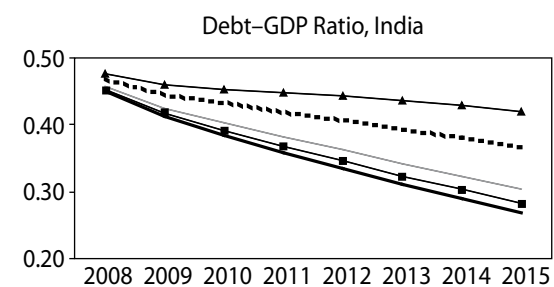
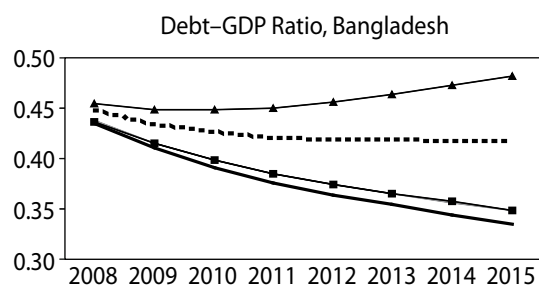
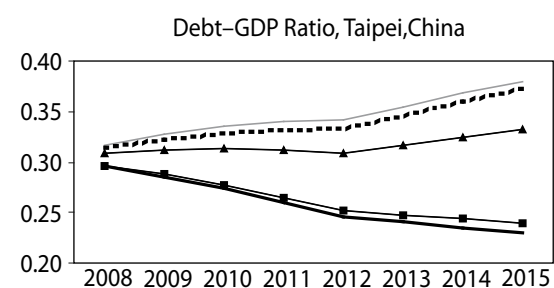
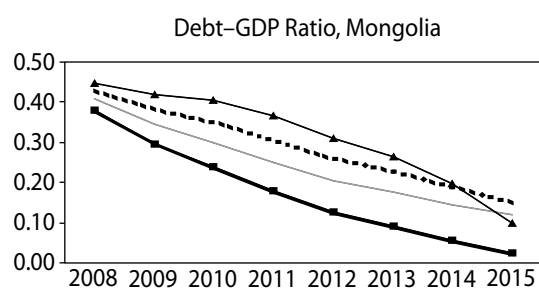
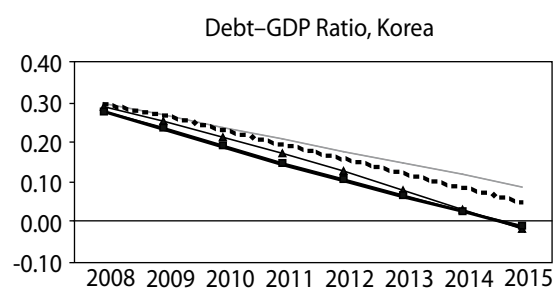
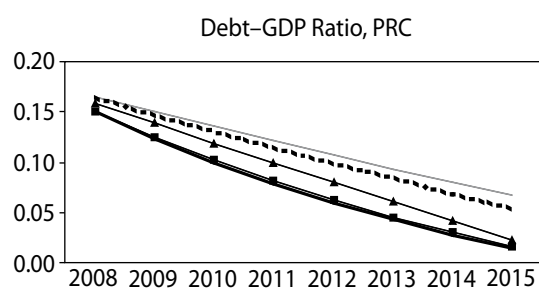
In the baseline scenario, as economic recovery takes place and the growth rate improves over the projection period, the debt–GDP ratio falls for all the countries. This increases the available fiscal space, which may be affected under adverse circumstances. Figure 6 presents the effects on debt–GDP ratio under the four stress test scenarios. The low-growth Scenario 2 particularly hits most countries hard. To measure the severity of risk to debt in each stress scenario, we compute the final period (2015) deviation in the debt–GDP ratio between the alternative and the baseline scenarios. A large positive difference increases the vulnerability to debt stress. Table 4 presents the differences and highlights the cases exceeding 10%.

⁶ Executing the stress tests as two standard deviation adverse shocks should capture most of the risks to the scenario assuming that the baseline projections characterize the true underlying probability distributions. See IMF (2002) for further discussion of the issue.

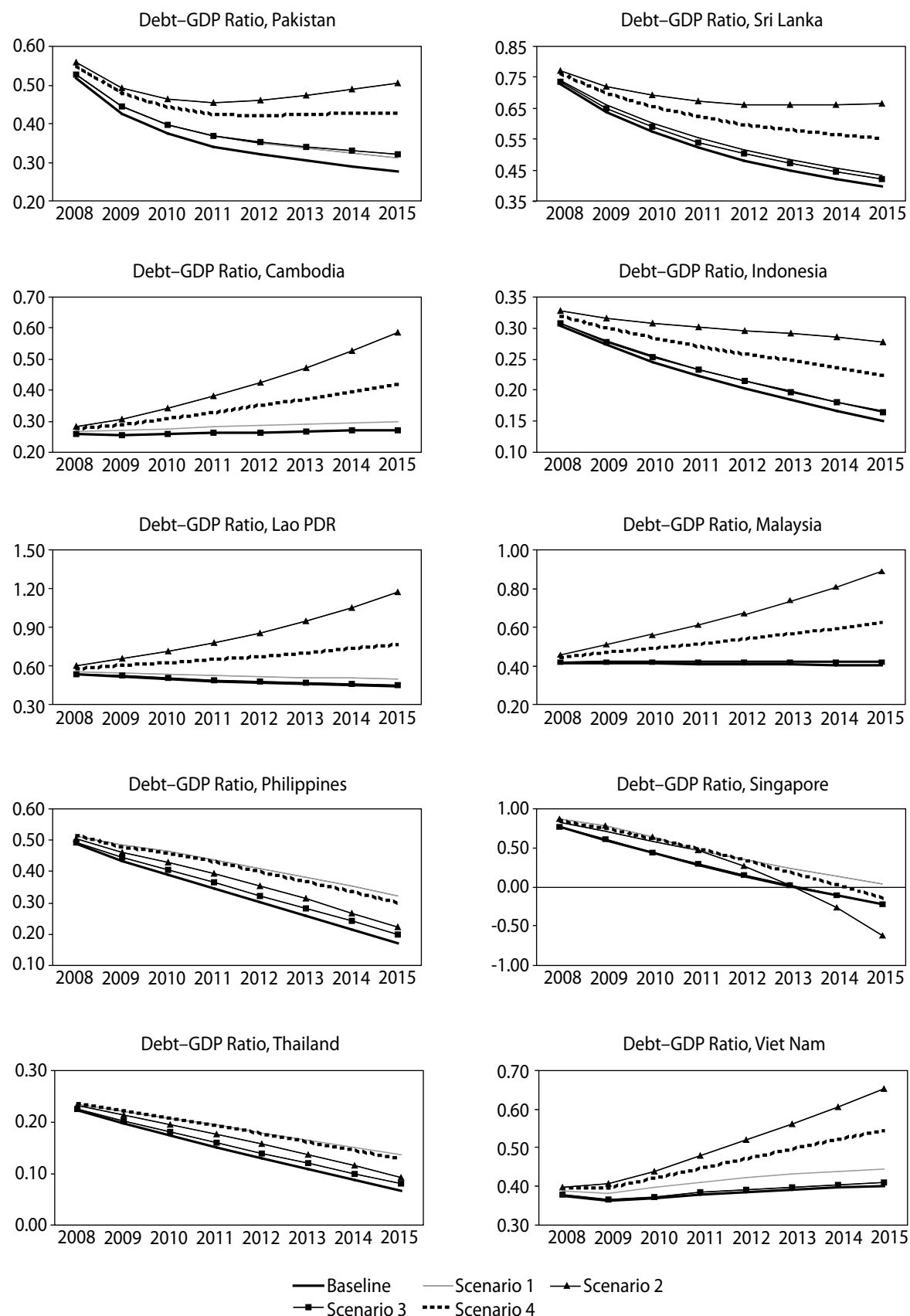
Figure 6: Stress Tests

Scenario 1: Higher primary deficit/GDP
 Scenario 3: Higher nominal interest rate on public debt

Scenario 2: Lower nominal GDP growth rate
 Scenario 4: Combined Scenarios 1-3



continued.

Figure 6: continued.

Source: Authors' calculations.

Scenario 1 when primary deficit–GDP ratio rises by 2 standard deviations from baseline levels during 2008–2015 shows severe risk to the debt–GDP ratio in some countries. From Table 4, countries that are particularly affected are Korea; Maldives; Philippines; Singapore; and Taipei,China, each having a debt–GDP ratio at least 10 percentage points higher than in the baseline in the last year of projection.

In Scenario 2 nominal GDP growth rate falls in the projection period by 2 standard deviations from the baseline. This stress test causes the most extreme deterioration of debt dynamics in several economies. The impact is noticeable with more than 10% deviation in Bangladesh; Cambodia; India; Indonesia; Lao PDR; Malaysia; Maldives; Nepal; Pakistan; Sri Lanka; Taipei,China; and Viet Nam, implying that this level of reduction in growth would render projected baseline debt unsustainable.

In the third stress test, Scenario 3, the cost of borrowing given by the average nominal interest rate on public debt is assumed to rise by 2 standard deviations from baseline levels. This test indicates the least risk to debt dynamics in all the countries concerned.

Scenario 4 combines the above three scenarios by giving a simultaneous 1 standard deviation adverse shock to each of the variables. The shock in this case is less severe than in Scenario 2 but high risk is still extended across a large number of economies, namely, Cambodia; Lao PDR; Malaysia; Maldives; Mongolia; Pakistan; Philippines; Sri Lanka; Taipei,China; and Viet Nam.

Table 4: Severity of Risk to Debt - Percentage Difference of Debt-GDP Ratio in the Final Period (2015) between the Alternative and Baseline Scenarios

Economy	Scenario 1: 2 SD Higher Primary Deficit/ GDP	Scenario 2: 2 SD Lower Nominal GDP Growth Rate	Scenario 3: 2 SD Higher Nominal Interest Rate on Public Debt	Scenario 4: Combined Scenarios 1–3 with 1 SD shocks
Bangladesh	1.3	14.7	1.4	8.2
Cambodia	2.7	31.3	0.0	14.3
PRC	5.4	0.8	0.3	3.9
India	3.4	15.1	1.4	9.6
Indonesia	1.5	12.6	1.4	7.2
Korea	10.3	(0.5)	0.3	6.0
Lao PDR	5.7	72.9	1.5	32.4
Malaysia	2.3	48.7	1.5	21.8
Maldives	22.4	165.9	2.3	78.1
Mongolia	9.6	(7.7)	0.3	12.5
Nepal	3.2	15.8	0.5	9.3
Pakistan	3.7	12.8	4.6	15.0
Philippines	15.1	5.1	3.0	12.7
Singapore	26.5	(39.4)	0.3	7.6
Sri Lanka	3.5	26.9	2.5	15.4
Taipei,China	15.0	10.2	0.9	14.2
Thailand	6.9	2.5	1.4	6.1
Viet Nam	4.3	25.0	0.9	14.2

Source: Authors' calculations.

C. Alternative Scenarios: Deficit Reduction to Sustain Debt at the Steady-state Level

This subsection estimates the fiscal correction needed to stabilize debt at the target steady-state level. Fiscal correction for each year is calculated as the difference between the prevailing fiscal deficit and the deficit required to sustain debt at the steady-state level (defined as the debt–GDP ratio in the final projection year 2015 under the baseline scenario). A positive difference indicates that the current deficit needs to be reduced or a higher surplus needs to be generated to sustain debt. In either case, fiscal tightening is necessary. A negative correction implies that the current fiscal deficit is lower or the current surplus is higher than that required for stabilizing debt. In both cases there is headroom for expansionary fiscal policies.

Scenarios 5 and 6 analyze how policy responses to shocks from recent macroeconomic uncertainties might affect public debt sustainability. These scenarios are considered respectively as 2-year sequences of 2 standard deviation temporary increases in primary deficit–GDP ratio and cuts in interest rate. In Scenario 5, the primary deficit–GDP ratio is increased to reflect higher public spending in the wake of the financial crisis. In Scenario 6, in addition to higher primary deficit, interest rate cut is also introduced to revive economic growth, as observed in recent months in many countries. While the former shock adds to the fiscal deficit, the latter lowers it. The net effect is that the fiscal correction required to support steady-state debt may be positive or negative and may rise or fall through time depending on the values the other exogenous variables take. In Korea, Mongolia, and Singapore, the fiscal gap under the two scenarios is negative or negligible, because they generate higher fiscal surpluses than the sustainable levels (Figure 7). In the PRC and Thailand, other fiscal-surplus countries, the gap is positive, implying that a higher level of surplus is required to sustain the steady-state debt. All the other countries require deficit reduction for debt sustainability, calling for fiscal prudence in implementing their policies. But the size of the correction declines over time if the policy responses play out as assumed, other things remaining unchanged.

The next two scenarios examine the impact of shocks from global oil prices. In Scenario 7, to account for the possibility of continued tight supply conditions, crude oil prices are assumed to rise 5% per year during 2009–2012 and 10% thereafter, crossing the US\$150 per barrel threshold by 2015 (Figure 8). In Scenario 8, global crude prices are assumed to move based on market sentiments as reflected by recent developments in futures markets. For Korea, Philippines, Singapore, and Thailand, domestic prices are assumed to move proportionately to changes in international crude oil prices, as their domestic prices are not regulated. For the rest of the countries, domestic prices are assumed to remain unchanged from the 2008 levels. The primary deficit is adjusted for the change in oil subsidy/ tax resulting from the price movements.⁷

⁷ Fuel subsidy projection for 2008–2015 assumes annual fuel consumption to grow at the same rate as the population growth, based on the UN Population Stat estimate, which is constant. Domestic retail prices for India; Indonesia; Philippines; Taipei, China; and Thailand are average pump prices for the period 1 January to 8 December 2008; while the reference period for other countries is October 2008.

Macroeconomic Shocks		
Scenario 5	Higher primary deficit/ GDP due to increase in general public spending and stimulus packages	2008–2009: increased baseline levels by 2 standard deviations 2010–2015: constant at 2009 level
Scenario 6	Scenario 5 + Lower interest rate to revive growth	2008–2009: reduced baseline levels by 2 standard deviations 2010–2015: constant at 2009 level
Global Oil Price Shocks		
Scenario 7	Primary deficit/ GDP adjusted for change in oil price subsidy with high crude prices	High global crude oil prices 2009–2012: 5% increase per year 2013–2015: 10% increase per year
Scenario 8	Primary deficit/ GDP adjusted for change in oil price subsidy with futures markets crude prices	Futures markets global crude oil prices 2008–2010: estimate and projections made in December 2008 2011–2015: futures prices
Joint Occurrence of Macroeconomic and Global Oil Price Shocks		
Scenario 9	Scenario 7 + combined shocks of reduction in growth and interest rates	2008–2015: baseline GDP growth reduced by 1 standard deviation 2008–2015: baseline interest rate reduced by 1 standard deviation
Scenario 10	Scenario 8 + combined shocks of reduction in growth and interest rates	2008–2015: baseline GDP growth reduced by 1 standard deviation 2008–2015: baseline interest rate reduced by 1 standard deviation

Figure 7 presents the results. In countries that regulate, administer, or control oil prices, global price shocks require pruning deficits or mobilizing more resources with a stronger need for fiscal correction in Scenario 7 than in Scenario 8. The divergence in the fiscal stress between the two cases widens over time. This could arise from higher price subsidy or lower taxes. In particular, in India, Indonesia, and Malaysia, high oil prices create much larger fiscal impact than macroeconomic shocks of Scenarios 5 and 6. While Bangladesh, PRC, Nepal, and Pakistan begin with larger fiscal headroom with oil price shocks than under the macroeconomic shocks, the excess is wiped out by the end of the projection period. This means that in all these economies, the need for caution and avoidance of complacency remains and fiscal tightening would be necessary to sustain the steady-state debt target. In Korea, Philippines, Singapore, and Thailand, the curves for Scenario 7 lie below those for Scenario 8. This happens because as these countries pass on higher global prices to their domestic markets, this takes off their burden of subsidies. The effects are more pronounced with higher oil prices in Scenario 7. The fiscal correction is not necessarily zero since their local prices, though moving in proportion with world prices, are not completely aligned. The difference captures trade and transport margins and taxes.

Figure 7: Economic Shocks and Fiscal Correction to Sustain Steady-state Debt

Scenario 5: Higher primary deficit/ GDP (due to higher general public spending and stimulus packages)

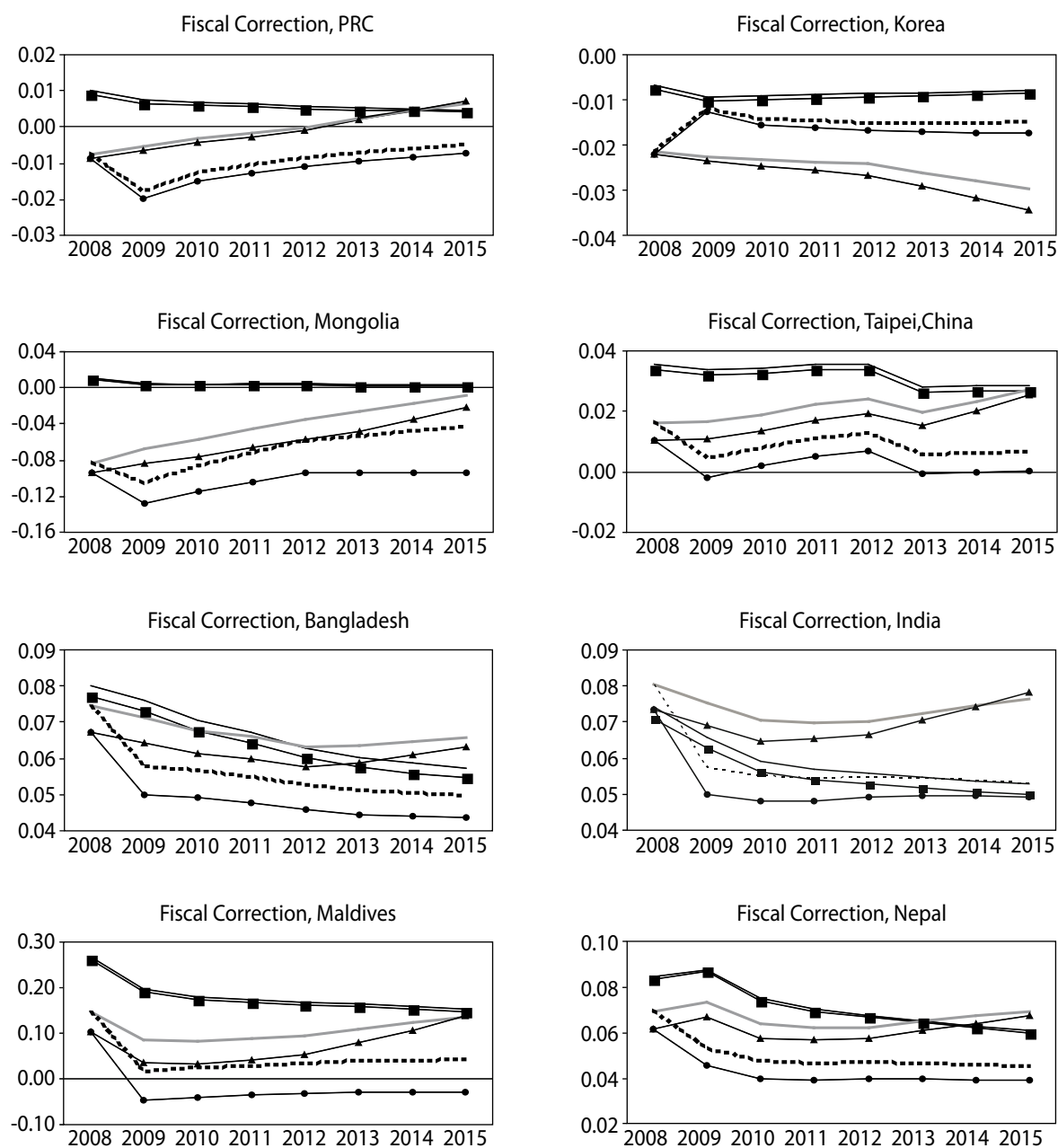
Scenario 6: Scenario 5 + lower interest rate (to revive growth)

Scenario 7: Primary deficit/ GDP adjusted for change in oil price subsidy with high crude oil prices

Scenario 8: Primary deficit/ GDP adjusted for change in oil price subsidy with futures crude prices

Scenario 9: Scenario 7 + high crude prices

Scenario 10: Scenario 8 + futures crude prices



continued.

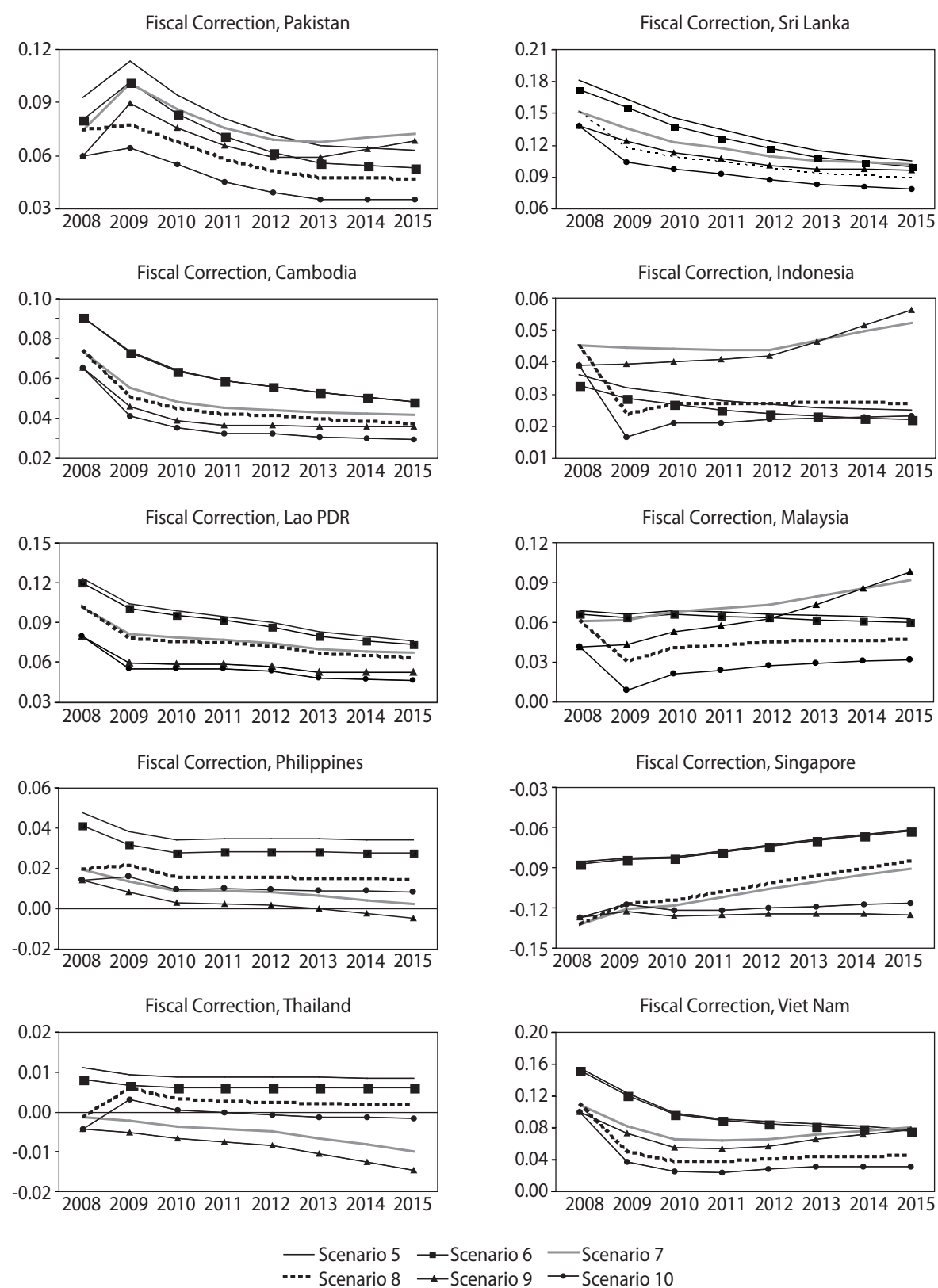
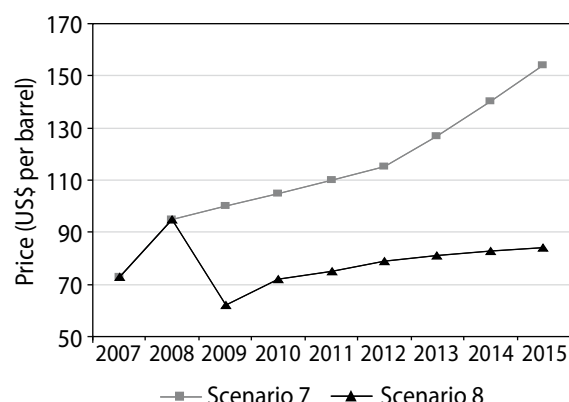
Figure 7: continued.

Figure 8: Assumptions on Brent Crude Oil Prices: Scenarios 7 and 8

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015
Scenario 7	72.7	95	100	105	110	115	127	140	154
Scenario 8	72.7	95	62	72	75	79	81	83	84

Note: Scenario 7: Estimate made in December 2008; 2009–2012: 5% annual increase; 2013–2015: 10% annual increase.
 Scenario 8: Estimate and projections made in December 2008; 2011–2015: futures prices implied by futures markets as of 5 December 2008.

Scenarios 9 and 10 consider the effects of simultaneous macroeconomic and oil price shocks.⁸ They incorporate joint but smaller occurrence of: (i) changes in global oil prices, (ii) ongoing slowdown in growth, and (iii) eased interest rates to revive the economies. The aggregate effect is a combination of the macroeconomic and oil price shocks but the direction is driven more by the latter, which in general has a larger impact. Since the joint shocks are smaller (1 standard deviation each) than the individual shocks (2 standard deviations each), the fiscal correction needed is closer to and almost mimics that for the oil price shocks. Combining the shocks gives mixed results. It may slow down or speed up the pace of debt reduction and accordingly affect debt vulnerability to more severe shocks.

V. Summary and Conclusions

High and volatile global oil prices affect the budgets of governments that subsidize or tax domestic oil consumption. Added to this, policy responses to recent macroeconomic uncertainties are creating a fiscal burden and contributing to public debt. Although growth in oil demand has slowed, a sharp cut in production, delayed investment in new production and processing capacity, expectations of conventional crude output to peak soon, and recovery of industrial economies will keep supply conditions tight.

⁸ See Celasun et al. (2006) and Hostland and Karam (2006) for a discussion on assessing debt sustainability under joint adverse movements in many variables.

Countries in Asia follow a complex system of oil pricing regimes and not all governments transmit world prices to domestic markets to the same extent. As international prices spiked in 2008, an overwhelming majority of countries across Asia increased the protection of domestic consumers through higher subsidies or lower taxes. The recipients of subsidies in Asia range from oil consumers and producers to state institutions and public utility providers. Our estimates of net oil price subsidy show that, in the aggregate, South and Southeast Asia subsidize oil consumption whereas Central and East Asia and the Pacific countries tax it.

Oil subsidies create a direct fiscal cost, part of which may be included in the budget but the rest may be off-budget and financed by cutting the refining and distribution margins of publicly owned refineries and oil marketing companies. Countries that directly subsidize one or more of gasoline, diesel, and kerosene seem in general to run high fiscal deficits. Higher fiscal deficits in turn are associated with higher public debts. We use a forward-looking methodology for debt dynamics to examine the potential impact of macroeconomic and oil price shocks on public debt for 18 regional economies and estimate the fiscal correction needed to sustain debt at the target steady-state level (defined as the final year debt–GDP ratio in the baseline). The base year is taken as 2007 and projections made from 2008 to 2015.

Our simulation results reveal that the low growth scenario will particularly hit most countries hard. A deep and prolonged economic slowdown would cause severe deterioration of debt dynamics in Bangladesh; Cambodia; India; Indonesia; Lao PDR; Malaysia; Maldives; Nepal; Pakistan; Sri Lanka; Taipei,China; and Viet Nam as their debt would rise by more than 10% of GDP by the end of the projection period. A permanent shock of higher primary deficit arising from higher public spending or lower revenue is seen to significantly raise the debt stress for Korea; Maldives; Philippines; Singapore; and Taipei,China. Higher public cost of borrowing indicates the least risk to debt dynamics. But a combination of these three adverse shocks would extend high debt risk to Cambodia; Lao PDR; Malaysia; Maldives; Mongolia; Pakistan, Philippines, Sri Lanka, Taipei,China; and Viet Nam.

Temporary macroeconomic shocks from higher public spending (e.g., through fiscal stimulus plans in the wake of the ongoing financial crisis) and interest rate reduction to revive growth may lower or raise debt vulnerability. While the former shock adds to the fiscal deficit, the latter lowers it. The net effect is that the fiscal correction required to support steady-state debt may be positive or negative. Our simulation results show that Korea, Mongolia, and Singapore generate higher fiscal surpluses than the sustainable levels necessary to respond to the macroeconomic shocks. But in the PRC and Thailand, two other fiscal-surplus economies, a higher level of surplus is required to sustain the steady-state debt. The remaining countries need to cut down deficit for debt sustainability, calling for fiscal prudence. But the size of the fiscal correction declines over time as the gap between the prevailing and the sustainable deficit narrows.

In countries that regulate, administer, or control oil prices, high global oil prices require fiscal correction. This could arise from higher price subsidy or lower taxes. In particular, higher oil prices create much larger fiscal impact than the macroeconomic shocks for India, Indonesia, and Malaysia. While high oil prices leave PRC, Bangladesh, Nepal, and Pakistan in a better fiscal position than with the effects of macroeconomic shocks, the excess dwindles by the end of the projection period. Thus the need for caution and avoidance of complacency remains and fiscal tightening would be necessary in all the countries to sustain the steady-state debt target. In Korea, Philippines, Singapore, and Thailand, which pass on higher global prices to their domestic markets, this takes off their burden of oil subsidies. Combining the macroeconomic and oil price shocks gives mixed results. It may slow down or speed up the pace of debt reduction and accordingly affect debt vulnerability to more severe shocks.

To address the external challenges and yet maintain sustainable deficit and manage the fiscal risks, governments will need to decide whether to simply stabilize the debt stock at a specified level (as a percentage of GDP) or target a reduction in the debt stock, and thus the interest burden, in which case tighter targets will be needed. Disclosure and preparation for the risks can promote fiscal sustainability, reduce borrowing costs, and lower the chances of a crisis (Brix and Schick 2002, IMF 2008d). Integrating the activities financed through off-budget funds (such as oil subsidies) into the budget process can make transparent the associated fiscal risks. Allowing domestic oil prices to be fully linked to global prices while protecting the poor through various safety net programs funded from tax revenues would eliminate the risk arising from a spurt in subsidies. Proposals for reform of oil-pricing policies in India and PRC seem to be moving along these lines.

Countries that follow fiscal policy rules may tend to breach the rules under external shocks. It has been argued that fiscal policy rules, by tying down the hands of governments, reduce the scope for countercyclical fiscal stabilization. Nevertheless the consensus of the literature is that they are useful in catalyzing, supporting, and sustaining fiscal adjustment. Their adoption has generally led to much improved fiscal position in these countries. Indeed, the extensive survey of Poterba (1996) concludes that “fiscal institutions do matter”. In countries with such rules, the net fiscal costs of the shocks should be clearly identified. Establishment of a stabilization fund to address such unforeseen fiscal outcomes would be an option for improving fiscal sustainability without dismantling the rules. The other countries would benefit from rationalization of public spending and reform of taxes. Consideration of relative merits of various options (in terms of, e.g., protecting poor consumers, controlling inflation, and promoting growth) would be important.

At the global level, countries can cooperate to mitigate the shocks. For example, Kilian et al. (2009) note the important role that international financial integration can play in allowing sharing of risk of oil shocks between oil importers and the rest of the world. It can also greatly influence the sharing of burden of adjustment by oil-importing countries.

References

- Asian Development Bank. 2008a. *Asian Development Outlook 2008*. Manila.
- . 2008b. *Asian Development Outlook 2008 Update*. Manila.
- Backus, D. K., and M. J. Crucini. 2000. "Oil Prices and the Terms of Trade." *Journal of International Economics* 50:185–213.
- Baig, T., A. Mati, D. Coady, and J. Ntamatungiro. 2007. Domestic Petroleum Product Prices and Subsidies: Recent Developments and Reform Strategies. IMF Working Paper 07/71, International Monetary Fund, Washington, DC.
- Bixi, H. P., and A. Schick. 2002. *Government at Risk: Contingent Liabilities and Fiscal Risk*. World Bank, Washington, DC.
- Budina, N., and S. van Wijnbergen. 2008. "Quantitative Approaches to Fiscal Sustainability Analysis: A Case Study of Turkey since the Crisis of 2001." *World Bank Economic Review* November:1–22.
- Burnside, C., M. Eichenbaum, and S. Rebelo. 2001. "Prospective Deficits and the Asian Currency Crisis." *Journal of Political Economy* 109(6):1155–97.
- . 2001. "Hedging and Financial Fragility in Fixed Exchange Rate Regimes." *European Economic Review* 45:1151–94.
- . 2002. "Prospective Deficits and the Asian Currency Crises." *Journal of Political Economy*. Forthcoming.
- Celasun, O., X. Debrun, and J. D. Ostry. 2006. Primary Surplus Behavior and Risks to Fiscal Sustainability in Emerging Market Countries: A "Fan-Chart" Approach. IMF Working Paper 06/67, International Monetary Fund, Washington, DC.
- Coady, D., M. El-Said, R. Gillingham, K. Kpodar, P. Medas, and D. Newhouse. 2006. The Magnitude and Distribution of Fuel Subsidies: Evidence from Bolivia, Ghana, Jordan, Mali, and Sri Lanka. IMF Working Paper 06/247, International Monetary Fund, Washington, DC.
- Davis, S. J., and J. Haltiwanger. 2001. "Sectoral Job Creation and Destruction Responses to Oil Price Changes." *Journal of Monetary Economics* 48:465–512.
- Economic Intelligence Unit. 2008a. Hong Kong Country Report. Available: www.eiu.com/report_dl.asp?issue_id=203854405&mode=pdf, downloaded 28 October.
- . 2008b. Kazakhstan Country Report. Available: www.eiu.com/report_dl.asp?issue_id=1613819946&mode=pdf&rf=0, downloaded 28 October.
- . 2008c. Papua New Guinea Country Report. Available: www.eiu.com/report_dl.asp?issue_id=1063876491&mode=pdf, downloaded 28 October.
- . 2008d. Uzbekistan Country Report. Available: www.eiu.com/report_dl.asp?issue_id=1703836555&mode=pdf, downloaded 28 October.
- Fischer, S., and W. Easterly. 1990. "Economics of the Government Budget Constraint." *World Bank Research Observer* 5(2):127–42.
- Hamilton, J. D. 2003. "What is an Oil Shock?" *Journal of Econometrics* 113:363–98.
- Hostland, D., and P. Karam. 2006. Assessing Debt Sustainability in Emerging Market Economies Using Stochastic Simulation Methods. World Bank Policy Research Working Paper WPS3821, Washington, DC.
- IMF. 2002. *Assessing Sustainability*. International Monetary Fund, Washington DC. Available: www.imf.org/external/np/pdr/sus/2002/eng/052802.pdf.
- . 2008a. *Food and Fuel Prices—Recent Developments, Macroeconomic Impact, and Policy Responses: An Update*. Washington DC. Available: www.imf.org/external/np/pp/eng/2008/091908.pdf.
- . 2008b. *Fuel and Food Price Subsidies: Issues and Reform Options*. Washington DC. Available: www.imf.org/external/np/pp/eng/2008/090808a.pdf.

- . 2008c. Staff Guidance Note on Debt Sustainability Analysis for Market Access Countries, Washington, DC. Available: www.imf.org/external/np/pp/eng/2008/070308a.pdf.
- . 2008d. Fiscal Risks—Sources, Disclosure, and Management. Washington DC. Available: www.imf.org/external/np/pp/eng/2008/052108.pdf.
- . 2008e. Bangladesh Country Report No. 08/334. Available: www.imf.org/external/pubs/cat/longres.cfm?sk=22419.0, downloaded 28 October.
- . 2008f. Mongolia Country Report No. 08/201. Available: www.imf.org/external/pubs/cat/longres.cfm?sk=22110.0, downloaded 28 October.
- . 2008g. Nepal Country Report No. 08/182. Available: www.imf.org/external/pubs/cat/longres.cfm?sk=22040.0, downloaded 28 October.
- . 2008h. Cambodia Country Report No. 07/291. Available: www.imf.org/external/pubs/cat/longres.cfm?sk=21284.0, downloaded 28 October.
- . 2008i. Lao Country Report No. 08/340. Available: www.imf.org/external/pubs/cat/longres.cfm?sk=22425.0, downloaded 28 October.
- . 2008j. Viet Nam Country Report No. 07/386. Available: www.imf.org/external/pubs/cat/longres.cfm?sk=21515.0, downloaded 28 October.
- Keane, M. P., and E. Prasad. 1996. “The Employment and Wage Effects of Oil Price Changes: A Sectoral Analysis.” *Review of Economics and Statistics* 78:389–400.
- Kharas, H., and D. Mishra. 2001. “Fiscal Policy, Hidden Deficits and Currency Crises.” In S. Devarajan, F. H. Rogers, and L. Squire, eds., *World Bank Economists Forum*. World Bank, Washington, DC.
- Kilian, L., A. Rebucci, and N. Spatafora. 2009. “Oil Shocks and External Balances.” *Journal of International Economics*. Forthcoming.
- Macalister, T., and G. Monbiot. 2008. “Global Oil Supply will Peak in 2020, Says Energy Agency.” Available: www.guardian.co.uk/business/2008/dec/15/global-oil-supply-peak-2020-prediction.
- Maldives Monetary Authority. 2008 Monthly Statistical Reports. Available: www.mma.gov.mv/, downloaded 26 November.
- Milesi-Ferretti, G.M. 2000. Good, Bad or Ugly: On the Effects of Fiscal Rules with Creative Accounting. IMF Working Paper WP/00/172, International Monetary Fund, Washington, DC.
- National Bureau of Statistics of China. 2008. *China Statistical Yearbook 2007*. Available: www.stats.gov.cn/tjsj/ndsj/2007/indexeh.htm, downloaded 26 November.
- Poterba, J. M. 1996. Do Budget Rules Work? National Bureau of Economic Research, Working Paper 5550. In A. Auerbach, ed. 2007. *Fiscal Policy: Lessons from Empirical Research*. Cambridge: MIT Press.
- The Guardian*. 2008. “Global Oil Supply will Peak in 2020, Says Energy Agency.” Available: www.guardian.co.uk/business/2008/dec/15/global-oil-supply-peak-2020-prediction.
- Tirole, J. 2002. *Financial Crises, Liquidity, and the International Monetary System*. New Jersey: Princeton University Press.
- World Bank. 2008. *The Challenges of High Food and Fuel Prices, Poverty Reduction and Economic Management Network*. Washington, DC.

About the Paper

Shikha Jha, Pilipinas Quising, and Shiela Camingue find, based on repeated surveys of local fuel prices in 32 Asian economies, that governments curtailed world price transmission to domestic markets to shield consumers from rising global oil prices in 2008. Simulations using their estimates of oil price subsidies show that countries with fiscal surpluses or with higher price transmission would be in a better fiscal position to respond to steep rises in oil prices. Higher public spending and interest rate reduction to revive growth under a prolonged economic slowdown would raise debt vulnerability especially in countries with fiscal deficits or oil price controls.

About the Asian Development Bank

ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries substantially reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to two thirds of the world's poor: 1.8 billion people who live on less than \$2 a day, with 903 million struggling on less than \$1.25 a day. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

Asian Development Bank
6 ADB Avenue, Mandaluyong City
1550 Metro Manila, Philippines
www.adb.org/economics
ISSN: 1655-5252
Publication Stock No.:

Printed in the Philippines