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## Post-GFC External Shocks and Indonesian Economic Performance

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**Prayudhi Azwar**

Business School, University of Western Australia and  
Bank Indonesia

**Rod Tyers**

Business School, University of Western Australia  
Research School of Economics, ANU and  
Centre for Applied Macroeconomic Analysis, ANU

### Abstract

The post-GFC era sees slower global growth and a substantial Chinese slowdown, unusually combined with lower investment financing costs, and with the eventual prospect of a US-led re-tightening of global financial markets. For Indonesia in the medium term, these developments imply a slowing of export growth and a temporary surge in net inward investment incentives. These changes are examined here using a numerical macro model. The results suggest that recent fiscal reform is long-run beneficial and that it will moderate the negative effects of expectations linked to these global events, the formation of which is shown to be an important determinant of performance. Finally, a sensitivity analysis is conducted, mainly on parameters indicating Indonesian openness to trade and finance. Liberal product markets and home investment are shown to offer unambiguous gains in the face of negative external shocks, while openness to external financial flows does not.

**Keywords**

Indonesia, External shocks, Exchange rates, Macroeconomic policy

**JEL Classification**

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**Address for correspondence:**

(E) [cama.admin@anu.edu.au](mailto:cama.admin@anu.edu.au)

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# **Post-GFC External Shocks and Indonesian Economic Performance\* \*\***

Prayudhi AZWAR

Business School  
University of Western Australia and  
Bank Indonesia\*\*

Rod TYERS

Business School  
University of Western Australia  
Research School of Economics and  
Centre for Applied Macroeconomic Analysis (CAMA)  
Crawford School of Government  
Australian National University

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Author best contact details:

Rod Tyers, M251, UWA Business School  
Crawley, WA 6009, Australia  
[rod.tyers@uwa.edu.au](mailto:rod.tyers@uwa.edu.au)

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\*\* The analysis and conclusions expressed here are those of the authors and do not necessarily represent those of Bank Indonesia.

# **Post-GFC External Shocks and Indonesian Economic Performance**

## **Abstract**

The post-GFC era sees slower global growth and a substantial Chinese slowdown, unusually combined with lower investment financing costs, and with the eventual prospect of a US-led re-tightening of global financial markets. For Indonesia in the medium term, these developments imply a slowing of export growth and a temporary surge in net inward investment incentives. These changes are examined here using a numerical macro model. The results suggest that recent fiscal reform is long-run beneficial and that it will moderate the negative effects of expectations linked to these global events, the formation of which is shown to be an important determinant of performance. Finally, a sensitivity analysis is conducted, mainly on parameters indicating Indonesian openness to trade and finance. Liberal product markets and home investment are shown to offer unambiguous gains in the face of negative external shocks, while openness to external financial flows does not.

## **1 Introduction**

The global recovery from the GFC in the advanced economies was initially driven by fiscal policy, yet rising sovereign debt forestalled this. This was problematic because conventional monetary policy had been disabled as short maturity bond yields approached zero in the US, the UK, Europe and Japan. Unconventional monetary policy then emerged in a manner that proved advantageous to the US, which has enjoyed an employment-led, recovery.

Internationally, however, it has had the effect of substantially reducing yields on long maturity returning assets. Combined with what is at least the perception that new capital formation is increasingly risky, this has stifled global investment and growth. While real wages have stagnated in the advanced economies, low yields have seen relative asset price inflation, exacerbating the global trend toward inequality. And this has tended to destabilize democracies in the advanced economies, fostering political suspicion of “economically rational”, integrative, economic policies.

Separate but related developments that have contributed to global financial volatility include the slowing of the Chinese economy, political tensions between the West and Russia that have contributed to the global glut of some key commodities and Middle Eastern conflicts that have undermined OPEC control of petroleum prices, leading also to a global glut of both petroleum and natural gas. The effects of these developments have been to sustain and extend the long period of excess liquidity associated with continuing unconventional

monetary policy, keeping the external opportunity cost of investing in Indonesia low. While this has been advantageous, its effects on Indonesian investment may have been tempered by the public desire of the US Federal Reserve to “normalize” monetary policy, and raise both short and long maturity yields notwithstanding the low yield environments elsewhere in the world (Arteta et al. 2015). External shocks emanating from these events include low foreign yields, and therefore increased incentives to finance Indonesian investment from abroad, and reduced export demand due to commodity gluts, including declines in exports of coal to China and of palm oil to China and Europe. At the same time the prospect of the eventual “normalization” of US monetary policy leaves open the prospect of a reversal of these financial flows and a real depreciation relative to the US.

For Indonesia, the management of these effects has been complicated by the need for domestic reforms that reduce fuel and food subsidies as well as trade distortions while at the same time increasing public infrastructure investments.<sup>1</sup> Progress is being made on these reforms but they are politically difficult because, while they offer long term gains, they are contractionary in the short run.<sup>2</sup> Here, an elemental macro model is used to assess the effects of post-GFC external shocks, combined with these reforms, along with expectations that are formed based on near-term global liquidity and slowing exports on the one hand and longer-term global financial tightening on the other. A subsequent sensitivity analysis indicates that liberal and globally integrated product markets offer unambiguous improvements in Indonesia’s performance in the face of such net negative external shocks.

A summary of the main global developments in the post-GFC era is presented in Section 2. In section 3 a numerical model representing Indonesia’s economy in 2014 is presented and, in Section 4, this model is used to analyse the long run effects of domestic fiscal reform. Section 5 then employs the same model to examine the short run consequences of prospective external shocks, including the extent to which domestic reform helps to achieve better performance outcomes and the roles of expectations. Section 6 offers the sensitivity analysis and Section 7 concludes.

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<sup>1</sup> See Hill (2002), Patunru and Tarsidin (2012), and Patunru and Rahardja (2015).

<sup>2</sup> See Azwar and Tyers (2015).

## **2. Post-GFC Global Developments and Impending External Shocks**

Global economic developments since the GFC have significant implications for transitional economies like that of Indonesia. These are assessed in detail in recent reports by the IMF, the World Bank and the OECD, along with a number of scholarly publications. The results are briefly reviewed here.

### **2.1 Slowdown in Global Growth**

The IMF (2016) expresses concern that the trend to slower global growth has persisted for too long. They point to the recent softening of activity in advanced economies, global financial volatility and particular stresses in key emerging markets. China's transition to consumption led growth, and the associated, disorderly, slowing of its economy is given particular attention. This is a partial explanation of lower commodity prices that have been disruptive in most of the developing world. They identify three transitions influencing the global outlook: 1) China's slowing and rebalancing, 2) lower commodity prices, and 3) an anticipated tightening of US monetary policy, in its bid to restore conventional monetary policy operations, while other major central banks are taking the opposite stance. To this is added concern about financial market volatility, which is presumed to be associated with rising aversion to financial risks as suggested by the upward trend of private relative to public credit spreads and historically low (and even negative) yields on (safe-haven) sovereign bonds.

The IMF assesses these risks as requiring the following remedies. In the advanced economies they advocate efficiency-enhancing structural reforms, continued monetary expansion and "growth-friendly" fiscal adjustment with stimulation where "fiscal space" allows. In the emerging markets and developing economies they advocate the reduction of macroeconomic and financial vulnerabilities and productivity-enhancing microeconomic reforms.

At the same time the World Bank (2016), while expressing equivalent concerns, offers more detail on the performance of developing countries during this slowdown. In particular, commodity exporters have been under particular pressure, while commodity importers have not only been gainers in terms of the growth in, and accommodation of, domestic demand but have, on average, taken the opportunity to build resiliency. Overall, however, the picture described is grim. It includes the advanced economy slowdown, the more sudden slowing of key emerging market economies, geopolitical tensions, weakened confidence in the policies

seen as driving growth and the erosion of resilience in the form of “policy buffers” in many developing countries. Key indicators of trouble are global trade growth reaching a post-GFC low in 2015 and global investment continuing to fall, along with slower economic integration by supply chains and stagnating trade liberalisation. They see little scope for traditional remedies in the form of monetary and fiscal stimulus but, like the IMF, they advocate efficiency-enhancing structural reforms in all economies.

The OECD (2016) expresses concerns that overlap with those indicated by the IMF and the World Bank. They refer to “cycles of forecast optimism followed by disappointment” and a “low growth trap” in which businesses show pessimism about future growth and so have little incentive to build capital. Moreover, the quality of governance has declined so much that growth-enhancing structural reforms are stalled.

## **2.2 Low Petroleum and other Commodity Prices**

Average petroleum prices fell by half in 2015, relative to 2014, and this was accompanied by correspondingly large declines in other commodity prices, including coal and palm oil, as shown in Figure 1.

The IMF (2016) examines the implications of these market changes using an analytical, global model. They identify three possible explanations for the change and simulate their effects. These include rising global supply, anticipated long run slackness in global demand and energy saving technologies. The supply increase, by itself, is found to be positive for global GDP, while the demand contractions, and particularly the component driven by negative expectations, are shown to reduce global activity, sufficient to outweigh the supply side gain.

## **2.3 A US Return to Conventional Monetary Policy**

Both the IMF (2016) and the World Bank (2016) see the US plan to return to conventional monetary policy as negative for developing and transitional economies. Some indication of the likely consequences is evident from the global response to the 2013 US declaration of its intention to “taper” acquisitions under QE3. This “taper tantrum” saw a substantial sell-off of US Treasury long term bonds and a rise in their yields and it has been the subject of a scholarly literature. Sahay et al. (2014) find that the impacts were largest when the plan to taper was first broached publicly. Effects on financial stability in emerging markets are seen as considerable. At the same time those vulnerable emerging economies that acted early and

decisively tended to be less affected in the end. The case is made for more careful announcements and more readiness on the part of the IMF to support countries that are adversely affected by sudden yield rises.

Aizenman, Binici and Hutchison (2014) take a similar view of the taper tantrum, adding that emerging economies with comparatively advanced and open financial markets seemed to be affected most. They examine the effects on exchange rates, asset prices and private-public bond spreads, finding that the most challenged economies were more insulated by their lack of financial development. Dahlhaus and Vasishtha (2014) offer similar findings, quantifying the effects of a 120 basis point rise in US short yields as yielding an initial rise in international financial flows but a decline by 1.2 per cent of GDP at three months post announcement and 1.8 per cent of GDP after one year. Diez (2014) examines the effects of the taper announcement on seven emerging markets: Brazil, China, India, Indonesia, Russia, South Africa, and Turkey. Early warning signals of a possible crisis are seen as a sudden fall in a country's exchange rate and a decline in its official foreign reserves. No strong evidence predicting a crisis in the near future emerges.

Eichengreen and Gupta (2014) focus on the countries most affected by the “taper talk”. They find that the emerging economies that had experienced appreciating real exchange rates and growing current account deficits during the years of US QE suffered the sharpest impacts. Consistent with the results from Aizenman et al. (2014), the most important determinant of differential impact proved to be the size of a country's financial market. Countries with more developed and more open financial markets had larger real depreciations, foreign reserve reductions and equity price falls, along with widening current account deficits. Clearly, the more developed and more liquid are domestic financial markets the more responsive are domestic investors, who are then better able to rebalance their portfolios in response to yield signals. Similar conclusions are drawn by Rai and Suchanek (2014) who also note that the emerging economies with less capital account openness had more favourable responses to taper talk, but this result diminished in subsequent tapering announcements, suggesting delayed responses under capital restrictions and the trend toward capital account openness in these countries.

## **2.4 Synthesizing Potential External Shocks**

Along with the global stagnation that continues in the near term, real long bond yields are historically low and show signs of continuing to decline, notwithstanding the short-lived rise



in 2013 due to the “taper tantrum” discussed previously. The longer term pattern is clear from Figure 2. The cost of external financing in Indonesia can therefore be expected to decline further in the short run, so the initial financial shock should incorporate a decline in the opportunity cost of investing in Indonesia. The scale of any prospective shock is speculative. For purposes of illustration we settle on a central shock constituting a decline by a tenth of the 2014 yield, though we undertake sensitivity analysis on this in Section 6.

The prospect of slowing growth, particularly in the advanced economies, suggests slowing export demand facing emerging economies. Relative to their generally more rapid underlying steady state growth paths, this implies declining relative export demand. In the comparative static framework that is the focus of the next section, this implies a negative shock to export demand. The scale of this decline is speculative but could be of the order of the difference between the average growth rate of Indonesia and that of the advanced economies, or about four per cent. On top of this, the export demand shift facing Indonesia will be affected by the relative decline in commodity prices. Since its exports depend on energy markets (coal and petroleum) and energy-linked markets (palm oil), the prospective cut in export demand can be expected to be larger, say five per cent. That this is a conservative estimate of the shock is suggested by the pattern of real GDP and real export growth as indicated in Figure 3. This shows a gulf of four percentage points per year opening between GDP and export growth between 2010 and 2014, while, as Figure 1 shows, the major commodity price declines did not emerge until the second half of 2014, further deteriorating thereafter.

This combination of a decline in export demand with a decline in real foreign yields might be considered a near-term scenario. Beyond this, however, there is always the expectation that the US, and eventually the other advanced economies, will return to conventional monetary policy. To represent this, then, we construct a long term scenario with some global financial tightening, on the basis of which expectational shocks can be formed from which short run effects might be gleaned using the numerical model.

## **2.5 The Role of Domestic Reforms**

There are numerous post-GFC developments in the Indonesian economy. Of particular relevance is the reform of domestic consumption subsidies, which was implemented in 2015 and which has significantly reduced the associated fiscal burden. The scale of these reductions to consumption subsidies is evident from Table 1. The energy subsidy component

of the budget was reduced by 70 per cent, bringing down overall consumption subsidies by 17 per cent of the budget. This meant a decline in those subsidies from 4.8 per cent to 1.8 per cent of GDP. As Table 2 shows, while considerable subsidies remain, particularly on food consumption and fertilizer use, their collective scale is comparatively small.

In controlling the size of Indonesia's budget as a proportion of GDP and reducing the incentive distortions associated with these subsidies, the government has expanded its "fiscal space" in such a way as to improve its resilience in the face of further external shocks. The additional fiscal space is particularly favourable (Huidrom et al. 2016) in that fiscal multipliers depend on fiscal positions: they are larger when government debt and deficits are low.

Of course other policy reforms were stimulated by the experiences of the AFC and the GFC. One change of particular importance was the abandonment of the exchange rate peg and the adoption of a floating rate regime after the AFC. Initially this resulted in the overshooting of the associated currency depreciation, due to the prior foreign exchange market distortion and the absence of hedging by key portfolio managers. Many firms were rendered insolvent (Stiglitz and Greenwald 2003) contributing to the deep post-AFC recession. During the GFC, however, the floating exchange rate regime supplied a buffer against the external shock. This, in combination with a leaner fiscal position post-2015, might therefore be expected to improve the country's resilience in the face of post-GFC external shocks.

### **3. Modelling External Shocks and Domestic Reforms**

An elemental comparative static framework is adopted that is calibrated to national accounts data for Indonesia in 2014. It incorporates the markets for two products (differentiated home and foreign goods) and three primary factors (production labour, skill and capital). To represent policy reforms, taxes are included on labour income, capital income, consumption expenditure, imports and exports. Emphasis is placed on single year responses to a combination of underlying growth shocks, external shocks and policy changes. The growth shocks incorporate changes in labour and skill supply as well as in capital use, solved iteratively for consistency with real net investment. The simulated economy is not in a steady state and so the expected rates of return that drive investment need not equal the real equilibrium rates of return on installed capital in the simulated financial market.

Expectational variables are included with expectations formed based on separate, longer run simulations, as explained in Section 4.

### 3.1 The supply side

Output is assumed to be Cobb-Douglas in the three primary factors, so that the production of local “corn” and the local marginal product of capital are:

$$(1) \quad y = A L^{\beta_L} S_K^{\beta_S} K^{\beta_K} \text{ where } \beta_L + \beta_S + \beta_K = 1$$

$$(2) \quad MP_K = \beta_K \frac{y}{K} = \left[ A \beta_K S_K^{\beta_S} K^{\beta_K-1} \right] L^{\beta_L}$$

The rate of return on installed capital is then the ratio of the value of the marginal product of capital and the price of capital goods, net of depreciation. If the producer price level is  $P_P$  and  $P_K$  is the price of capital goods, the ratio of these can be applied to (2) to obtain a gross rate of return. But, since only a single home good is modelled, the latter is related to the producer price level via an exogenous constant:  $P_K = \theta P_P$ , which can be shocked to represent differences in the trend of capital and final goods.

$$(3) \quad r_c = \frac{P_P MP_K}{P_K} - \delta = \theta MP_K - \delta,$$

where  $\delta$  is the depreciation rate. Recall, from above, that the simulated economy is not in a steady state and so, in general, this net return does not equal the real return the collective home portfolio,  $r$ , so  $r_c \neq r$ .

The product real wages of low-skill workers depend on the corresponding marginal products.

$$(4) \quad w = \frac{W}{P_P} = MP_L = \beta_L \frac{y}{L},$$

where the real production wage is  $w$ , the nominal wage is  $W$  and  $P_P$  is again the producer price level. In the short run, the nominal wage is assumed fixed. Importantly, if monetary policy targets the producer price level, or its inflation rate, to stabilise the real production wage and hence employment, this implies that both sides of (4) are constant and that employment and output expand at the same rates. There is a corresponding relationship for skill, though the skilled wage is assumed to be flexible in the short run.

$$(5) \quad w_s = \frac{W_s}{P_P} = MP_{S_K} = \beta_S \frac{y}{S_K}$$

The unemployment rate is calculated for all workers, where the labour force is  $F$ .

$$(6) \quad u = \frac{F - S_K - L}{F}$$

### 3.2 The demand side:

Both direct and indirect tax revenues,  $T^D$  and  $T^I$ , play key roles in the formulation. Nominal GDP at factor cost (or producer prices),  $Y^{FC}$ , is the total of direct payments to the collective household in return for the use of its factors. Nominal GDP is then

$$(7) \quad Y = Y^{FC} + T^I, \quad Y^{FC} = C + T^D + S^P.$$

This is the standard disposal identity for GDP, or the collective household budget, where  $C$  is the total value of final consumption expenditure, including indirect taxes paid, and  $S^P$  is private saving. The GDP price,  $P_Y$ , and the producer price,  $P_P$ , would be the same were it not for indirect taxes. In their presence we have:

$$(8) \quad Y = P_Y Y = Y^{FC} + T^I = P_P Y + T^I, \text{ so that } \frac{P_Y}{P_P} = 1 + \frac{T^I}{Y}.$$

Conventionally, overall balance on expenditure is constrained by:

$$(9) \quad Y = C + I + G + X - M,$$

where all upper case characters signify measurement in currency, in this case billion Rupiah.  $I$  is expenditure on investment,  $G$  is government spending on goods and services (net of transfers),  $X$  is export revenue (including export tax revenue) and  $M$  is the landed cost of imports (pre-tariff) in domestic currency.

*Income tax:* A constant marginal direct tax rate,  $t_W$ , is assumed to apply to all labour income, while the marginal tax rate on capital income is  $t_K$ . The corresponding “powers” of these rates are  $\tau_W = (1 + t_W)$  and  $\tau_K = (1 + t_K)$  and these appear in the coding of the model. There is no distinction between home “corn” and capital goods, so the capital goods price is  $P_P$ .

$$(10) \quad T_Y = t_W (WL + W_S S_K) + t_K r_C P_P K$$

Note that capital income is taxed based on its actual net (of depreciation) rate of return,  $r_C$ , rather than the market interest rate,  $r$ .

*Consumption:* Aggregate consumption, here volume  $c$ , corresponding with expenditure  $C$ , depends negatively on the real after-tax return on savings and positively on disposable money

income. This is nominal GDP,  $Y = P_Y y$ , combined with net factor income from abroad, less direct tax:

$$(11) \quad Y_D = Y + \frac{N}{E} - T_Y,$$

where  $N$  is nominal net factor income from abroad, which is set as constant in foreign currency and  $E$  is the nominal exchange rate in foreign currency per unit of home currency. Real consumption volume,  $c$ , depends positively on the present and expected future levels of disposable income,  $Y_D$  and  $Y_D^e$ , deflated by the consumer price, which depends as indicated below on the home producer price and the import price, marked up by the consumption tax.

$$(12) \quad c = \frac{C}{P_C} = A^C \left( \frac{r}{\tau_C} \right)^{-\tau_{CR}} \left( \frac{Y_D}{P_C} \right)^{\tau_{CY}} \left( \frac{Y_D^e}{P_C [1 + \tau_C e]} \right)^{\tau_{CY}}.$$

To capture the home household's substitution between home "corn", which it consumes in volume  $c_H$ , and foreign "corn", consumed as imports the real volume of which is  $m$ , aggregate consumption is a CES composite of the two:

$$(13) \quad c = \left( \alpha_H c_H^{-\rho} + \alpha_M m^{-\rho} \right)^{-\frac{1}{\rho}}$$

The home household then solves the following problem: for given aggregate consumption,  $C$ , above, choose  $C_H$  and  $m$  to minimise consumption expenditure:

$$(14) \quad P_C C = P_P (1 + \tau_C) c_H + \frac{P^*}{E} (1 + \tau_M) m = P_P \tau_C c_H + \frac{P^*}{E} \tau_M m$$

To obtain the prices home consumers actually face, here the volumes,  $c_H$  and  $m$ , are each multiplied by their respective domestic prices as augmented by the "powers" of the consumption tax and the import tariff,  $\tau_C$  and  $\tau_M$ .  $P^*$  is the foreign currency denominated price of foreign "corn" before any import tariff is paid and  $E$  is the nominal exchange rate in foreign per unit of home currency.

Optimum consumption yields an elasticity of substitution between home "corn" and imports of  $\alpha = 1/(1 + \rho)$  and the initial expenditure shares of each in the composite of consumption are  $s_H = \alpha_H^\alpha$  and  $1 - s_H = \alpha_M^\alpha$ . The volumes of the two "corn" varieties consumed then depend on the "powers" of the consumption tax and import tariff and the prices:

$$(15) \quad c_H = s_H c \left[ \frac{P \tau_C}{P_C} \right]^{-\alpha}, \quad m = (1 - s_H) c \left[ \frac{\frac{P^*}{E} \tau_M \tau_C}{P_C} \right]^{-\alpha}$$

Given these consumption volumes, the composite price of all consumption emerges from the combination of (12), (13) and (14) as:

$$(16) \quad P_C = \tau_C \left[ \alpha_H^\alpha P_P^{1-\alpha} + \alpha_M^\alpha \left\{ \frac{P^*}{E} \tau_M \right\}^{1-\alpha} \right]^{\frac{1}{1-\alpha}}$$

*Private savings:* This is the residual after direct tax and consumption (gross of consumption tax) are deducted from the nominal value of GNP, which includes both nominal GDP =  $y P_Y$  and net factor income from abroad,  $N$ , set as constant in foreign currency. We can also expand the final term by substituting from (13), above:

$$(17) \quad S^P = P_Y y + \frac{N}{E} - T_Y - P_C C = P_Y y + \frac{N}{E} - T_Y - P_P \tau_C C_H - \frac{P^*}{E} \tau_M \tau_C M$$

*Indirect tax revenue:* This includes that from import and export taxes:

$$(18) \quad T_M = t \frac{P^*}{E} M = (\tau_M - 1) \frac{P^*}{E} M, \quad T_X = t \frac{P}{X} X = (\tau_X - 1) \frac{P}{X} X.$$

and from consumption tax, which is levied on both home goods and imports:

$$(19) \quad T_C = t \frac{P}{C} C + t \frac{P^*}{E} (1 + t) M = (\tau_C - 1) \frac{P}{C} C + (\tau_C - 1) \frac{P^*}{E} \tau_M M.$$

*Government (+central bank) revenue:* This is government revenue less the sum of government expenditure and the annual increment to the holdings of official foreign reserves. So the dollar value of government savings is then:

$$(20) \quad S^G = T_Y + T_C + T_M + T_X - P_G - \Delta R.$$

To simplify the demand side, government spending is assumed to be directed only at home goods free of consumption tax, whose home price is  $P_P$ .

*Domestic savings:* This is then the (value) sum of private and government savings in the home economy.

$$(21) \quad S^D = S^P + S^G$$

*Capital and financial account flows:* On the inflow side, these are associated with acquisitions of home assets by foreigners, while on the outflow side, they represent acquisitions of foreign assets by home residents. These flows are assumed to depend on the extent of the departure from uncovered interest parity, which links the yield from the home collective portfolio to the yield required by those abroad to invest in the home economy. This link is based on changes in a parity ratio that depends on the after tax yield on the home collective portfolio,  $r$  and the expected rate of return on foreign assets, which in turn depends on the current real yield abroad,  $r^*$ , a risk premium,  $\rho$ , and the expected rate of change in the real exchange rate,  $e^e$ :

$$(22) \quad \lambda = \frac{r(1-t^K)}{r^* + \rho + e^e}.$$

Home to foreign flows,  $S_{HF}$ , and foreign to home flows,  $S_{FH}$ , are then:

$$(23) \quad S_{HF} = S_D \varphi \begin{pmatrix} \lambda_0 \\ \lambda \end{pmatrix}^{\alpha_H}, \quad S_{FH} = S_{FH}^0 \begin{pmatrix} \lambda \\ \lambda \end{pmatrix}^{\alpha_F},$$

where the subscript 0 refers to initial equilibrium conditions,  $\varphi$  is the initial proportion of home saving that is directed abroad,  $\alpha_H$  is the elasticity of substitution between home and foreign assets, viewed from the home economy, and  $\alpha_F$  is the corresponding elasticity, as viewed from abroad.<sup>3</sup> While we do not distinguish the different propensities for cross border flows that apply to controlling equity and portfolio investments, changes in this composition can be represented via changes to these two elasticities.

*Investment:* This comprises real break-even investment,  $\delta K$ , and *real* net investment,  $i^N$ . Real net investment depends on the (expected) profitability of new physical capital, which depends in turn on the expected value of the net real rate of return on installed capital,  $r_C$ , from (3), compared with its opportunity cost, the real rate of return on the collective home portfolio,  $r$ .<sup>4</sup> The (expected) net return from the last unit of physical capital purchased is larger the larger is the quantity of effective labour to go with it. So the (expected) return from investment in new capital must also be larger the larger is the expected number of effective workers in employment – that is, following technical change or an increase in

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<sup>3</sup> It is assumed that the elasticity viewed from home is smaller given the comparatively idiosyncratic nature of home assets and investors and of home capital market distortions.

<sup>4</sup> Note that the equilibrium real yield from the home portfolio is influenced by the risk premium imposed by financial investors, via (21) and (22).

employment.<sup>5</sup> Here this determines real net investment via a Q-style ratio,  $\gamma$ , in which the numerator reflects the current value of new capital (determined by the expected future net rate of return) and the denominator its current financing cost (determined by the current portfolio yield).

$$(24) \quad i = i^N + \delta K = i_0^N \left[ \frac{\gamma}{\gamma_0} \right]^\phi + \delta K, \quad \gamma = \left( \frac{r^e}{r} \right),$$

where  $\phi$  is an elasticity of response to changes in the ratio.

*Financing domestic investment:* This is financed from domestic savings and net foreign savings. Nominal expenditure on investment is  $I$ :

$$(25) \quad I = P_K i = \theta P_p i = S^D + S^{FH} - S^{HF}.$$

*Real exchange rate:* This is defined as the ratio of the home currency price of home “corn” to the (before import tax) home currency price of foreign corn:

$$(26) \quad e = \frac{P_Y}{\left( \frac{P^*}{E} \right)} = E \frac{P_Y}{P^*} \quad (E \text{ in foreign per unit of home currency}).$$

*Exports:* The quantity of home “corn” demanded by foreigners is  $x$  while its nominal value is  $X$ . These depend negatively on the (after export tax) foreign currency price of home “corn” relative to the foreign currency price of foreign corn:

$$(27) \quad x = a_X - b_X \left[ \frac{EP_Y(1+t_X)}{P^*} \right] = a_X - b_X e_R (1+t_X) = a_X - b_X e_R \tau_X, \quad X = x P_p \tau_X.$$

*Imports:* The quantity of foreign “corn” demanded by home consumers is  $m$ , from (14), while its nominal value is  $M$ , which is the landed value of imports and so excludes tariff and consumption taxes.

$$(28) \quad M = \frac{P^*}{E} m.$$

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<sup>5</sup> To allow the expected net return on installed capital to be fixed exogenously (for example, reflecting a change in expectations not determined within the model) we add a slack variable, so  $r_c^e = r_c \cdot RCSLK$ . If expectations require an exogenous shock to the expected net return on installed capital,  $RCSLK$  is made endogenous and the link between the net returns in the current and future periods is severed. If, on the other hand, the current and expected future net returns are to be the same, then  $RCSLK$  is made exogenous and set to unity.



*The balance of payments:* This sets private and public net inflows on the capital account,  $KA$ , equal to net outflows on the current account (the current account deficit  $-CA$ ). Note that inflows on the current account associated with exports incorporate export tax revenue since foreigners pay the export tax, at rate  $t_X$  or with power  $\tau_X$ . Import tax revenue does not appear, since this is a transfer between the domestic household and the government. Current account inflows also include net factor income from abroad,  $N$ , which is held constant in foreign currency.

$$(29) \quad KA = S^{FH} - S^{HF} - \Delta R = -CA = M - X - \frac{N}{E}$$

*The money market (LM equation):* These offer a textbook characterisation of the home money market, with transactions demand for home money driven by GDP and the opportunity cost of holding home money set at the nominal yield on the home portfolio (long maturity, since the aggregate portfolio comprises mainly long term assets), which is the real yield plus the expected inflation rate,  $\pi^e$ . The short interest rate determines the monetary base,  $M_B$ , with the monetary base the active monetary policy variable and so short yields are in the background here. The money supply and the monetary base are linked by an exogenous money multiplier,  $\mu$ . Real money balances ( $m^D = m^S$ ) are measured in terms of purchasing power over home “corn”.

$$(30) \quad m^D = a^{MD} (y)^{\frac{1}{\tau}} \left( \frac{r(1 + \pi^e)}{\tau^k} \right)^{-\frac{1}{\tau} \tau^{MR}} = m^S = \frac{M^S}{P} = \frac{\mu M_B}{P}$$

### 3.3 Policy Responses and Closures

As the model analytics indicate, a variety of macroeconomic closures and policies instruments are incorporated and these are all available to construct representative responses to external and internal shocks. They are detailed in Table 3.

Model closures indicate assumptions about the behaviour of labour markets and fiscal policy as well as the choice of monetary policy targets. They indicate which variables are to be held as exogenous in any model solution. In the case of the labour market, for example, short run solutions most appropriately hold the nominal unskilled wage as exogenous and allow employment to be determined endogenously. Long run solutions, on the other hand, best assume that labour markets clear and so the nominal unskilled wage is endogenous instead. The alternatives are detailed in Table 4.

### 3.4 Model databases and operation

The model database is built on national accounts as well as international trade and financial data for the Indonesian economy in 2014. The numbers used and this compilation are detailed in the Appendix.

## 4. Long Run Analysis of Indonesian Reform

This section quantifies the effects of a stylised reduction in consumption subsidies. The numerical model introduced in the previous section is used to examine these reform shocks, commencing from a steady state growth path that has the underlying properties indicated in Table 5.

The approach taken is to apply these short run shocks to the numerical model and allow the model to determine the level of real investment net of depreciation. The level of real net investment is then used to establish the associated growth rate of the capital stock. This and the rates listed in Table 5 are then used to construct 10-year growth paths for these variables, which are used to shock the model forward to 2024. This then represents a baseline projection against which the long run effects of policy and other shocks can be compared. The advantages of this are twofold. First, the long run effects of policy reforms can be assessed, allowing for subsequent capital accumulation and its effects on growth. Second, it is assumed that long run changes underlie the formation of expectations over the price level, the real exchange rate, the net rate of return on installed capital and the level of nominal, disposable, household income. These expectations are then central to the analysis of the short run effects of prospective external shocks in the next section.

Following the approach detailed in the previous section, the key assumptions about market behaviour in the Indonesian economy over the decade 2014-2024 take the form of closure choices, the full range of which are listed in Table 4. The shocks are further detailed in Table 6, in combination with key elements of the closures chosen. Of particular significance is the choice of the producer price level,  $P_P$ , as the monetary target. This is chosen because the long run shocks tend to depreciate Indonesia's real exchange rate and so tend to be deflationary. Use of the consumer price level,  $P_C$ , as a target would therefore cause producer price deflation and slow modern sector employment growth. Moreover, the reform policy

regime associated with the reduction of consumption subsidies must allow for some temporary inflation of consumer prices to avoid further producer price deflation.

The fiscal policy closure assumption is also important. The reform is assumed not only to reduce consumption distortions but also to restore fiscal balance. In principle, under these assumptions, the level of government expenditure on goods and services,  $G_X$ , could either rise or fall. In this case, the results presented in Table 7 suggest that the overall gains in government revenue, at existing income and trade tax rates, combine with the reduced consumption subsidy expenditures to ensure that fiscal balance occurs with a net *increase* in  $G_X$ .

The net long run effect of the reduction in subsidies is to increase government saving and therefore to put downward pressure on investment financing costs. This steepens the path of capital accumulation and, therefore, of overall economic performance. The new path therefore moderates the growth in the rate of return to capital as well as in capital income while at the same time advantaging workers, whose improved modern sector employment conditions result from the stronger physical capital growth. The losses in skilled labour and capital income in Table 7 represent differences in the growth paths, however, in both of which there are major gains in capital and skilled income through time.

Of course, this is but one source of gains from fiscal reform. Since the model carries only a single domestic product, the associated gains in allocative efficiency are not measured. While these are probably small in association with the reduction in consumption subsidies alone, they would be larger were the reforms to include reductions in trade taxes beyond those represented in the transition from the 2007 to the 2014 databases. All this suggests that the on-going net welfare gains from domestic reforms in Indonesia are underestimated by this approach.

## **5. Analysis of Prospective External Shocks**

This analysis focusses on short run effects. This time, however, the short run shocks incorporate annual growth shocks and so represent movements along, rather than departures from, the long run growth path of the Indonesian economy. Five cases are considered. First, the short run effects of the underlying growth shocks alone are considered. Second, two external shocks are added, namely a decline in export demand and a decline in the external interest rate. These are imposed along with underlying growth rates with iteration to ensure

that the underlying growth rate of the capital stock is consistent with the short run effects on net investment. No changes in prices, incomes or exchange rates are anticipated in this case. Third, expectation shocks are added, based on a long run analysis similar to that of the previous sub-section. Fourth, the anticipation shocks are changed to represent a long run expectation of global financial tightening, though these are imposed along with the short run financial easing and export contraction shocks as previously. Finally, to the fourth simulation is added the effects of fiscal (consumption subsidy) reform.

The details as to how these simulations are constructed are provided in Table 8. Short run shocks to the capital stock are iterated until they are consistent with the model's simulated levels of investment net of depreciation. Expectation shocks play an important role and these are derived by applying the external shocks in long run mode, observing the projected changes in the real exchange rate, the consumer price level, the rate of return on installed capital and the level of nominal disposable income. These observed changes are then annualised to obtain the expectational shocks listed in the table. The monetary target is the producer price level in each case, to ensure that real exchange rate depreciations do not lead to contractionary producer price deflations and to allow the short run effects of consumption subsidy reform to include temporary consumer price inflation. By contrast with the long run analysis of the previous sub-section, the remaining closures are all short-run, by which it is meant that nominal wages of low-skill workers are temporarily rigid and nominal government spending on goods and services is also fixed and the government fiscal position is endogenous. The results from these simulations are summarised in Table 9. Overall economic performance is captured in the form of corresponding annual growth rates of real GDP, real GDP per capita and welfare (the purchasing power of nominal GNP at the domestic consumer price level) that are listed in Table 10.

Because the underlying growth shocks indicate the expansion of the capital stock, the labour force the skilled labour force and total factor productivity while there are no changes in foreign variables to reflect similar changes abroad, the model projects a declining real exchange rate. This means the import component of the consumer price level becomes more expensive and, since monetary policy is assumed to target the producer price level, there is some consumer price inflation. This leads to some erosion of the purchasing power of the unskilled wage, which is assumed to be fixed in nominal terms. Apart from this, the underlying growth shocks show obviously beneficial effects in terms of aggregate output and output per capita. Taking all workers and capital owners collectively, there is also rising

welfare, which is defined here as real purchasing power of domestic income over goods and services at the domestic consumer price level.

When the external shocks are imposed as unanticipated, the positive effects of the reduced external financing costs outweigh the negative effects of reduced export demand. Growth is faster, including of economic welfare per capita. This is primarily because the cheaper capital sees greater net investment and capital growth even though the short run effect of this is a widening current account deficit. When expectations are formed based on the long run analysis of the external shocks, performance is less strong. This is because those expectations are driven primarily by the slower exports and so embody anticipated declines in rates of return on capital and in nominal disposable income, along with an expected increase in inflation.

Next, the expectation shocks are changed to incorporate nothing other than an anticipated (eventual) tightening of global financial markets. Agents no longer expect an export contraction because it is likely that a financial tightening will accompany comparatively strong growth in the US economy and therefore an improvement in Indonesia's exports. But the primary shock is still a short run decline in external financing costs and export revenues, this time with agents anticipating a more depreciated real exchange rate. The expectations shocks, since they are still pessimistic, tend to expand current saving and to shift the current account toward surplus but, alone, they do not act to tighten the current domestic capital market. Overall, the effective anticipation of an eventual restoration of export growth dominates the expectational effects and this simulation delivers higher annual growth in real GDP and real GDP per capita than the case in which expectations are focussed on the nearer term export moderation. The pessimism embodied in both sets of expectation shocks means, however, that neither delivers performance that is as good as that achieved when agents are myopic about prices, exchange rates and nominal incomes.

Finally, the simulation with the anticipation of global financial tightening is combined with the reform of consumption subsidies considered in the previous sub-section. Importantly, this is seen to deliver the best overall performance of all, in terms of real GDP and real GDP per capita. Yet, because the simulation includes temporary inflation, that occurs when consumption subsidies are reduced, there are falls in real purchasing power of national and group incomes. Beyond the initial inflationary effects of this policy reform these effects are expected to fade and the real gains recorded in the simulation to dominate. As before, those real gains stem in this case from the balanced government budget and therefore the

elimination of government borrowing, leading to rising net saving and greater investment and capital growth. This analysis does not capture the allocative gains that would be expected from such reform and so offers an underestimate of the advantages it confers.

## 6. Sensitivity to Shock Sizes and the Role of Openness

The analysis to this point depends on stylised, external shocks and the parameter values embodied in the model. The central external shocks are to the real international cost of long maturity funds,  $r^*$  (Figure 2) and to a slowing in export demand growth, which, as Figure 3 shows, continues to unfold. Taken prospectively, the precise scale of these shocks is uncertain, warranting sensitivity analysis. Key parameters in the model are also uncertain, amongst which those of direct relevance to behaviour in the face of external and policy reform shocks are those that dictate openness to trade and financial flows and the responses of investment and export demand to changes in rates of return on the one hand and the real exchange rate on the other. Variations in these parameters are also examined here with a view not only to assessing robustness of the results in Tables 9 and 10 but also to infer the advantages, if any, that might stem from greater trade and financial openness. In assessing these results it should be borne in mind that the precise simulation under assessment is the combination of shocks and closures listed last in Table 8, namely that which imposes *“external negative shocks to  $r^*$  and  $X$  combined with domestic consumption subsidy reform, and with expectations over prices, exchange rates and incomes consistent with an eventual global financial tightening”*.

### 6.1 Sensitivity to the Scale of the Shocks

By repeating the simulation for different sizes of the shock to  $r^*$  and of that to export demand we obtain the results summarised in Figure 4. This variation tends to yield only small departures from the real GDP growth noted in the last row of Table 10. This stems from the small changes in the growth of the capital stock associated with the shocks and the assumption that monetary policy targets the producer price level, therefore holding fixed the real production wage in the short run. External financial flows and the current account are significantly affected, however, and hence so is the change in GNP. Net welfare, or the real purchasing power of GNP over home goods, then depends on this and the home consumer price level, which is also significantly affected. From the advantageous directions of change are toward a decline in the external cost of funds and smaller export demand contractions.

The cheaper is external financing the greater is net funding from abroad and hence real investment. The additional inflow appreciates the real and nominal exchange rates, however, reducing consumer price inflation and raising home consumption. This limits the tendency for the current account to return to balance but it increases the growth rate of real GDP and moderates the loss of welfare due to inflation. Higher consumption volume, however, combined with the associated fiscal reform shocks and the assumed return to fiscal balance, allows increased government spending. Overall, sensitivity to the size of this shock is significant, though the central value of -10 per cent seems representative.

The shifts to export demand cut against the  $r^*$  shocks. The larger is the contraction the larger is the real depreciation and therefore the greater is the inflation in consumer prices relative to the (targeted) producer price. This has the effect of moderating consumption and raising domestic saving, and therefore raising the current account surplus. Reduced consumption and GNP cuts revenue to the government and, since a restoration of fiscal balance is part of the shocks imposed, there is less room for expanded government expenditure from either the reform shocks or from changes in the broader tax base. The boost in government expenditure the reform provides is therefore smaller the larger is the decline in exports. Overall, these results indicate that the results are quite sensitive to the size of this shock and that the estimates of effects in Tables 9 and 10 may be optimistic if the export moderation is to be more serious than the five per cent assumed.

## **7.2 The Effects of Parameters Driving Economic Openness**

Four key parameters relate to the openness and market responses within and outside the Indonesian economy. First, the more open and lightly regulated are domestic product markets the greater will be the response of exports to the real exchange rate, via (27). Second, openness through trade is also suggested by the elasticity of substitution,  $\sigma$  (15), between home and foreign goods, which indicates preparedness to substitute at the household and firm levels but also the extent to which regulations and infrastructure costs limit competition from foreign products. Third, openness to external financial flows is indicated by the elasticities of response to the uncovered interest parity ratio,  $\sigma_H$  and  $\sigma_F$  (23). And, finally, openness to foreign investment is suggested by the elasticity of net investment to the ratio of the expected net rate of return on domestic installed capital and the home interest rate on long assets,  $\varphi$  (24).

### *The elasticity of export demand*

The of real export demand elasticity implied by the slope  $b_X$  (27), is allowed to vary around its central value of unity, as shown in Figure 5. The more elastic is export demand the more a shift decline in real exports can be offset by a subsequent decline in the export price, or the real exchange rate. The effects are quite non-linear, with an elasticity less than unity causing the shocks would be seriously welfare reducing while larger elasticities cause the effects to be more modest. Aside from the non-linearity, however, the general pattern of sensitivity is the same as for the shift in export demand considered previously, and for the same reasons. The effects of the shocks modelled are therefore considerably more moderate the greater is the openness of domestic markets to export opportunities.

### *Product market integration*

Varying the elasticity of substitution around its central value of  $\sigma=3$  yields the results indicated in Figure 6. Again, the effects on the boost to real GDP arising from the external and reform shocks are small enough to be omitted from the figure. The pattern of other effects is similar to that due to changes in export demand or its elasticity. The more closed are domestic product markets the less responsive is Indonesia's trade to shifts in the external terms of trade and the larger is the real depreciation that results. A larger real depreciation exacerbates the resulting consumer price inflation, cuts consumption, raises saving and pushes the current account toward surplus. The welfare effects of the external and reform shocks therefore deteriorate. For small variations around the central value of  $\sigma=3$ , however, the sensitivity is moderate. Nonetheless, once again the more open are domestic product markets the better equipped is the economy to withstand the external and reform shocks modelled with minimal welfare impact.

### *Financial openness:*

When the elasticities of response to the uncovered interest parity ratio,  $\sigma_H$  and  $\sigma_F$  (23) are allowed to vary above and below their central values of  $\sigma_H = 5$  and  $\sigma_F = 10$ , a different pattern emerges. Financial openness is shown in Figure 7 not to be advantageous in the face of external trade and financial shocks. This time the greater is openness to financial flows the larger is the real depreciation, which we have seen stems primarily from the export demand shock. The larger this real depreciation the greater is the consumer price inflation that emerges from the producer price level target, the smaller is the gain in consumption and the larger is the improvement in the current account. The very modest effect on the size of the



real GDP gain, and the rise in inflation, ensure that welfare deteriorates with greater financial openness. This result is consistent with the empirical findings following the “taper tantrum” of Aizenman et al. (2014) and Dahlhaus and Vasishtha (2014), discussed in Section 2.3.

### *The responsiveness of investment*

The elasticity,  $\varphi$ , of real net investment to the ratio of the expected net rate of return on installed capital,  $rc^e$ , and the domestic real long bond yield,  $r$ , is initially set at unity. Here the same external, reform and expectations shocks are applied for values of this elasticity that range from 0.3 to 1.6, as shown in Figure 8. In this case the benefits from more responsive investment are unambiguous. Even the short run effects on real GDP have an observably positive dependence on  $\varphi$ . This arises because the underlying growth shocks raise productivity and the supplies of labour and skill, raising  $rc^e$  even though long run expectations are consistent with a global tightening (Table 8). At the same time the external shock lowers the home financing cost, at least in the short run. To the extent that the responsiveness of investment is aided by relatively unfettered domestic financial markets, openness to foreign investment and light regulatory barriers to new capital, these results favour liberalisation and openness. They indicate the potential for the mixed external shocks to result in stronger interim growth performance with considerably less welfare-sapping inflation and currency depreciation.

## **7. Conclusion**

Increased global uncertainty since the GFC has seen a trend toward slower global growth, unusually combined with lower investment financing costs, with some long run prospect of a re-tightening of global financial markets. The most salient short run effects of this on Indonesia are a tendency for exports to slow in real terms and for lower external interest rates to foster a rise in net inward investment. At the same time, the Indonesian government has undertaken some important reforms, most particularly a fiscal reform that has included a substantial reduction in consumption subsidies. These changes are examined here using a numerical macro model. The results show that, as modelled, the fiscal reform is unambiguously beneficial to the Indonesian economy, by boosting domestic saving and the rate of capital accumulation, both in the long run and in moderating the effects of negative external shocks in the short run.

It is further shown that the effects of the external shocks depend importantly on expectations formed over the real exchange rate, the price level, the rate of return on installed capital and the level of nominal disposable income. Whether those expectations are constructed from the consequences of the short run tendency for exports to slow and financing costs to fall, or from a longer run expectation that financial markets will tighten, they tend to be headwinds against future growth. At the same time, slowing exports prove to be a significant growth retardant which makes near term expectations more negative than the prospect of long run tightening, albeit by just 10 per cent of the available long yield.

Finally, a sensitivity analysis on parameters that reflect the openness of the Indonesian economy demonstrates that, notwithstanding the apparent net negativity of the external shocks, the integration of home and foreign product markets and strong responsiveness to domestic competitiveness of export demand and home investment can turn initially negative welfare effects into net welfare gains. The only drawback to the widespread application of the principle that market liberalisation is advantageous is that more liberal policies toward external financial flows can cause growth-restricting net outflows in the short run.

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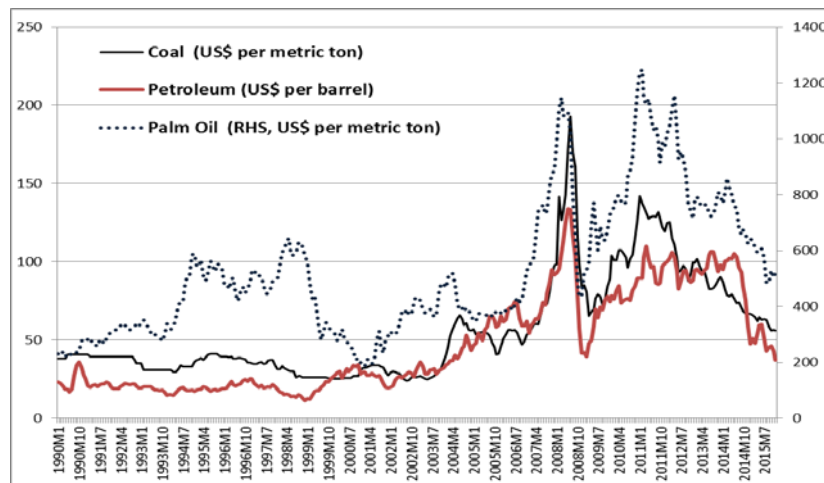
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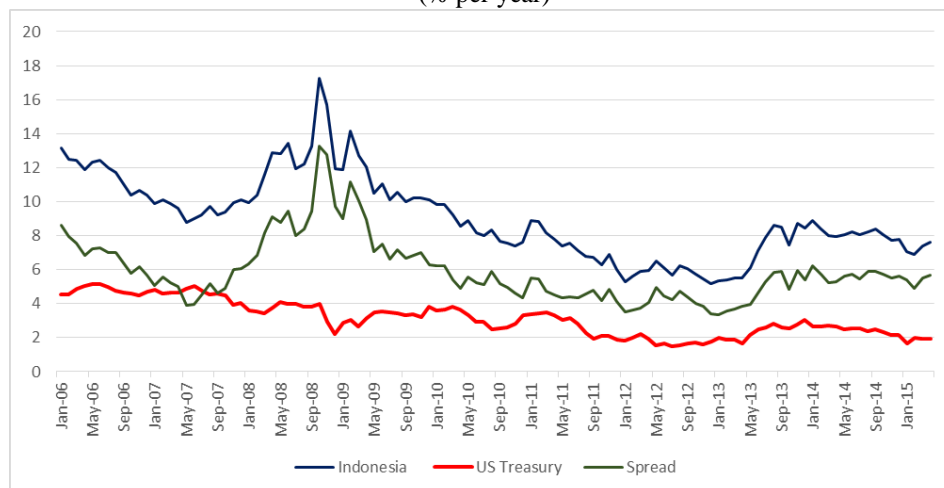
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**Figure 1 International Commodity Prices of Interest to Indonesia.**



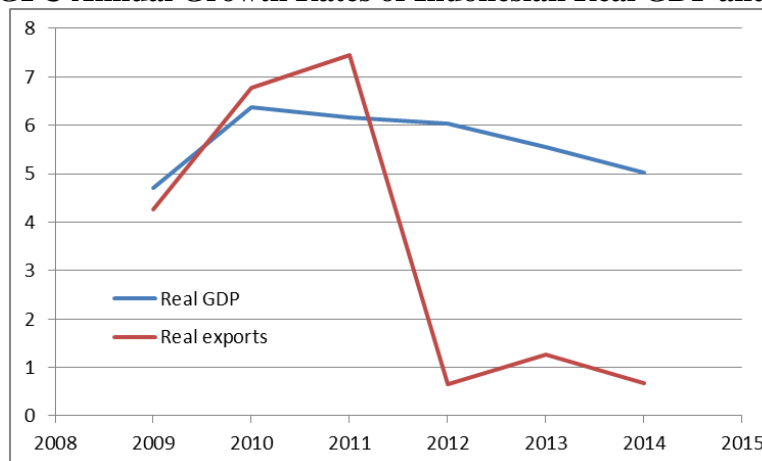
Source: Primary Commodity Prices, International Monetary Fund (IM).

**Figure 2 US and Indonesian Long Bond Yields**  
(% per year)



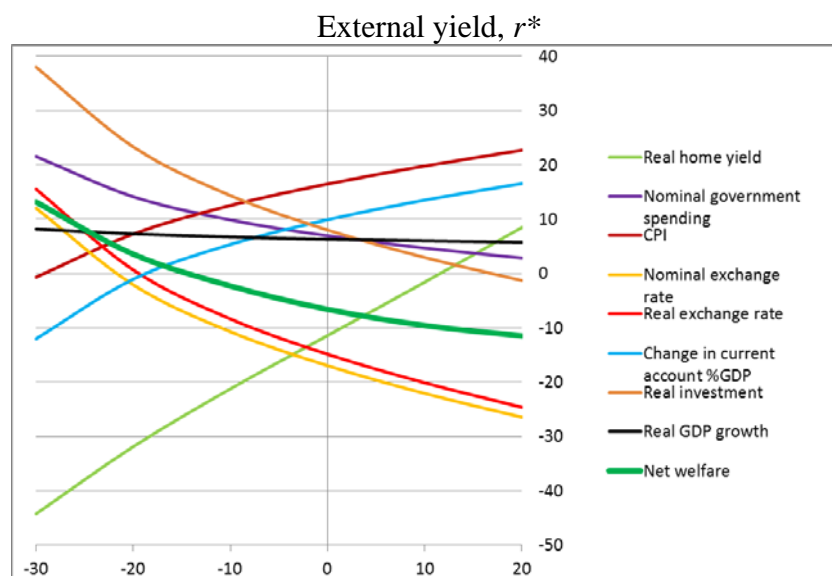
Source: Primary Commodity Prices, International Monetary Fund (IM).

**Figure 3: Post-GFC Annual Growth Rates of Indonesian Real GDP and Real Exports**

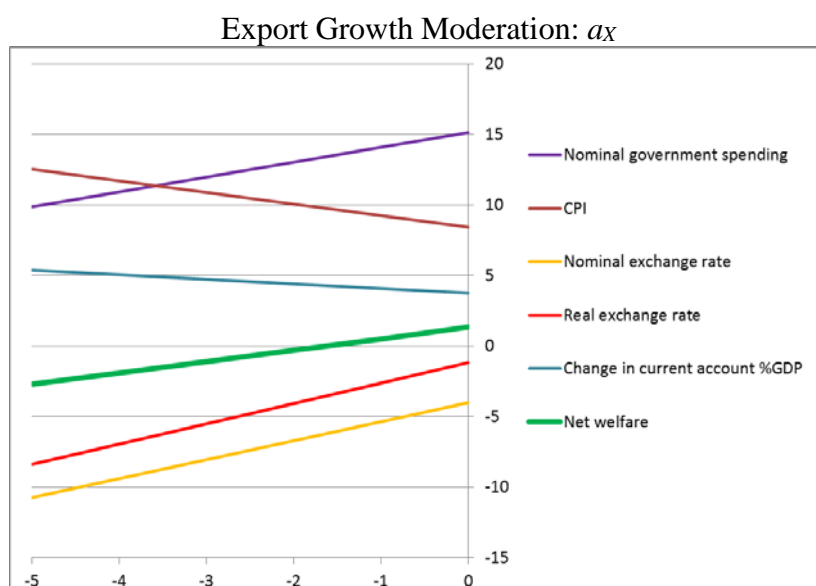


Source: IMF World Economic Outlook Database, April 2016.

**Figure 4: Dependence of the Short Run Projection on the Scale of Shocks<sup>a</sup>**  
(% change)

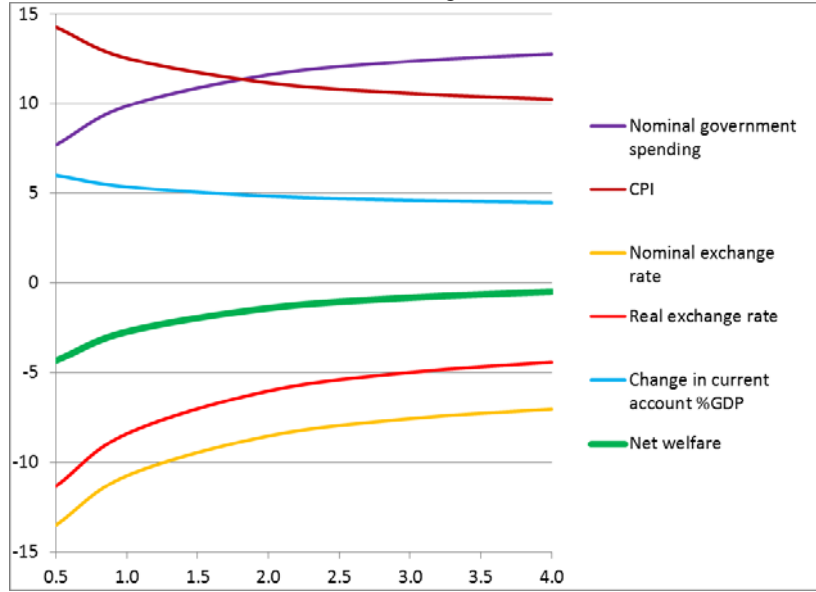


a The change in the external interest rate,  $r^*$ , with the central change being -10%. Variables with very little sensitivity to changes in  $r^*$  are omitted from the figure. All shocks imposed are otherwise as in the final simulation represented in Tables 8, 9 and 10. Net welfare is the purchasing power of home income at home prices, or simulated nominal GNP divided by the consumer price level.



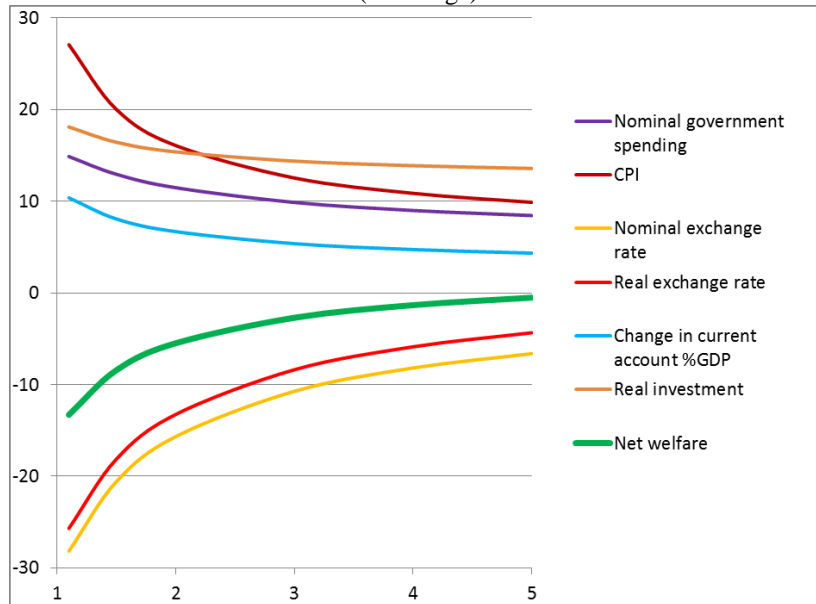
a The change in the shift parameter,  $a_X$ , in the foreign demand curve for Indonesian exports is indicated on the horizontal axis, with -5%, the left hand extreme, being the size of the shock imposed in the previous section. Variables with very little sensitivity to changes in  $a_X$  are omitted from the figure. All shocks imposed are otherwise as in the final simulation represented in Tables 8, 9 and 10. Net welfare is the purchasing power of home income at home prices, or simulated nominal GNP divided by the consumer price level.

**Figure 5: Dependence of the Short Run Projection on the Export Demand Elasticity<sup>a</sup>**  
(% change)



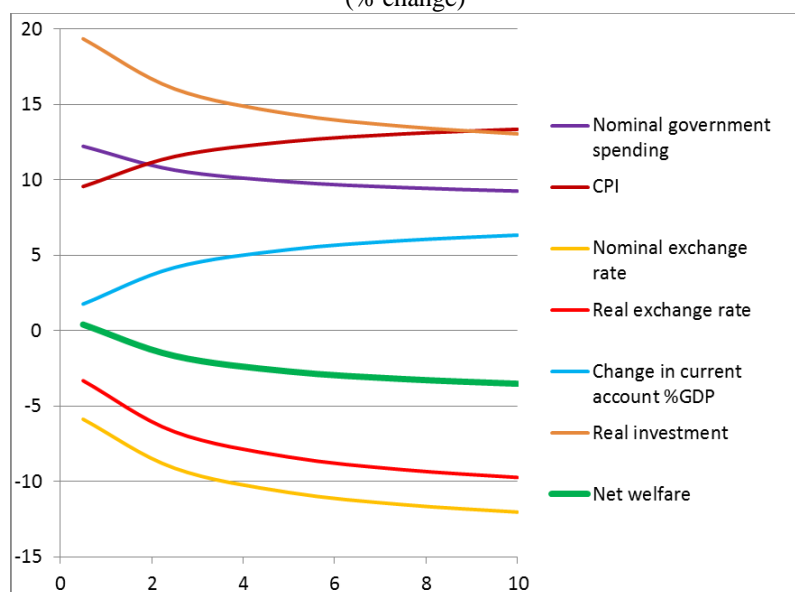
<sup>a</sup> This varies values of the elasticity of foreign demand for Indonesian products, which underlies the parameter  $b_X$  (equation 27), with the value of unity being used in the prior analysis, as indicated in the appendix. Variables with very little sensitivity to changes in  $b_X$  are omitted from the figure. All shocks imposed are as in the final simulation represented in Tables 8, 9 and 10. Net welfare is the purchasing power of home income at home prices, or simulated nominal GNP divided by the consumer price level.

**Figure 6: Dependence of the Short Run Projection on Product Market Integration<sup>a</sup>**  
(% change)



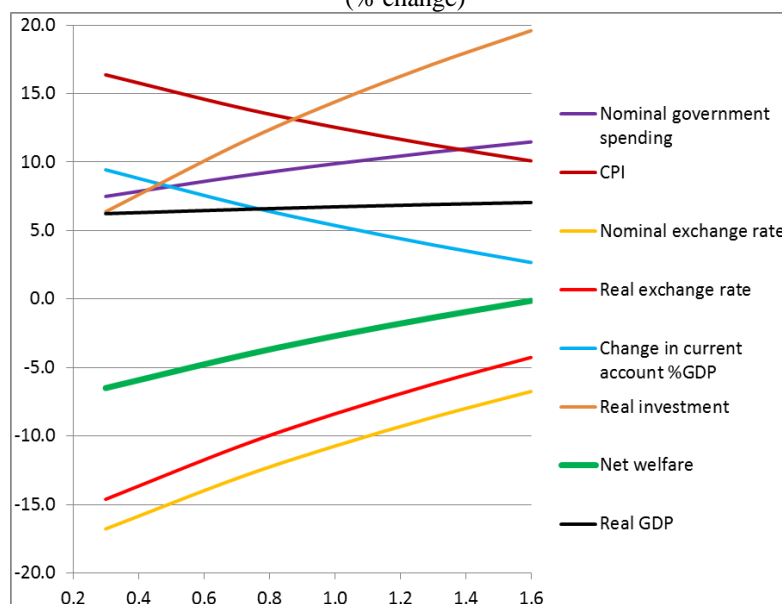
<sup>a</sup> This varies values of the elasticity of substitution between home and foreign goods,  $\sigma$  in equation (15), with the central value, 3, being used in the prior analysis, as indicated in the appendix. Variables with very little sensitivity to changes in  $\sigma$  are omitted from the figure. All shocks imposed are as in the final simulation represented in Tables 8, 9 and 10. Net welfare is the purchasing power of home income at home prices, or simulated nominal GNP divided by the consumer price level.

**Figure 7: Dependence of the Short Run Projection on Financial Openness<sup>a</sup>**  
(% change)



<sup>a</sup> This varies values of the two elasticities governing flows on the capital account,  $\sigma_H$  and  $\sigma_F$  (equation 23). These maintain a constant ratio with  $\sigma_H$  allowed to vary as shown on the horizontal axis around the central assumption of  $\sigma_H = 5$ , as per the appendix. Higher values imply greater financial openness. Variables with very little sensitivity to changes in  $\sigma_H$  and  $\sigma_F$  are omitted from the figure. All shocks imposed are as in the final simulation represented in Tables 8, 9 and 10. Net welfare is the purchasing power of home income at home prices, or simulated nominal GNP divided by the consumer price level.

**Figure 8: Dependence of the Short Run Projection on the Investment Elasticity<sup>a</sup>**  
(% change)



<sup>a</sup> This varies values of the elasticity of real net investment to the ratio of the expected net rate of return on installed capital and the home real interest rate,  $\phi$  (equation 24). This is allowed to vary as shown on the horizontal axis around the central assumption of  $\phi = 1$ , as per the appendix. Variables with very little sensitivity to changes in  $\phi$  are omitted from the figure. All shocks imposed are as in the final simulation represented in Tables 8, 9 and 10. Net welfare is the purchasing power of home income at home prices, or simulated nominal GNP divided by the consumer price level.



**Table 1: Subsidies and the National Budget**  
(Trillion Rupiah)

Description	2012	2013	2014	2015
Subsidy (Total)	346.4	355.1	506.0	207.8
Energy Subsidy	306.5	310.0	453.3	137.8
- Oil & Gas	211.9	210.0	350.3	64.7
- Electricity	94.6	100.0	103.8	73.1
Non-Energy Subsidy	39.9	45.1	52.7	70
National Budget	1,548	1,726	1,876	1,995
GDP	8,616	9,546	10,566	11,541
Ratio Total Subsidy/Budget (%)	22.4	20.6	27.0	10.4
Ratio Budget/GDP (%)	18.0	18.1	17.8	17.3

Source: Ministry of Finance, Republic of Indonesia

**Table 2 Composition of Non-Energy subsidies, 2015**  
(Budget = Rp 1,995 Trillion, 17.3 % of GDP)

	Nominal (Trillion Rupiah)	% of Budget
Non Energy Subsidy, total	70.0	3.51
Food	18.9	0.95
Fertilizer	35.7	1.79
Seeds	0.9	0.05
Public Service Obligation	3.3	0.17
Interest rate	2.5	0.13
Tax Subsidy	8.7	0.44

Source: Ministry of Finance

**Table 3: Government Policy Instruments Represented in the Modelling**

Policy	Instrument	
<b><i>Fiscal policy</i></b>	Government spending	$G$
	Labour income tax	Tax rate, $t^L$
	Capital income tax	Tax rate, $t^K$
	Consumption tax (GST)	Tax rate, $t^C$
	Import tariff	Tax rate, $t^M$
	Export tax	Tax rate, $t^X$
<b><i>Monetary policy</i></b>	Monetary base, \$ bn	$M^B$
(application depends on the target of monetary policy) <sup>a</sup>	Rate of increase of official foreign reserves, \$ bn/year	$\Delta R$

a For the alternative targets, see the closures available in Table 4.  
Source: See the analytical description of the model in the text.

**Table 4: Simulation Closures<sup>a</sup>**

Closure	
<b><i>Labour market:</i></b>	Exogenous nominal production (unskilled) wage with endogenous production employment
<b><i>Fiscal policy:</i></b>	Exogenous nominal government spending and endogenous government revenue at exogenous rates of tax (or subsidy) on income, consumption and trade
<b><i>Monetary policy targets<sup>b,c</sup></i></b>	<ol style="list-style-type: none"> <li>1. Monetary base<sup>d</sup>, <math>M^B</math></li> <li>2. Producer price level, <math>P^P</math></li> <li>3. Consumer price level, <math>P^C</math></li> <li>4. Production employment, <math>L</math></li> </ol>

a Since the model is a system of non-linear simultaneous equations and more variables are specified than equations in the system, there is flexibility as to the choice of those to make exogenous. This choice mirrors assumptions about the behaviour of labour markets, fiscal deficits and monetary policy targets.

b Money supplies can be set to target any of the three price levels (consumer, producer and GDP), nominal exchange rates against the US\$ or nominal GDP levels.

c No changes in commercial bank reserve behaviour are assumed so that money multipliers remain constant.

**Table 5 The Stylised Baseline Growth Path**

Annual growth rate of	% per year
Population and labour force <sup>a</sup>	1.13
Skilled labour force <sup>b</sup>	1.84
Total factor productivity growth <sup>c</sup>	2.00

a This is the average annual growth rate in Indonesia's population from 2014-2024 in the global demographic projections by Golley et al. (2016), during which the population is projected to rise from 252 to 282 million, or by 11.9 per cent.

b This also draws on the Golley et al. (2016) projection, which shows an increase in the skilled labour force in Indonesia by 20 per cent over 2014-2024.

c This is an assumption regarding Indonesia's prospective performance to 2024.

**Table 6: Stylised Long Run Closures and Shocks<sup>a</sup>**

Scenario	Long run (10 year) shocks, %, and closure elements	
<b>1. Baseline</b>	Growth shocks	
	labour force, $L$	12.0
	skilled labour force, $S$	20.0
	total factor productivity, $A_T$	22.0
	capital stock <sup>b</sup> , $K$	46.0
	Closures	
	Monetary closure: float with target, $P_P$	
	Labour market closure: fixed (full) employment, $L$	
	Fiscal closure: fixed government saving, $S_G$	
	Government spending, $G$ , endogenous	
<b>2. Policy reform, reduced consumption subsidy</b>	Growth shocks	
	labour force, $L$	12.0
	skilled labour force, $S$	20.0
	total factor productivity, $A_T$	22.0
	capital stock <sup>c</sup> , $K$	51.0
	Reform shocks	
	fiscal deficit, $-S_G$	-100.0
	consumption tax rate (power), <sup>d</sup> $\tau_C$	6.0
	Closures	
	Monetary closure: float with target, $P_P$	
	Labour market closure: fixed (full) employment, $L$	
	Fiscal closure: exogenous government saving, $S_G$ , shocked to balance, Government spending, $G$ , endogenous	

a Closures vary with cases, as indicated, but are selected from the list in Table 4.

b To obtain the change in capital stock one-year versions of these shocks are applied to the model and the level of real, net investment determined. From this a growth rate is calculated and applied over 10 years.

c As in b, above, one-year versions of these shocks are applied to the model and the annual level of real, net investment determined. From this a growth rate is calculated and applied over 10 years.

d The power of the consumption tax rate is altered from 0.93, implying a 7% initial subsidy, to 0.99, implying a reduction to a 1% subsidy.

Source: Text analysis and simulations of the model described.

**Table 7 Effects of Domestic Reforms on Long Run Levels<sup>a</sup>**

%	% differences between long run pathways
Domestic real long yield, $r$	-3.0
Monetary base, $M_B$	8.5
Nominal government spending on goods and services, <sup>b</sup> $G_X$	19.5
Consumer price level, <sup>c</sup> $P_C$	15.6
GDP price level, <sup>c</sup> $P_Y$	2.9
Exchange rate vs US\$, $E$	-12.4
Real exchange rate vs US, $e_R$	-11.1
Change in current account $\Delta CA/Y_0$ %	9.9
Change in fiscal position $\Delta S^G/Y_0$ %	2.2
Change in consumption tax revenue $\Delta T_C/Y_0$ %	3.5
Real rate of return on $K$ , $r_C$	-1.7
Real investment, $I/P_P$	4.3
Real consumption low-skill wage, $W/P_C$	2.7
Real consumption skilled wage, $W_S/P_C$	-9.9
Real capital income, $Y_K/P_C$	-9.2
<b>Real output (GDP), <math>Y/P_Y</math></b>	<b>12.4</b>
<b>Welfare: national income at home consumer prices</b> <b><math>(Y+N/E)/P_C</math></b>	<b>3.0</b>

a These numbers are the proportional differences between the levels of key variables in the long run (ca 2024), before and after the reduction in consumption subsidy is applied.

b Note that it is assumed that the Indonesian central bank targets the producer price level, allowing some consumer price inflation and ensuring that employment in its modern sector is not impaired by producer price deflation.

Source: Text analysis and simulations of the model described.

**Table 8: Stylised Post-GFC External Shocks, Closures and Policy Responses<sup>a</sup>**

Scenario	Short run (one year) shocks, %, and closure elements	
<b><i>Baseline growth shocks only</i></b>	Annual growth shocks	
	labour force, $L$	1.13
	skilled labour force, $S$	1.84
	total factor productivity, $A_Y$	2.00
	capital stock <sup>b</sup> , $K$	3.94
	Closures	
	Monetary closure: float with target, $P_P$	
	Labour market closure: fixed nominal wage, $W$	
	Fiscal closure: fixed government expenditure, $G$	
<b><i>External negative shocks to <math>r^*</math> and <math>X</math>, myopic expectations over prices, exchange rates and incomes</i></b>	Annual growth shocks	
	labour force, $L$	1.13
	skilled labour force, $S$	1.84
	total factor productivity, $A_Y$	2.00
	capital stock <sup>b</sup> , $K$	4.55
	External shocks	
	foreign yield, $r^*$	-10.0
	export demand shifter, $a_X$	-5.0
	Closures	
	Monetary closure: float with target, $P_P$	
	Labour market closure: fixed nominal wage, $W$	
	Fiscal closure: fixed government expenditure, $G$	
<b><i>External negative shocks to <math>r^*</math> and <math>X</math>, with price, exchange rate and income shocks anticipated</i></b>	Annual growth shocks	
	labour force, $L$	1.13
	skilled labour force, $S$	1.84
	total factor productivity, $A_Y$	2.00
	capital stock <sup>b</sup> , $K$	4.24
	External shocks	
	foreign yield, $r^*$	-10.0
	export demand shifter, $a_X$	-5.0
	Expectation shocks <sup>c</sup>	
	Real exchange rate, $e^e$	-0.11
	Consumer price inflation, $\pi^e$	0.06
	Rate of capital net return, $r_c^e$	-0.29
	Nominal disposable income, $Y_D^e$	-0.52
	Closures	
	Monetary closure: float with target, $P_P$	
	Labour market closure: fixed nominal wage, $W$	
	Fiscal closure: fixed government expenditure, $G$	
<b><i>External negative shocks to <math>r^*</math> and <math>X</math>, with expectations over prices, exchange rates and incomes consistent with an eventual global financial tightening</i></b>	Annual growth shocks	
	labour force, $L$	1.13
	skilled labour force, $S$	1.84
	total factor productivity, $A_Y$	2.00
	capital stock <sup>b</sup> , $K$	4.49
	External shocks	
	foreign yield, $r^*$	-10.0
	export demand shifter, $a_X$	-5.0
	Expectation shocks <sup>c</sup>	

	Real exchange rate, $e^e$	-0.46
	Consumer price inflation, $\pi^e$	0.28
	Rate of capital net return, $r_c^e$	0.19
	Nominal disposable income, $Y_D^e$	-0.34
	Closures	
	Monetary closure: float with target, $P_P$	
	Labour market closure: fixed nominal wage, $W$	
	Fiscal closure: fixed government expenditure, $G$	
<b><i>External negative shocks to <math>r^*</math> and <math>X</math> combined with domestic consumption subsidy reform, and with expectations over prices, exchange rates and incomes consistent with an eventual global financial tightening</i></b>	Annual growth shocks	
	labour force, $L$	1.13
	skilled labour force, $S$	1.84
	total factor productivity, $A_Y$	2.00
	capital stock <sup>b</sup> , $K$	4.76
	External shocks	
	foreign yield, $r^*$	-10.0
	export demand shifter, $a_X$	-5.0
	Expectation shocks <sup>c</sup>	
	Real exchange rate, $e^e$	-0.46
	Consumer price inflation, $\pi^e$	0.28
	Rate of capital net return, $r_c^e$	0.19
	Nominal disposable income, $Y_D^e$	-0.34
	Reform shocks	
	fiscal deficit, $-S_G$	-100.0
	consumption tax rate (power), <sup>d</sup> $\tau_C$	6.0
	Closures	
	Monetary closure: float with target, $P_P$	
	Labour market closure: fixed nominal wage, $W$	
	Fiscal deficit exogenous but shocked as above, $-S_G$	
	Government spending <i>endogenous</i> , $G$	

a Closures vary with cases, as indicated, but are selected from the list in Table 4.

b To obtain the change in capital stock these shocks are applied to the model and the level of real, net investment determined. From this a growth rate in the capital stock is calculated and applied, iteratively, to arrive at the correct one-year growth rate of the capital stock.

c Expectation shocks are derived by comparing corresponding long run simulations, of the type described in Tables 4 and 5, except that they are set up to include long run versions of the shocks listed here. In these cases the external shocks are imposed one-off, so the levels of  $r^*$  and  $a_X$  fall only initially, rather than continuously. The simulated long run changes in the real exchange rate, the inflation rate, the rate of return on capital and nominal disposable income are then annualised to form the short run expectation shocks.

d The power of the consumption tax rate is altered from 0.93, implying a 7% initial subsidy, to 0.99, implying a reduction to a 1% subsidy.

Source: Text analysis and simulations of the model described.

**Table 9: Effects of Stylised Post-GFC External Shocks and Policy Responses<sup>a</sup>**

<i>% changes</i>	<i>Baseline growth shocks only</i>	<i>External negative shocks to <math>r^*</math> and <math>X</math>, myopic expectations over prices, exchange rates and incomes</i>	<i>External negative shocks to <math>r^*</math> and <math>X</math>, with price, exchange rate and income shocks anticipated</i>	<i>External negative shocks to <math>r^*</math> and <math>X</math>, with expectations over prices, exchange rates and incomes consistent with an eventual global financial tightening</i>	<i>External negative shocks to <math>r^*</math> and <math>X</math>, with expectations over prices, exchange rates and incomes consistent with an eventual global financial tightening, following domestic consumption subsidy reform<sup>b</sup></i>
Domestic real long yield, $r$	-3.0	-16.0	-16.1	-16.3	-21.2
Monetary base, $M_B$	6.2	7.9	7.6	7.8	12.0
Nominal government spending, $G^c$	0.0	0.0	0.0	0.0	9.9
Consumer price level, $P_C$	3.5	3.5	3.7	4.0	12.5
GDP price level, $P_Y$	-0.2	-0.4	-0.4	-0.4	2.6
Exchange rate vs US\$, $E$	-6.2	-6.3	-6.5	-7.1	-10.7
Real exchange rate vs US, $e_R$	-6.4	-6.7	-6.9	-7.4	-8.4
Change in current account $\Delta CA/Y_0$ %	2.6	-0.8	-0.7	-0.2	5.4
Change in fiscal position $\Delta S^G/Y_0$ %	0.1	-0.1	-0.1	-0.1	2.2
Real rate of return on $K$ , $r_C$	2.1	1.9	2.0	1.9	1.9
Real investment, $I/P_P$	4.5	11.8	10.5	11.0	14.4
Production employment, $L$	6.1	6.6	6.3	6.5	6.7
Real consumption low-skill wage, $W/P_C$	-3.4	-3.4	-3.5	-3.8	-11.1
Real consumption skilled wage, $W_S/P_C$	0.7	1.1	0.8	0.6	-6.8
Real capital income, $Y_K/P_C$	2.5	2.9	2.6	2.5	-5.2

a These results use the closures and shocks as for Table 5-6. Note that all results and policy responses refer to the immediate short run (one year).

b The final column results refer to single-year results in the period during which the consumption subsidy reform necessarily causes temporarily high inflation. This causes welfare measures for labour, skill and capital owners to be negative, while, once the post-reform price level stabilises, these effects would be net positive.

Source: Simulations of the model described in the text.

**Table 10. Effects of External Shocks and Reforms on Trend Growth Rates**

(Trend growth rate, % per year)

%/yr growth rate	Real GDP	Real GDP per capita	Real purchasing power of national income per capita
<i>Baseline growth shocks only</i>	6.1	4.9	1.2
<i>External negative shocks to <math>r^*</math> and <math>X</math>, myopic expectations over prices, exchange rates and incomes</i>	6.6	5.4	1.4
<i>External negative shocks to <math>r^*</math> and <math>X</math>, with price, exchange rate and income shocks anticipated</i>	6.3	5.2	1.0
<i>External negative shocks to <math>r^*</math> and <math>X</math>, with expectations over prices, exchange rates and incomes consistent with an eventual global financial tightening</i>	6.5	5.4	0.9
<i>External negative shocks to <math>r^*</math> and <math>X</math>, with expectations over prices, exchange rates and incomes consistent with an eventual global financial tightening, following domestic consumption subsidy reform</i>	6.7	5.6	-3.8

a These results use the closures and shocks as for Table 6. Note that all results and policy responses refer to the immediate short run (one year).

b The final row's results refer to single-year results in the period during which the consumption subsidy reform necessarily causes temporarily high inflation. This causes welfare measures for labour, skill and capital owners to be negative, while, once the post-reform price level stabilises, these effects would be net positive.

Source: Simulations of the model described in the text.



## Appendix: Database and Parameters for the Indonesian Economy in 2014

Variables and base values Billion (2010) Rupiah		Key parameters	
<i>Volumes:</i>		<i>Production shares:</i>	
GDP, $Y$	8,568	$\beta_L$	0.248
Consumption, $C$	5,012	$\beta_S$	0.203
Investment, $I$	2,913	$\beta_K$	0.550
Government spending, $G_X$	771 <sup>a</sup>	<i>Money market parameters:</i>	
Exports, $X$	2,442	Elasticity, money demand to	
Imports, $M$	2,570	$Y$	1.00
Net foreign factor income, $N$	-140	$r$	-0.10
<i>Values:</i>		Reserve to deposit ratio	
Tax revenue	582	<i>Powers of marginal tax rates</i>	
Direct	333 <sup>a</sup>	$(1 + t_W) = \tau_W$	
Consumption	-358 <sup>b</sup>	$(1 + t_K) = \tau_K$	1.04
Import	386	$(1 + t_C) = \tau_C$	0.933 <sup>b</sup>
Export	222	$(1 + t_M) = \tau_M$	1.15
$M_S$	4,284	$(1 + t_X) = \tau_X$	1.10
$M_B$	257	<i>Consumption parameters:</i>	
$K$ stock	34,300	Elasticity consumption to $Y^D$	
Private saving, $S^P$	2,833	Elasticity consumption to $r$	
Government saving, $S^G$	-189	Elasticity of exports to $e_R, \alpha$	
Total domestic saving, $S^D$	2,645	<i>Trade parameters:</i>	
Financial outflow, $S^{HF}$	264	Elasticity substitution $c_H$ to $m$	
Financial inflow, $S^{FH}$	619	Elasticity of exports to $e_R$	
Reserve growth, $\Delta R$	86	<i>Financial flow parameters:</i>	
<i>Price, initial calibrated levels:</i>		Elasticity $S_{HF}$ to parity ratio $\lambda$	
$r$	0.137	Elasticity $S_{FH}$ to parity ratio $\lambda$	
$r^*$	0.025	Initial share of home saving	
$P_C$	0.906	invested abroad, $\varphi$	
$P_P$	0.971	<i>Investment parameters:</i>	
$P_Y$	1.000	Elasticity of $I_N$ to $(r_c^e/r)$	
$P^*$	0.844	Depreciation rate, $\delta$	
$E$	1.000		
$e_R$	1.185		
<i>Labour:</i>			
Skill share of $L$	0.12		
Initial skill premium, $W_S/W$	6.00		
Participation rate, $L/N$	0.66		
Population, millions, $N$	252		

a  $G_X$  is government expenditure on goods and services. This and direct tax revenue are both net of transfers.

b The effective consumption tax rate is negative due to food and energy consumption subsidies.

Sources: Parameter values are indicative. Flows and levels from raw data are drawn from IMF, *World Economic Outlook Database*, April 2016 update, and Bank Indonesia.