Oil Supply Shocks and Tax Policy Responses in Australia: Insights from a Dynamic CGE Framework

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Xianglong Liu,
Jason Nassios
And
James Giesecke
Centre of Policy Studies,
Victoria University

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Address: Centre of Policy Studies, Victoria University, PO Box 14428, Melbourne, Victoria, 8001
home page: www.vu.edu.au/CoPS/ email: copsinfo@vu.edu.au Telephone +61 3 9919 1877

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Oil supply shocks and tax policy responses in Australia: insights from a dynamic CGE framework

By

Xianglong Liu, Jason Nassios and James Giesecke
Centre of Policy Studies
Victoria University

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Abstract

Recent surges in global crude oil prices, caused by supply disruptions from Russia's invasion of Ukraine and associated sanctions, have increased the cost of living globally. In response, in the 2022/23 Australian Federal budget, the former Coalition government announced a halving of Australia's fuel excise from 44 cents per litre to 22 cents per litre for six months. This paper explores the impact of an oil supply shock on the Australian economy, and the effectiveness of a fuel excise reduction as a policy response. We adopt a single-country dynamic computable general equilibrium (CGE) framework. Because Australia is a net oil-importing economy, ceteris paribus, the rise in world oil prices puts downward pressure on the terms of trade and household consumption. The impact at the macro level on real GDP is damped by a rise in net exports and world LNG prices, a key Australian export. Our analysis unpacks the role played by the linkage between world oil and LNG prices. While this linkage attenuates the macroeconomic effects of an oil price rise in Australia, its capacity to mitigate the economic damage is muted because of the LNG sector's low labour intensity, high foreign ownership, and the associated rise in domestic gas prices, which hurt domestic gas users. We find a 50 percent reduction in fuel excise can help damp the overall fall in real GDP and employment, at the expense of larger budget deficits. Rather than strengthening calls for a cut in fuel tax excise rates, we show that higher oil prices compromise calls for its reduction from an allocative efficiency perspective, because it is a specific tax. Finally, we study an alternative policy response to higher world oil prices in Australia: adoption of a UK-style energy profits levy on LNG producers. We find that such a policy would promote household consumption without compromising the federal budget.

JEL classification: C68; E62; H25; Q43

Keywords: Taxation policy; CGE modelling; Dynamics; Oil prices.

Contents

1. Introduction

While much of 2020 and 2021 was shaped by the effects of COVID-19 on global health and economic outcomes, 2022 has been defined by geopolitical tensions and the Russian Federation's invasion of Ukraine. The sanctions that have accompanied this conflict have increased intermediate input costs for businesses and the price of transport for households across the globe. Compared to price levels in July 2021, crude oil prices had increased by more than 50 percent by March 2022. On 29th March 2022, the Australian federal government announced that in response to this rapid inflation in the cost of fuel, it would cut the federally-imposed fuel excise by 50 percent for six months.

Holding a key position in the global energy supply chain, Australia is among the top liquefied natural gas (LNG) exporters in the world. Australia exports its gas in the form of LNG mainly to the Asian-pacific market. Prices in this market are explicitly linked to oil prices, through long-term contracts with a lag of three to six months. Herein, we refer to this feature of the Asian-pacific LNG market as the oil-gas price linkage. Importantly, oil-gas price linkages of this form mean that global oil price fluctuations directly pass through to Australian LNG export prices and Australian domestic gas prices. This amplifies the inflationary pressures felt by Australian households due to high oil and thus fuel prices, while LNG exporters realise super-normal profits that mostly flow offshore, due to the sector being mostly foreign-owned.

Studies of energy price shocks from the demand- and supply-side have a long history. There is an extensive body of literature discussing the negative impact of oil price increases on economic activities, many of which follow the influential work by Hamilton (1983). Recent studies have highlighted the importance of understanding the underlying causes of oil price shocks when assessing their effects on the global economy [for example, see Kilian (2009); Aastveit et al. (2014); and Peersman and Robays (2012)]. In particular, the cross-country study by Peersman and Robays (2012) compares the dynamic effects of several types of oil shocks across a diverse set of industrialised countries, and finds substantial asymmetries in the effects of exogenous oil supply shocks across countries. They add further nuance to previous work, by highlighting the necessity of understanding the underlying sources of oil price shifts and the importance of the role of industry structure when studying the effects of exogenous oil supply shocks.

In recent years, Australia gradually reduced its domestic oil production capacity, becoming more reliant on foreign imports of both crude oil and refined petroleum. This is juxtaposed against its position as one of the largest non-oil energy exporters in the world. As summarised by Peersman and Robays (2012), given this economic structure oil supply shocks will drive very different economic consequences for Australia, compared to other developed economies.

In this paper, we quantify the economic impact of a 52.6 percent rise in world crude oil prices due to supply-side effects on the Australian economy. The analysis is undertaken within a single-country dynamic computable general equilibrium (CGE) modelling framework, namely the Victoria University Regional Model with Taxation detail (VURMTAX). Our model is parametrised using 2017/18 Australian national accounts data from Australia's Bureau of Statistics (the ABS), which recognises: (i) the nation's heavy reliance on crude oil and refined petroleum imports; and, (ii) the presence of a largely foreign-owned LNG export sector. In accounting for point (ii) above, we also examine to what extent the increase in LNG industry profits, arising from the aforementioned oil-gas price linkage, attenuates the effects of oil price shocks on the Australian economy.

We make two further contributions to this body of literature, by quantifying the degree to which the economic effects of oil shocks can be muted by policy responses. We study two such responses. First, we consider the economic impacts of Australia's response to the oil shock: a 50 percent reduction in domestic fuel excises, which are specific taxes levied at a fixed cost per litre of fuel. Second, we study the impact of a UK-style energy profits levy on LNG producers as an alternative fiscal policy option, and contrast its capacity to support households and the economy with fuel excise reductions.

To quantify the impact of the oil supply shock, oil-gas price linkages, fuel tax excise cuts, and an energy profits levy, we present four counterfactual simulations herein. We begin with our core oil supply shock scenario. As discussed, our 52.6 percent rise in world crude oil prices is modelled as a supply-side shock that is assumed to persist for three years. The quantum of our shock is based on observed market responses following the recent rise in geopolitical tensions. We find that such a shock translates to a 0.41 percentage point rise relative to baseline in the shock-year Australian unemployment rate on impact. This translates to shock-year falls in private consumption of 0.51 percent, and real GDP of 0.24 percent relative to baseline. Our CGE model carries rich industry detail: we find the supply-side shock drives expansions in Australian mining industry output, largely via expansions in LNG exports. While other industries largely contract in response to the shock, smaller contractions are experienced by export-oriented and import-competing domestic industries, such as agriculture and manufacturing.

Throughout the core scenario described above, oil and gas prices are linked via the Asian-pacific market mechanism, reflecting the unique oil-importing LNG-exporting energy structure of Australia. In our second scenario, we deactivate this price channel and examine the extent to which higher LNG export prices mitigate the negative economic effects of an oil supply shock in Australia. We find the oil-gas price linkage drives up the terms of trade, but the gain to the economy is diluted for three reasons: (1) the relatively low labour intensity of the LNG industry, which damps the degree to which higher LNG prices translate to real wage gains; (2) the LNG industry is largely foreign-owned, and hence higher profits manifest as increased foreign capital income outflows rather than higher real national income; and, (3) higher domestic gas prices, which put downward pressure on real wages. As a result of these features of Australia's LNG industry, we conclude that the oil-gas price linkage mechanism has limited capacity to cushion the negative impact of higher oil prices in Australia.

In our third scenario, we explore Australia's recent policy response, specifically the degree to which a cut in the rate of Australian fuel excise can offset the adverse economic effects of higher oil prices. The magnitude of the cut in the fuel excise rate we study (a temporary 50 percent reduction) is informed by the policy response put forward by the Australian federal government in its 2022-23 Budget. Our modelled cut is aligned to the duration of the oil price rise we study (three-years). The 2022-23 Budget response is expected to last 6 months, which when announced in March 2022 was aligned to the expected duration of the rise in global crude oil prices. In Scenario 3, we assume the excise cut is budget-neutral, with shortfalls funded via a direct tax on households. We find that the size of the employment gain in this case is modest. Compared to the scenario that has no such policy response to the oil price shock, the fuel excise cut reduces the shock-year unemployment rate deviation by 0.13 percentage points (from 0.41 percent in Scenario 1, to 0.28 percent in Scenario 3).

To illustrate the impact of budget neutrality, in Scenario 4 we relax this assumption and revisit our findings. As we show, a deficit-financed fuel excise cut cushions the damage of high oil prices during the crisis; however, debt overhang following the return of oil prices to baseline damps the post-shock recovery path.

To complement Scenarios 3 and 4, we derive the marginal excess burden (MEB) of Australian fuel excises under two scenarios: (1) a business-as-usual baseline forecast with no oil supply shock; and, (2) a baseline forecast aligned to Scenario 1. In each case, the MEBs are small relative to those derived for other Australian taxes, e.g., see Nassios *et al.* (2019a). As we also show, the MEB in (2) is lower than the MEB in (1). This is because Australia's fuel excise is a specific tax; hence, its MEB falls when oil prices rise, because its ad valorem equivalent tax rate is reduced. Our analysis highlights that, on allocative efficiency grounds, the arguments for lower fuel excises are weaker when oil prices rise.

Finally, in Scenario 5 we assess the impact of an alternative Australian policy response: a UK-style energy profits levy on LNG producers. On May 26, 2022, the UK government announced a temporary Energy Profits Levy (the Levy), at a rate of 25 percent on the profits of oil and gas companies operating in the UK and on the UK continental shelf. The revenue raised by the Levy was used to help ease the impact of high energy bills on UK households via direct transfers from Government. The policy was thus intended as being revenue neutral. In Scenario 5, we model the impact of a similar 25 percent levy on the Australian LNG industry as a response to Scenario 1 described previously. The tax revenue uplift is redistributed to households via direct transfers. We find such a revenue-neutral LNG levy damps the fall in private consumption compared to Scenario 1 (Scenario 5: -0.16 percent; Scenario 1: -0.51 percent); the improvement in private consumption relative to Scenario 1 is much larger than in Scenario 3, where we simulate a revenue-neutral fuel excise cut. The improvement in private consumption however falls short of that materialising from the deficit-financed fuel excise cut in Scenario 4. Because the government's fiscal position does not deteriorate in Scenario 5 however, the post-crisis recovery path is not burdened by higher levels of debt, and is consequently stronger. We conclude that, from a welfare perspective, a UK-style LNG industry levy could be a valuable addition to the taxation toolbox for policymakers.

Scenarios 1 – 5 are simulated using the Victoria University Regional Model with Taxation detail (VURMTAX), a dynamic multi-regional computable general equilibrium (CGE) model of Australia's states and territories. VURMTAX identifies 91 distinct industries, which produce a mix of 98 distinct commodities. As is standard in CGE models, VURMTAX determines the supply and demand for each regionally-produced commodity as the outcome of the optimising behaviour of economic agents. Regional industries are assumed to choose labour, capital and land in order to maximise their profits, while operating in a competitive market. In each region a representative household purchases a particular bundle of goods in accordance with the household's preferences, relative prices and its disposable income. Regions are linked via interregional trade, interregional migration and capital movements. Governments operate within a fiscal federal framework.

VURMTAX differs from its predecessor VURM [Adams et al. (2015)] in that it contains a detailed government finance module, which provides a comprehensive treatment of revenues, expenditures and budget balances at two levels of government: federal, and state/territory. The model contains a number of innovations relating to the treatment of many taxes relative to VURM [see Nassios et al. (2019a) and Nassios and Giesecke (2022) for a full account]. As outlined by Dixon and Nassios (2018), VURMTAX also includes provision for several important aspects of the company tax system in Australia, including: separate treatment of local and foreign investors; explicit modelling of refundable dividend imputation; provision for retained earnings by companies and the impact of profit retention on the personal income tax base; and an allowance for Australian double taxation treaty (DTT) arrangements and their impact on unfranked dividend withholding taxes.

In VURMTAX simulations, annual industry- and region-specific investment is based on industry- and region-specific expected rates of return on capital in future periods. By default, VURMTAX carries an assumption that investors' expectations of industry- and region-specific post-tax rates of return on capital are adaptive; see Dixon and Nassios (2018).

Our paper advances thinking around oil supply shocks and fiscal policy responses in five ways. First, cross-country studies on the effects of oil price shocks typically focus on a small subset of macroeconomic outcomes. As demonstrated by Peersman and Robays (2012), the effects of oil supply shocks can be very different across countries, largely due to differences in industry structure. Australia has the unusual characteristic of simultaneously being a net oil-importing country, and a net non-oil-energy-exporting country. As we show, these characteristics drive unique economic consequences for Australia when world oil prices spike. Adopting an economic model that carries within its theory and database this kind of structural detail, together with rich fiscal detail, allows us to quantify the economic impact of an oil price shock not only at the aggregate macroeconomic level, but also at the disaggregated sectoral level within a single, consistent analytical framework.

Second, we contribute to the energy market literature by evaluating the offsetting economic effect of the linkage between Australian LNG export prices and world oil prices.

Third, we study the potential economic benefits of a real-world policy response to the recent oil price shock: Australia's recent temporary reduction in fuel excises. This warranted two model developments:

1. Fuel excise in Australia is levied at a fixed rate per litre of fuel, i.e., it is a specific tax. We introduce new theory to VURMTAX to model fuel excise as a specific tax; and,
2. Many Australian industries receive credits for fuel excise paid via the Australian Fuel Tax Credits Scheme. We use ATO Taxation Statistics to disaggregate Australian Fuel Tax Credits across VURMTAX industries. This ensures that a reduction in fuel excise correctly passes through to industry costs on a net of tax credit load basis.

Fourth, we evaluate the marginal excess burden (MEB) of fuel excise under both business-as-usual and fuel price-spike environments. This allows us to: (a) contribute to the tax efficiency literature by evaluating the MEB of the fuel excise; and, (b) comment on the merits of the fuel excise cut, not only from the perspective of its macroeconomic and industry effects as outlined above, but also on allocative efficiency grounds.

Finally, we explore the economic impact of an energy profits levy on LNG producers who make substantial profits from energy price hikes.

The remainder of the paper is organized as follows. Section 2 outlines VURMTAX. Section 3 presents and discusses the main results. Section 4 concludes.

2. VURMTAX

2.1 Model description

VURMTAX is a 91-industry, 98-commodity, eight-region computable general equilibrium model of Australia based on the Victoria University Regional Model (VURM).[1] VURMTAX is a modified version of VURM designed for detailed taxation analysis. Each model contains the desirable properties required of a multi-regional model, as discussed by Giesecke and Madden (2013). In addition to these features, VURMTAX contains a number of detailed tax-specific features which facilitate modelling of the Australian tax system. An example is the inclusion of private transport activity in VURMTAX, which facilitates detailed modelling of motor vehicle taxes [see Nassios et al. (2019a)]. To accurately model Australia's dividend imputation system, VURMTAX also distinguishes between local investors (who can claim franking credits but must pay personal income tax) and foreign investors (who cannot claim franking credits but do not pay personal income tax). For a detailed description of this innovation, we refer the reader to Dixon and Nassios (2018). Theory is also included to model the impact of changes in payroll tax thresholds on firm-size bias [see Dixon et al. (2004)]. We also incorporate theory to model regional migration proclivities [see Giesecke and Madden (2013)], and the Goods and Services Tax [see Giesecke and Tran (2018) and Giesecke et al. (2021a)]. For a full description, see Nassios et al. (2019a). In order to parameterise VURMTAX, we rely on data from a variety of sources, including the Australian Bureau of Statistics (ABS) Census data, Agricultural Census data, state accounts data, and international trade data. The core VURMTAX model database was updated in 2019 to incorporate the

[1] A detailed description of VURM is in Adams et al. (2015)

ABS Input-Output data release, together with updated Government Financial Statistics data from ABS cat. no. 5512.0.

Each region in VURMTAX has a single representative household and a single state/local government agent. The single federal government agent is distinguished from the other agents in that it operates in all regions. The foreign sector is described by export demand curves for the products of each region, and by supply curves for international imports to each region. Supply and demand for each regionally produced commodity is the outcome of optimising behaviour. Regional industries are assumed to use intermediate inputs, labour, capital, and land in a cost-minimising way, while operating in competitive markets. Region-specific representative households purchase utility-maximising bundles of goods, subject to given prices and disposable income. Regions are linked via interregional trade, interregional migration and capital movements. Governments operate within a fiscal federal framework.

Investment in each regional industry is positively related to expected rates of return on capital in each regional industry. VURMTAX recognises two investor classes: local investors (i.e., domestic households and government) and foreign investors. The theory underpinning these two investor classes is described in Dixon and Nassios (2018). Capital creators assemble, in a cost-minimising manner, units of industry-specific physical capital for each regional industry.

VURMTAX provides results for economic variables on a year-on-year basis. The results for a particular year are used to update the database for the commencement of the following year. More specifically, the model contains a series of equations that connect capital stocks to past-year capital stocks and net investment. Similarly, debt is linked to past and present borrowing/saving, and the regional population is related to natural growth and to international and interstate migration [see Giesecke and Madden (2013) for a description of the interregional migration module in VURMTAX]. The model is solved with the GEMPACK software package [see Horridge et al. (2018)].

In solving VURMTAX, we typically undertake two parallel model runs: a baseline simulation and a counterfactual simulation. The baseline simulation is a business-as-usual (BAU) forecast for the period of interest. The counterfactual simulation is identical to the baseline simulation in all respects, other than the addition of shocks describing the policy under investigation. We report results as cumulative deviations (either percentage or absolute) away from the base case in the levels of variables in each year of the counterfactual simulation.

Applications of VURMTAX include analysis of the GST [Giesecke and Tran (2018); Giesecke et al. (2021a)], company tax [Dixon and Nassios (2018)], land tax [Nassios et al. (2019b)] and other property taxes [Nassios and Giesecke (2022)].

2.2 Fuel excise collections and fuel tax credit payments

Our analysis of Australia's policy response to the recent oil price shock (viz., a reduction in the fuel excise rate) required careful calibration within VURMTAX of fuel excise collections across households and industries, and subsequent derivation of fuel tax subsidies claimed by industry. To derive matrices for fuel excises paid by industry, we rely on ABS 5215.0 T22 (Taxes on products not elsewhere included, IOPG 1701: Petroleum products). This allows us to disaggregate fuel excises paid on the consumption of petroleum products by end-user (either industries or households). We disaggregate this by region using existing regional consumption shares for each industry in VURMTAX.

The fuel tax credit is in effect a rebate of the excise included in the price of fuel. To derive fuel tax credit claims, we use ATO Taxation Statistics data for 2017/18 (Selected taxation items, by broad industry). This data provides a 20-industry disaggregation of fuel tax credits claimed. We cross-validate this using known fuel excises paid, as reported in ABS 5215.0 T22. The result is a set of revised fuel excise and credits scheme matrices in VURMTAX, which track collections and credits by industry and region. We plot the top seven industries from which fuel excises are collected in Chart 1 and include any fuel tax credits claimed by these industries. As shown in Chart 1, the private transport industry accounts for the largest share of fuel excise collections, followed by domestic tourism.[2] Fuel tax credits are largely claimed by the road freight and mining industries, of which the latter are largely foreign-owned in VURMTAX.

2.3 Baseline forecast and scenario description

2.3.1 Baseline forecast

As outlined in Section 2.1, a VURMTAX simulation involves two parallel model runs: a BAU or baseline forecast and a counterfactual scenario. In our baseline forecast, oil price growth is aligned to the reference oil price projection from the Annual Energy Outlook 2022 by the U.S. Energy Information Administration (EIA). We assume that global oil prices would follow the baseline forecast, if not for the recent oil price shock. Five counterfactual scenarios are simulated with results measured relative to the core baseline forecast. The attributes of these scenarios are summarised in Table 1. As described in Table 1, all five scenarios share the same set of shocks describing an environment of elevated global oil prices. The scenarios are distinguished in terms of: (a) model closure assumptions relating to government finances and the determination of LNG prices; and (b) policy responses, namely fuel excise cut or LNG profits levy. We expand below, beginning with Scenario 1.

2.3.2 Scenario 1

A difficulty in establishing a counterfactual oil price scenario lies in the uncertainty surrounding the duration of the geopolitical tensions that have driven the current supply-side shock. We abstract from this root cause, and instead envisage a hypothetical supply-side shock that causes world oil prices to rise by 52.6 percent in 2022 relative to the baseline forecast by the EIA, and remain elevated by this proportion relative to baseline for a period of three years.[3] Thereafter, global prices ease back to the baseline forecast in a straight-line manner over a period of three years; by 2028, world oil prices have returned to the EIA forecast path, as illustrated in Chart 2.

The global oil supply disruptions not only damage the Australian economy by virtue of the higher than baseline forecast crude oil prices, but also via contracted global demand and global commodity price inflation.

Chart 3 plots the shocks to global demand and foreign currency commodity prices. We set the nominal exchange rate as the numeraire and hold it at its baseline forecast level.

We conjecture that higher oil prices damp global economic activity. All else equal, lower global economic activity reduces demand for Australian exports. The degree of the global contraction depends on the elasticity of global GDP to oil price changes. We calibrate the global demand shock based on empirical findings that an increase in world oil prices of 25 percent from baseline causes about a 0.5 percent loss of global GDP [Timilsina (2015); Peersman and Robays (2012)].

We require a systematic approach to appropriately inform our single-country model with information about global price inflation, by commodity, resulting from the oil supply disruption. First, we assume world prices for Australian exports and imports move in an identical fashion on a commodity-specific basis. This means Australian agricultural import prices move in line with Australian agricultural export prices, for example, however the Australian aggregate export price index will differ from the Australian

[2] The private transport industry is modelled as a dummy industry which takes motor vehicle capital, and intermediate inputs in the form of fuel, electrical componentry and repair services and supplies its output entirely to households.

[3] The crude oil price growth of 52.6 percent is based on the observed growth in the Europe Brent Spot Price FOB, U.S. dollar per barrel, between July 2021 and March 2022.

import price index, because commodity-specific weights differ across the two. We allow for commodity-specific detail in our shocks, as emphasised in Chart 4, where we plot our shocks to world (foreign-currency) crude oil, refined petroleum, LNG, and coal and iron ore prices. We include the final realised path for aggregate import prices, which is a divisia index of the foreign currency prices of Australian imports. The crude oil price shock in Chart 4 is hypothecated on recent events, as discussed. We calibrate the shocks to LNG export prices specifically, as the oil-gas price linkage in the Asia-pacific LNG market will directly pass global oil price fluctuation to Australian LNG export prices. We assume 50 percent of the oil price shock is transmitted to LNG export prices for Australia, according to the quantitative results of Zhang et al (2018) on the oil-gas price variation linkage in the Asian LNG market.[4] The elasticity of the foreign-currency prices of coal and iron ore to world crude oil prices, are set in line with the elasticity of US price inflation to crude oil prices, estimated by Peersman and Robays (2012).[5] They each therefore rise by 1.84 percent under all scenarios herein. The duration of the LNG export price shocks is aligned to the duration of the oil price shocks.

In what follows, we discuss the refined petroleum price path, and paths for commodities not referred to explicitly above. Heterogeneity is introduced in the world commodity price responses by assuming global unit cost functions, by commodity, match Australian unit cost functions. There are two steps involved in this process.

First, we tie the variation of foreign currency prices to the variation in domestic production costs by commodity (except crude oil, refined petroleum, LNG, coal and iron ore) to accommodate their relative oil dependency.[6] Hence the relative basic price outcomes of domestically-produced commodities inform world price responses to oil price shocks in VURMTAX.

Second, we account for differences between Australian and global unit costs by scaling up the relative commodity price outcomes from step 1 to accommodate the empirical findings by Choi et al. (2018), who show that foreign prices are more responsive to oil price shocks than Australian domestic prices. According to Choi et al. (2018), there is significant cross-country heterogeneity in the elasticity of domestic prices to world oil prices. There are several reasons advanced as to why, such as the share of transport in the CPI basket, and the importance of energy subsidies across countries. Choi et al. (2018) estimate the impact of global oil inflation on Australian domestic headline inflation to be about 28 percent of the US headline inflation response. We calibrate the price scalar in VURMTAX by setting the ratio of Australian inflation to Australia's aggregate import price index to be equal to 28 percent, in line with Choi et al. (2018).

In this way, our modelling recognises that import prices of oil-intensive products (measured using Australian unit cost functions) will have larger responses, than those that are relatively less oil-dependent. This is clear in Chart 4, which shows that the foreign currency price of refined petroleum rises by 18.5 percent relative to baseline in Scenario 1. This is inferred from the Australian domestic petroleum refining industry unit cost function, which has crude oil accounting for around 32 percent of this sector's total production costs, based on ABS data. We also recognise that Australian production costs are less sensitive to oil prices than production costs in other countries, in line with Choi et al. (2018).

Considering higher global oil prices are caused by temporary supply disruption due to geopolitical tension, we mute the standard model-generated investment responses for Australian domestic oil and

[4] Zhang et al (2018) construct a VAR system that incorporates supply and demand side factors, oil prices, and global economic conditions. They investigate how much oil prices and market fundamentals contribute to natural gas prices in three major regional gas markets: Japan, the US, and Germany. They find that oil price changes alone account for 30 percent of the variation of gas price changes in Japan, while the system other than gas accounts for around 50 percent of gas price variation due to the anchor effect of oil prices. They also demonstrate that the oil-gas price linkage in Japan has been declining in the last decade because of oil indexation.

[5] Peersman and Robays (2012) show that a 10 percent shock to oil prices from the supply-side leads the CPI of the US, taken as the world market, to increase by around 3.5 percent in the first year.

[6] This implicitly assumes that there is no significant difference between domestic and foreign production structures for these commodities.

refined petroleum industries, as well as the gas and LNG industries that have export prices linked to oil prices. This reflects the expectation that business investment does not flow into these industries in response to a temporary oil supply shock. Similarly, we hold aggregate mining investment at baseline levels to reflect the expectation that temporary changes in resource exports will not motivate private investment to flow into the mining sector, particularly given the many years over which mining investment decision making and investment activity take place. Such treatment of mining investment is in line with Ballantyne et al. (2020).[7]

We assume that the government keeps its fiscal position neutral through a direct tax on households. The budget-neutrality assumption is relaxed in Scenario 4.

2.3.3 Scenario 2

The main market for Australian LNG exports is the Asian gas market [Cassidy and Kosev (2015)]. This market is dominated by long-term contracts, under which LNG prices are explicitly linked to global crude oil prices. This has important implications for Australia as a net oil importing and net non-oil energy exporting country.

The direct oil-gas price transmission channel is activated in Scenario 1 and our results discussion in Section 3.1, so that the overall economic consequences of global oil price shocks from the supply-side can be investigated. An interesting question to investigate is whether the contractual linking of Australian LNG export prices to world oil prices has a mitigating effect on the economic damage from an oil price spike. To investigate the extent to which the co-movement in oil import prices and LNG export prices may help stabilise the Australian economy when oil prices rise, in Scenario 2 we deactivate the oil-gas price linkage and study the consequences in Section 3.2. Specifically, in Scenario 2 we modify the simulation described by Scenario 1 by holding LNG export prices at their baseline forecast level.

2.3.4 Scenario 3

The Australian federal government responded to the recent oil supply shock and rise in global crude oil prices by reducing Australian fuel excise rate by 50 percent, from 44 cents per litre of fuel to 22 cents per litre of fuel. In Scenario 3, we revisit Scenario 1 by overlaying a similar policy response: a reduction in the rate of the fuel excise of 50 percent. With fuel tax credits by industry assumed to be fixed relative to fuel excises paid throughout our counterfactual case, we also reduce fuel tax credits by a similar percentage. The duration of the excise/credit rate shocks is aligned to the duration of the oil price shocks, and therefore return to their baseline forecast levels by 2028. We study the impact of this policy response in Section 3.3.

2.3.5 Scenario 4

In Scenarios 1 – 3, we assume that the federal government maintains budget neutrality via a direct tax levied on households.[8] In Scenario 4 we revisit Scenario 3 and relax this assumption, with the federal

[7] Ballantyne et al. (2020) also assume the productive capacity of the resources sector does not change in the short run. In contrast, we allow mining industries to expand production in the short run by hiring more labour.

[8] The underlying idea of maintaining budget neutrality is introduced for two reasons. First, to avoid the introduction of potential allocative inefficiencies caused by introducing or increasing the rate of another tax instrument; and second, to allow readers to interpret the impact of oil price shocks directly, rather than some overlay of oil shocks with fiscal contractions/expansions that carry very different economic implications.

government funding its revenue shortfall due to the implementation of the 50 percent fuel excise cut via deficit financing. The results are studied in Section 3.4.

2.3.6 Scenario 5

On May 26 2022, the British government announced an Energy Profits Levy (the Levy) on oil and gas companies operating in the UK, to help raise funds for direct payments to UK households to ease its cost-of-living crisis. The Levy is an additional 25 percent tax on UK oil and gas industry profits, on top of the existing 40 percent headline rate of tax, taking the combined rate of tax on profits to 65 percent. It is established to be temporary and will be phased out when energy prices return to historical norms, with a sunset clause included to have the tax removed after 31 December 2025.

Australia, while being small in oil production, is one of the top gas producers and exporters in the world. Approximately 80 percent of gas output in Australia is devoted to exports. When world oil prices rise, export prices of Australian LNG also rise via the aforementioned oil-gas price linkage; see Section 2.3.3. This is problematic for two reasons. First, because this sector is largely foreign-owned, the rise in income largely flows offshore unless some portion of the super-profits accruing to the industry are taxed. Second, because domestically produced gas is both an intermediate input to LNG production and a key source of energy for Australian industries and households, domestic gas prices rise, reducing real wages. A revenue-neutral UK-style energy profits levy would go some way to mitigating both these issues; super-profits in the LNG industry would fall under the umbrella of Australian national income and be recycled to households to boost real income.

In Scenario 5, we thus investigate the impact of a UK-style energy profits levy on LNG producers in response to high energy prices. Specifically, we describe a case where the Australian government follows the approach of the UK government by imposing a 25 percent levy on the LNG industry. The tax revenue is redistributed to households through direct payments that do not distort market pricing.

This tax is implemented temporarily through the high oil price period from 2022 to 2025, unwinding as global crude oil prices fall and returning to the baseline by 2028. The duration of the policy response is consistent with the sunset clause of the UK Energy Profits Levy, which will see the tax removed after 31 December 2025.

Throughout all counterfactual simulations herein, as discussed in 2.3.2, by assumption we hold investment by the LNG industry at its baseline forecast level. This is consistent with the investment incentive of the UK Energy Profits Levy, which includes a (new) 80 percent investment expenditure allowance for energy companies to offset the impact of the Levy on investment incentives.

3. Oil supply shocks and their impact on the Australian economy

3.1 Scenario 1: World oil prices rise by 52.6 percent

3.1.1 Macro impacts

Charts 5 to 10 plot the effects on macro variables, measured as deviations from the baseline forecast, of the oil price shock scenario outlined in Section 2.3.2.

As a net oil importing country, ceteris paribus a significant rise in world crude oil and refined petroleum prices drives Australian import prices up, and the terms of trade down. However, from Chart 5, we see that the terms of trade experience a mild appreciation in Scenario 1, of about 0.2 percent relative to baseline. In Australia, crude oil and refined petroleum account for about 1.8 and 6 percent respectively of aggregate imports by value. Ceteris paribus, we can use Chart 4 and the discussion in Section 2.3.2 to estimate the corresponding movement in the aggregate import price index. In Section 2.3.2, we saw that the rise in the foreign currency refined petroleum price is 18.5 percent in Scenario 1, which is about 35 percent as large as the shock to global crude oil prices. Assuming all other prices remain at baseline forecast levels, we expect a 52.6 percent rise in crude oil price to cause a 0.06*18.5+0.018*52.6 = 2.1 percent rise in the aggregate import price index in Australia. To estimate the terms of trade response, we must also estimate the export price index response. On a value-weighted basis, LNG makes up about 6.5 percent of Australian exports, with iron ore (20 percent) and coal (15 percent) also significant contributors. Value-weighting the price response for each key export, and assuming no other price responses, we estimate the export price index response to be 0.065*26.3 + (0.15+0.18)*1.84 = 2.3 percent. This exceeds the import price response by about 0.2 percent, or about the same as the term of trade response. The mild improvement in the terms of trade in Chart 5 is thus a consequence of the oil-gas price linkage.

Because the LNG sector is largely foreign-owned and capital intensive, and we assume no investment response arising from this transitory shock to world LNG prices, the gains from the rise in the terms of trade caused by higher LNG prices flow largely to existing foreign capital owners as higher profits. A comparatively small proportion flows directly to Australian households, via either increases in government tax receipts or capital income accruing domestic owners of LNG capital, and there is little in the way of expansion in demand for labour. With short-run unit labour costs influenced by the CPI, which is weighted towards imports, particularly fuel and domestic gas (which rises due to the oil-gas price linkage), industries that are also large employers, i.e., excluding LNG, see labour costs rise relative to output prices (Chart 6). This leads to a rise in the real producer wage, triggering a fall in aggregate employment in the short run. [9]

On impact, the national unemployment rate is 0.41 percentage points above baseline due to the oil price shock (see Chart 7). This means if the baseline forecast unemployment rate is 3.5 percent in 2022, under the counterfactual Scenario this would rise to 3.91 percent. This generates gradual pressure on real wages, which experience a fall of 0.5 percent relative to baseline by 2025. As the oil price shock begins to unwind from 2026 onwards (Chart 2), real wages begin to rise (Chart 6) back towards their baseline forecast level.

The weakened labour market drives up the capital-labour ratio in the short run. Capital rentals therefore fall relative to construction costs, causing rates of return to fall below their baseline forecast level. In VURMTAX, real investment is an increasing function of the rate of return on capital. With rates of return down relative to baseline in 2022, so too is real aggregate investment activity, falling by 0.38 percent relative to baseline (Chart 8).

In Chart 8, we also plot the investment response across a series of aggregated sectors. As shown in Chart 8 and described in Section 2.3.2, mining investment is held at baseline by assumption. Relative to baseline, dwelling investment falls by 0.24 percent in the initial year of the oil price shock. Non-mining and non-dwelling investment experiences the largest fall, down by 0.49 percent relative to baseline. In line with the negative investment deviation relative to baseline, rental-weighted capital stocks begin to fall from the second year of the shock, with a slow recovery from 2026 onwards (Chart 8).

With employment depressed relative to baseline, real GDP also falls, by 0.24 percent relative to baseline upon impact (Chart 9). Over subsequent periods, as the unemployment rate rise attenuates, capital stocks begin to fall, and real GDP remains depressed. While the terms of trade rises, as discussed this

[9] In Chart 6, we report the deviation in the real producer wage measured as the economy-wide nominal wage, deflated by an index of wage-bill-weighted industry costs. This places additional weight in the deflator on industry cost deviations, if these industries are also large employers. As shown here, this measure of the real producer wage captures the dynamic at play when oil prices rise in Australia.

is largely due to the oil-gas price linkage mechanism and much of the gains flow to existing foreign capital owners. Real private consumption therefore falls, due in part to the rise in energy prices faced by consumers and also due to increased unemployment, with the fall relative to baseline peaking at 0.51 percent in 2022 (Chart 10). Public consumption is assumed to move with real private consumption throughout our simulation. After 2025, private and public consumption gradually move back to baseline, in line with the gradual return of world oil and LNG prices to baseline.

With real investment, private and public consumption down relative to real GDP, real GNE falls relative to real GDP. The balance of trade thus moves towards surplus, with real export volumes rising by 0.37 percent relative to baseline in 2022, and real imports falling by 0.82 percent (Chart 10).

This movement towards surplus in the balance of trade is aided by real depreciation. Domestically produced goods thus become more competitive in international markets (see Chart 5). As discussed in Section 2.3.2, foreign prices rise more than Australian domestic prices in response to the oil price surge. We thus see expansions in Australian exports as foreign purchasers substitute towards cheaper Australian-produced goods when oil prices are high. As high oil prices start to unwind from 2026, exports gradually fall, dragged down by the sluggish recovery of the domestic capital stock.

3.1.2 Industry impacts

The version of VURMTAX applied herein identifies 98 commodities. To aid our discussion, for presentation purposes we aggregate results for these commodities into 20 broad categories that closely align with the Australian Bureau of Statistics ANZSIC level 1 industry aggregation. In Table 2, we tabularise our aggregated results and present cumulative percentage deviations from the baseline forecast.

In Section 3.1.1, we discussed positive deviations over the period of high oil prices in real aggregate export volumes, while real private consumption falls relative to baseline. All else being equal, we therefore expect expansions in the output of export-oriented and import-competing commodities over this period, while commodities supplied to households will likely experience output contractions relative to baseline. This is largely consistent with the initial-year commodity output responses in Table 2: we see two of the three best-performing industries during the high oil prices period are trade-exposed and thus benefit from real devaluation, namely *Mining*, and *manufacturing* (which is import competing). An exception is *dwelling services*. In Chart 10, we see that real private consumption spending falls, yet in Table 2 output of *dwelling services* is largely unchanged. The explanation is substitution by the household sector. When the price of refined petroleum (and thus *transport*) and gas rises, households substitute towards consumption of other commodities. Consumption of *dwelling services* is a major component of household consumption spending, and is thus a beneficiary of the expenditure-switching induced by the oil supply shock. Among the commodities that experience the largest reductions in output relative to baseline in the initial year, *Transport* falls most sharply. This is because it is intensive in the use of refined petroleum. Commodities that are intensive in the use of petroleum, or complements of petroleum use, e.g., tourism, also experience sharp falls. This explains the contraction in output of *Accommodation and food* and *Arts and recreation*, which both sell relatively large shares of their output to households, and supply to tourism.

Industries that largely supply to the public sector, such as *Public administration and defence*, also contract. This is a direct consequence of our closure assumption, which ties real public consumption on a commodity-specific basis to the aggregate real private consumption response.

As the oil price shock unwinds from 2026 to 2031, industry outputs largely return to their baseline forecast levels.

3.2 Scenario 2: Evaluating the offsetting effect of the oil-gas price linkage to oil price shocks

The results from Section 3.1 highlight that the expansion of the mining output (largely LNG) helps counter some of the negative economic consequences of higher oil prices. Together with the US and Qatar, Australia is one of the largest LNG exporters in the world. About 80 percent of Australia's LNG is sold under long-term contracts in the Asian market that carry terms linking LNG prices to oil prices with a lag of around three to six months, depending on specific contractual arrangements (Cassidy and Kosev, 2015). Such oil-indexed pricing arrangements will directly pass global oil price fluctuations into Australian LNG export prices, and consequently affect Australia’s terms of trade.

RBA (2015) anticipates such an offsetting effect will grow as Australia's LNG exports increase in importance. Cassidy and Kosev (2015) outline that the impact of the oil-gas price linkage will be tempered, due to the high level of foreign ownership and the relatively low labour intensity of LNG production in Australia.

To investigate the extent to which the oil-gas price linkage damps the overall damage of the oil supply shock in Australia, we revisit Scenario 1 and deactivate the transmission of oil prices to LNG prices in VURMTAX. As described in Section 2.3.3, under this new scenario (Scenario 2 hereafter) the LNG export price response to the oil price shock is muted. We compare the simulated macro responses in Scenario 2 to those from Scenario 1 (where the oil-gas price linkage is active), to study the impact of oil-gas price linkages during oil supply shocks.

Charts 11–14 compare the simulated impacts on a selection of macroeconomic variables of the oil price rise with and without activation of the gas-oil price linkage. Each one of the four charts contains two sets of results: one for Scenario 1 (oil-gas price linkage active, blue line), and one for Scenario 2 (oil-gas price link deactivated, orange line). Each chart plots one of four variables: the terms of trade (Chart 11), the unemployment rate (Chart 12), real GDP (Chart 13), and real private consumption (Chart 14). In what follows, we comment on the capacity of oil-indexed LNG export prices to counter the adverse macroeconomic effects of higher oil prices.

As expected, in Chart 11 we see that the higher LNG export prices under Scenario 1 (where the oil-gas price linkage is active) significantly improve the terms of trade response, relative to that in Scenario 2 (where the oil-gas linkage is not active). Relative to the baseline forecast, the terms of trade rise by 0.16 percent in Scenario 1, while they fall by 2 percent in Scenario 2. In contrast, the linking of gas export prices to oil prices has very little effect on the unemployment rate (Chart 12). The rise in the unemployment rate in 2022 is muted by 0.006 percentage points, from 0.414 percent in Scenario 2 to 0.408 percent in Scenario 1; an improvement of about 1.5 percent in Scenario 1 relative to Scenario 2. This represents the net impact of two countervailing effects. First, the oil-gas price linkage will increase domestic gas prices, flowing through into domestic production costs. This will drive unemployment up in Scenario 1 relative to Scenario 2. Second, the oil-gas price linkage will increase taxation revenue from largely foreign-owned industries, increasing national income in Scenario 1 relative to Scenario 2, driving unemployment down.

As illustrated by Charts 13-14, the oil-gas price linkage damps the initial fall in real GDP by approximately 8 percent (reducing the deviation from baseline from -0.26 percent [orange line] to -0.24 percent [blue line]) and cushions the initial fall in real private consumption by approximately 23 percent (reducing the deviation from baseline from -0.66 percent to -0.51 percent). This damping of the real consumption response is small, given the size of the terms of trade response. There are several reasons why.

First, the LNG industry is highly capital intensive. This mutes the direct impact of LNG output expansion on the labour market. Second, as discussed in Section 2.3.2, with LNG investment held exogenous (because the shock is temporary), indirect effects on employment via a rise in LNG investment activity does not materialise. Third, the substantial foreign ownership of the Australian LNG industry dilutes the contribution of the improvement in the terms of trade to national income, as also noted by Cassidy and Kosev (2015). This is opposite in sign but functionally similar to the effect noted by Giesecke et al. (2021b). In Giesecke et al. (2021b), embargos in Australian coal exports cause a reduction in Australian coal prices, damping the terms of trade. The Australian coal industry is however largely foreign owned, so the resulting domestic price fall is mostly a gain for domestic agents. Here, the rise in LNG prices is mostly a loss to domestic agents due to the rise in domestic gas prices.[10]

To expand on this third point, domestically produced gas is consumed by households and other industries as intermediate goods. We find that from 2022-2025, the oil-gas price linkage causes domestic gas prices to rise 10 percent relative to baseline, weakening household purchasing power and elevating domestic production costs for industries. The boost in LNG sector profits moderates some of the damage to real private consumption (Chart 14), because corporate income tax receipts rise and some LNG producers are domestically-owned.

Overall, our findings suggest that while the oil-gas price linkage in Australian LNG exports provides some cushion to the negative effect of increased oil prices, it does not reverse the economic downturn caused by the oil supply shock. The strength of this automatic stabiliser is compromised because of: (1) the relatively low labour intensity of the LNG industry and little indirect employment stimulus via a rise in LNG investment activity, leading to small labour market responses; (2) large foreign ownership shares, meaning higher profits accrue to foreign investors; and, (3) less affordable gas for domestic users.

3.3 Scenario 3: World oil prices rise by 52.6 percent and fuel excise tax rates fall by 50 percent

As discussed in Sections 1 and 2.3.4, in our third scenario we explore the capacity of Australia's recent policy response, a cut in the rate of federally-imposed fuel excise, to damp the economic impact of higher oil prices. The magnitude of the cut in the fuel excise rate we study (a temporary 50 percent reduction) is informed by the policy response put forward by the Australian federal government in its 2022-23 Budget. Our modelled cut is aligned to the duration of the oil price rise we study (three-years, spanning 2022-2025), which contrasts with the 2022–23 Budget response which is due to unwind on 28 September 2022. We explore two funding models for the policy response. In Scenario 3, the fuel excise cut is revenue-neutral and financed via a direct tax on households. We compare the impact of deficit-financing the cut (Scenario 4) in Section 3.4. As outlined in Section 2.3.4, the fuel excise rate reduction we simulate occurs in 2022 and unwinds as the oil price rise unwinds over 2026 – 2028.

Charts 15–17 plot the effect on a selection of macroeconomic variables. Each chart plots the cumulative deviation from baseline in Scenarios 1 (blue line), 3 (orange line), and 4 (grey line), of one of three variables: the unemployment rate (Chart 15), real GDP (Chart 16), and real household consumption (Chart 17). In what follows, we study the capacity of the excise cut to damp the economic damage of the oil price rise with the aid of these three charts.

From all of Charts 15–17, we see that the deviations in the unemployment rate, real GDP, and household consumption are damped in Scenario 3 relative to Scenario 1 across all time periods. For example, from Chart 15 we see that the national unemployment rate response under Scenario 3 (0.28 percentage points in the first year) is 0.13 percentage points lower than the rise experienced under Scenario 1, i.e., when the fuel excise remains at 44 cents per litre. While this contributes to a favourable household consumption response, real private consumption remains 0.48 percent below the baseline in Scenario 3

[10] We estimate the foreign ownership of the Australian LNG industry to be 87 percent based on the estimation of the Tax Justice Network in 2017. This number is very close to the estimation of approximately 88 percent of the LNG industry in Western Australia being foreign-owned by the Conservation Council of Western Australia in 2019.

in 2022. This small improvement of 0.03 percentage points relative to results in Scenario 1, arise because the policy response is budget-neutral and funded via a direct tax on households. With only small allocative efficiency gains, the resulting improvement in household incomes and thus real consumption are only small. Despite small real income gains, the policy response does reduce fuel and transport costs, aiding international competitiveness. Compared with Scenario 1, this mutes the peak fall in real GDP relative to baseline by 0.08 percentage points; see Chart 16, where the Scenario 3 GDP downturn in 2022 is -0.16 (orange line) compared to the Scenario 1 response (blue line) of -0.24 percent. Expressed as a percentage improvement in the real GDP response relative to Scenario 1, the Scenario 3 outcome represents a reduction in the real GDP downturn of 33 percent.

3.4 Scenario 4: deficit-financed fuel excise cut

In this Section, we revisit our financing assumption for the policy response studied in Section 3.3.[11] In contrast with the budget-neutral fuel tax cut case of Scenario 3, households do not pay for the short-run costs of the fiscal policy response in Scenario 4, with the federal budget position moving towards deficit and net debt rising. From Chart 17, we see that the first-year impact of the oil supply shock to real private consumption is largely neutralised in this case.

Supported by strong real private consumption, the negative impact of the global oil supply shock on the labour market and real GDP is significantly mitigated. With regard to the deviation from baseline, we see the unemployment rate rises by 0.13 percent in the first year in Scenario 4 (Chart 15). Relative to the results of Scenario 1, this is equivalent to an improvement of 0.28 percentage points in the initial year.

Chart 16 illustrates that the fall of real GDP in Scenario 1 is stabilised, with a fall of 0.07 percent relative to baseline in the initial year. Relative to Scenario 1, this is equivalent to an improvement of 71 percent, i.e., a fall of 0.07 percent instead of 0.24 percent relative to baseline.

While the debt-financed fuel tax policy smooths the negative consequences of high oil prices on the economy in the short-run, interest payments on the higher net debt position rise, driving debt overhang that dampens the post-shock recovery path. This is clear from Chart 16, which highlights that real GDP experiences a sluggish post-shock recovery to baseline.

3.5 Excess burden evaluation

The fuel excise in Australia is a specific tax that is levied as a fixed rate per litre of fuel, i.e., imposed on the quantity of fuel purchased rather than the value of fuel purchased. When oil prices rise, fuel prices also rise; this reduces the ad valorem rate of the fuel excise, because the value of one litre of fuel rises while the tax paid on one litre of fuel remains fixed. The economic distortions of the fuel excise thus fall as oil prices rise, and so does the merit of cutting the fuel excise tax cut (relative to cutting other taxes) on pure efficiency grounds. To explore this effect further, in this section we define and evaluate the marginal excess burden of fuel excise against two baseline forecasts: (i) the U.S. EIA business-as-usual (BAU) oil price forecast from Section 2.3.1; and, (ii) in the presence of a three-year 52.6 rise in the oil price relative to the U.S. EIA BAU forecast.

Following Nassios et al. (2019a), we define the excess burden as the ratio of the change in leisure-adjusted real national income, to the change in real government lump sum transfers to households. More

[11] We also examine an alternative scenario that the federal government funds its revenue loss due to surged oil prices and the 50 percent fuel excise cut via deficit financing. We find the second-order effect of high oil prices on government fiscal position is relatively small. The major impact on the budget position is from policy response.

specifically, the efficiency loss caused by a tax policy package in time-period t (EB_t) at the national level is evaluated according to the formula:

$$EB_t = -100\left(\frac{\Delta GNI_t + \Delta VLEIS_t}{\Delta LST_t}\right) \tag{1}$$

Where ΔGNI_t is the deviation in real gross national income (GNI) in year t expressed as the difference between the counterfactual simulation and baseline simulation values for GNI in year t; $\Delta VLEIS_t$ is the deviation in the value of leisure at time t, which is calculated as the product of the real consumer wage and the proportion of the working population that is not participating in the labour force; and ΔLST_t is the deviation in revenue-neutral lump sum transfer in year t.

Since the 50 percent fuel tax cut implemented in 2022 begins to unwind from 2026 onwards, our assessment of the allocative efficiency change is made by comparing the marginal excess burdens in the year 2025, i.e., three years after the fuel excise is cut by 50 percent. In the U.S. EIA BAU case, the 50 percent fuel excise cut drives an allocative efficiency gain of two cents per dollar of tax revenue foregone by the year 2025. This is very small when compared to some other Australian taxes, e.g., property transfer duty, which carries a marginal excess burden of 82 cents per dollar [Nassios and Giesecke (2022)]. This suggests that the deadweight loss of the fuel excise is small. As expected, the allocative efficiency gain is lower when oil prices are elevated, with the marginal excess burden equal to 0.9 cents per dollar of tax revenue foregone when the foreign-currency price of crude oil is 52.6 percent higher than the U.S. EIA BAU forecast level in 2025.

3.6 Scenario 5: Energy profits levy on LNG industry, the alternative policy option

As discussed in Section 2.3.6, energy producers can accrue significant windfall gains when energy prices rise due to dramatic changes in economic circumstances. While the recent rise in global crude oil prices has driven up profits for oil producers, prices for other energy commodities, e.g., LNG, have also risen. The impact associated LNG prices rise was studied in Section 3.2, where we explored the impact of oil-gas price linkages for Australia. As we showed, the large terms of trade gains that materialise when oil prices rise, even for oil-importing but non-oil energy exporters like Australia, do not necessarily translate to large national income and real consumption stimulus. Herein, we showed that this was in part due to high degrees of foreign ownership, low labour intensity, and because higher LNG export prices drive up domestic gas prices, making gas less affordable for domestic users.

In Australia, the response to this situation was to deliver stimulus via a temporary tax cut; see Sections 3.4 and 3.5, where we study this response in detail. In this section, we explore an alternative fiscal policy response: a UK-style energy profits levy on the Australian LNG industry. In this scenario (Scenario 5 hereafter) we assume that the Australian federal government introduces an energy profits levy of 25 percent, in addition to the existing 30 percent corporate tax on LNG producers. The policy is revenue-neutral and proceeds are redistributed to households via direct payments, in keeping with the spirit of the UK policy where revenues were used to fund welfare payments.

In Chart 18, we plot the deviation from baseline in the national unemployment rate in both Scenario 1 (no energy profits levy, blue line) and Scenario 5 (orange line). From Chart 18, we see that the LNG profits levy helps attenuate the damage of the oil price rise on the labour market, with the peak rise in the national unemployment rate in 2022 being 0.1 percentage points lower under Scenario 5 (orange line) than Scenario 1 (blue line).

Because the policy is budget-neutral and the revenue from the levy is collected from an industry that is largely foreign-owned, from Chart 19 we see the energy profits levy drives a significant improvement in the real private consumption response (orange line) during the crisis, relative to Scenario 1 (blue line) where there is no fiscal response. With a smaller real consumption downturn, the fall in real GDP is also smaller; see Chart 20.

We can compare and contrast the impact of each of the three policy responses simulated in Scenarios 3 (excise cut, revenue-neutral), 4 (excise cut, deficit-financed) and 5 (energy levy, budget-neutral). In Section 3.3, we showed that while a budget-neutral 50 percent fuel excise cut helps mitigate the damage of high energy prices to real GDP, the impact on household income and thus private consumption is small. In Section 3.4, short-run impacts of the oil price rise are neutralised when the excise cut is deficit-financed, but this delays the cost; as we see in Charts 16 and 17, the rise in net debt under Scenario 4 causes a debt overhang that damps the post-crisis recovery path. If debt levels are already high and the financial environment is one where global interest rates are rising, this increase in net debt may impact financial stability and the capacity to respond to future economic crises. In Section 3.6, we find the 25 percent UK-style energy profits levy improves private consumption outcomes relative to Scenario 3, but by less than in Scenario 4. Importantly, Scenario 5 carries no debt overhang, because the policy raises additional tax revenue that is returned to households via direct transfers. Long-run macro stability consequences are thus lower than under Scenario 4, because debt-to-income ratios are not increased by the fiscal response.

4. Concluding remarks

This paper investigates the effects of a global oil price rise on the Australian economy and the effects of policymakers responding with a temporary cut to fuel excise tax. The oil price shock is hypothetical, in the sense that the duration of both its peak and its gradual return to baseline are assumed. However, the magnitude of our peak shock to world oil prices (52.6 percent) is based on observed market responses following the onset of Russia's invasion of Ukraine. Our analysis elucidates what a shock of this nature would mean for Australian labour markets, real GDP, household consumption and industry prospects. In Scenario 1 described herein, we find that upon impact such a shock translates to a 0.41 percentage point rise in the Australian unemployment rate, a fall in private consumption of 0.51 percent, and a fall in real GDP of 0.24 percent.

Taking a step further, we investigate the capacity of oil-linked LNG export prices to attenuate the economic impact of elevated oil prices (Scenario 2 herein). We find that the oil-gas price linkage greatly improves the terms of trade, but the benefits to the domestic economy are attenuated by: (1) muted response in the labour market due to the low labour intensity of gas production, (2) high foreign ownership of gas production, leading to profits mostly flowing offshore, and (3) higher domestic gas prices that harm households and businesses that rely on gas for heating, cooking and energy.

We then examined the degree to which cuts in Australian fuel excise can attenuate these adverse economic impacts (Scenarios 3 and 4 herein). The magnitude of the 50 percent reduction in the fuel excise rate we study is predicated on the policy response put forward by the former Australian federal government in its 2022-23 Budget. Our simulated excise cut is temporary: it commences in the shock-year (2022) and unwinds over 2026 – 2028 in line with the return of world oil prices to the EIA baseline forecast level. The rate of fuel tax credit claims by industries are simultaneously reduced, and subsequently normalised to the baseline.

Overall, we find this policy can help mitigate the damage of high energy prices to the labour market and real GDP. Compared to the scenario that has no such policy response to the oil supply shock (Scenario 1 herein), the policy helps cushion the negative impact of the oil supply shock on employment and real GDP by about 30 percent. However, its ability to elevate private consumption will be marginal if a budget-neutral implementation is achieved through a direct tax on households. In contrast, by investigating an alternative scenario where the 50 percent fuel excise cut is deficit-financed, we find the benefits of smoothing damages in the short run are at the cost of an unfavourable debt overhang problem which slows post-shock economic recovery and weakens household financial resilience to future shocks. From an allocative efficiency perspective, we find increased oil prices compromise the merit of the fuel excise tax cut and mitigate its capability to reduce tax distortion.

Last, we investigate the policy impact of an energy profits levy on the largely foreign-owned LNG industry (Scenario 5 herein). By reorienting part of the windfall financial gains due to high energy prices from largely foreign-owned LNG producers to domestic households, such a policy can improve private consumption. Our findings suggest such a budget-improving policy should be considered as a valuable addition to the taxation toolbox for Australian policymakers, to help households cope with financial hardship caused by energy price inflation.

Nevertheless, when it comes to crafting the practical implementation of such an LNG profits levy, a clear perspective should be set out within a predictable and sound taxation system. An arbitrary tax may compound uncertainty and thus impair investor confidence. Moreover, solid monitoring and regulation would be necessary to ensure such tax cannot be passed to domestic consumers.

While the main scope of this paper is to explore the impact of the oil supply shock on the Australian economy and the effectiveness of fiscal policy responses, the price response of other important export commodities of Australia may also have significant effects on the economy. This motivates our investigation on the offsetting effect of LNG exports as a stabilising channel to oil price shocks, because of its direct price linkage with the global oil market as well as its economic importance as one of the top exporting industries in Australia.

By contrast, iron ore and coal, as the other two top exporting commodities in Australia, would also be expected to help mitigate the negative consequences of soaring oil prices to some degree. Intuitively, the iron ore industry could be expected to be fully capable of passing the increased production costs due to soaring oil prices to export prices. The coal industry may also benefit from higher oil prices, as coal is an energy substitute for oil for heating uses. Since the coal mining industry is relatively labour intensive, its expansion in response to oil price hikes would have a larger impact on the employment market and household income. These interesting questions are beyond the scope of this paper and are left for future research.

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Charts

Chart 1: Fuel excise and fuel tax credits claimed across a selection of VURMTAX industries, 2017/18

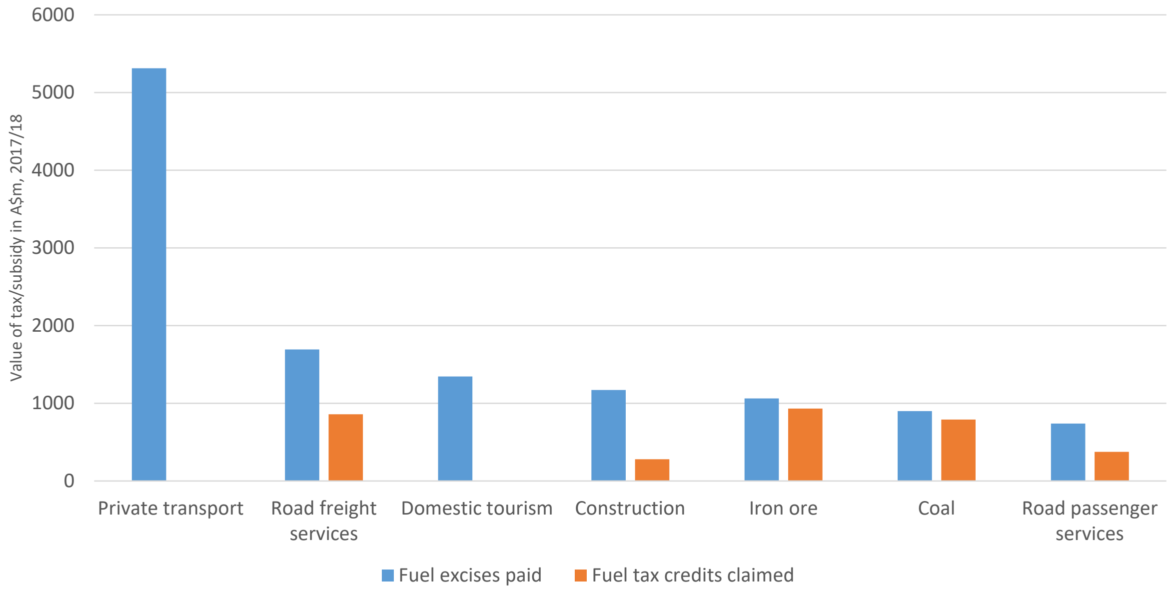


Chart 2: Foreign oil prices: baseline and counterfactual scenarios (European Brent spot price)

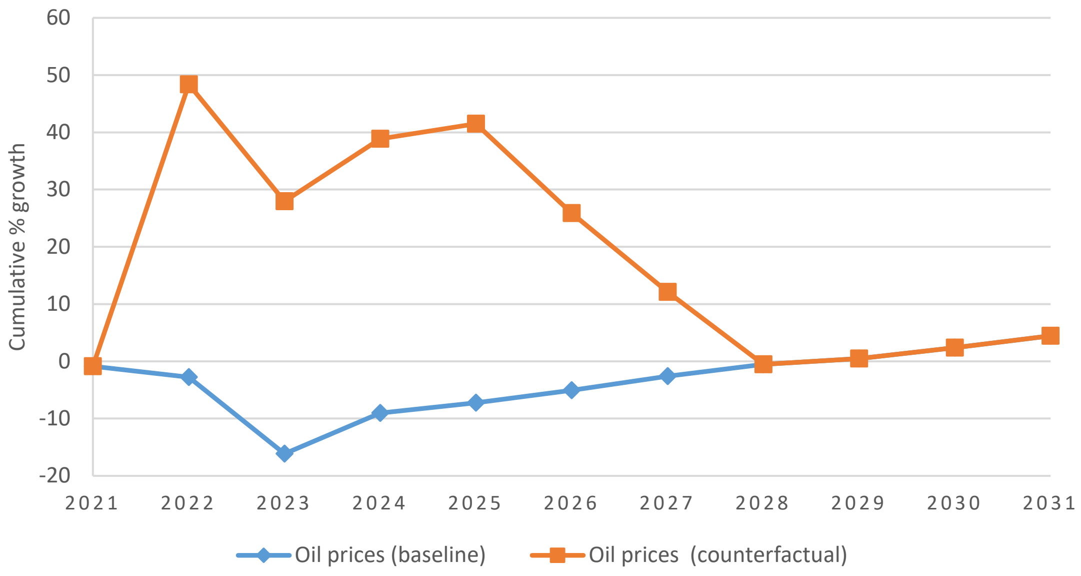


Chart 3: Foreign currency price and demand shocks (% deviation from baseline)

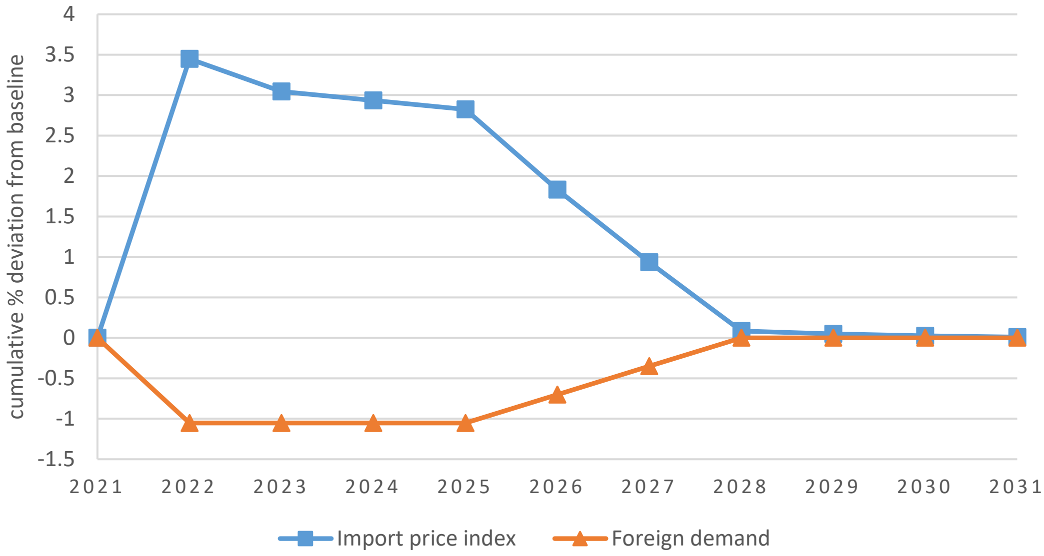


Chart 4: Foreign currency price shocks by commodity (% deviation from baseline)

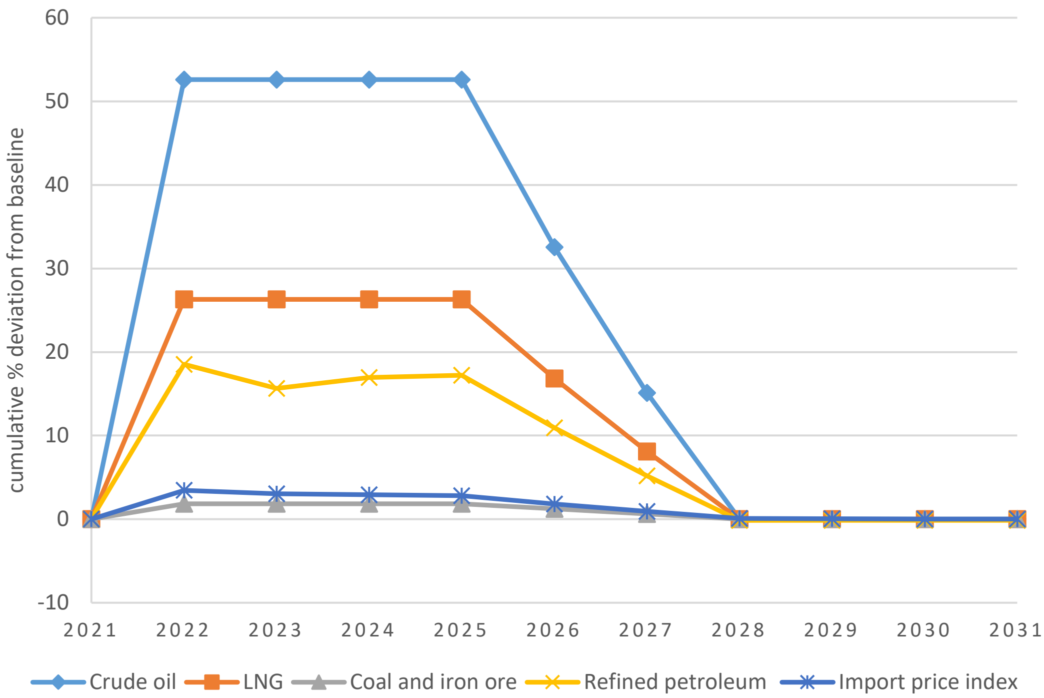


Chart 5: Temporary oil price rise: foreign trade (% deviation from baseline)

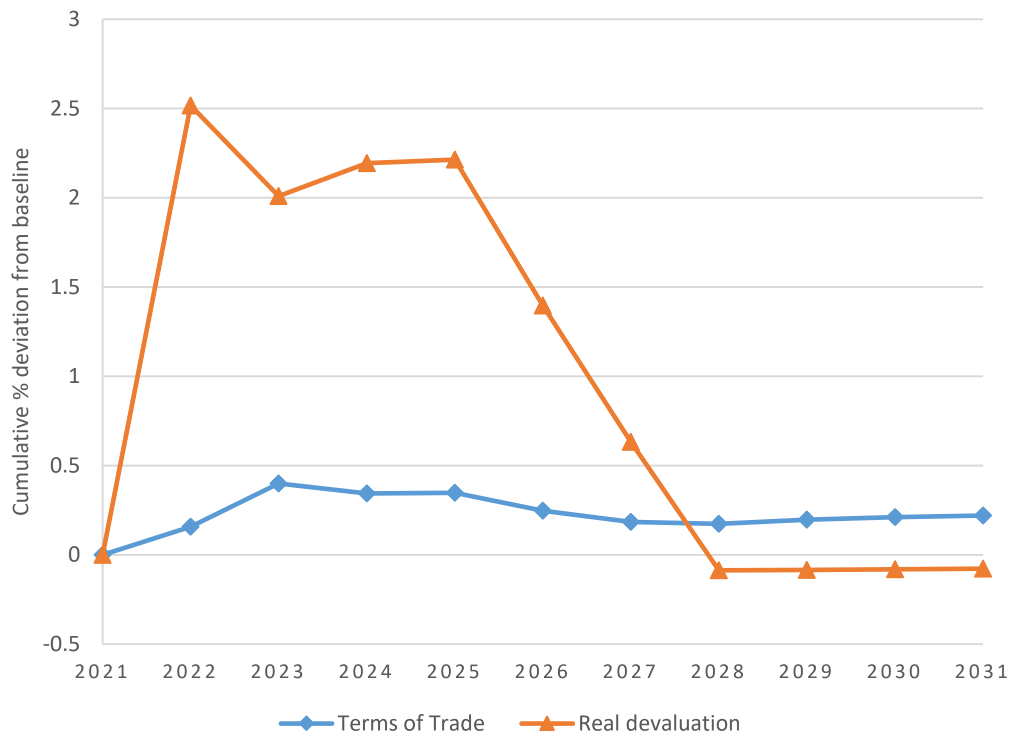


Chart 6: Temporary oil price rise: labour market (% deviation from baseline)

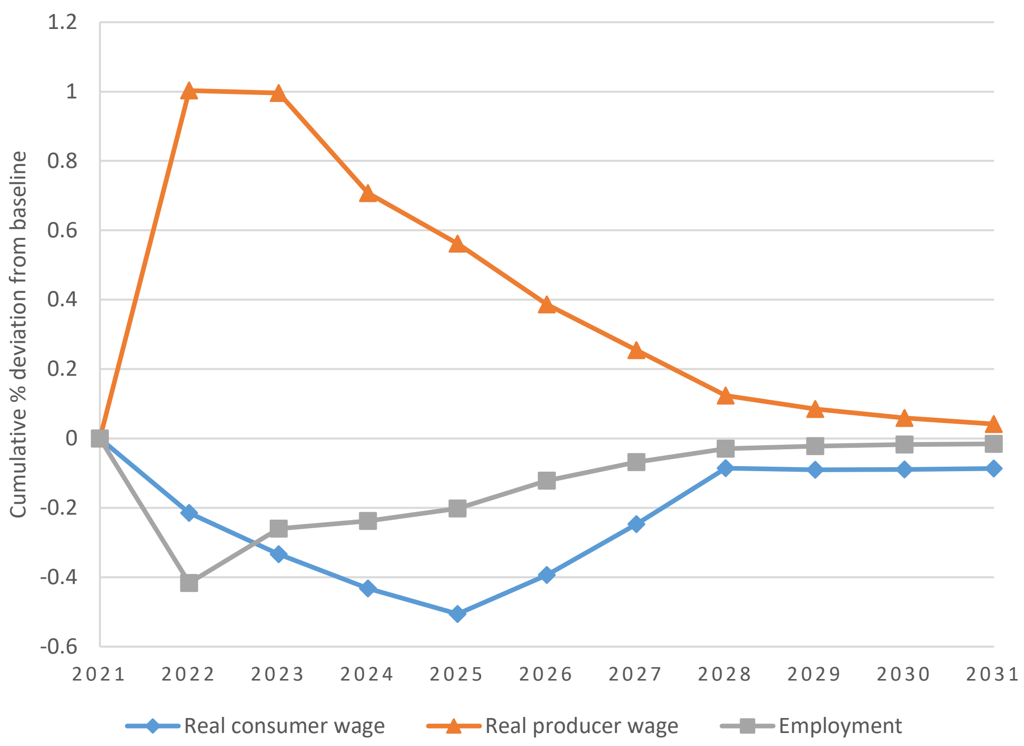


Chart 7: Temporary oil price rise: unemployment rate (percentage point deviation from baseline)

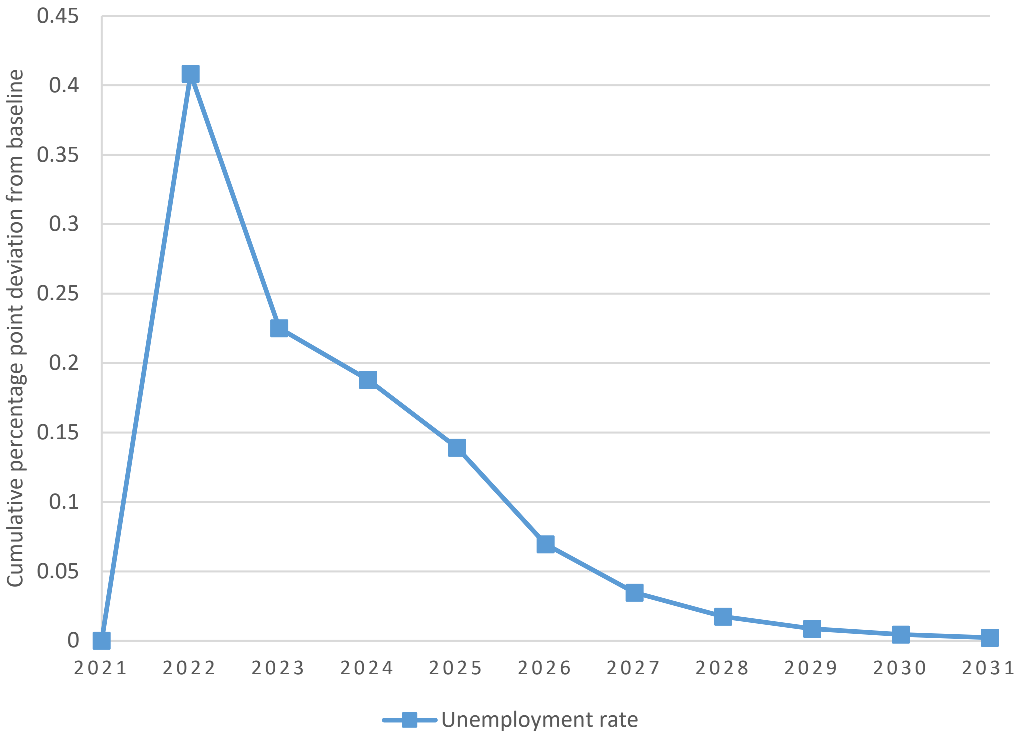


Chart 8: Temporary oil price rise: investment (% deviation from baseline)

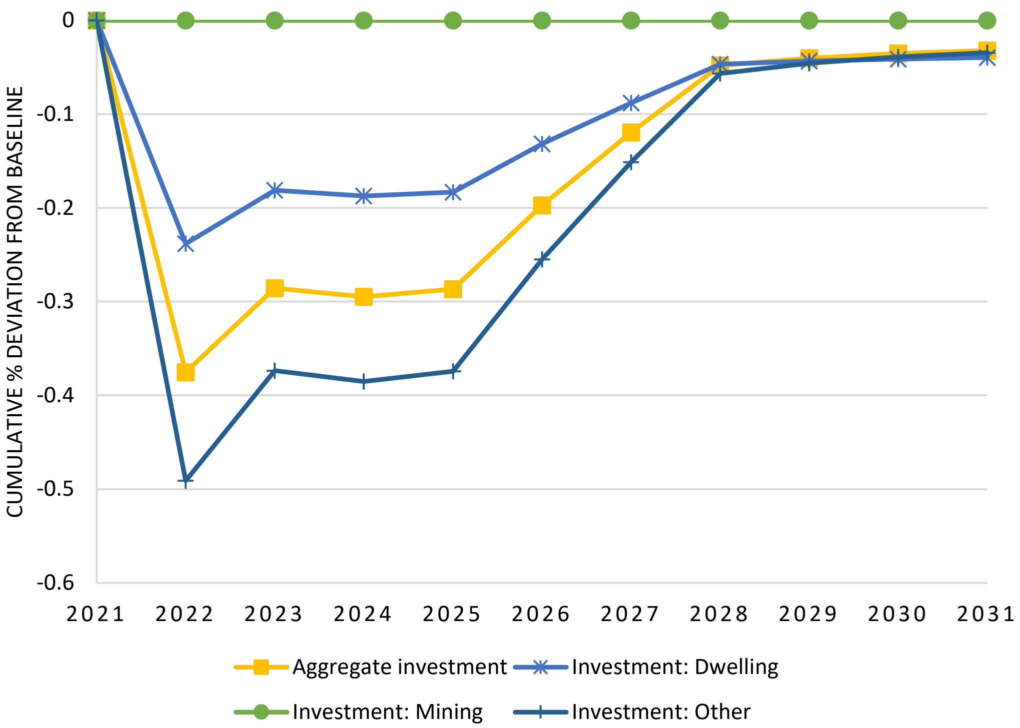


Chart 9: Temporary oil price rise: real GDP and factor inputs (% deviation from baseline)

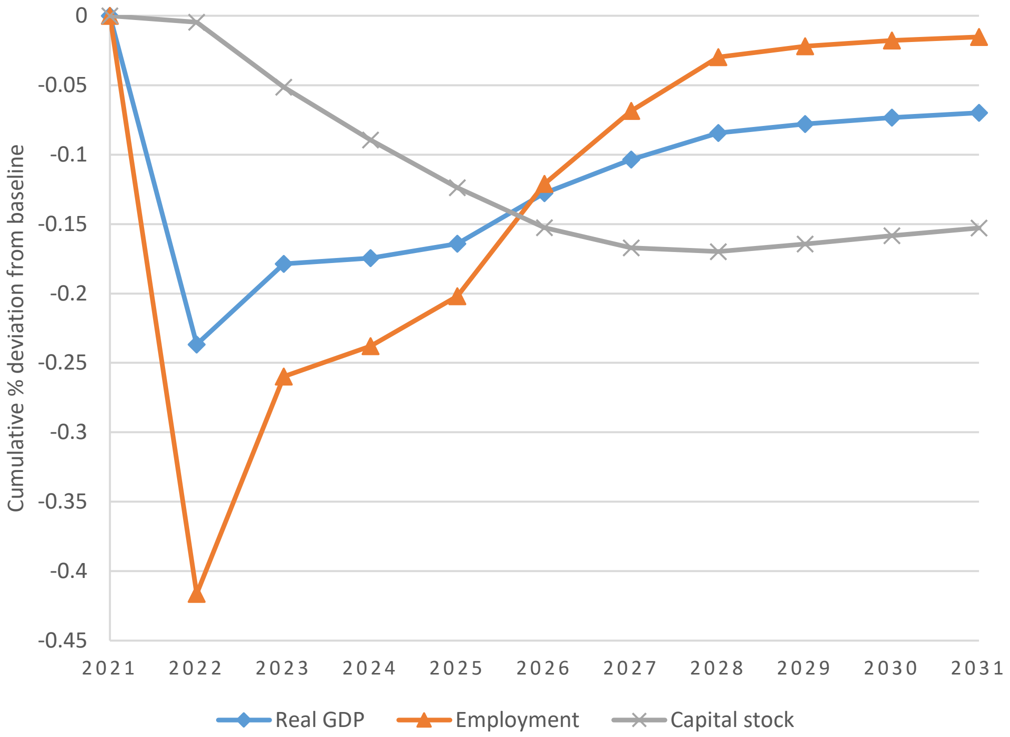


Chart 10: Temporary oil price rise: real GDP expenditure (% deviation from baseline)

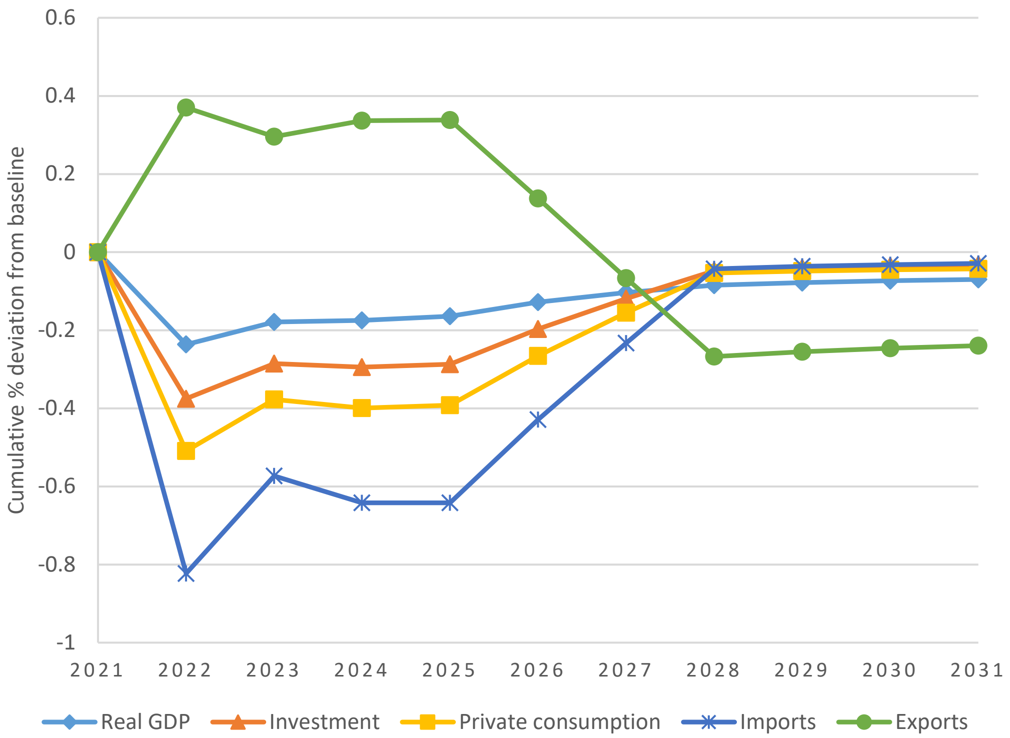


Chart 11: Terms of trade under temporary oil price rise scenario, with and without linked oil and gas prices (% deviation from baseline)

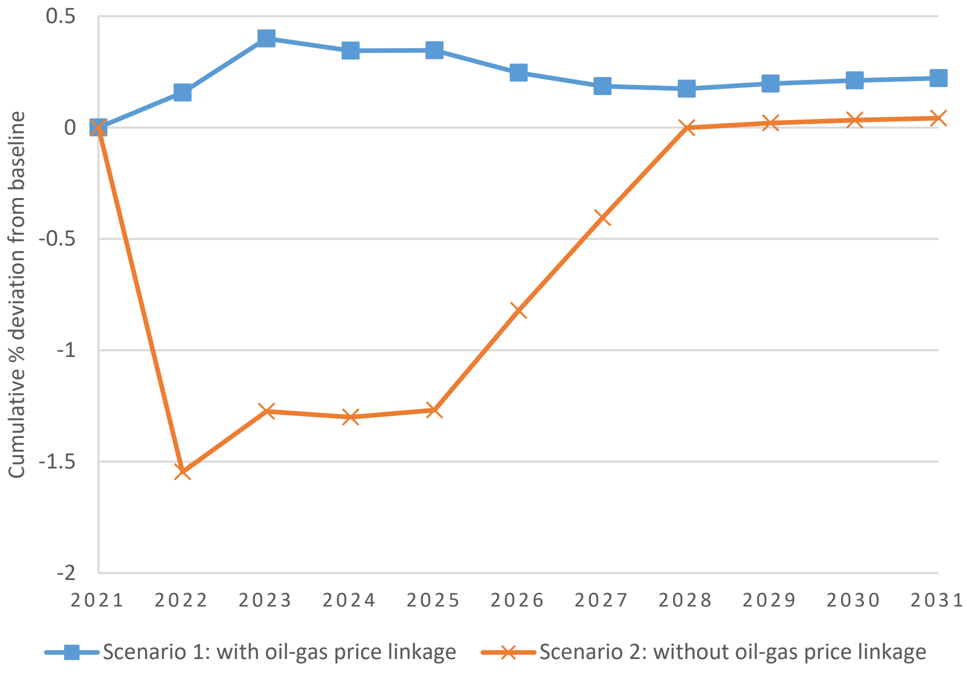


Chart 12: Unemployment rate under temporary oil price rise scenario, with and without linked oil and gas prices (percentage point deviation from baseline)

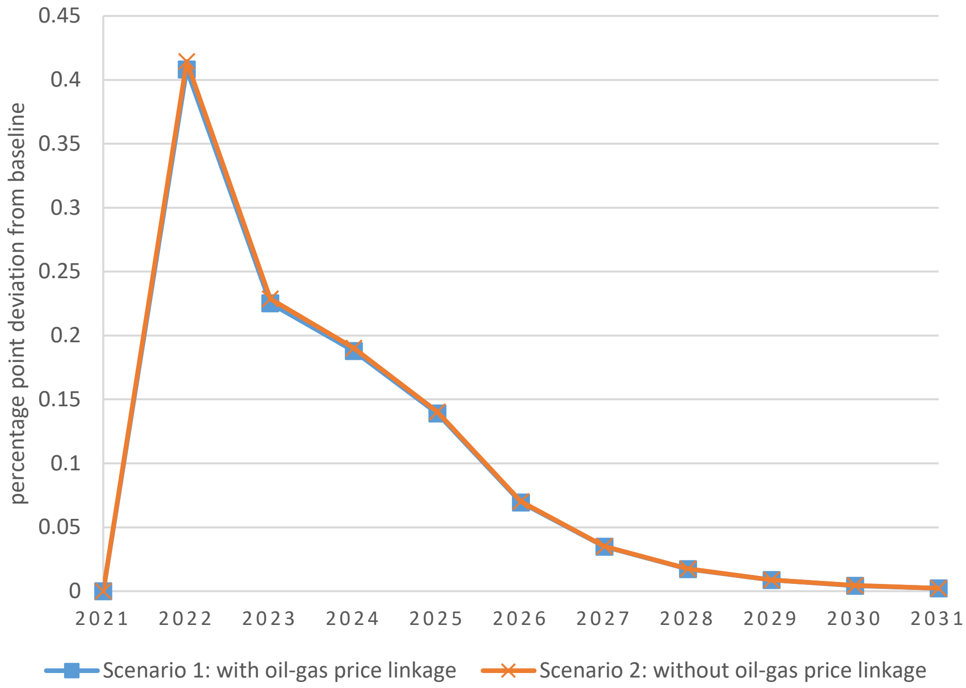


Chart 13: Real GDP under temporary oil price rise scenario, with and without linked oil and gas prices (% deviation from baseline)

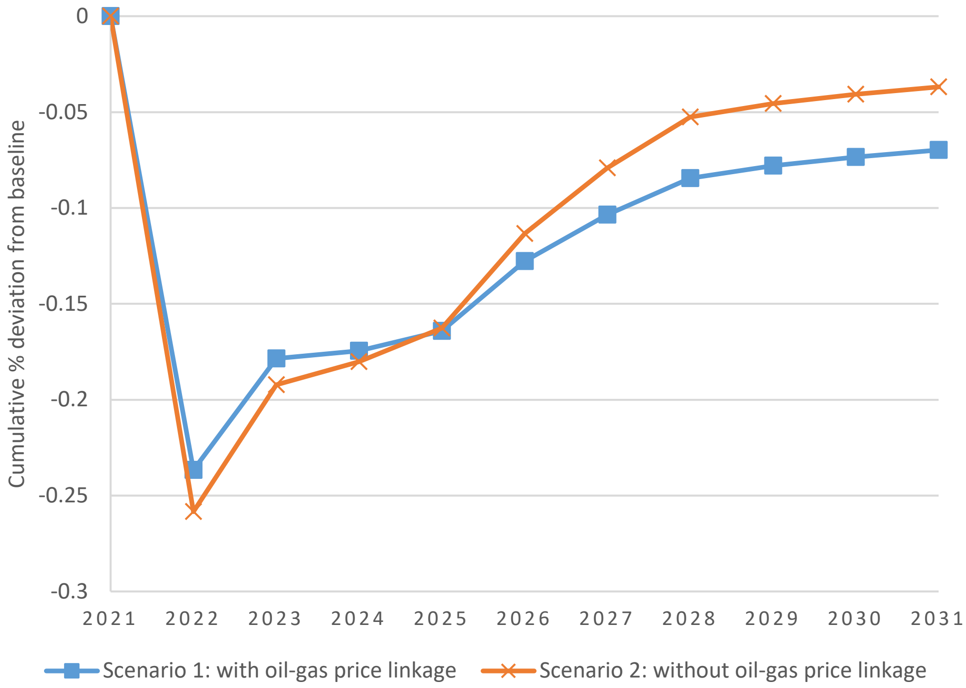


Chart 14: Real private consumption under temporary oil price rise scenario (with and without linked oil and gas prices) (% deviation from baseline)

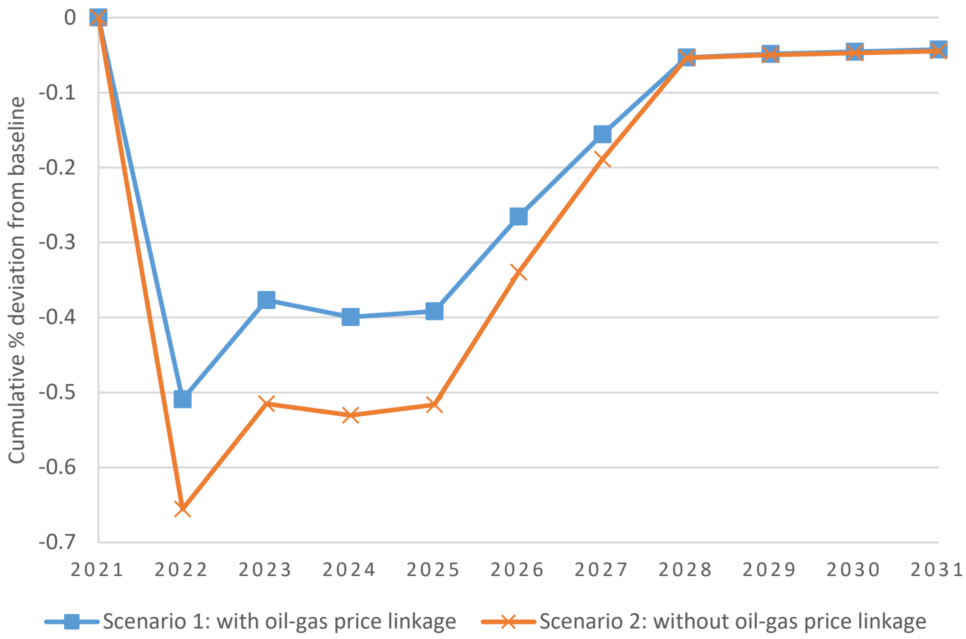


Chart 15: Unemployment rate under temporary oil price rise scenario, with and without fuel excise cut (percentage point deviation from baseline)

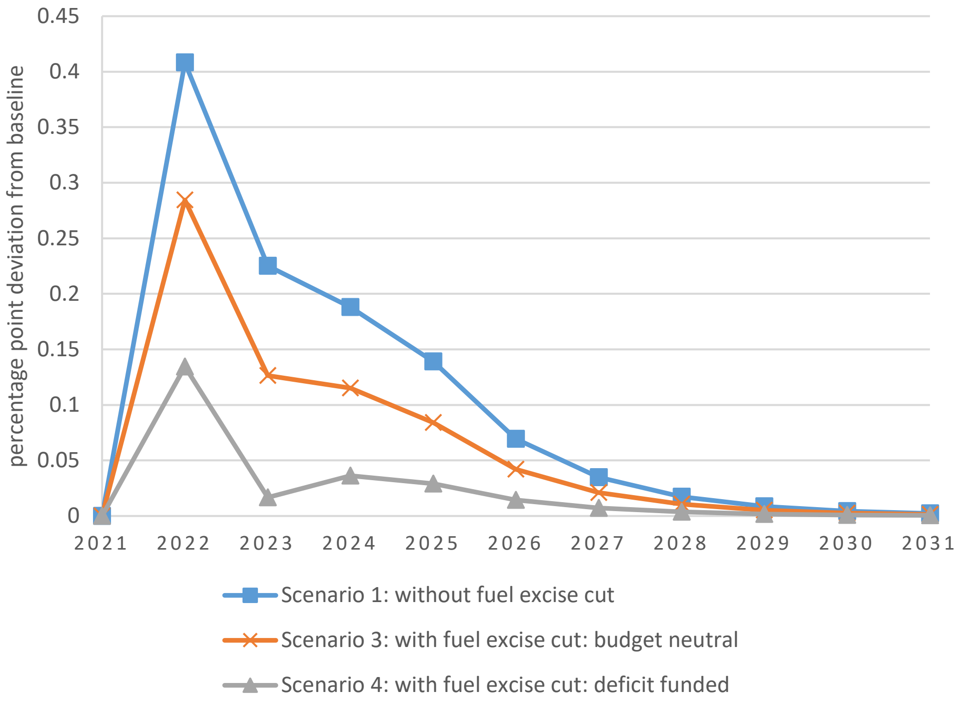


Chart 16: Real GDP under temporary oil price rise scenario, with and without fuel excise cut (% deviation from baseline)

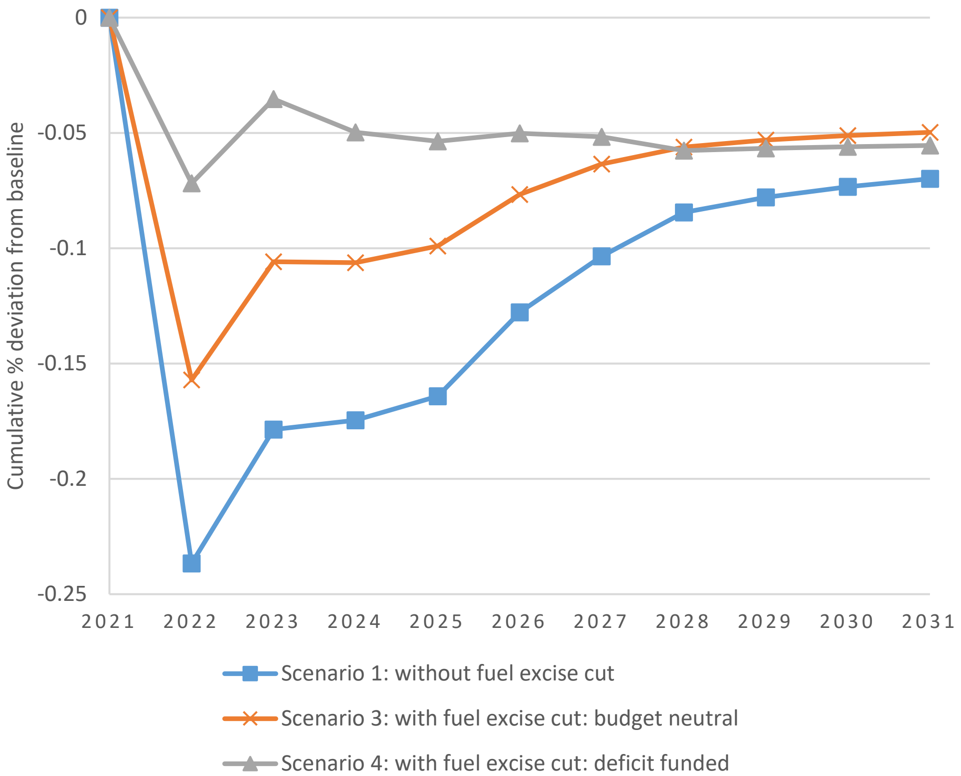


Chart 17: Real private consumption under temporary oil price rise scenario, with and without fuel excise cut (% deviation from baseline)

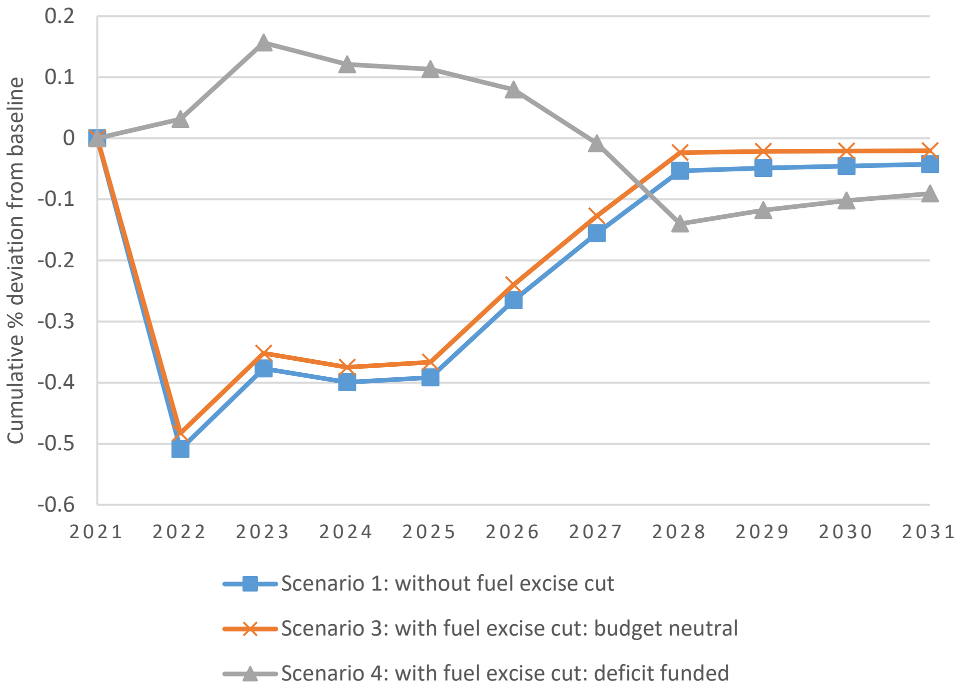


Chart 18: Unemployment under temporary oil price rise scenario, LNG profits levy (percentage point deviation from baseline)

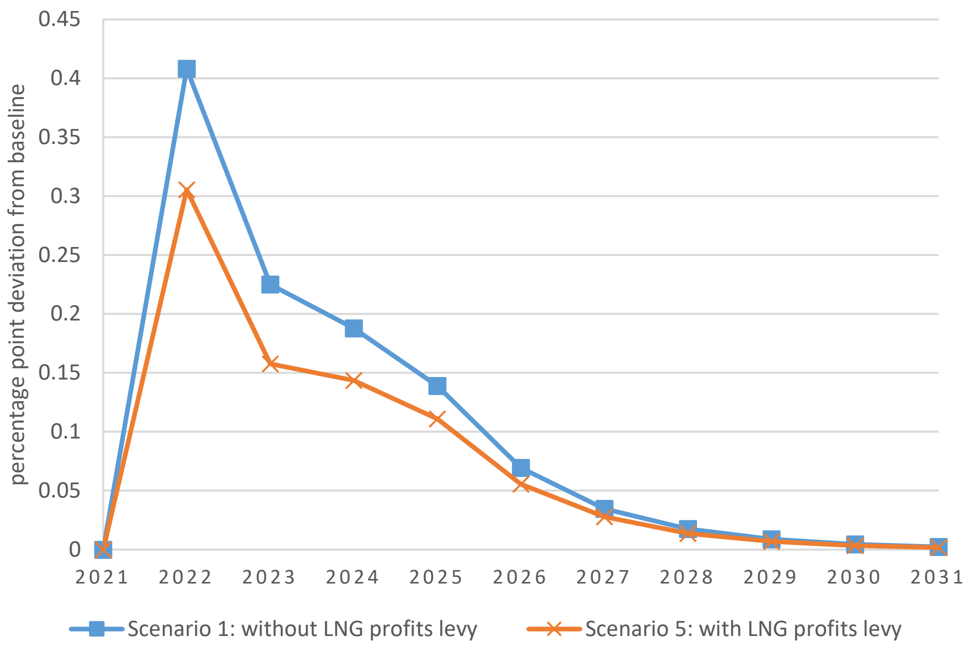


Chart 19: Real private consumption under temporary oil price rise scenario, LNG profits levy (% deviation from baseline)

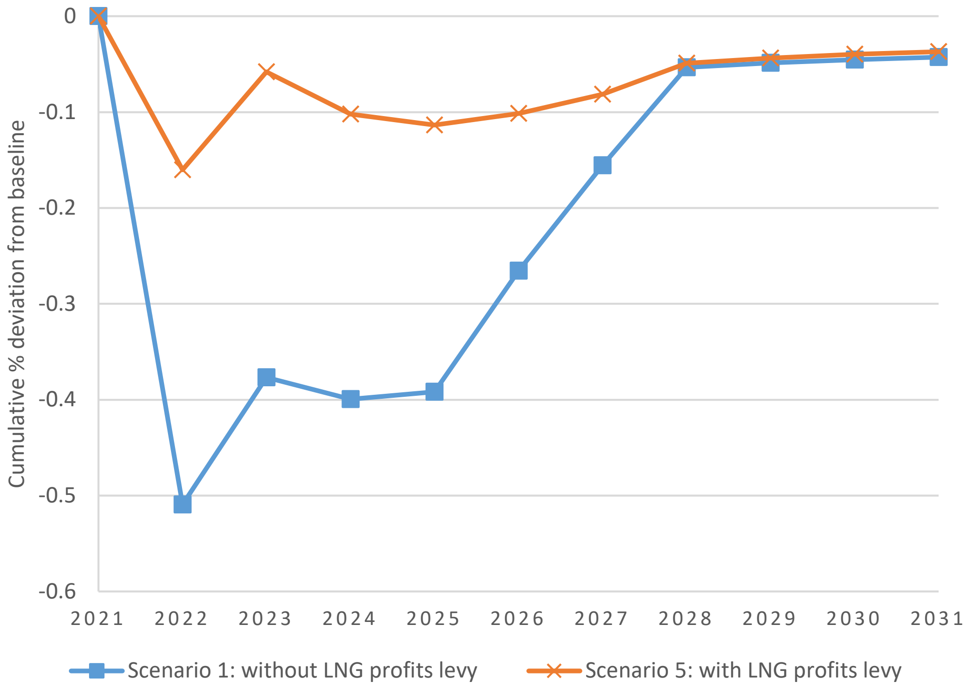
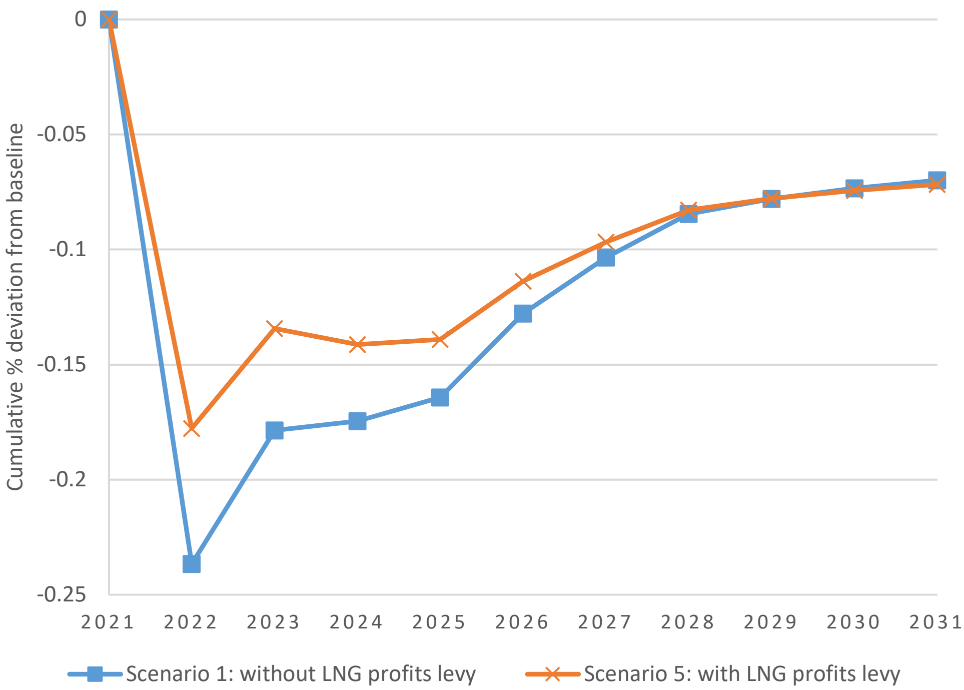


Chart 20: Real GDP under temporary oil price rise scenario, LNG profits levy (% deviation from baseline)



Tables

Table 1: Distinguishing characteristics of the five counterfactual scenarios

	Scenario				
	1	**2**	**3**	**4**	**5**
Shocks describing an elevated oil price environment					
Elevated oil prices	*	*	*	*	*
Export demand shifts	*	*	*	*	*
Elevation of energy-intensive import prices	*	*	*	*	*
Shocks describing policy responses					
Fuel excise cut			*	*	
LNG profits levy					*
Closure assumptions					
Linkage of LNG export prices to world oil prices	*		*	*	*
Fiscal neutrality via direct tax adjustment	*	*	*		*
Deficit financing				*	

"*" indicates that the relevant shock or closure assumption is active in the scenario

Table 2: ANZSIC Level 1 industry output, cumulative deviation from the baseline forecast in percent, Scenario 1*

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
1	Agriculture, forestry and fishing	0	-0.11	-0.05	-0.03	-0.01	-0.02	-0.04	-0.06	-0.05	-0.04	-0.04
2	Mining	0	0.72	0.72	0.74	0.76	0.54	0.29	0.01	0.01	0.01	0.01
3	Manufacturing	0	-0.07	-0.02	-0.02	-0.02	-0.02	-0.03	-0.05	-0.05	-0.04	-0.04
4	Gas, electricity and water	0	-0.12	-0.07	-0.06	-0.05	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02
5	Construction	0	-0.24	-0.18	-0.18	-0.17	-0.12	-0.08	-0.05	-0.04	-0.04	-0.03
6	Wholesale trade	0	-0.40	-0.29	-0.29	-0.28	-0.19	-0.12	-0.05	-0.05	-0.04	-0.04
7	Retail trade	0	-0.46	-0.34	-0.35	-0.34	-0.23	-0.14	-0.06	-0.05	-0.04	-0.04
8	Accommodation and food	0	-0.71	-0.53	-0.50	-0.46	-0.31	-0.18	-0.08	-0.06	-0.06	-0.05
9	Transport	0	-0.52	-0.41	-0.45	-0.46	-0.34	-0.24	-0.14	-0.13	-0.12	-0.11
10	Communications	0	-0.27	-0.18	-0.18	-0.16	-0.12	-0.08	-0.05	-0.05	-0.04	-0.04
11	Finance and insurance	0	-0.16	-0.11	-0.10	-0.09	-0.07	-0.06	-0.06	-0.05	-0.05	-0.05
12	Rental and hiring services	0	-0.22	-0.15	-0.13	-0.11	-0.08	-0.07	-0.06	-0.05	-0.05	-0.04
13	Professional services	0	-0.33	-0.25	-0.21	-0.18	-0.12	-0.08	-0.06	-0.05	-0.04	-0.03
14	Administrative services	0	-0.39	-0.27	-0.25	-0.22	-0.15	-0.10	-0.05	-0.05	-0.04	-0.04
15	Public administration and defence	0	-0.46	-0.34	-0.35	-0.34	-0.23	-0.14	-0.05	-0.05	-0.04	-0.04
16	Education	0	-0.43	-0.29	-0.29	-0.27	-0.17	-0.10	-0.04	-0.04	-0.03	-0.03
17	Health services	0	-0.46	-0.33	-0.33	-0.31	-0.21	-0.12	-0.04	-0.04	-0.04	-0.03
18	Arts and recreation	0	-0.53	-0.38	-0.37	-0.34	-0.23	-0.14	-0.06	-0.06	-0.05	-0.05
19	Other services	0	-0.27	-0.19	-0.19	-0.17	-0.14	-0.11	-0.09	-0.08	-0.08	-0.07
20	Dwelling services	0	-0.02	-0.02	-0.02	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02

*The three best performing commodities in each year are shaded in green, with the three industries experiencing the largest fall (smallest rise) in output each year in orange.