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DISCUSSION PAPER

Energy Subsidies in Malta: Estimating the Effects of Current Policies and Hypothetical Exit Strategies.[1]

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[1] This Discussion Paper expands the work featuring in Rapa (2024b) in multiple directions.

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Abstract

This study assesses the macroeconomic, fiscal, and environmental impacts of Malta's fixed energy price policy introduced in response to the global energy crisis. Using MEDSEA-NRG, a dynamic structural macroeconomic model with energy and fiscal blocks, the analysis quantifies the short-term benefits and long-term costs of maintaining artificially low energy prices through public subsidies. The policy supported economic activity, reduced inflation, and protected low-income households, particularly during 2022–2023. However, the subsidies also suppressed market signals, reduced incentives for energy efficiency and renewable investment, and placed significant strain on public finances—raising the debt-to-GDP ratio by around 4 percentage points by 2024. Hypothetical exit strategies show that a sudden subsidy removal would result in economic contraction and disproportionate hardship for poorer households. In contrast, gradual tapering or fiscal recycling strategies—particularly those that reallocate savings to green investment—mitigate economic and environmental trade-offs. A phased and well-communicated exit, combining targeted social support and renewable subsidies, emerges as the most balanced path toward fiscal sustainability, energy efficiency, and environmental alignment with EU goals.

JEL Classification: C54, H23, Q43, Q48, Q58.

Keywords: Energy subsidies, Macroeconomic modelling, Distributional effects, Environmental policy

Contents

1. Introduction 6

2. Simple Pass-Through Estimates of Natural Gas and Oil Prices 9

3. Model and Simulation Design 13

3.1. MEDSEA-NRG – a brief description of the model 14

3.2. Simulation Design 17

4. The Impact of the Fixed Pricing Strategy 18

5. Impact of Hypothetical Exit Strategies 21

5.1. Surprise Interruption of Subsidies – No Fiscal Recycling 22

5.2. Surprise Tapering of Subsidies without Recycling 24

5.3. Surprise Interruption of Subsidies – Fiscal Recycling Experiments 27

6. Conclusion 30

References 32

Executive Summary

In the wake of surging international energy prices driven by the post-pandemic economic rebound and the geopolitical turmoil, the Maltese Government introduced a fixed energy price policy. This intervention effectively decoupled domestic energy prices from global markets, shielding both households and firms from extreme retail energy cost increases. As this discussion paper demonstrates, the macroeconomic and distributional gains of this policy were significant. Nonetheless, its long-term implications raise important fiscal, environmental, and structural concerns that merit serious policy consideration.

This study uses MEDSEA-NRG, a Dynamic Stochastic General Equilibrium (DSGE) model tailored to Malta's economic structure with detailed energy and fiscal blocks, to evaluate the effects of maintaining artificially low energy prices through public subsidies. The model simulates how energy is consumed by firms and households, differentiates between fossil-based and renewable energy sources, and traces the impact of various energy pricing strategies across macroeconomic indicators, government finances, and environmental outcomes.

Results confirm that the fixed-price strategy proved highly effective at preserving economic stability during a period of heightened uncertainty. By shielding energy consumers from international price shocks, the policy helped maintain higher levels of output, with real GDP estimated to have been approximately 1.3 percent above what would have occurred under a no-subsidy scenario by 2023. The strategy also dampened inflationary pressures, reducing both headline and core inflation, and proved particularly beneficial for lower-income households, who devote a larger portion of their income to energy-related expenses and have fewer options for substitution. In the absence of subsidies, these households would have faced almost twice the inflationary burden compared to wealthier segments of the population.

Yet, these benefits have come at a cost. Simulation results show that the subsidy regime is estimated to have contributed to around 4 percentage points (pp) to the public debt-to-GDP ratio. The continued insulation of retail energy prices from market signals has negatively affected investment in energy efficiency and renewable energy infrastructure, thereby reducing the share of clean energy in Malta's energy mix and slowing progress toward the country's climate targets when compared to a no-subsidy scenario. Furthermore, by stimulating continued demand for imported fossil fuels and limiting price-induced adjustments in consumption, the policy has weakened Malta's trade balance and increased external indebtedness.

Against this backdrop, the study explores a series of hypothetical exit strategies aimed at gradually restoring market-based energy pricing while mitigating the associated economic, social, and environmental risks. A sudden and unannounced termination of subsidies in 2025 would result in a sharp contraction in output and a spike in inflation, disproportionately affecting vulnerable households. A more gradual, tapered withdrawal of subsidies between 2025 and 2027 would allow for a smoother transition. Nonetheless, the relative benefits of a tapered exit strategy would depend on the price level of fossil fuels at the time of the announcement.[3]. This approach reduces the economic adjustment burden while still giving consumers and firms time to adapt to rising energy prices, thereby facilitating a more orderly shift toward energy efficiency and green investment. The forward-looking nature of energy investment decisions means that even a phased exit can yield substantial increases in renewable energy production, provided the strategy is credible and clearly communicated.

The paper also evaluates fiscal recycling mechanisms as complementary policies to offset the adverse effects of higher energy prices. Targeted lump-sum transfers to lower-income households are found to be effective in protecting purchasing power and minimizing inequality, although they offer limited support to Malta's green transition. In contrast, redirecting fiscal savings toward green capital subsidies proves highly effective in spurring investment in renewable energy, boosting the supply of clean electricity, and

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[3] In this respect, the recommendation to gradually taper energy subsidies is dependent on the fuel price assumptions surrounding this study.

enhancing long-term economic competitiveness. However, this approach does little to insulate poorer households from short-term price shocks.

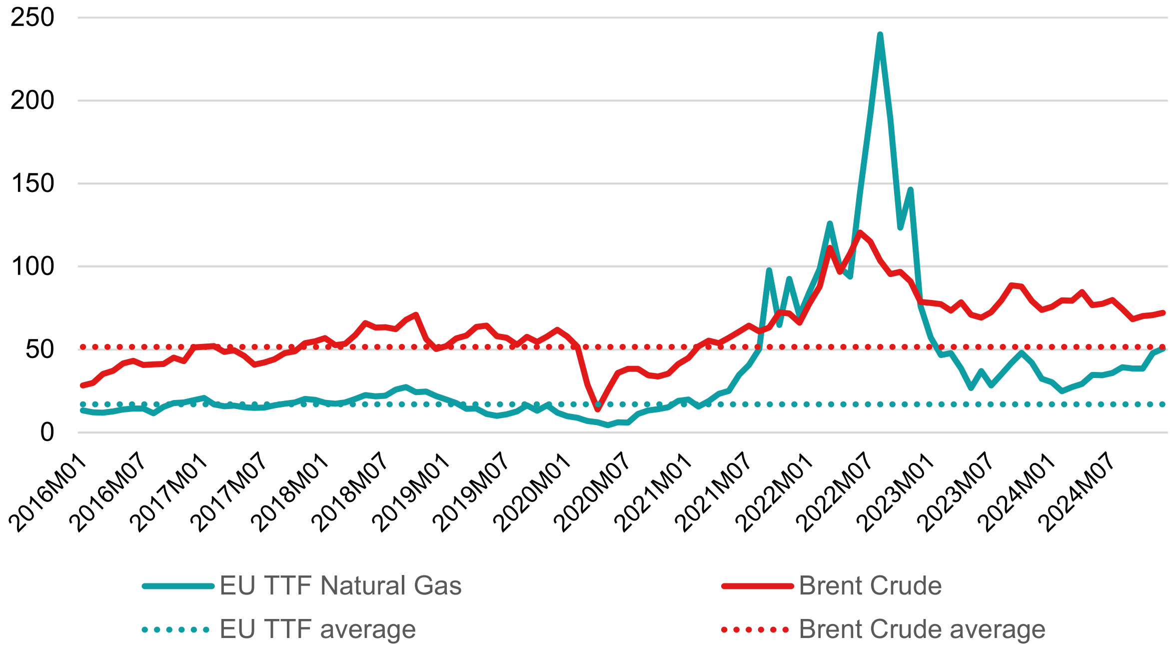
A combined strategy, involving both social transfers and green subsidies, emerges as the most balanced policy option. It protects vulnerable households, supports macroeconomic stability, and accelerates environmental sustainability.

In conclusion, while Malta's fixed energy price policy was instrumental in buffering the domestic economy from the worst effects of the European energy crisis, its indefinite continuation comes at fiscal, environmental and structural costs. When used over an indefinite period, the fixed energy price system undermines the efficiency of price signals, delays necessary structural adjustments, and may place increasing pressure on government finances and external balances. A well-sequenced, transparent, and credible exit strategy that recycles fiscal space into targeted social support and renewable energy investments offers a viable path forward. This approach would enable Malta to transition from crisis response to long-term resilience, aligning its energy policy with its EU climate commitments, enhancing energy security, and safeguarding both economic stability and social equity.

1. Introduction

Following the drops experienced during the Covid-19 crisis in 2020, global fossil fuel prices started to recover rapidly as from the second part of 2021. A steep recovery in global economic activity led to a strong resurgence in demand for energy which in the short-term was not met by increases in fossil fuel supply. Cyclical drivers were compounded by concerns of inadequate gas supplies for the winter ahead together with the Nord-Stream II approval standoff. This led Brent crude oil prices to increase from a low of $15.09 per barrel registered in April of 2020 to an intra-year peak of $83.84 registered in October of 2021, above its long-term average of around $56 per barrel. Similarly, the EU natural gas price benchmark Title Transfer Facility (TTF) prices increased from a low of €4.38/MWh in April 2020 to €97.77 by September of the same year, well above the long-term average of around €20/MWh.

Figure 1: LPG and Brent crude prices



Note: Figure shows prices in Euro for the benchmark natural gas price for Europe, EU TTF Natural Gas and for Brent Crude oil compared with their pre-Covid long-term averages.
Source: Trading Economics, Eurostat

The start of the Russia-Ukraine conflict in February 2022 also caused widespread disruptions in the European energy markets. Given the geographical configuration of European primary energy supplies, in particular that for natural gas, the start of the Russia-Ukraine conflict led to a sudden disruption in the primary energy supplies that immediately reverberated through prices of oil products (both crude and refined) and natural gas. In fact, up until 2021, Russia supplied around 30% of all oil and petroleum products (excluding natural gas derivatives) imported by the EU from extra-EU sources. When considering only refined products, in particular petrol and diesel products, the share of EU imports from Russia expressed as a percentage of extra EU-sources increases to 43%, amounting to around 20% of all diesel and petrol traded by the EU. The EU’s dependence on the Russian energy market was even more marked when considering natural gas imports. By 2021, Russian natural gas accounted for around 45% of all Extra-EU natural gas imports of the union. When considering also LNG supplies, the EU imported around 37% of all its gas supplies from Russia. This dependence on the Russian energy sector exhibits considerable heterogeneity across European countries, due to both different energy mixes as well as to the extent of interconnectedness with the Russia-owned pipelines that are used to transport natural gas into the continent.

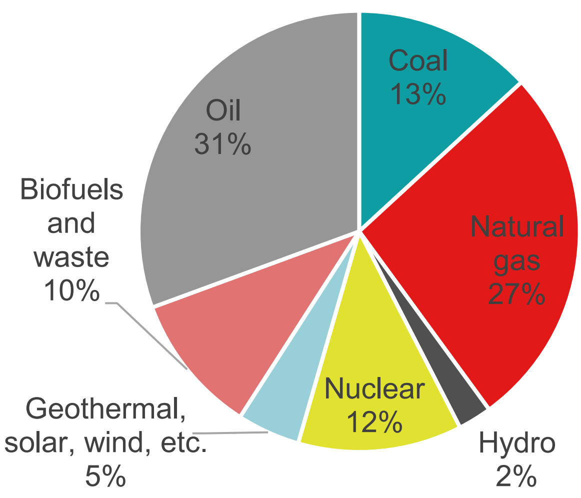
Given the above configuration of the European primary energy input market, immediately following the Russian invasion of Ukraine in 2022, EU natural gas TTF prices surged to around €240\MWh by September of the same year. Between February and June 2022, Brent crude oil also experienced a surge in prices peaking to around $130 per barrel. This together with increased volatility in refining margins has led to increases in international prices of refined gasoline and diesel prices.

Indeed, following the Russian invasion of Ukraine, refining margins, especially those for diesel, jumped up, peaking at around $80 a barrel by October 2022. These dynamics were fuelled by concerns surrounding the global supply of diesel and were based on the fact that Russia is a major diesel exporter.[4] Moreover, stringent gas supplies led to electricity operators across Europe to ramp up coal-driven powerplants leading to a rise in coal demand and subsequently in an increase in coal prices.

The effects of the conflict, however, were not limited to energy prices. They also posed considerable concerns on the EU's ability to secure the required natural gas quantities thus leading to a geographical reconfiguration of global gas and oil trade flows especially as EU energy firms diversified away from Russian supplies. This feat was further complicated by the fact that natural gas, can only be transported through existing pipeline infrastructure. Nonetheless, by end of 2022, Europe has successfully replaced most of Russian gas and oil imports. This was done by ramping up imports of oil from the Middle East and United States while increasing LNG imports. In fact, by the onset of winter of 2022, as European gas storage plants were largely filled up, EU natural TTF prices, together with benchmark prices of other fossil fuel alternatives, have started to decline significantly. By the start of 2023, fossil fuel prices stabilised to levels that while being considerably lower than the peaks registered in 2022 are still between 40% (in case of Brent crude oil) and 100% (in case of EU natural gas TTF) higher than their pre-Covid long run levels.

These international developments had very important repercussions on European wholesale and retail energy prices. In fact, despite the recent rise in the share of renewables in total energy consumption, the European energy mix is still heavily skewed in favour of fossil fuel inputs. Figure 2 shows that by 2021, fossil fuels, defined as coal, natural gas (liquified and piped) and oil-products amounted to 75% of all primary sources of energy produced in the EU, with (piped) natural gas and Liquified Natural Gas (LNG) making up more than a quarter of all primary energy input requirements. Moreover, within most of Europe, dynamics in gas supplies and prices also extended to the electricity market, owing to the use of natural gas as the primary source for electricity generation and the auction mechanism in place for the determination of electricity prices.

Figure 2: EU Energy Mix - 2021



Note: Figure shows the composition of EU energy mix in 2021
Source: International Energy Agency

[4] See International Energy Agency (2022), Oil Market Report - September 2023 and earlier editions

Against this backdrop, some EU policymakers have tried to preserve industry competitiveness and household purchasing power by shielding economic agents from retail wholesale energy price movements through the use of energy subsidies. In particular, the Maltese Government's approach to the energy crisis was significant with a sustained effort at controlling retail price increases of electricity and fuels. This was achieved through the form of subsidies transferred to a number of public sector entities which directly covered increases in the operating costs faced by entities such as Enemalta and Enemed. These subsidies were further accompanied by reductions in the duties levied on fuel products.[5] As will be shown in the following sections, these policy measures ensured that there was no pass-through of commodity to retail energy prices in Malta. This strategy was largely successful at bridging the energy crisis in 2022 and 2023, thus supporting energy-intensive industries and related jobs as well as sustaining the purchasing power of households.

In spite of their success in bridging a temporary energy crisis, fossil fuel (and brown energy in general) subsides can have sizeable macroeconomic and environmental implications (IMF, 2013). From an economic perspective, the fiscal consequences of energy subsidies in the long run need to be assessed while taking in consideration the fact that energy prices are estimated to remain above their pre-2021 long run averages.[6] In this light, if the emergency measures introduced during the peak of the energy crisis are set to continue indeterminately, these will mechanically lead to considerable drag on public finances, possibly crowding-out other priority fiscal spending.

In this light, international institutions have issued recommendations to the Maltese Government to prepare an exit strategy from the current fixed price policy.[7] Nonetheless, when designing an exit strategy, policymakers should first and foremost measure both the macroeconomic and distributional benefits that the fixed-price strategy has had on the Maltese economy. With this in mind, the macroeconomic and distributional costs of the proposed exit strategies can be better evaluated.

Against this backdrop, this study seeks to estimate the effects of different exit strategies utilising MEDSEA-NRG, a DSGE model with detailed fiscal and energy blocks. As a first step, the model is used to quantify the realised as well as the projected economic effects of the fixed price strategy employed by Government with respect to the retail prices of electricity, gas and transport fuels. I then simulate the suspension of the ongoing strategy and experiment with a number of alternative recycling strategies, ranging from the provision of targeted transfers to the most hardly hit households, to the increase of subsidies on the return of green capital.

I find that the fixed-price strategy proved highly effective at preserving economic stability during a period of heightened uncertainty. By shielding energy consumers from international price shocks, the policy helped maintain higher levels of output while dampening inflationary pressures, reducing both headline and core inflation, and proved particularly beneficial for lower-income households. However, simulations confirm that these benefits have come at rising fiscal, structural and environmental costs which are projected to persist as long as this strategy is kept in place. Apart from the drag on fiscal space, energy subsidies distorted price signals, negatively affecting investment in energy efficiency and renewable infrastructure. Furthermore, by stimulating continued demand for imported fossil fuels and limiting price-induced adjustments in consumption, the policy has weakened Malta's trade balance and adversely affects external indebtedness. Results also indicate that sudden removals of this strategy could prove costly in terms of economic costs and a tapered or progressive removal of energy subsides coupled with a recycling of fiscal space could be a viable option.

The paper is organised as follows: the next section looks into pass-through estimates of natural gas and oil prices to wholesale and retail energy prices in the EU and motivates the use of energy subsidies by

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[5] See Farrugia J. (2023) for a more detailed description of inflation relief measures enacted by the Maltese Government during the Covid-19 pandemic and at the start of the energy crisis.

[6] See Sgaravatti et al (2023) and https://www.imf.org/en/Topics/climate-change/energy-subsidies

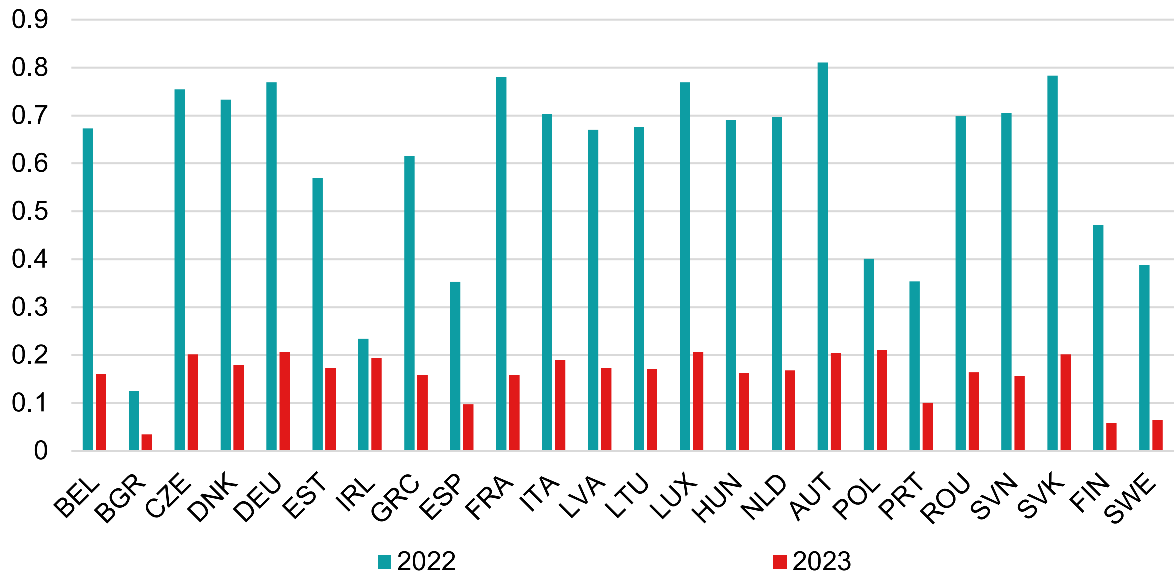
[7] See for instance IMF (2024) and EC (2024)

EU policy makers to cushion the effects these could have on economic agents. Section 3 gives a brief overview of the model used in the main part of the paper, focusing on the simulation design. Section 4 looks at the impact that the current energy pricing policy has had and is expected to have on the Maltese economy, while section 5 provides a number of hypothetical policy experiments that investigate different exit strategies. The final section concludes.

2. Simple Pass-Through Estimates of Natural Gas and Oil Prices

The link between natural gas prices and wholesale and retail electricity prices in Europe has been extensively studied. Ari et al (2022) find that around 90% of electricity price variation at the wholesale level that occurred between 2021 and 2022 can be attributed to natural gas price changes. The tight relationship between natural gas prices and wholesale electricity prices is also dictated by the auctioning system in place for the wholesale electricity market in Europe.[8]

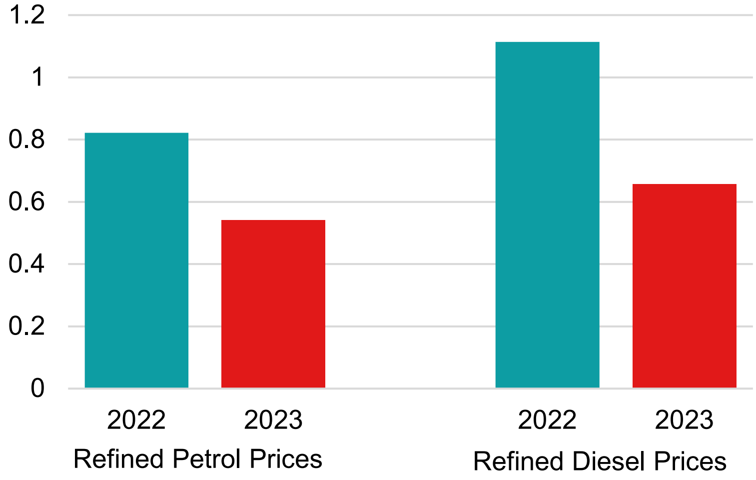
Figure 3 : Pass-through estimates of EU natural Gas TTF prices to wholesale electricity prices



Note: Figure shows simple pass-through estimates of changes in EU Natural Gas TTF prices occurred in 2022 and 2023 into wholesale electricity prices. The change in the reference price of EU Natural Gas TTF is estimated as the average price indices estimated in 2022 relative to the long-run average price indices calculated between 2016 and 2021. The change in the wholesale electricity prices is estimated as the average price level in 2022 and 2023, relative to the long run average price index calculated between 2016 and 2021.Data for Croatia, Cyprus and Malta are unavailable.
Source: Eurostat, Trading Economics and author's calculations

[8] The wholesale electricity market in Europe operates a marginal pricing system whereby the highest priced accepted bid offered by any customer at each point in time sets the overall wholesale price. In periods of high demand and high gas prices, bids fulfilled by natural gas plants tend to be the highest and are therefore responsible for a considerable variation in wholesale electricity prices. See Ari et al (2022) and Emiliozzi et al (2023).

Figure 4: Pass-through estimates of Brent to wholesale fuel prices



Note: Figure shows simple pass-through estimates of changes in Brent crude prices occurred in 2022 and 2023 into wholesale refined fuel prices. The change in the reference price of Brent crude is estimated in line with those of gas prices in figure 4. The change in the wholesale refined fuel prices are estimated as the average price level in 2022 and 2023, relative to the long run average price index calculated between 2016 and 2021.
Source: SDW, Eurostat, internal estimates and author's calculations

Figure 3 shows country-specific estimates for the 2022 and 2023 pass-through of natural gas to wholesale electricity prices.[9] While being imperfect, these passthrough estimates show a significant correlation between the 2022 gas price shock and wholesale electricity prices – a result which is expected considering the fact that in 2021, around 20% of EU electricity was produced by burning natural gas. Moreover, results for 2022 show a considerable heterogeneity in the wholesale prices across the EU ranging from a pass-through of around 20% in Bulgaria and Ireland, to estimates close to 80% for mainland Europe. Cross-country heterogeneity in the pass-through to wholesale prices reflects varying shares of natural gas in the electricity mix and the extent of inter-connectedness with the European electricity grid network. Moreover, different passthrough estimates could also be driven by lags in adjustment of pipeline import contracts to the TTF benchmark (EC, 2022). Results also show that by 2023, pass-through estimates in wholesale electricity prices exhibited less country-specific heterogeneity, with estimates also falling considerably on the back of a reduction in natural gas prices from the peaks registered in 2022. Figure 4 shows passthrough estimates of Brent crude oil prices to wholesale refined fuel prices.[10] Data shows that pass-through of Brent into refined fuel prices is also very high and almost contemporaneous. Results are especially interesting for diesel prices, with passthrough estimates for 2022 exceeding 1, in turn reflecting an increase in diesel refining margins, on the back of a drop in diesel supplies imported from Russia.

Turning to retail prices and starting with the electricity market, figures 5a and 5b show the pass-through of natural gas and electricity wholesale prices to retail electricity prices respectively. First, as expected, passthrough estimates to retail electricity prices are considerably smaller than those estimated for wholesale prices and exhibit significant heterogeneity across countries. As discussed in Ari et al (2022) and European Commission (2022), retail passthrough is affected by a number of country-specific factors. The passthrough from wholesale to electricity prices depends on different tax and levies structures and network fees. Moreover, the passthrough to retail prices has been affected by the measures adopted by some European governments since the last part of 2021, in an effort to either smoothen out or outright absorb part of the increase in retail prices through the reduction on VAT, levies or the introduction of new temporary or semi-permanent subsidy structures. Moreover, while country heterogeneity for wholesale electricity passthrough estimates is quite subdued by 2023, passthrough

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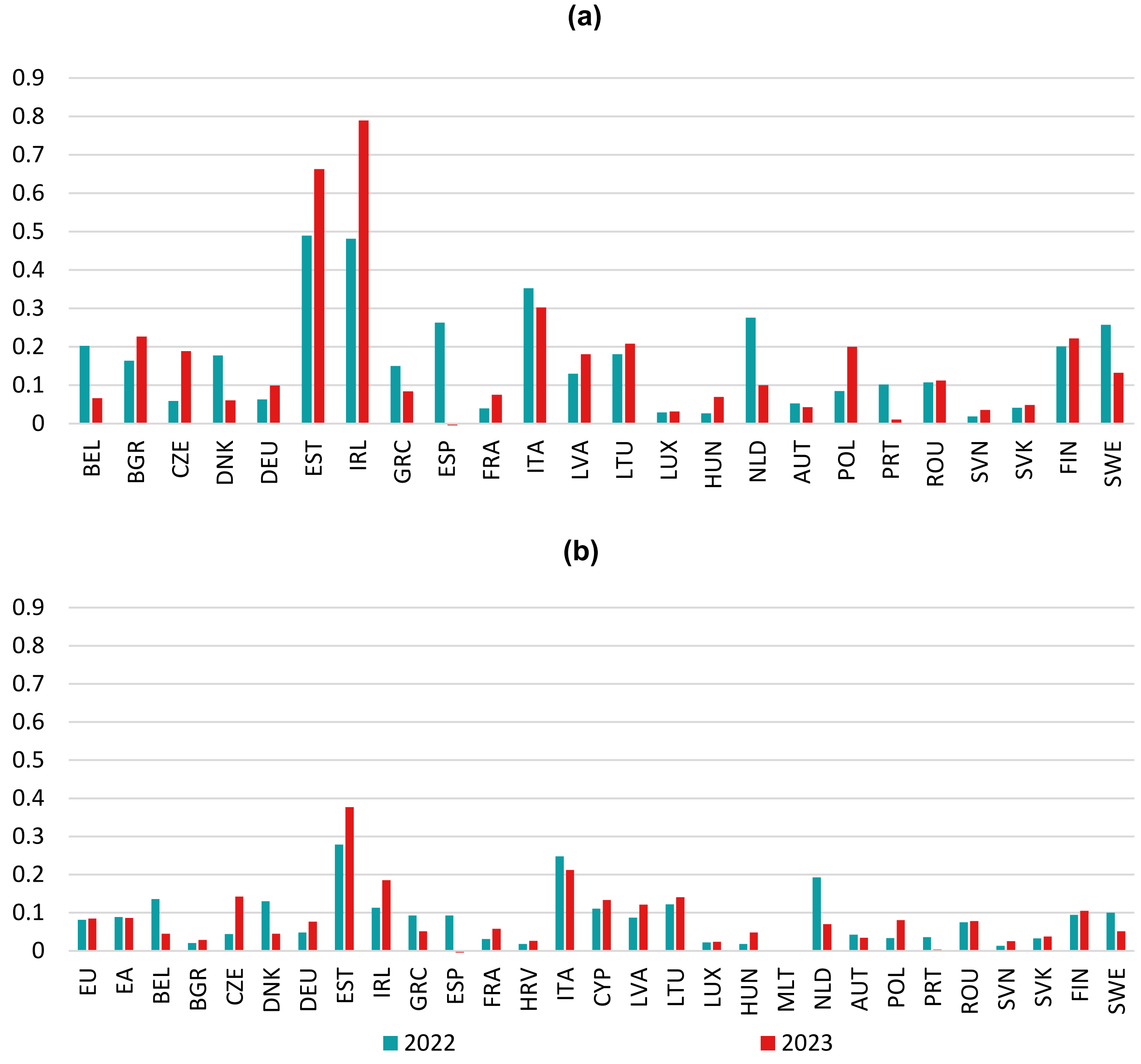
[9] The passthrough for 2022 can be defined as: $\frac{P_{2022}^{EL,W}}{\bar{P}^{EL,W}} / \frac{P_{2022}^{TTF}}{\bar{P}^{TTF}}$, where $P_{2022}^{EL,W}$ is the average wholesale price of electricity in 2022, $\bar{P}^{EL,W}$ is the long run average of wholesale prices from 2003 onwards, while P_{2022}^{TTF} and $\bar{P}^{TTF}$ are EU natural gas TTF prices from 2022 and its long run average respectively. Passthrough for 2023 is found as: $\frac{P_{2023}^{EL,W}}{\bar{P}^{EL,W}} / \frac{P_{2022}^{TTF}}{\bar{P}^{TTF}}$ such that all passthrough estimates are defined relative to changes in the reference price that occurred during 2022.

[10] Passthrough is estimated in line with previous estimates.

estimates for retail prices show considerable country heterogeneity also in 2023, suggesting that the main sources of cross-country differences in passthrough are more of a structural nature rather than temporary issues such as contract renegotiations.

Second, contrary to the wholesale prices case, retail passthroughs in 2023 are quite close to those estimated a year earlier. This indicates that retail electricity operators as well as governments have decided to smoothen out as much as possible the shock to natural gas and wholesale electricity prices that hit the markets in 2022. So much so that in the case of Bulgaria, Czechia, Germany, Ireland, Poland, Romania, Finland and Balkan states, retail electricity prices are seen to peak in 2023, a full year after the initial shock. This lag in retail price adjustments might reflect government policies aimed at smoothing changes in retail electricity prices, as well as differences in the contractual agreements across countries, with retail operators in Croatia, Bulgaria, Lithuania, Slovakia, and Poland updating retail prices every six months as opposed to monthly updates adopted in other states.

Figure 5 : Pass-through estimates to retail electricity prices

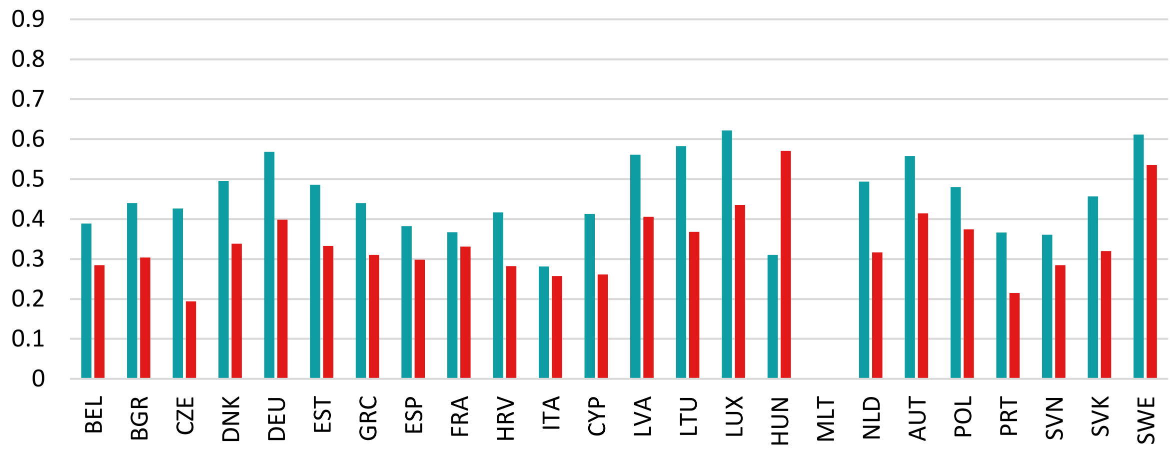


Note: Charts show simple pass-through estimates to retail electricity prices (measured as HICP – 0451) in 2022 and 2023 estimated as a share of changes in wholesale electricity prices (panel a) and EU Natural Gas TTF (panel b). The change in all prices is estimated as the average price indices measured in 2022 relative to the long-run average price indices calculated

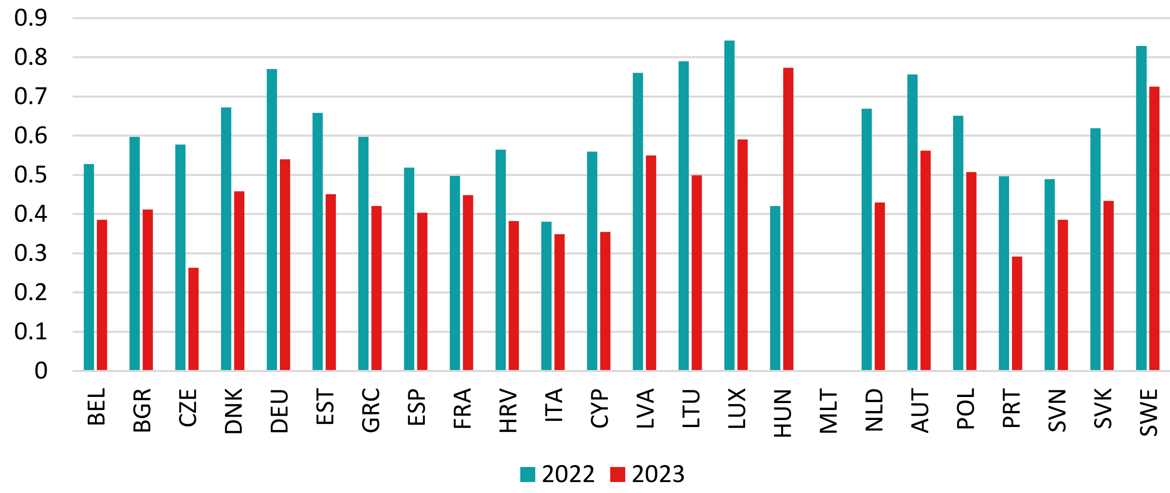
between 2003 and 2021 in line with previous results. Data for wholesale electricity prices for Croatia, Cyprus, Malta as well as for the EA and EU averages is unavailable.
Source: Eurostat, Trading Economics and author's calculations

Figure 6: Pass-through estimates to retail fuel prices

(a)



(b)



Note: Charts show simple pass-through estimates of changes in retail petrol and diesel prices (respectively, measured as HICP – 07222 and HICP – 07221) occurred in 2022 and 2023 estimated as a share of wholesale fuel prices changes. The change in all prices is estimated as the average price indices estimated in 2022 relative to the long-run average price indices calculated between 2003 and 2021 in line with previous results.
Source: Eurostat, Trading Economics and author's calculations

Finally, charts 6a and 6b show the pass-through estimates of international wholesale diesel and petrol price to retail prices for EU countries. Results show that on average, pass-through to diesel prices was slightly lower than that for petrol. Moreover, pass-through of wholesale price benchmarks of refined fuels to petrol and diesel retail prices is larger than that exhibited by retail electricity prices. Moreover, while still present also for refined fuels, cross-country heterogeneity is significantly less pronounced then in the case of retail electricity prices. This reflects a faster speed of adjustment of fuel prices in general and fewer mitigating measures adopted by government to control or smoothen dynamics in transport fuels. These results confirm the initial results published in Ari et al (2022).

3. Model and Simulation Design

As discussed previously, one of the main factors affecting the degree of pass-through to retail fuel and electricity prices is the degree of Government intervention aimed at smoothing out or shielding households and firms from international movement in energy prices. Between 2021 and 2023, Governments of the 27 EU states had either utilised or earmarked a total of around €540 billion, equivalent to around 3.2% of EU-wide GDP. These funds were either targeted at compensating households and/or firms with one-off transfers that partially make up for the lost purchasing power due to energy inflation, or else at directly intervening in the utilities markets by imposing semi-permanent price caps. The different strategies adopted by Governments across the EU differ both in terms of the effect they have on retail-passthrough estimates as well as in the fiscal burden they exert. In particular, strategies based on price caps are associated with lowering pass-through and having direct effects on household inflation but also tend to be more expensive to finance. On the other hand, strategies based on compensations to households or firms have no direct effect on energy inflation but tend to be cheaper to maintain especially in the case of targeted transfers.

Figure 7: Government allocations for energy subsidies

Note: Data show the funds allocated by EU Governments between 2021 and 2023, expressed as % of the GDP in 2023. Source: Sgaravatti et al (2021), updated on https://www.bruegel.org/dataset/national-policies-shield-consumers-rising-energy-prices.

Figure 7 shows the funds allocated by Governments in the EU to compensate households for higher energy inflation and/or to directly control retail prices of electricity and fuels.[11] The figure highlights the extent of the heterogeneity in the approaches adopted by policymakers in the EU, both in terms of magnitude and composition of the subsidy programmes. Governments in Malta, Austria and Italy have

[11] Comparable data on actual energy subsidies spent across the EU could not be found.

allocated between 5.1% and 4.5% of their GDP in aid between 2021 and 2023, while for instance the Finnish and Cypriot policymakers have opted for considerably less intervention with state aid amounting to around 0.6% of their respective output. Similarly, the type of government policies has varied considerably with countries such as Malta and Cyprus utilising most of the allocated aid to impose price caps on utility and transport prices, contrary to Governments of Austria, Germany and Italy for instance, who channelled most of the funds as direct aid to households or firms.

The financial effort undertaken by the Maltese Government to contain retail energy inflation has been substantial. As illustrated in Figures 5b and 6, Malta was the only EU economy that did not experience any increase in retail energy prices during the global energy crisis. This achievement, however, has come at a significant fiscal cost, placing considerable pressure on the government's available fiscal space. In this context, the following sections present simulation results derived from a structural economic model with a detailed energy block, aimed at quantifying both the economic and social benefits, as well as the fiscal and environmental costs, associated with this policy.

3.1. MEDSEA-NRG – a brief description of the model

The model used for this exercise is MEDSEA-NRG (Rapa, 2024), a New Keynesian model with a detailed fiscal and energy block. Energy is used within the model both as an intermediate input to production as well as a final good in the private consumption bundle of households. In line with Rapa (2017) and other structural models in its class, MEDSEA-NRG allows for a tradable and a non-tradable sector. Within each sector however, the production process is split into two parts. In the first step the intermediate good firms problem is akin to other DSGE models, that is a continuum of firms choose the optimal allocation of labour and capital to produce value added. In the second step firms are required to combined this valued added with an energy input. In particular, for both non-tradable and tradable sectors indexed by $i \in (N, XD)$ there is a continuum of monopolistically competitive firms that minimise the following cost function by choosing optimal levels of value added V_t^i and energy E_t^i.

$$min_{V_t^i,E_t^i} C_t^i = P_t^E E_t^i + \kappa_t^{V^i} V_t^i$$

$$st. \qquad Y_t^i = \left[\iota_i^{1/\eta_i} E_t^{i\,(\eta_i-1)/\eta_i} + (1-\iota_i)^{1/\eta_i} V_t^{i\,(\eta_i-1)/\eta_i} \right] \; for \; i \in (N, XD)$$

And the first order conditions are given by:

$$E_t^i = \iota_i \left(\frac{P_t^E}{\kappa_t^i}\right)^{\eta_i} Y_t^i; \qquad V_t^i = (1-\iota_i)\left(\frac{\kappa_t^{V_i}}{\kappa_t^i}\right)^{\eta_i} Y_t^i \qquad for \; i \in (N, XD)$$

Where P_t^E are energy prices, ι_i is the sector-specific bias on energy in the output mix while κ_t^i is the sector-specific marginal cost of producing intermediate goods, κ_t^{Vi} is the sector-specific marginal cost of producing value added and Y_t^i is sector-specific output.

Direct energy consumed by households, E_t^C, is optimally chosen by households together with non-energy private consumption $C_t^{P,NE}$. The demand for energy private consumption is given by the following first order condition:

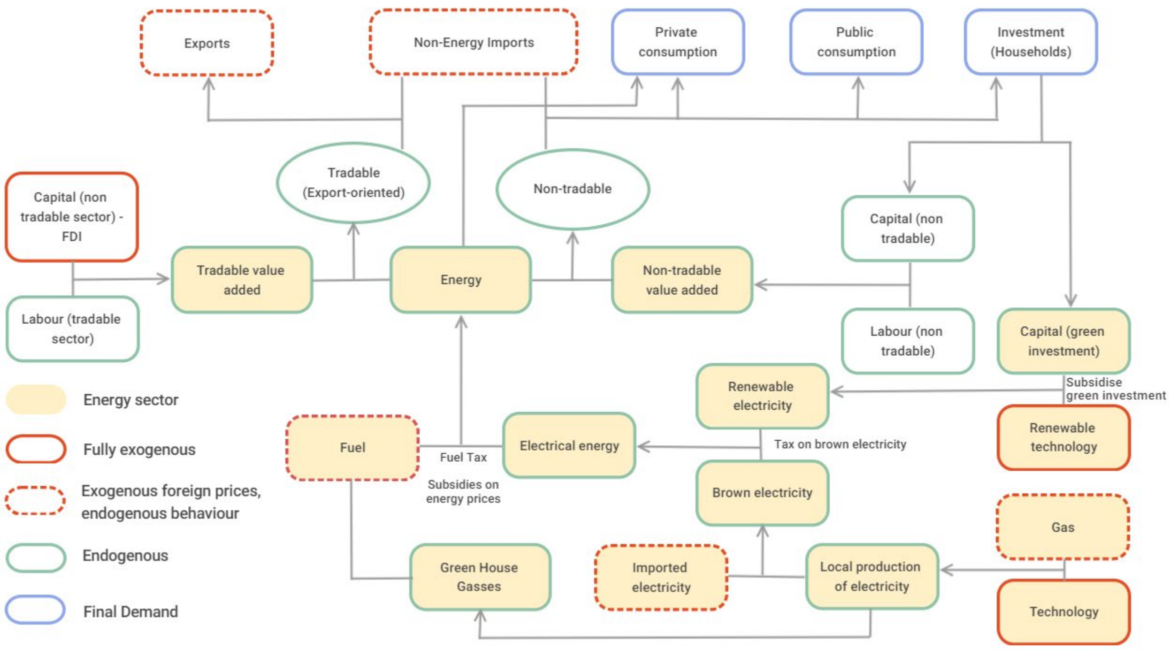
$$E_t^C = \phi_E \left(\frac{P_t^E + ADJ_t^{CE}}{P_t^C}\right)^{-\eta_E} C_t^P$$

Where C_t^P and P_t^C are quantity and price of the private consumption bundle made up of energy and non-energy consumption while ADJ_t^{CE} are adjustment costs which are paid by households each time they choose to change the composition of their consumption bundle.

Energy within the model is produced using a layered multistage production process where energy firms optimally combine different energy types and fuels. In the first layer of energy production, the model distinguishes between electrical and "fuel" based energy, with the latter proxying the fuels used for transport.

Electrical energy within the model is a further combination of "brown" electricity produced using conventional fuels, and electricity produced using renewable sources. The former is a combination of locally produced electricity and electricity imported from the Malta-Sicily interconnector. This distinction is quite important since the marginal cost dynamics of electricity produced locally through LNG-burning powerplants differ significantly from those of electricity imported from mainland Europe mainly because price dynamics of LNG and LPG (the type of gas that powers most of continental Europe gas powerplants) can be quite different as the former is not dependent on pipeline infrastructure for transportation, making it less prone to supply shocks due to continental geopolitical tensions. Electricity generated locally in conventional power plants is produced using some local (fixed) capital and LNG, such that its price is heavily dependent on the prices at which Malta's electricity producer can source LNG. The price of imported electricity is on the other hand simply equal to the price of euro area electricity and is therefore fully exogenous. "Green" electricity produced with renewable sources is generated using green capital that is financed through local savings. "Green" electricity within the model captures the energy that is presently produced by households and firms using photovoltaic panels and other renewable sources, which is then either consumed directly or sold to the national grid.

Figure 8: Bird's eye view of MEDSEA-NRG



More formally, energy is produced by an infinite number of monopolistically competitive firms that bundle together electrical E_t^E and fossil fuel driven energy E_t^F (the latter including heat and kinetic energy directly derived by burning liquid gas, diesel, petrol or other similar fuels). Given the optimal energy requirements derived from the intermediate good production problem, energy firms in this stage choose the optimal energy allocation by minimising their present value of future costs subject to a CES aggregator. In order to model the progressive adjustments in the energy mix following a change in relative prices, I assume that firms face quadratic adjustment costs whenever they choose to change the ratio of electrical energy to fossil fuels (similar to the adjustment costs faced by households when trying to switch the share of energy in their consumption basket).

$$\min_{E_t^E, E_t^F} C_t^E = E_t \Sigma_{k=0}^{\infty} \Lambda_{t,t+k} \{P_{t+k}^{EE} E_{t+k}^E + P_{t+k}^{EF} E_{t+k}^F + AC_{t+k}^E + AC_{t+k}^F\}$$

Subject to:

$$E_t = \left[\iota_E^{\frac{1}{\eta_E}} E_t^{E^{\frac{\eta_E - 1}{\eta_E}}} + (1 - \iota_E)^{\frac{1}{\eta_E}} E_t^{F^{\frac{\eta_E - 1}{\eta_E}}}\right]^{\frac{\eta_E}{\eta_E - 1}}$$

Where P_t^{EE} and P_t^{EF} are *retail* electricity and fuel prices while $\mathrm{AC}_{\mathrm{t+k}}^{\mathrm{E}} = \mathrm{AC}^{\mathrm{E}}(\Phi^{\mathrm{E}}; \mathrm{E}_{\mathrm{t}}^{\mathrm{E}})$ and $\mathrm{AC}_{\mathrm{t+k}}^{\mathrm{F}} = \mathrm{AC}^{\mathrm{F}}(\Phi^{\mathrm{F}}; \mathrm{E}_{\mathrm{t}}^{\mathrm{F}})$ represent adjsutment costs paid by electricity aggregators when they choose to change E_t^E and E_t^F respectively. ι_E is the intensity or bias of electrical energy in the energy mix.

The optimal energy mix is then given by the following first order conditions:

$$E_t^E = \iota_E \frac{P_t^{EE} + ADJ_t^{EE}}{MC_t^E} E_t$$

$$E_t^F = (1 - \iota_E) \frac{P_t^{EF} + ADJ_t^{EF}}{MC_t^E} E_t$$

Thus, the optimal energy mix is given by the relative prices of different energy types adjusted by ADJ_t^{EE} and ADJ_t^{EF} which are non-linear functions of AC_{t+k}^E and AC_{t+k}^F. The presence of adjustment costs is warranted by the slow adjustment of energy types in the energy mix. In fact, while literature finds support of very high elasticities of substitution between energy types in the long run, the short run substitution between energy sources might be very inelastic, driven by relatively high one-time costs that need to be incurred by agents.[12]

A similar optimisation problem arises when agents try to optimally choose the composition of electric energy, which is a combination of grid or brown electricity E_t^{EG} and green or renewable electricity, E_t^{ER}. In this case, the first order conditions are given by:

$$E_t^{ER} = \iota_{EE} \frac{P_t^{EER}}{P_t^E} E_t^E$$

$$E_t^{EG} = (1 - \iota_{EE}) \frac{P_t^{EEG}}{P_t^E} E_t^E$$

[12] The model has two sets of energy adjustment costs, one for the choice between fuel and electrical energy, and one for the choice between energy and non-energy consumption (shown in the household problem above). The rest of energy mix choices do not necessitate of energy adjustment costs due to stickiness which is endogenously present in the model. For instance, the switch from brown to green energy sources, requires the build-up of green capital which is by its nature a slow-moving variable. For more information the reader is referred to Rapa (2024a).

Where P_t^{EER} and P_t^{EEG} are the *retail* prices of renewable and grid (or brown) electricity respectively, P_t^{E} is the overall energy bundle price and ι_{EE} is the bias of renewables in the electricity bundle.

The model allows for a number of fiscal instruments that allow Government to distort households' and firms' demand preferences for energy type. Most importantly for the purpose of this study, Government can either levy taxes or grant subsidies on all brown and green energy types independently. Moreover, for brown energy types, subsidies can be adjusted endogenously in the model to smoothen out changes in wholesale fuel prices thus mimicking the fixed-pricing strategy of Government enacted in the last years.

In particular, I allow retail prices for fuel and brown electrical energy to differ from the wholesale prices (which are in turn function of marginal costs of producing said energy) through taxes and subsidies. This takes the following form:

$$P_t^{EF} = P_t^{EF,W} + \tau_t^{EF} - S_t^{EF}$$

$$P_t^{EEG} = (P_t^{EEG,W} - S_t^{EEG})(1 + \tau_t^{EEG})$$

Where $P_t^{EF,W}$ is the wholesale price of fuel energy, τ_t^{EF} is an excise duty levied of the volume of fuels and S_t^{EF} are subsidies used to stabilise the retail price level. Similarly, $P_t^{EEG,W}$ is the wholesale price of grid or brown electricity, τ_t^{EEG} is ad-valorem tax and S_t^{EEG} are subsidies used to stabilise retail electricity prices. Both subsidies can be set to adjust endogenously to cancel out any shocks that perturb the wholesale prices of fuel and grid electricity prices. In particular, S_t^{EF} and S_t^{EEG} are subsidies introduced to mimic the current Government policy of fully shielding energy prices in Malta from fluctuations in the wholesale brown prices or alternatively the marginal costs of producing such energy.[13]

The model is calibrated using actual data. In particular, both real (in terms of calorific value) and nominal (in terms of expenditure) energy mixes are perfectly matched to actual data. Similarly, all energy-specific taxes/duty and subsidies are matched to actual fiscal estimates.

3.2. Simulation Design

The first step in measuring the impact that direct Government price intervention had on the Maltese economy is to calibrate the international energy crisis scenario within the model. The calibration of this step is complicated by the unknown effects that purchase and hedging agreements that were valid during this period, had on the pass-through of the international energy shock on the marginal cost structure of local energy producers. In fact, between 2017 and 2022, Electrogas Malta, the importer of LNG gas that supplies the LNG-powered power plants in Delimara, had a fixed-price Supply and Purchase Agreement with a foreign supplier.[14] When the fixed-price period of the above purchase agreement expired, Enemalta entered into a new agreement with another foreign supplier effectively locking the price of a fixed volume of LNG.[15] Albeit less structured in nature, fuel for transport use is also usually covered by similar hedging agreements. Given the confidential nature of such agreements,

[13] Renewable electricity retail prices, P_t^{EER}, are similarly a function of wholesale prices, $P_t^{EER,W}$, and are given as: $P_t^{EER} = P_t^{EER,W}(1 + \tau_t^{EER})$ where $\tau_t^{EER} < 0$ are subsidies on renewable electricity prices. Apart from this mechanism, the model also allows for subsidies on the return of green investment, which is turn used to produce green energy. The latter subsidies increase the net return on green capital, boosting green investment and green electricity generation, thus also reducing green electricity prices in gross terms.

[14] https://www.electrogas.com.mt/wp-content/uploads/2020/09/publicstatement0004-110920.pdf

[15] https://timesofmalta.com/article/malta-signs-new-deals-to-lock-in-price-of-lng.951223

the extent to which shocks in foreign LNG and refined fuel prices transmit into the marginal cost structure of local distributors is largely unknown.

In this light, the simulation design of the energy crisis rests on data of Government funds that were actually spent on maintaining the fixed pricing strategy between 2021 and 2024.[16] The shocks are calibrated by first turning on the fixed price subsidy system which allows S_t^{EF} and S_t^{EEG} to adjust endogenously to fix retail prices. I then impose shocks to all types of brown energy in the model, including imported interconnector electricity, LNG prices, as well as foreign fuel prices with their magnitude calibrated such that the value of fuel-specific and electricity specific subsidies match exactly the actual subsidies spent by Government. From 2025 onwards, I use internal forecast of government spending on the fixed energy price strategy, to extend the shocks till 2030.[17] These forecasts are in turn based on the assumption that Government will continue to fully subsidise any changes in foreign commodity and energy prices, in line with its most recent announcements. The simulations are then performed under a deterministic setup, implying that all agents in the economy are aware of the Government's policy. Moreover, this setup implies that Government's announcements of the price fixing strategy are fully credible and adhered to throughout the length of the simulation. Given the nature of the shock, such a setup is quite convenient as it replicates the actual strategy employed by Government of pre-announcing its commitment to keeping all energy prices fixed and adhering to it.[18] This simulation exercise provides a baseline scenario, consistent with the actual policy adopted by Government between 2021 and the present day.

After calibrating the shocks and running the model under a fixed energy price policy, I rerun the model with energy subsidies turned off. This setup simulates a scenario where Government chooses and commits, not to intervene in fixing local energy prices allowing all international commodity and energy prices to affect local prices. The impact of the Government price fixing strategy is then estimated as the difference between the hypothetical counterfactual (assuming Government did not intervene to fix prices) and the baseline scenario (with full energy subsidies).[19]

4. The Impact of the Fixed Pricing Strategy

Charts 4a and 4b below, show the impacts of a hypothetical scenario in which Government, back in 2021, chose not to intervene in any way to dampen the effects of the volatile energy markets. Results are expressed relative to the baseline scenario (or the actual scenario with full subsidies) in quarterly frequency starting from 2021 and spanning till 2030. These estimates suggest that had Government failed to intervene in the retail energy market, Malta's GDP level would have been significantly lower than the level actually observed. The peak effects of the energy price fixing policy were observed in 2023 with the GDP level expected to be around 1.3% lower than the observed levels. The drivers behind the slowdown in economic activity are quite diverse. In the absence of energy subsidies, an increase in

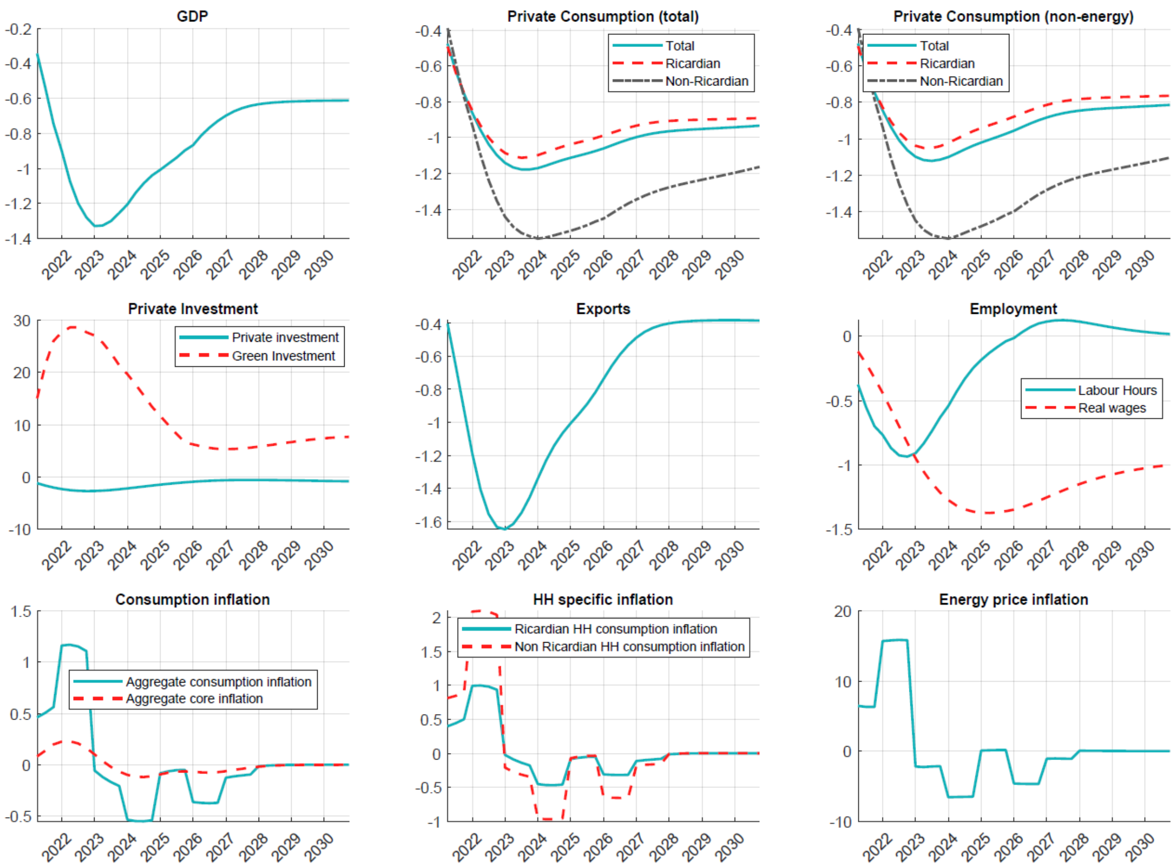
[16] At the time of writing, not all data for 2024 was yet published. Thus, data for this year is a mix of actual and projected estimates.

[17] Both past and projected Government spending on energy subsidies (up until 2026) are based on CBM internal estimates provided by the Fiscal Affairs and Reports Office. The cut-off date for these estimates is February 2025 for the period 2024-2026 period. Between 2027 and 2030, I assume that all international commodity and electricity prices are fixed at the levels reached in 2026.

[18] The main drawback of such a deterministic setup is that it assumes that agents not only know beforehand the Government's commitments but are also fully aware of the sequence of shocks that will hit the energy markets.

[19] Solving a New Keynesian Models like MEDSEA-NRG under a deterministic setup implies that the model is not linearized prior to solving. This implies that the model retains any non-linearities, in turn implying that any two shocks simulated separately are non-additive. While under its current setup, MESDEA-NRG does not have any important non-linear features such as binding constraints for instance, results from the simulation strategy employed in this study might nonetheless be affected.

Chart 4a: Energy counterfactual – macroeconomic results



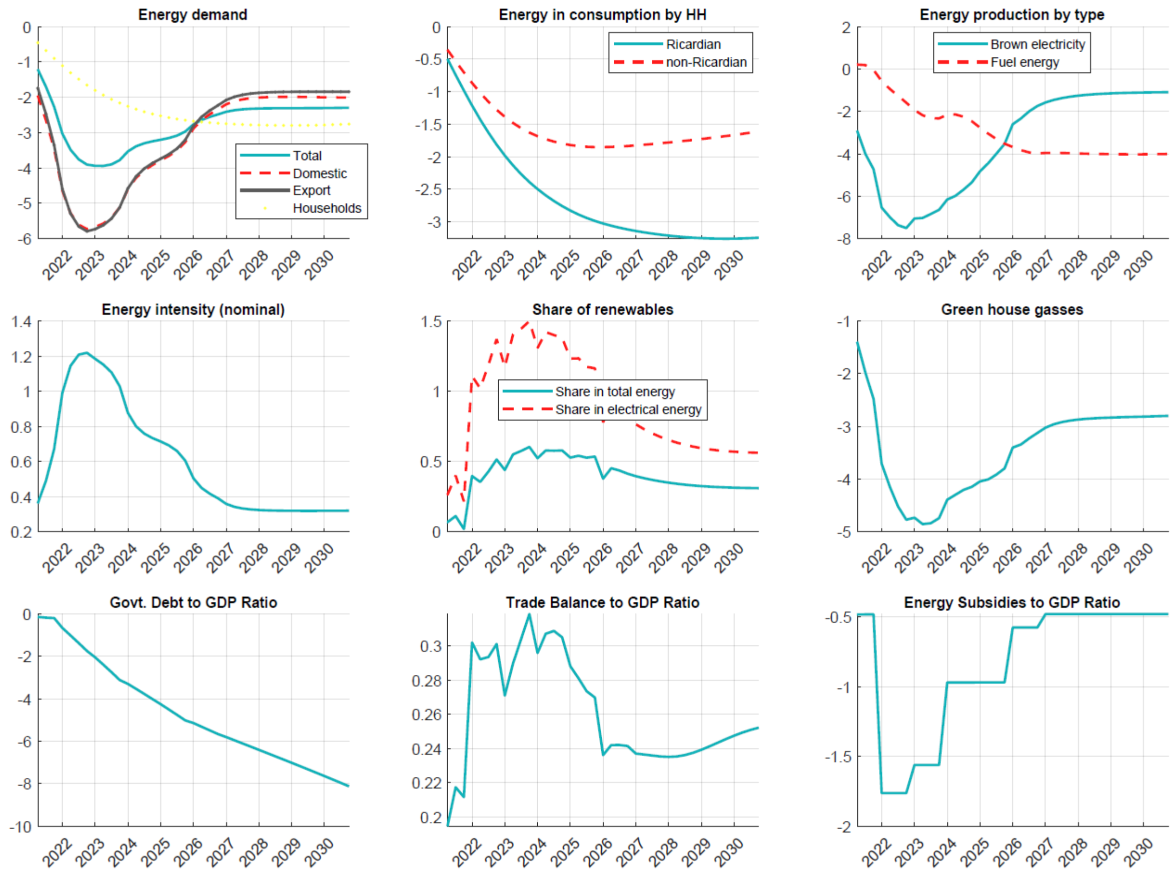
Note: Charts show deviations of macroeconomic variables pertaining to a hypothetical no Government intervention strategy, compared to a strategy based on full subsidisation (baseline scenario). Both scenarios are characterised by the same series of foreign energy price shocks and differ only in the subsidy policy. All results show deviations in % from the levels estimated under the baseline scenario. Results for inflation measures are in terms of pp deviations.
Source: Author's estimates

brown energy prices would have led to an increase in overall energy inflation of around 7pp in 2021, peaking to around 16pp in 2022. The increase in overall energy prices would be driven by the imperfect substitutability between brown and green energy sources. The surge in energy prices would have reduced energy demand and subsequently, due to their complementarity, also negatively affected value added. This in turn would have implied a reduction in labour and capital demand by firms leading to a reduction in employment hours and private investment. The drop in employment demand, would have led to downward pressures in both nominal and real wages. This notwithstanding, marginal costs of production would have increased, driven exclusively by the energy component in intermediate production. Indeed, these price pressures would have increased core inflation by around 0.3pp by mid-2022. On the external side, the increase in marginal costs would have led to a worsening of external competitiveness, leading to a reduction in real exports.

Domestically, negative income and wealth effects would have led to a reduction in Ricardian private energy and non-energy consumption.[20] The negative income effects experienced by non-Ricardians would have been even more pronounced. Driven by the higher share of energy consumption in their

[20] Within this model, Ricardian households proxy the richer part of the income and wealth distribution. On the other hand, non-Ricardians proxy poorer households. In this respect and to match data, the share of energy consumption in the consumption basket of non-Ricardian households is allowed to be larger than that of Ricardians.

Chart 4b: Energy counterfactual – energy-specific results



Note: Charts show deviations of energy-related and environmental variables pertaining to a hypothetical no Government intervention strategy, compared to a strategy based on full subsidisation (baseline scenario). Both scenarios are characterised by the same series of foreign energy price shocks and differ only in the subsidy policy. All results show deviations in % from the levels estimated under the baseline scenario. Results for variables expressed as ratios (energy intensity, share of renewables, government debt ratio, trade balance and energy subsidies) are in terms of pp deviations.
Source: Author's estimates

consumption basket, non-Ricardians would have cut back on their consumption almost by 1.5% by 2030 compared to cut of around 1.1% of Ricardians.

Negative income effects are driven by both falls in nominal wages as well as by the considerable spike in consumer price inflation. Assuming a no-intervention policy by Government, the model estimates that consumer inflation would have been around 1.2pp higher in 2023 when compared to the baseline scenario.

Turning to some sectoral results, we see that a no-subsidy policy by Government would have resulted in a considerable drop in energy demand, driven primarily by demand of intermediate producers. When compared to their Ricardian counterparts, rule of thumb households face stronger adjustment costs when changing the share of energy in their consumption basket. The latter is driven by the a-priori belief that the energy consumed by the relatively poorer households is necessary to sustain the non-energy type of consumption. In this respect, non-Ricardians are assumed to have a lower price elasticity of energy in their consumption basket in the short term when compared to their wealthier counterparts.

These dynamics, together with the greater energy intensity at steady state of non-Ricardian consumption leads to considerably different inflation dynamics between the two types of households. Under the scenario of no energy subsidies, non-Ricardian households would have seen inflation increasing by more than 2pp when compared to baseline levels, more than double the increase estimated for Ricardian households. In turn, this would have resulted in deeper cuts in real disposable income of poorer households leading to stronger cuts on overall non-energy private consumption of the latter.

The counterfactual analysis also reveals that the fixed energy price policy has had strong effects on environmental outcomes, mainly by affecting the brown-green energy mix in the country. Results show that in the hypothetical scenario of no energy subsidies, the share of green energy in overall energy supply would have been around 0.6pp higher than in the baseline, or almost 1.5pp higher when considering the share of green electricity in total electricity supply. In fact, the market induced increases in brown energy prices would have led to increased demand for renewable energy in turn leading to an increase in the demand for green capital. This would have translated into an increase in the rate of return to green capital and a considerable and sustained increase in private investment in capital used in the production of electricity through renewable sources. Estimates indicate that “green” investment would have increased by almost 30% by 2022, stabilising at around 10% for the rest of the period under consideration. The cut in overall energy demand as well as the increase in the share of green energy in the energy mix would have in turn resulted in a drop in greenhouse gasses emitted of around 5% by 2022.

Turning to the impact on Government finances, the fixed-price policy is estimated to have had significant implications on the fiscal space enjoyed by Government. Indeed, by end 2024, the current energy policy is estimated to have contributed to around 4pp in terms of Government debt-to-GDP ratio. While the size of energy shocks, and consequently of government subsidies, is projected to fall considerably over the coming years, the impact of this policy on Government finances is expected to continue accumulating. In fact, based on internal projections for international energy prices, the cumulative impact of this policy on Government debt is expected to reach 8pp by end 2030 when compared to a hypothetical no-intervention policy.

Furthermore, results indicate that the price cap enacted by Government could have contributed to a worsening of Malta’s trade balance. In fact, in spite of the improvement in export performance under a full subsidy scenario, the trade balance to GDP ratio is expected to have been negatively affected by the higher import prices coupled with the lack of adjustments in consumption and energy demand caused by artificially low retail energy prices. This exercise also shows that under a hypothetical case of no Government subsidies, outcomes for the trade balance are expected to remain more positive when compared to the baseline scenario which in turn foresees a continuation of the current policy. These results are based on the fact that a foreign energy price shock transmits itself to the local economy as an adverse terms of trade shock. While energy price caps are very effective at shielding the economy from the adverse macroeconomic and distributional effects of such a shock, they do not allow for economic agents to adjust their aggregate and energy demands leading to adverse trade balance and balance of payment effects that would be financed by extra external borrowing.

5. Impact of Hypothetical Exit Strategies

The above counterfactual suggests that the fixed energy price policy has had significant positive impacts on economic activity. The strategy has helped retain the purchasing power of household disposable income, leading to positive income effects that have propped up private consumption. Stable energy prices have also led to lower intermediate production inflation, translating to positive competitiveness effects helping export performance. The strategy has also helped combat the negative distributional impacts of higher energy prices, with poorer households being shielded the most.

On the other hand, the fixed energy pricing strategy is likely to have put considerable strain on Government finances with further deterioration of the fiscal space expected in the coming years. Furthermore, the counterfactual analysis indicates that overall energy demand would have fallen to a larger extent when compared to overall economic activity implying that higher energy prices would have incentivized economic agents not only to demand a greater share of green energy, but also to increase their energy efficiency. By eliminating these incentives, blanket energy subsidies have not only hindered Malta's progress toward its green targets but have also led to unwarranted negative balance of trade effects as it reduces the ability of economic agents to react to the negative terms of trade shocks.

Against this backdrop, the rest of this study seeks to understand the possible effects that a suspension of energy subsidies would have on the main macroeconomic, environmental and fiscal variables of the model. I then experiment with different recycling strategies that simulate the likely outcomes in case the fiscal space saved by Government is used for different expansionary fiscal policies.

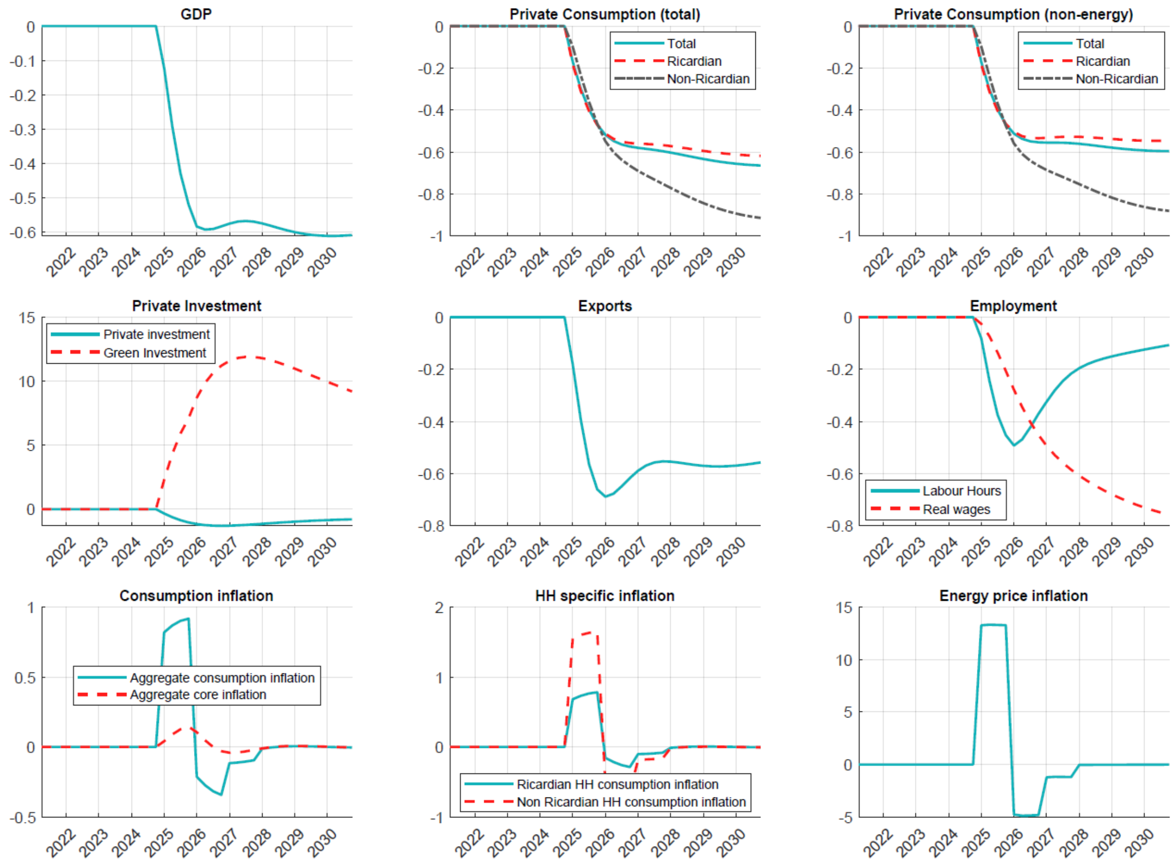
5.1. Surprise Interruption of Subsidies – No Fiscal Recycling

Charts 5a and 5b below show impacts of a surprise complete suspension of the fixed energy price policy. In this scenario, I first run a deterministic simulation in line with the baseline scenario above. Most importantly for this part of the study, the baseline scenario assumes that Government pre-announces its intention to fully subsidise retail electricity prices for the foreseeable future. In the *"surprise"* scenario, I assume that agents are surprised by an unforeseen Government decision to stop all subsidies by end 2024. The policy is therefore announced and enacted on the first quarter of 2025.[21] Results are then compared to the baseline scenario such that all results can be interpreted as the deviations from the status quo that assumes that Government will continue pursuing a fixed energy price strategy for the foreseeable future, in line with latest announcements.

In spite of the fact that international energy prices are projected to stabilize at much lower levels than experienced between 2021 and 2022, the suspension of the fixed energy price strategy is expected to lead to an immediate increase in energy prices of up to 13% in 2025. This is expected to lead to an increase in the marginal costs of intermediate goods production in turn leading to an increase in final good prices. On the external side, this would result in a loss of competitiveness leading to a drop in exports of around 0.7% by end 2026. On the domestic front, an increase in energy prices leads households to gradually cut back on energy consumption. Households are expected to also cut back on their non-energy private consumption, driven by negative income effects that arise due to the increase in consumer prices. In fact, the increase in energy prices is expected to directly lead to an increase in overall private consumption prices of around 1pp on a year-on-year basis. The increase in energy prices is also expected to push up core inflation by less than 0.2pp in annualized terms by end 2025. The erosion in household disposable income (as well as negative wealth effects on the part of Ricardians) is expected to drive down non-energy private consumption by around 0.6% by end 2026. In line with previous results, these estimates hide a considerable degree of heterogeneity. Increases in

[21] In the surprise scenario, between 2021 and 2024, the model is solved with the same sequence of shocks as in the baseline scenario. From 2025 onwards, the model is solved with the same sequence of energy shocks but with energy subsidies turned off.

Chart 5a: Complete suspension of energy subsidies – macroeconomic results



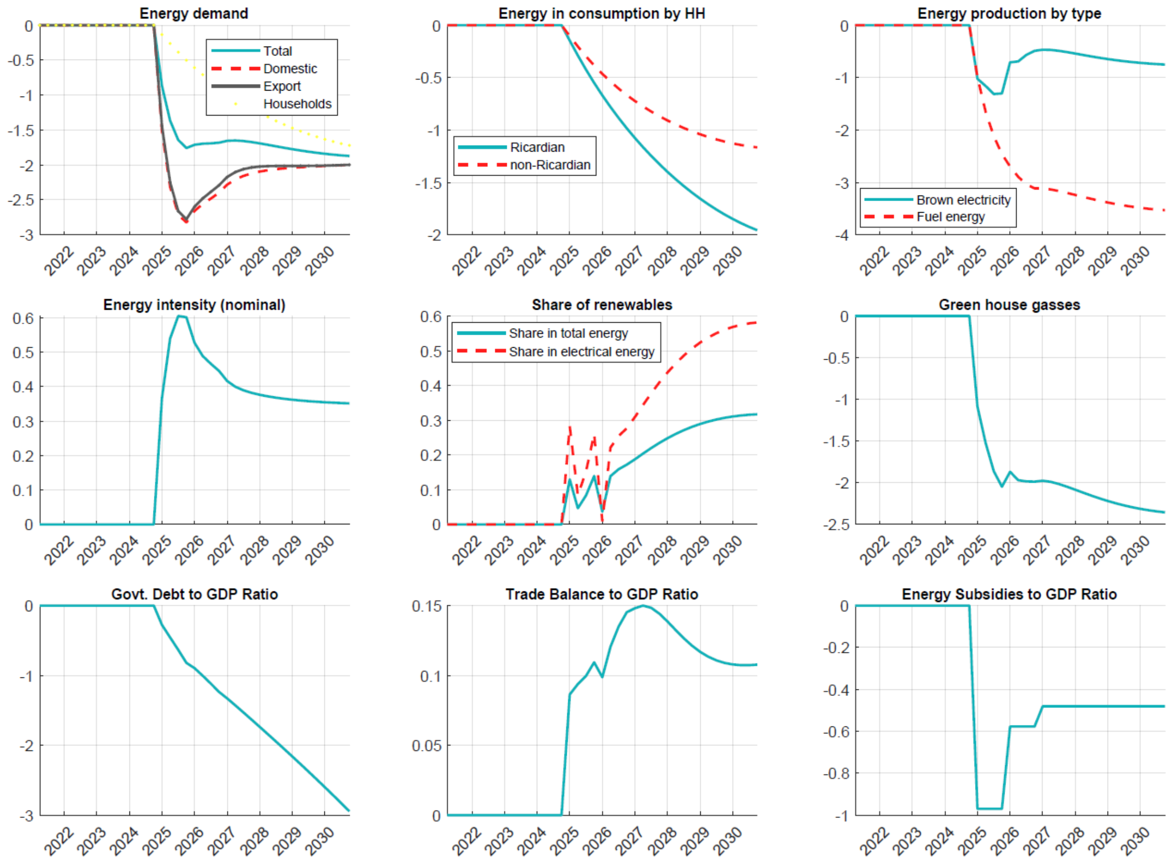
Note: Charts show deviations of macroeconomic variables pertaining to a hypothetical surprise complete suspension of Government fixed energy price intervention strategy. The announcement and implementation of the surprise suspension of subsidies occur simultaneously on the first quarter of 2025. Results are compared to a strategy based on full subsidisation that is maintained throughout the period under consideration (baseline scenario). Both scenarios are characterised by the same series of foreign energy price shocks and differ only in the length of the subsidy policy. All results show deviations in % from the levels estimated under the baseline scenario. Results for inflation measures are in terms of pp deviations.
Source: Author's estimates

overall consumption inflation for the poorer households are expected to peak at around 1.6pp in annualized terms in 2025. On the other hand, increases in inflation in the Ricardian basket of consumer goods is expected to peak at less than 0.8pp, again reflecting a lower share of energy in the consumption basket and the greater price elasticity of demand for energy when compared to the poorer group of households. In turn, this discrepancy in household-specific consumer inflation contributes to explain the divergence in the private consumption paths of households, with non-Ricardians expected to cut back on consumption by almost twice as much as Ricardians by 2030.

Looking into energy-specific variables, the increase in brown energy prices projected as a result of the suspension of energy subsidies is expected increase the demand for electricity produced using sustainable fuels. The increase in demand is expected to lead to an increase in "green" capital investment which slowly contributes to an increase in the overall supply of sustainable energy. This is expected to gradually push up the share of renewable electricity in overall electricity supply by 0.6pp by the end of the period under consideration. The drop in fossil fuel-derived energy together with the increased uptake of renewable energy is expected to contribute to a gradual drop in greenhouse gasses of around 2.5pp by end of 2030.

Suspending the fixed energy price strategy by end 2024 would also result in a projected improvement in the Government financial position. Indeed, in the event of a suspension of the fixed energy price

Chart 5b: Complete suspension of energy subsidies – energy-specific results



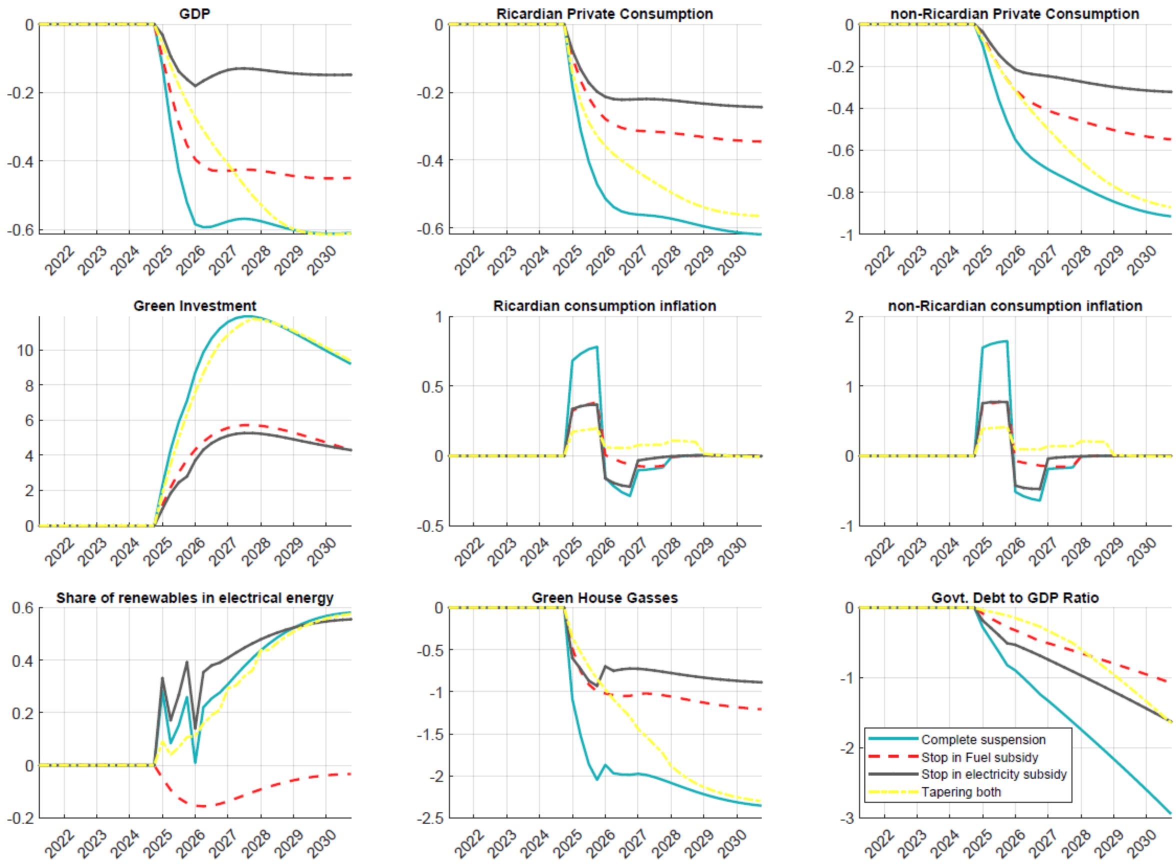
Note: Charts show deviations of energy-related and environmental variables pertaining to a hypothetical surprise complete suspension of Government fixed energy price intervention strategy. The announcement and implementation of the surprise suspension of subsidies occur simultaneously on the first quarter of 2025. Results are compared to a strategy based on full subsidisation that is maintained throughout the period under consideration (baseline scenario). Both scenarios are characterised by the same series of foreign energy price shocks and differ only in the length of the subsidy policy. All results show deviations in % from the levels estimated under the baseline scenario. For ratio-based variables ratios (energy intensity, share of renewables, government debt ratio), deviations are expressed in percentage points (pp).
Source: Author's estimates

strategy, the Government debt to GDP ratio is expected to be around 5pp lower than the level that would prevail under the baseline assumption of a continuation of the current status quo. In turn, this would imply that Government would potentially have the fiscal space to implement other expansionary fiscal policies that can reduce the macroeconomic and distributional costs associated with suspending the current energy pricing policy. Moreover, Government can also utilize the funds that were earmarked to help maintain the energy price freeze, to subsidize the investment in renewable energy production.

5.2. Surprise Tapering of Subsidies without Recycling

The previous section outlined that, despite lower international energy prices compared to the 2022–2023 period, a sudden, complete, and unannounced suspension of government subsidies can exert significant downward pressure on local economic activity. In this context, particularly given the government's current commitments to maintain fixed retail energy prices for the foreseeable future, a scenario involving a sudden, complete, and uncompensated removal of energy subsidies appears

Chart 6: Partial Suspension of energy subsidies



Note: Charts show deviations of macroeconomic variables pertaining to a hypothetical surprise partial suspension of Government fixed energy price intervention strategy. Charts contrast the benchmark complete suspension scenario with 3 partial suspension strategies; one in which Government suspends fuel subsidies, another suspending electricity subsidies and one in which a complete suspension takes place over five years. In the latter scenario, both electricity and fuel subsidies begin to be reduced in 2025 and are fully eliminated by end-2027 through a linear and progressive path. The announcement and implementation of all strategies occur simultaneously on the first quarter of 2025. Results are compared to a strategy based on full subsidisation that is maintained throughout the period under consideration (baseline scenario). All four scenarios are characterised by the same series of foreign energy price shocks and differ only in the timing and type of subsidy strategy adopted by Government. All results show deviations in % from the levels estimated under the baseline scenario. For inflation and ratio-based variables, deviations are expressed in percentage points (pp).
Source: Author's estimates

unrealistic. Therefore, in the remainder of this study, I conduct a series of policy experiments that partially relax these assumptions.

This sub-section looks at three different tapering experiments. First, I assume an unannounced progressive tapering of energy subsidies which however are still not compensated by other fiscal stimuli. Similar to the previous scenario the simulation assumes Government maintains full subsidies till the end of 2024 after which progressive tapering of energy aid is announced. Subsidies are progressively reduced by 25% per annum starting form 2025Q1 and resulting in a complete removal of aid by end 2027. In the second and third experiments I assume an unannounced sudden but partial cut in energy subsidies. In particular, I assume that in from 2025Q1, Government announces the removal of energy aid either on fuel or electrical energy only. Results of all three scenarios are expressed as deviations from the baseline scenario that foresees the indefinite continuation of the current subsidy regime. To aid in the comparison, the results of these three scenarios are then compared with those consistent with the impacts driven by a sudden complete and unannounced cut in subsidies with no fiscal compensation (consistent with sub-section 5.1 above).

As is the case with the complete suspension of subsidies, all three partial suspension scenarios are consistent with a fall in economic activity. As expected, a suspension to either fuel or electrical energy subsides leads to less pronounced drops in economic activity, both in the short run and medium run, when compared to a complete stop in energy aids. The transmission channels of shocks to fuel and electrical energy prices are quite similar from a macroeconomic perspective. The difference in the magnitude of activity falls following a suspension of fuel and electricity subsidies stems from two facts. First, the share of fuel expenditure in overall energy demand is slightly higher than that of electrical energy and secondly, due to projected fuel and electricity prices, the size of fuel subsidies is estimated to be slightly higher after 2025 when compared to electricity subsidies. Thus, the removal of fuel subsidies is expected to impact a larger portion of overall marginal energy costs and with greater intensity, resulting in more substantial losses in economic activity compared to the suspension of electricity subsidies. From a fiscal perspective, a hypothetical suspension of fuel subsidies is expected to lead to lower improvements in Government's fiscal position. This effect is registered despite of the stronger declines in economic activity and non-energy related fiscal revenues that are consistent with higher retail fuel prices. This effect is entirely driven by the fact that fuel energy is predominantly taxed through an excise duty while electricity taxes are mainly ad-valorem. Thus, in the absence of fuel-specific subsidies, the increase in fuel prices will lead to subdued direct increases in tax revenues.[22] On the other hand, increases in electricity prices due to a suspension of electricity-specific subsides would lead to a direct increase in tax revenues.

An asymmetric subsidy system which suspends either fuel or electrical subsidies separately, can also have interesting effects on the share of green energy in total electricity demand. Suspending fuel subsidies leads to a pickup in electrical energy demand as economic agents slowly substitute away from the use of fossil fuel-based heating and transportation. As the demand for electrical energy increases, the supply of green electrical energy (which is rather inelastic in the short-run) does not keep up with the increase in locally produced and imported "brown" electrical energy leading to a short-run dip in the share of renewables in total electrical energy demand. Nonetheless, total green electricity supply still increases in the short run as evident by the increase in green investment that occurs immediately after the suspension of fuel subsidies. The shift away from the more GHG intensive energy source towards a greener combination of electrical energy also leads to a drop in GHG emissions when compared to a no-subsidy scenario.

As expected, the hypothetical scenario characterised by a tapering of both types of subsides from 2025 onwards before a complete suspension by end 2027, is consistent with considerably lower economic activity costs in the short run. Indeed, the peak output loss of around 0.6%, which is consistent with the peak result under a sudden and complete suspension, is not reached before 2029; that is three years after the peak effect of a strategy based on a sudden suspension of subsidies. A tapering scenario is also consistent with a more evened out inflation profile. In fact, a smooth transition out of a fixed energy regime is expected to reduce the peak consumer inflation impact from around 0.8pp to 0.2pp in annualised terms. This difference in peak inflationary impacts is even more prominent when looking into non-Ricardian household inflation. However, a tapered exit strategy is consistent with more persistent inflationary pressures as consumer price inflation is expected to linger slightly above that consistent with a no-exit strategy.

Compared to a sudden and complete suspension of energy subsidies, a tapered exit strategy leads to more moderate improvements in the public debt-to-GDP ratio. However, the tapering approach yields particularly noteworthy results in terms of green investment. Specifically, the outcomes for green investment under a gradual withdrawal are both qualitatively and quantitatively similar to those observed under an immediate and full removal of subsidies. This reflects the forward-looking nature of green

[22] Government levies an excise duty on fuel imports which does not linearly depend on fuel prices but on import volumes. Fuels used for final consumption are then further taxed through consumption taxes (Value Added Tax or VAT) which is then ad-valorem. The model can track both of these tax revenue sources. However, for the case of fuel energy, the revenues accruing from the excise duty exceed those driven by the consumption tax, implying that the direct effects that higher fuel prices have on Government revenue are rather small.

investment decisions: economic agents appear to anticipate the eventual withdrawal of support and begin increasing the supply of green electricity even while some subsidies remain in place.

Indeed, under a tapering strategy, the share of renewable energy in total electricity demand is expected to align closely with that observed in the case of a sudden withdrawal. This suggests that the effectiveness of a gradual exit depends heavily on a clear and credible pre-announced tapering schedule. Such an approach would allow temporary subsidies to cushion short-term economic impacts, while expectations of rising energy prices over the medium term would continue to incentivise investment in green energy production.

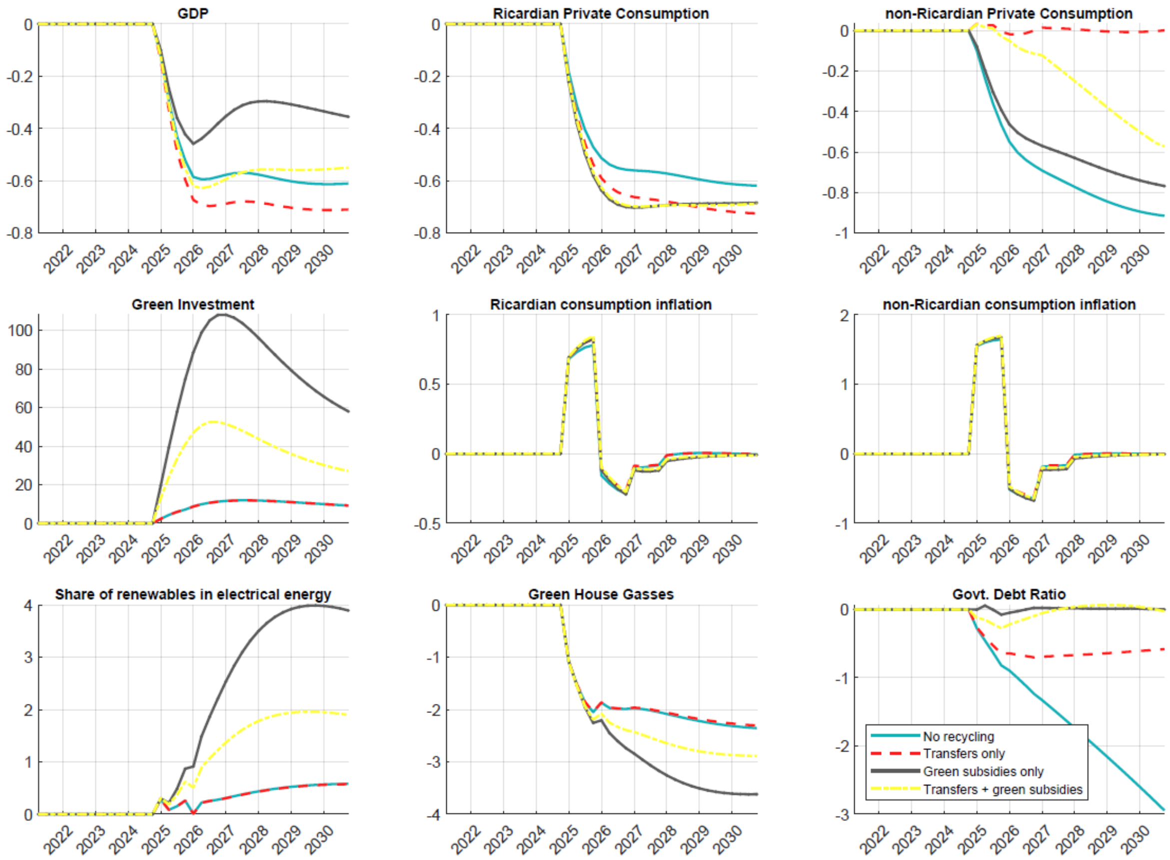
5.3. Surprise Interruption of Subsidies – Fiscal Recycling Experiments

In this section, I assume that Government will completely and suddenly suspend all energy subsidies as from 2025, in line with the scenario explored in section 5.1. Contrary to previous scenarios however, I look at three different recycling strategies that differ in the extent to which and in the tool with which Government chooses to recycle the fiscal space created. All results are again expressed in terms of deviations from the levels estimated to prevail under the baseline scenario that foresees the continuation of the current energy subsidy strategy. For ease of reference, these three recycling strategies are then compared with the first counterfactual presented earlier, which assumes that Government suspends all energy subsidies and does not recycle any fiscal space created. Results are depicted in chart 9.

In the first scenario, I simulate the case in which Government partially utilises the fiscal space created to fully refund non-Ricardians, or the poorer subset of households, for the loss in their purchasing power brought about by the suspension of the fixed energy price policy. This strategy is motivated by stark heterogenous impacts that energy price shocks have on poorer households, and that were uncovered in the previous simulations. The scenario is designed to use lump-sum transfers, distributed to households in a way to sustain non-Ricardian private consumption to the levels that would have prevailed in a scenario where Government continued to pursue a fixed energy pricing policy. As seen in the results, the strategy is very effective at propping up non-Ricardian household private consumption. As expected, a strategy based on refunding households with lost purchasing power, does not in any way soften the impact of foreign energy prices on consumer inflation. Given the positive demand-side effects that are consistent with an increase in lump-sum transfers, this strategy is in fact associated with a very short-lived and very subdued increment in consumption inflation when compared to the no-recycling counterfactual. Moreover, despite the non-targeted nature of these transfers, the wealthier subset of households is affected by negative wealth effects that depress their private consumption expenditure to a larger extent when compared to a no-recycle counterfactual. This together with the slight increase in inflation brought about by positive income effects which negatively affects international competitiveness, leads to a slight worsening in the outcome for overall output. In this light, a strategy based on refunding households of lost purchasing power by paying lump-sum transfers to all households can be regarded as having substantial redistributive effects, with the potential to fully compensate non-Ricardian households of lost purchasing power while further depressing private consumption of wealthier households.

A refund strategy based on lump-sum transfers has no effect on energy-specific and environmental variables. As expected, lump-sum transfers are non-distortionary in nature and therefore are unable to play a role in shifting demand from fossil fuels to renewables, leading to environmental and energy specific variables which remain unchanged from the no-recycling counterfactual. Another result that emerges from this simulation, is that fully shielding poor households from the effects of higher energy costs through the provision of lump-sum transfers, has considerable effects on the Government's fiscal position. In fact, despite a more pronounced fall in overall economic activity, when compared to the scenario consistent with the suspension of fixed energy prices with no recycling, a policy based on lump-

Chart 7: Complete suspension of energy subsidies with recycling



Note: Charts show deviations of macroeconomic variables pertaining to different recycling strategies relative to the baseline scenario. Charts contrast 4 strategies, a full suspension without fiscal recycling, full suspension with transfers that fully retain purchasing power of non-Ricardians, full suspension with full recycling using green subsidies and full suspension with full recycling using equally sized increases in transfers and green subsidies. The announcement and implementation of all strategies occur simultaneously on the first quarter of 2025. Results are compared to a strategy based on full subsidisation that is maintained throughout the period under consideration (baseline scenario). All four scenarios are characterised by the same series of foreign energy price shocks and differ only in the recycling strategy of Government. All results show deviations in % from the levels estimated under the baseline scenario. For inflation and ratio-based variables, deviations are expressed in percentage points (pp).
Source: Author's estimates

sum transfers is consistent with a marginal improvement (of 1 pp by 2030) in the Government's fiscal position.

The second experiment conducted in this part of the study assumes that Government utilizes all fiscal space saved when suspending the fixed energy price policy to boost green capital subsidies. In particular, I assume that Government increases the subsidies on green capital rates of return, with the amount necessary to utilize all the fiscal space created when suspending the fixed energy price policy. The size of green capital subsidies is closely linked to the level of subsidies that would have existed under a baseline scenario with fixed energy prices. This baseline trajectory is, in turn, based on internal projections of foreign energy prices, which generally indicate a slowdown in energy price levels that are however expected to stabilize at levels higher than those seen before the COVID-19 pandemic.

Under this scenario therefore, the subsidies on green capital (expressed in terms of GDP) are assumed to increase by around 1.5% of GDP in 2025, by 1% of GDP by 2026 and to stabilize at around 0.5% of

GDP for the rest of the period under consideration. The increase in green capital subsidies improves the net return to green capital investment, leading to a considerable increase in the optimal green capital allocation chosen by Ricardian households. The significant increase in green investment leads to a rise in the production of green electricity putting some downward pressure on the increase in overall energy prices that is foreseen in the event of a suspension of the fixed energy price policy.

The increase in the demand for green capital goods leads to some marginal additional short-term pressures in consumption inflation, driven mainly by an increase in labour demanded by green investment firms. In the first year of the simulation, this inflationary effect is expected to outweigh any downward inflationary pressures exerted by the stronger adoption of green electricity (which is relatively cheaper when compared its brown counterpart). As the share of renewable electricity in overall electrical energy starts to climb however, the downward inflationary pressures driven by lower overall energy prices outweighs the inflationary pressures exerted from the demand side of the economy. In fact, as from mid-2026 onwards, household consumption inflation is expected to be lower than the levels that would have been expected under the baseline scenario of a continuation of energy subsidies.

Comparing results directly to either the scenario foreseeing no recycling of fiscal space or the scenario foreseeing partial recycling through lump-sum transfers, one can note an increase in green capital subsidies is consistent with a considerable cut in the economic activity costs associated with suspending the fixed energy price policy. Indeed, under this strategy, the drop in economic activity associated with the suspension of the energy price freeze is halved by 2027.

Turning to environment-specific variables, one notes that the considerable increase in green investment pushes up the share of green electricity by 7pp by the end of the period, that is more that 5pp higher than the scenarios foreseeing either a no-recycling plan or else a partial recycling through an increase in lump-sum transfers. This is expected to have obvious positive repercussions on the energy-specific greenhouse gas emissions, which are estimated to fall by almost 6%, almost double the fall in the other scenarios considered.

When analysing these results, one needs to keep in consideration that the full recycling of fiscal space through the sole use of green capital subsidies is consistent with a very strong spike in green incentives. Indeed, this scenario foresees a threefold increase in green subsidies in 2025, going gradually down to a doubling of subsidies between 2027 and 2030. It is therefore important to keep in mind that the size of the green capital subsidies under this scenario are considerable, and this explains the very strong response of green investment over the period under consideration. Moreover, although recycling fiscal space through green capital subsidies effectively mitigates the macroeconomic costs of suspending energy subsidies, it does little to address the distributional impacts of ending the fixed energy price policy.

In this light, the final policy experiment conducted in this study seek to find a balance between the two recycling policies. The final scenario assumes that Government utilizes lump sum transfers to fully refund non-Ricardians, of the loss in their purchasing power brought about by the suspension of the fixed energy price policy. Moreover, I assume that Government utilizes the rest of the fiscal space to increase green capital subsidies. In this respect, the final scenario is still budget neutral when compared to the baseline, in the sense that it utilizes all fiscal space saved through the suspension of energy subsidies. Contrary to either one of the two previous recycling scenarios, the final experiment seeks to combine the distributional elements of the strategy based on transfers and the environmental ones associated with a recycling policy based exclusively on green subsidies.

It is immediately apparent that complementing a full redistributive strategy based on lump-sum transfers with one based on green capital return subsidies leads to only marginal improvements in overall output outcomes. Private consumption of both types of households remains fairly unchanged from the scenario based solely on lump-sum transfers. The only noticeable changes are expected in energy and environment-specific variables. When compared to a recycling strategy based solely on lump-sum transfers, green investment is expected to increase considerably, peaking in 2026. This in turn is expected to push up the share of renewable electricity in overall electricity output for all the period under consideration, in turn leading to slight improvements in greenhouse gas emissions. As expected however, environmental gains (in terms of GHG emission and green energy adoption) under this balanced strategy are considerably less pronounced when compared to a recycling strategy based solely on boosting green capital returns.

6. Conclusion

Following the increase in international energy prices, the Maltese Government introduced a fixed energy price policy, effectively shielding Maltese households and industry from any rise in retail energy prices. During the European energy crisis, these subsidies brought about considerable economic benefits. Nonetheless, the size and design of the current subsidies are likely to have significant fiscal implications and non-trivial price misalignments with potential environmental consequences that merit further study. In this light, this discussion paper assesses the impact of the policy on Malta's economy using a newly developed New Keynesian model featuring detailed energy and fiscal blocks. The study evaluates the economic effects of the fixed-energy pricing policy while also addressing energy-specific and environmental considerations. The paper also explores the hypothetical implications of suspending the current energy subsidy system and examines alternative policy options, such as a complete surprise suspension (with and without fiscal recycling) and tapered suspension strategies.

Results indicate that the Maltese Government policy was successful at supporting economic activity. In the event of a no-subsidy hypothetical scenario, overall economic activity would have been around 1.3% lower when compared to the realised levels by 2023, mainly due to lower exports, private consumption and private investment. The policy is estimated to have reduced headline and core inflation by approximately 1.2 and 0.2 percentage points, respectively. Due to their higher share of energy in consumption, and the lower elasticity of substitution between energy and non-energy goods, poorer households are expected to be affected the most by a non-intervention policy. Indeed, in the absence of Government intervention, consumer inflation faced by poor households would have been almost twice that experienced by wealthier counterparts. These effects on economic activity and inflation are expected to persist also going forward despite the stabilisation in foreign energy prices.

In view of their distortive nature, the energy price caps have also had significant implications for Malta's energy mix. Subsidies on brown energy have resulted in lower levels of green investment compared to a scenario without such subsidies, leading to a reduced share of renewable energy in the overall mix. In addition, this strategy has placed considerable pressure on public finances, with energy subsidies estimated to have increased the public debt-to-GDP ratio by approximately 4 percentage points by 2024. While the energy price cap may have contributed to maintaining Malta's international competitiveness, it is also estimated to have had adverse effects on Malta's current account balance. These effects are largely attributed to persistently high energy import costs and a lack of adjustment in both energy and aggregate demand. Looking ahead, this policy is expected to continue supporting economic activity. At the same time, it is also expected to weigh on Government fiscal space, worsen the trade balance, and marginally hinder progress towards Malta's green transition targets in the coming years.

In this light, the hypothetical exit strategies put forward in this study are assessed in terms of the costs to economic activity, including the impact on consumer inflation, but also on their fiscal implications and their effect on green investment and renewable energy supply. Even though global energy prices are projected to stabilize below peak levels, a surprise suspension of energy subsidies in 2025 would lead to a significant drop in economic activity compared to the full subsidy scenario. However, tapering strategies or those involving fiscal recycling, potentially through a combination of targeted transfers and green capital subsidies, offer more balanced outcomes. In particular, a clearly communicated gradual suspension of these subsides is found to smoothen the adjustment costs on the real side of the economy while still offering the correct incentives to private agents to increase investment in green and cheaper energy alternatives.

Focusing on fiscal recycling policies, strategies that reinvest public funds show strong potential to mitigate both macroeconomic and distributional impacts of rising energy cost. Targeted lump-sum transfers to the most affected households are particularly effective in protecting consumer purchasing power but are less successful in offsetting lost economic output or accelerating the green transition. In contrast, using recycled funds to increase green subsidies effectively stimulates investment in renewable energy, expands the supply of cheaper, cleaner electricity, and enhances Malta's competitiveness and overall economic performance. However, while this approach leads to a modest decline in energy prices in later periods, it does not fully protect poorer households' purchasing power.

Ultimately, the current energy subsidy system has been highly effective in the short term, helping to absorb the impact of the European energy crisis that unfolded between 2022 and 2023. However, its continuation into the medium term is likely to bring important challenges. By suppressing price signals, fixed energy prices reduce incentives for energy conservation and slow the transition to renewable energy sources. From a fiscal perspective, maintaining this policy would require a substantial allocation of public resources, potentially crowding out other priority spending areas. It may also continue to weigh on Malta's external balance, given the reliance on energy imports, although Malta has been recording current account surpluses and is projected to continue to do so. Moreover, looking ahead, it is important for policymakers to ensure that any long-term energy strategy is aligned with Malta's climate commitments. Future energy support measures should be explicitly designed to support the country's decarbonisation targets and comply with EU climate policy. In this context, a carefully sequenced and clearly communicated exit strategy, such as one that recycles fiscal space into socially and environmentally productive uses, can support a more sustainable and balanced energy policy framework.

However, it is important to note that these results do not factor in possible non-linearities in the pass-through of energy prices. In fact, as documented in De Santis et al 2023, there is concrete evidence that the transmission of energy supply shocks on consumer prices is stronger in high-inflation regimes. In fact, time-dependent pricing models (such as Calvo 1983 and Rotemberg 1982 with the latter one being used in the current model) which are linear models of adjustment, are a good approximation only in low inflation settings. Consequently, during future episodes of elevated energy commodity prices, many structural models may underestimate the pass-through of such shocks to consumer prices, potentially leading to an underappreciation of the short-term benefits of government subsidies introduced in response to large energy price shocks. In this respect one possible avenue for future research includes the study of how state-dependent non-linearities, that is depending on the size of the energy shocks, may affect the results pertaining to the effectiveness of government energy subsidies.

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