

How should governments respond to energy shocks?

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Presented by:
Geoffroy Duparc-Portier
University of Strathclyde

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What do we already know?

Energy prices:

- 80% \uparrow price of gas in the EU (Eurostat 2023a)
- 50% \uparrow price of electricity in the EU (Eurostat 2023c,b)

Dependence on Russian gas and oil imports:

- $\frac{1}{2} \approx$ gas imports, $\frac{1}{2} >$ oil imports (Eurostat 2022)
- Germany even more dependent than EU average

We expect increases in income and consumption inequality (Lewbel and Houthakker 2017; Pizer and Sexton 2019; Williams et al. 2015; Larson et al. 2016; Guan et al. 2023).

- Energy \equiv necessary good
- Basket composition
- Satiation point (Stone 1954; Geary 1950)

Governments response to the energy crisis (Sgaravatti et al. 2023)?

- Energy price subsidies:
 - a. Targeted toward lower-income households
 - b. To all households
 - c. To households and firms
- Other measures:
 - d. Targeted income subsidies
 - e. Firm tax rate reductions proportional to energy use
- Governments have used different forms of financing for the policies:
 - Debt
 - Windfall taxes

In this paper, I compare the impacts of the five expenditure policies above under debt and windfall tax financing.

Research Question

How should governments respond to energy shocks?

- Should governments use price or income subsidies to households?
- Should subsidies be targeted at low-income household groups?
- Should firms' energy inputs be subsidized?
- Are there benefits of using windfall taxes to fund energy policies?

How does my research add to the literature?

1. This paper provides a direct comparison of a set of government policies introduced by governments across Europe.
2. It considers the source of funding of the policies comparing debt financing and windfall tax financing in a general equilibrium environment.

The general features of the model are as follows:

- 2-region model containing Germany and the rest of the EU as endogenous regions
- We have a multi-level production structure following (Lecca et al. 2014; Duparc-Portier and Figus 2022)
- There are two representative household groups in Germany (FSO 2023*b,c,a*)
- There is a government and a foreign agent

Modelling assumptions (1)

Firms:

- Non-energy sectors - perfect competition structure
- Energy sectors - oligopoly structure (Hosoe et al. 2010)
- International trade - Armington (1969) assumption
- Production function: $F_i (K_{r,i}, L_{r,i}, VVR_{r,i,r',j} \forall (r', j)) \mapsto O_{r,i}$
- I assume perfect labour mobility across sectors
- I assume a degree of wage rigidity following the shock

Modelling assumptions (2)

Households:

- Two Forward-looking households “L” and “H” (FSO 2023*b,c,a*)
 - International consumption - Armington (1969) assumption
 - Basket composition - Stone (1954); Geary (1950) assumption
- Labour supply
 - Short-run: sticky nominal wages
 - Medium- to long-run: Blanchflower and Oswald (1995) wage curve

Social Accounting Matrix:

- 2020 Figaro tables (Eurostat 2023d)
- 21 broad ISIC categories
- +1 category for the manufacturing of refined petroleum

Parameters:

- σ_i^{ARM} (Zofio et al. 2020, p.34)
- $\sigma^K = 0.3$ (Gechert et al. 2022)
- Stone (1954); Geary (1950) sustenance parameters
- Profit shares to high-income **domestic** households (arbitrary).

Energy shock and profit shares

Energy shock:

- Qualitatively equivalent to a tariff for ROW imports
- Only energy sectors are affected directly
- ROW energy price is increased by 200% (arbitrary)

Government response:

- I assume the government can introduce a policy costing 0.2% of GDP
- This can be used in the period following the shock
- The government can use debt or a combination of debt and windfall tax financing to raise the 0.2%

Following the shock, the government can introduce a set of fiscal policies:

1. Business tax reductions proportional to firm energy consumption (TR)
2. Untargeted household energy price subsidies (UPS)
3. Targeted household energy price subsidies (TPS)
4. General energy price subsidies to households and firms (GPS)
5. Targeted household income subsidies (TIS)

Governments must choose how to finance the fiscal policies and can use:

- a. Debt financing
- b. Windfall taxes to energy firms

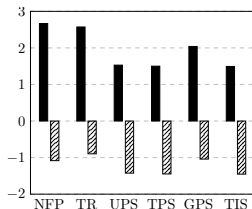
The government's objective is to maximize household welfare defined using a Welfarist approach:

$$Util_{r,t} = (1 - \gamma_g) \sum_h \left(\gamma_h CH_{h,r,t}^{1-\sigma_r} \right) + \gamma_g G_{r,t} \quad (1)$$

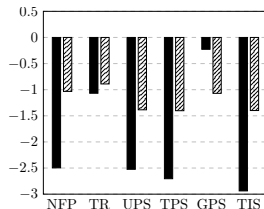
$$\Omega_r = \sum_t \sum_h (\beta_r^{t-1} Util_{r,t}) \quad (2)$$

- $\gamma_H \approx 0.25$, $\gamma_L \approx 0.75$ - household population weights proportional to the number of households in the groups
- $\gamma_g = 0.42$ public good weight (Stiglitz and Dasgupta 1971; Meunier and Schumacher 2020; Schram and van Winden 1989)

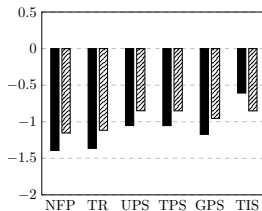
Aggregate results



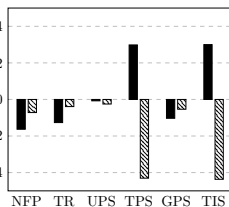
(a) CPI and Output



(b) Energy and non-energy output

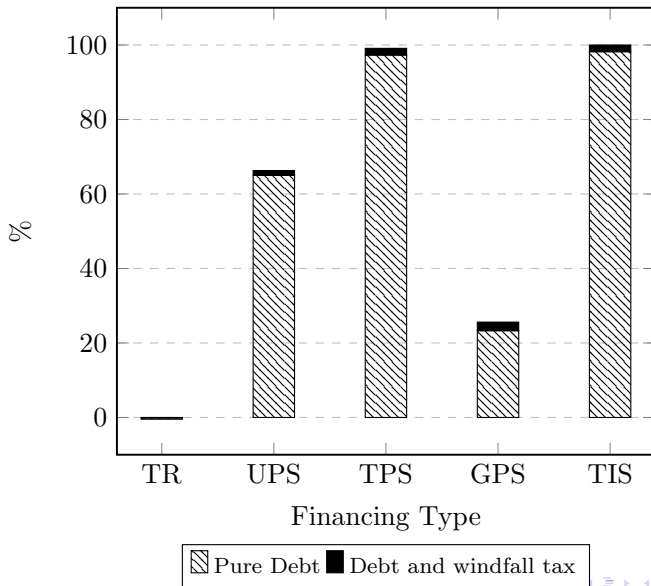


(c) Real household income



(d) Consumption

Welfare results



- A policy mix is optimal. This mix depends on:
 - Preferences for equity (linked to the EIS by group)
 - Output - inflation trade-off preference
 - Preference for the public good (γ_g)
- If $\gamma_g \geq 0.14$, windfall taxation is preferable to pure debt financing
- Income subsidies are only effective if the marginal propensity to consume of targeted households is close to 1
- Size of output and inflationary effects depend crucially on the degree of wage stickiness

Thank you for your attention! Any questions?

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