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Fossil Fuel to the Fire: Energy and Inflation in Europe

*Summary of main findings; full paper available **here***

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Our paper makes two main points

1. Fossil fuels added to recent economic instability

- Fossil fuel prices drove Europe‘s recent inflation
- High gas prices drove expensive electricity prices
- Mitigating fossil inflation was expensive

2. Replacing fossils with renewables can increase future price stability

- In general, electricity prices are more stable than fossil fuel prices
- Short run: renewable energy build-out already reduces inflationary pressures
- Long run: renewable energy’s anti-inflation potential is significant

But: the **mid-transition** brings challenges that must be tackled with policy today

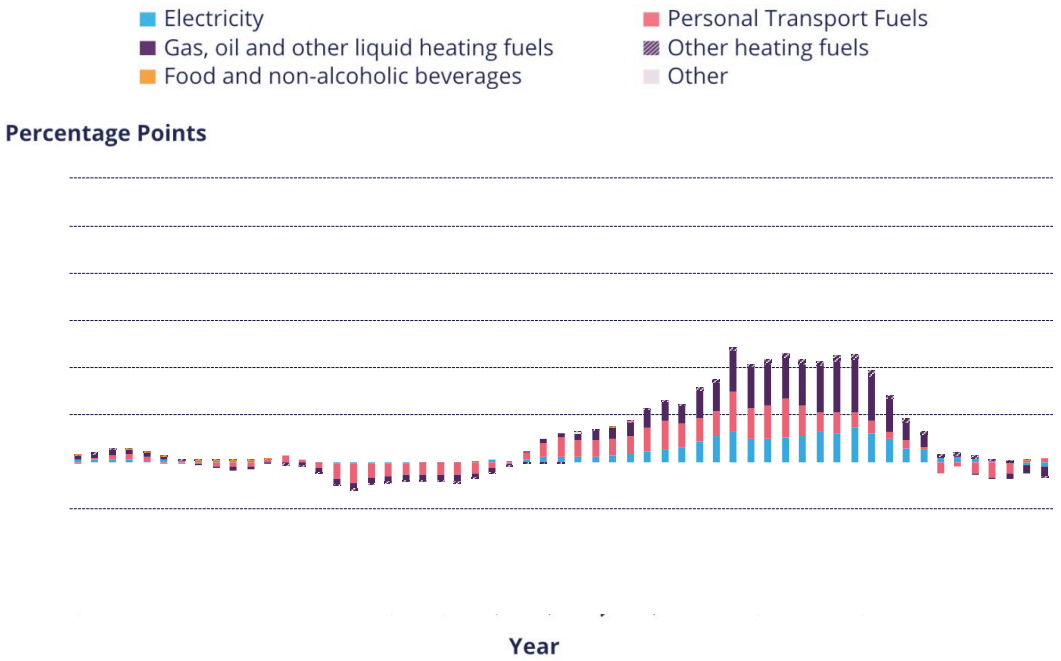
1. Fossil fuels added to recent economic instability (a)

Fossil fuel prices drove Europe's inflation

- Energy price increases directly constituted **50%** of euro area's 2022 inflation
- Full impact of fossil fuels even higher
  - **Food**: energy responsible for up to 50% of variable costs of farming
  - **Electricity**: see next slide

Fig. 1 Euro area inflation (HICP), breakdown by components

Euro area inflation, annual rate of change, monthly frequency



Reading example: The chart shows the weighted contribution of individual components to overall inflation in the euro area. In the most extreme month, March 2022, energy prices accounted for 66 percent of the overall 7.4 percent year-on-year inflation. Within the energy component, high oil and gas prices had the most significant direct and indirect impacts, including on elevated food prices.

Source: Eurostat (prc_hicp_manr)

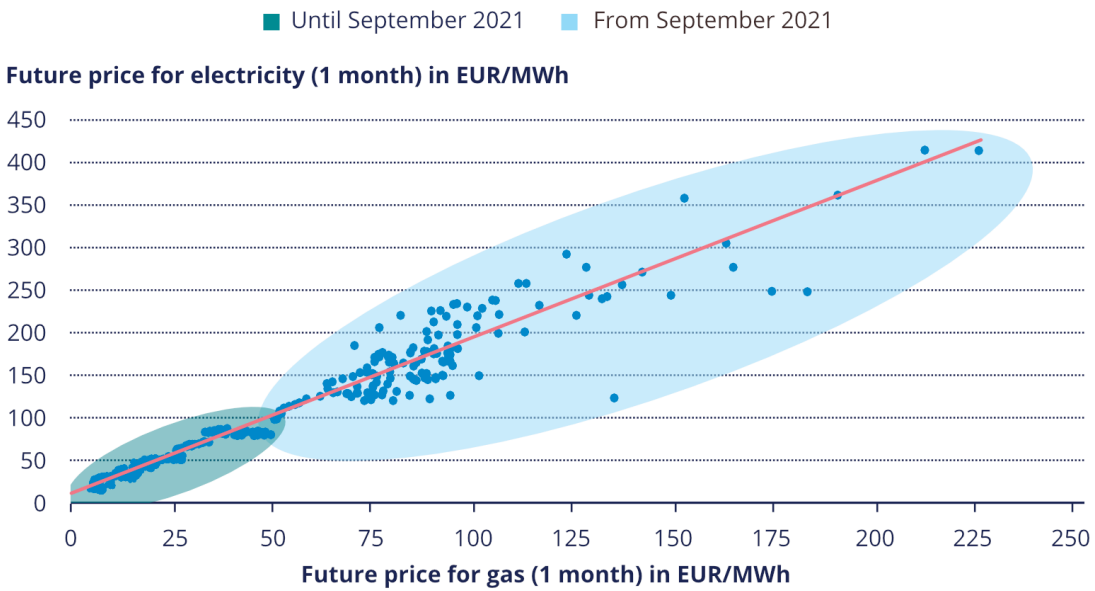
1. Fossil fuels added to recent economic instability (b)

High gas prices drove expensive electricity prices

- Electricity contributed to inflation
- But electricity price still **driven by fossils**
- **Expensive gas powerplants** set the price of electricity in much of Europe
  - Deep dive: Box 2, p. 16 of Krahé & Heilmann 2023

Fig. 2 Correlation between gas and electricity prices

Data for Germany. Correlation coefficient: 0.97



Reading Example: There is almost perfect correlation between gas and electricity prices, as gas plants are usually the most expensive power generation source and hence set the price. Historically high gas prices (from September 2021, light blue bubble) were the key driving force behind historically high electricity prices.

Source: BMWK (2022), p. 17

1. Fossil fuels added to recent economic instability (c)

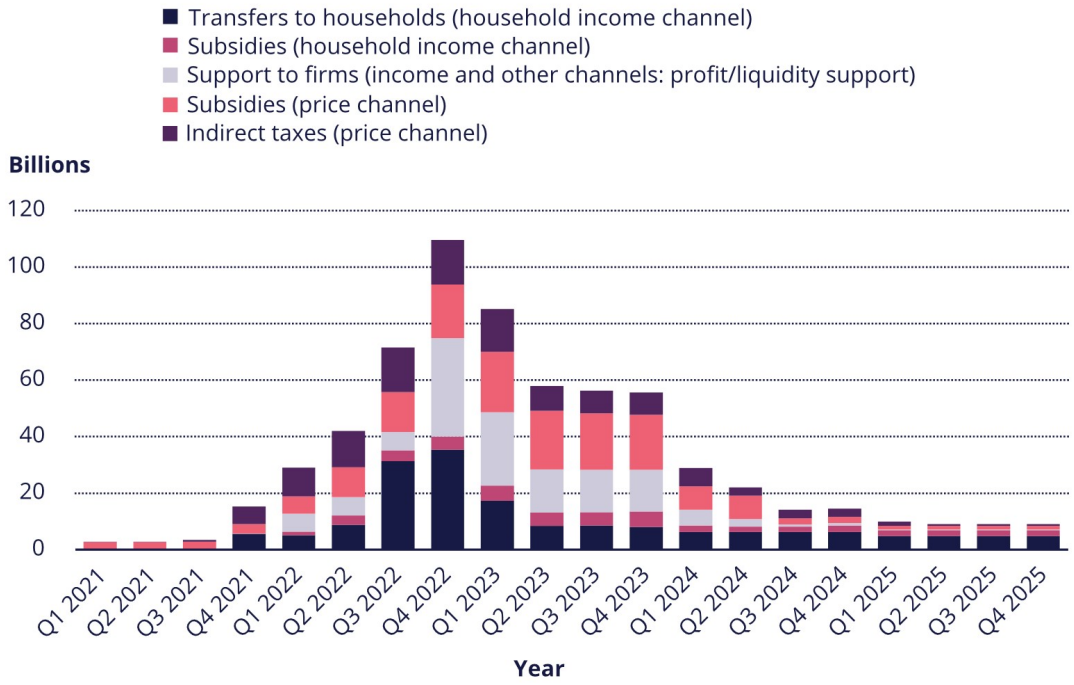
Mitigating fossil inflation was expensive

- Euro area governments spent 1.9% (2022) and 1.8% (2023) of GDP on fiscal support measures
- This reduced euro area inflation by 1.1 (2022) and 0.3 percentage points (2023)
- Withdrawal may increase inflation by 0.5 (2024) and 0.2 percentage points (2025)
    - Impact would be lower if fossil fuel dependency reduced further

Source: Checherita-Westphal & Dorrucci (ECB) 2023

Fig. 3 Euro area discretionary fiscal anti-inflation measures

In Euro

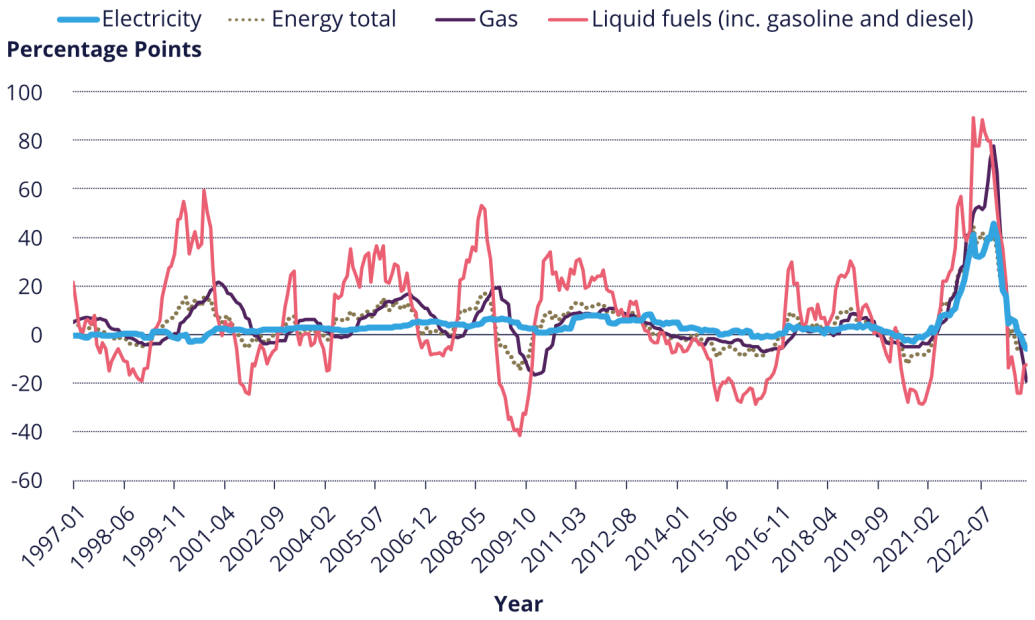


Sources: Checherita-Westphal & Dorrucci, ECB staff calculations (2023)

2. Replacing fossils with renewables can increase future price stability (a)

In general, electricity prices are more stable than fossil fuel prices

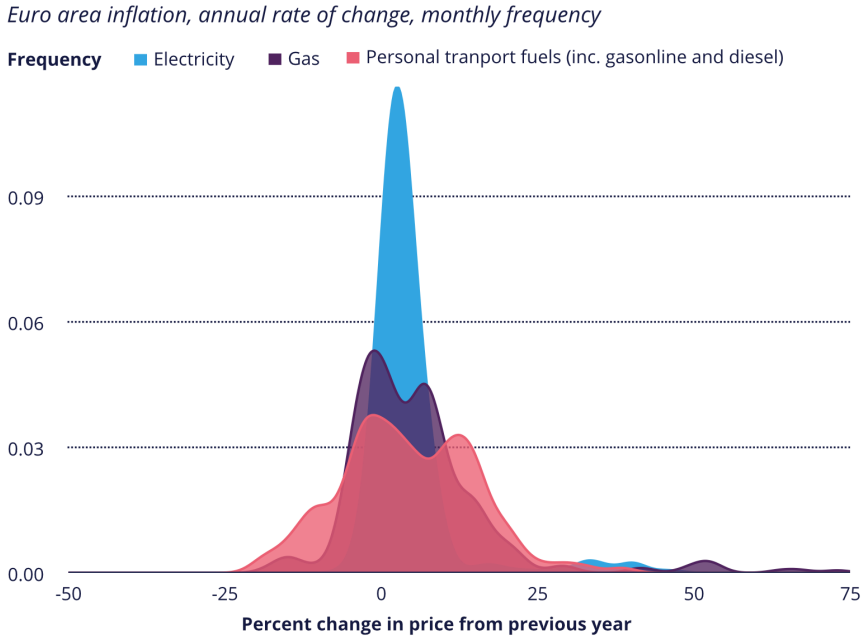
Fig. 4 Euro area inflation, breakdown of energy components



Reading Example: Prices paid for liquid fuels, most prominently oil in the form of gasoline and diesel, are the most volatile component of household energy expenditure and hence energy inflation, followed by expenditure on gas, as this data on year-on-year changes shows. Expenditure on gas increased at an unprecedented level during the recent energy crisis, and also affected the usually much more stable consumer prices of electricity due to the role of gas plants in electricity generation.

Source: Eurostat (prc_hicp_manr)

Fig. 5 Volatility of electricity-, gas-, and transport fuel prices



Reading example: This graph shows the distribution of price changes for electricity, gas and fuels for personal transport (mainly oil). Electricity prices are by far the most stable, as changes mostly occur within a small range, clustered between -3% and 10%. Oil and gas prices are significantly more volatile, with transport fuels (oil) being the most unstable. Gas prices used to be more stable than oil prices, but the energy crisis has led to some significant deviations, as can be seen at the right end of the horizontal axis.

Source: Own calculation based on Eurostat (prc_hicp_manr)

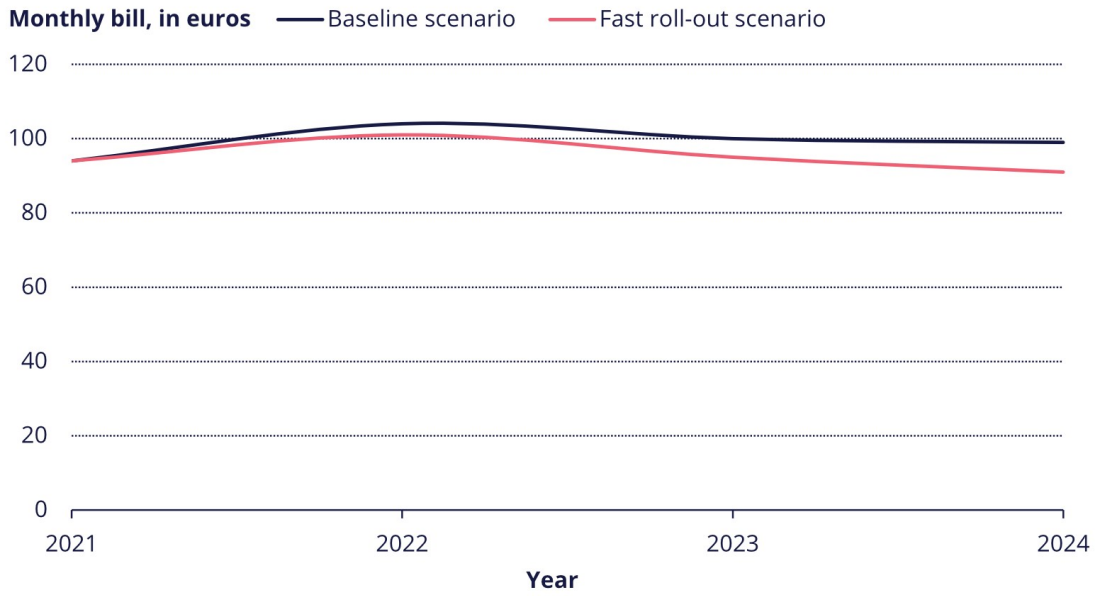
2. Replacing fossils with renewables can increase future price stability (b)

Short run: renewable energy build-out already reduces inflationary pressures

- New wind and solar PV displaced **230 TWh** of fossil fuel in EU since Russia's invasion
- Reduced EU wholesale electricity prices by 8% (2022) and **15%** (2023) (IEA 2023)
- Equivalent to a **0.2** (2022) and **0.4** (2023) percentage point reduction in inflation
- Savings for consumers of approx. **95 billion euro** by end of 2023 (IEA 2023)
- For Germany: addition of 18 GW of solar PV plus 7 GW of onshore wind per year in 2022, 2023, and 2024 estimated to cut bills by 9% in 2024 (Transition Zero 2022)

Fig. 6 Estimated impact of renewables roll-out on electricity bills

Electricity bill for typical German household consuming 3,500 kWh per year



Note: The fast roll-out scenario models the addition to the German energy mix of 18 GW of solar PV capacity plus 7 GW of onshore wind capacity per year in 2022, 2023, and 2024, together with appropriate amounts of battery storage.

Reading example: In 2024, the monthly electricity bill of a typical German household is 91 euro in a fast roll-out scenario, versus 99 euro in a base case with less renewable deployment.

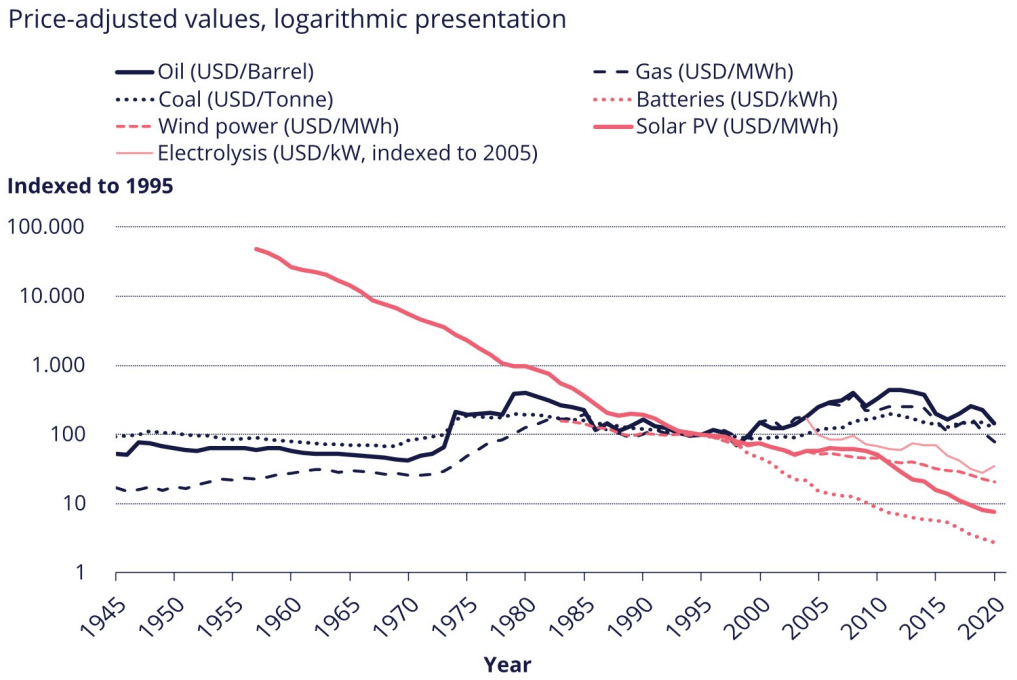
Source: Transition Zero (2022)

2. Replacing fossils with renewables can increase future price stability (c)

Long run: renewable energy's anti-inflation potential is significant

- Fossil fuel prices are **stagnating** or **rising**
- Prices of key clean energy technologies are **falling**
- Clean energy system likely **cheaper** and longer-term prices **more stable**
  - Cost base dominated by fixed, not variable costs (unlike fossil fuels)
  - Short-term prices: variable to coordinate weather-driven wind and solar PV with demand
  - But short-term variability ≠ macroeconomically bad inflation

Fig. 7 Long term real cost developments for energy



Fossil energy prices show no long-run declining costs, while key clean energy technology costs (solar PV, wind, short- and long-term storage) are declining considerably. These values are not directly comparable because energy conversion efficiencies are not considered and because each cost curve is indexed to its own value in 1995 (2005 in the case of electrolysis).

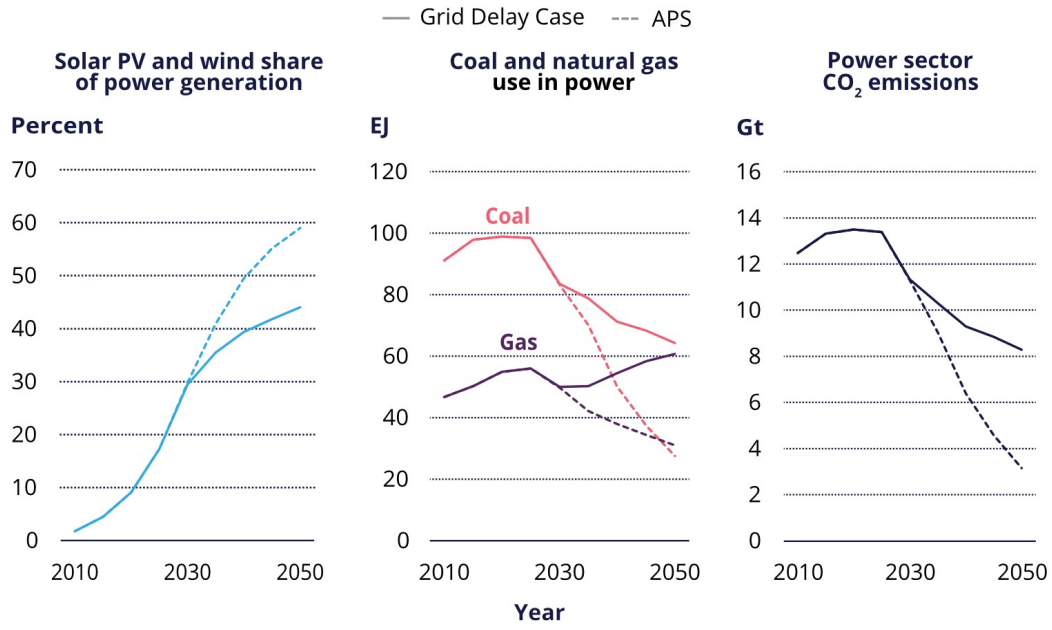
Source: Way et al. (2020)

The mid-transition brings challenges that must be tackled with policy today

Three challenges must be addressed

- Possibly increasing fossil fuel price volatility from poor coordination of phase-down / phase-out
- Possibly increasing volatility along renewable energy supply chains
  - "Problem of success": if downstream roll-out faster than expected, upstream production may not keep up
- Need for timely grid expansion and demand- and supply-side flexibility investments

Fig. 8 IEA projections of insufficient global grid rollout consequences



Reading example: If the expansion of electricity grids is delayed ("Grid Delay Case"), the expansion of renewables is slowed down, while the use of fossil fuels for electricity generation and power sector emissions increase relative to currently announced climate pledges ("APS").

Source: adapted from IEA (2023), p. 104

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For full sources & bibliography, see Krahé and Heilmann 2023