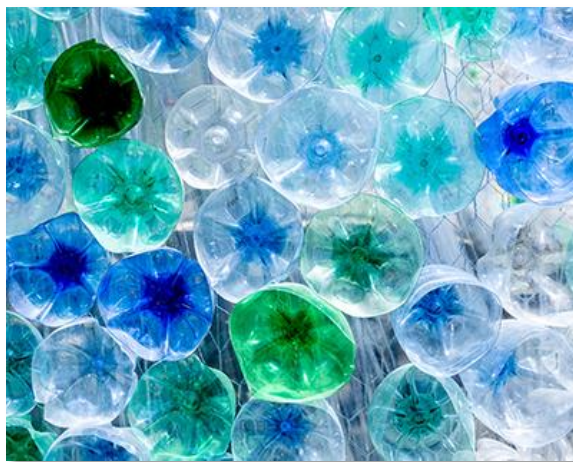


Embargo of Russia Energy

Marc Vielle, (EPFL)
Sigit Perdana, (EPFL)
Maxime Schenckery,
(IFPEN-IFP School)

Séminaire PSL de
recherches en
économie de l'énergie

Feb 2023



MAXIME SCHENCKERY

● 2018-... IFPEN - IFP SCHOOL Director Center for Energy Economics and Management

- Professor IFPEN in Energy Economics
- Visiting lecturer Energy Geopolitics: Pons, CNAM, ESSEC, University of Paris-Saclay
- Visiting lecturer Energy Transition Economics: Audencia, BI Norway, University of Paris-Saclay

● 2016-18 CEO ePwak Energy Research

● 2010-15 Head of Market Analysis and Forecast at Qatar Petroleum Corporate Strategy

● 2005-2010 Senior Advisor for Oil and Gas in Houston based French Consulate

● 2002-2005 Assistant Professor at IFP School

● 1997- 2002 Manager Ernst and Young Consulting – Fi System Internet consulting

● 1994-1997 Knowledge Manager Schlumberger

● 1994 Doctorate in Economics - Industrial Organization



Center for Energy Economics and Management (CEEM)

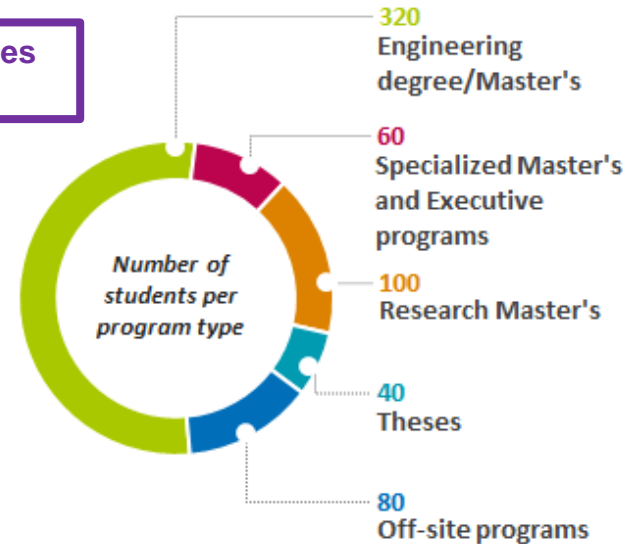
- 150 graduate students in 2021-22. (<https://www.ifp-school.com/en>)
- Two international Masters taught in English
 - **Master of Sciences in Energy Technology Economics and Management**
 - **Executive Master of Management in Energy** in partnership with BI Norwegian Business School
- **A Master of Sciences in « Energy and Markets »** with partners from energy and environment as well as trading and finance.
- **A Master in Transportation, Environmental and Energy Economics** in partnership with the Paris-Saclay University (AgroParisTech, Centrale Supelec, Ensta ParisTech, INSTN), Paris-Nanterre University, and Ecole des Ponts ParisTech.
- Supervision of **doctoral theses in energy economics**
- The economic touch to **Massive Open Online Courses** (MOOCs) and other internet based education on energy innovation, sustainable mobility and responsible resources (<https://www.ifp-school.com/en/programs/mooc>).

IFP SCHOOL

IFP School is an engineering school specializing in energy innovation and sustainable mobility.

- 17 high-level programs tailored to industry's and society's needs and leading to internationally-recognized degrees
- adapted to the needs of the energy and transport sectors
- for graduates with 4 or 5 years of higher education

**600 graduates
per year**



IFP ENERGIES NOUVELLES (IFPEN)

- IFP School is part of IFP Energies Nouvelles
 - Around 1,650 people
 - 280M€ budget
- A **public-sector** research & innovation center
 - Over 50 job fields, from geologists to engine technicians
 - Above 11,000 active patents
 - World class scientific recognition
- Major **industrial achievements**
 - 1,600 industrial references
 - Spin-off subsidiaries employing > 25,000 persons

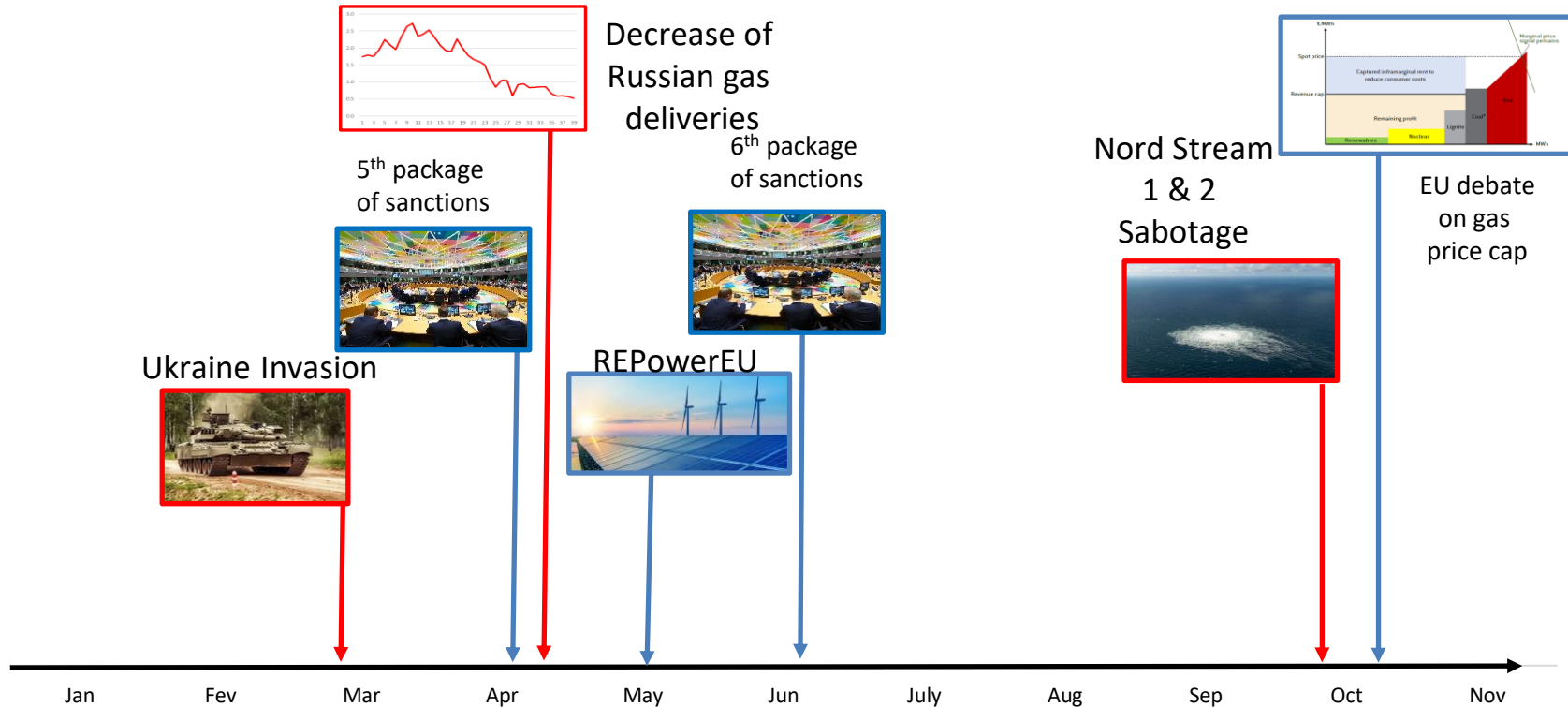


Prof. Yves Chauvin
(Nobel Prize 2005)



This institution punches well above its weight in terms of both scientific recognition and industrial relevance

TIMELINE OF EUROPEAN ENERGY EVENTS RELATED TO THE UKRAINE INVASION



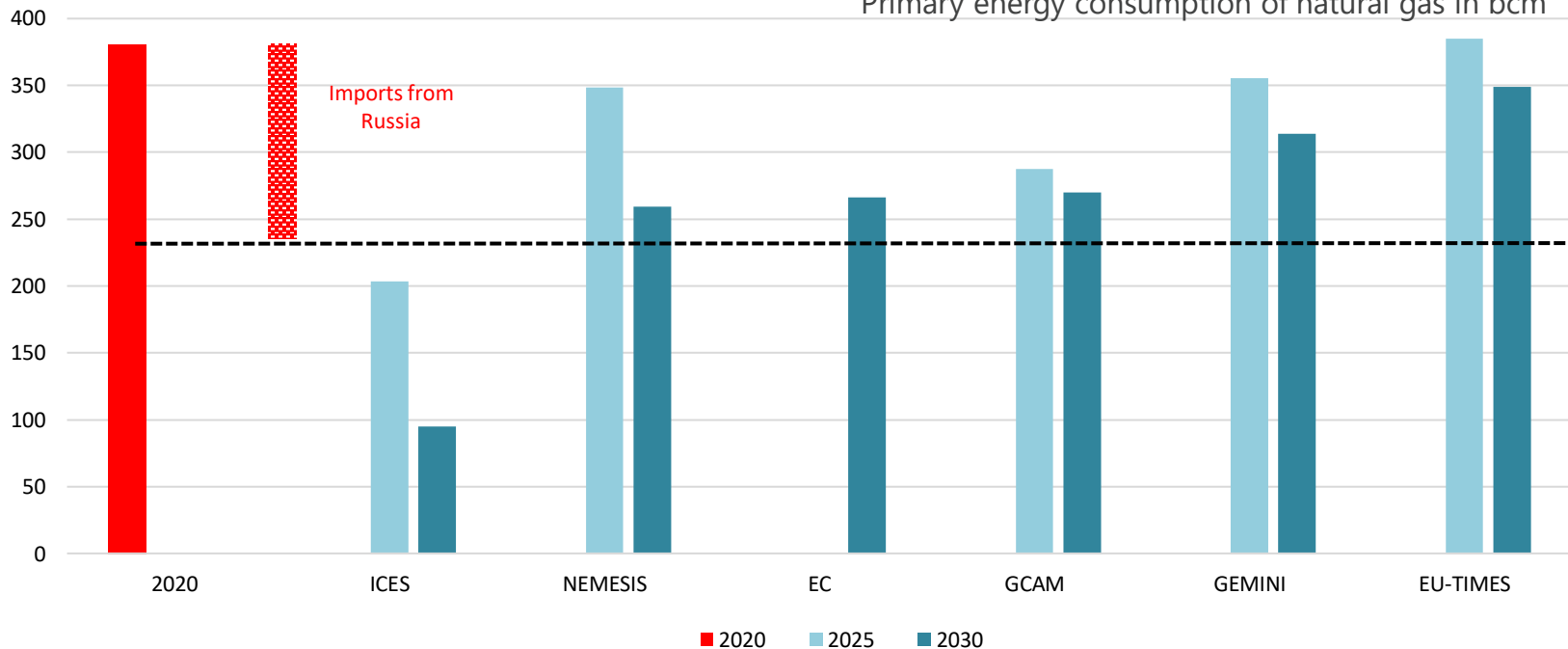
RESEARCH AIM, METHODS & SCENARIO DEVELOPMENT

- **Research Question:** What are the impacts of cutting Russian fossil energy imports considering the fit for 55 Package?
- The reference scenario assumes that the fit for 55 package is implemented (i.e. -55% of GHG emissions in 2030) and benefits from Paris Reinforce runs
- We use the GEMINI-E3 where EU27+UK and Russia are represented
- Timeframe 2022 – 2030

EU GAS CONSUMPTION WITHIN THE FIT FOR 55

Insights from Paris Reinforce runs Scenario NZE EU Policy standard

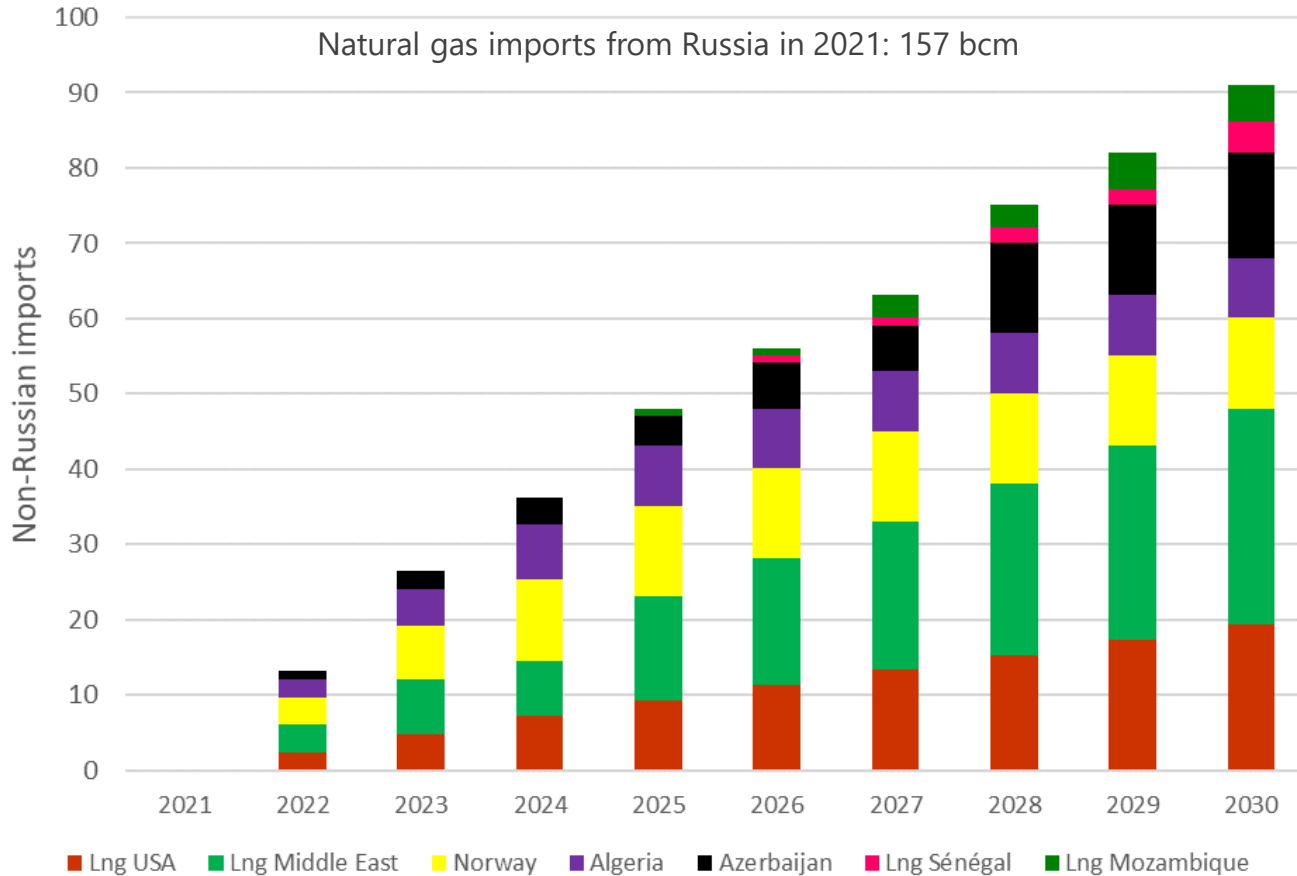
Primary energy consumption of natural gas in bcm



SCENARIO DESIGN

- Current Policies scenarios: NZE EU Policy Standard with two European CO2 prices
- No gas embargo: 5th and 6th packages of energy restrictive measures are implemented
- Full embargo: No gas embargo + embargo on natural gas
- Limited gas embargo: No gas embargo + only 80 bcm of Russian gas import
- Short term embargo: Limited gas embargo but with an additional assumption of war ending in 2025 and returning of energy deliveries
- All scenarios deliver a level of emissions compatible with Fit for 55

ASSUMPTIONS ON ADDITIONAL GAS IMPORT CAPACITIES



NO GAS EMBARGO SCENARIO

Table 3

No gas embargo scenario - EU28.

	2022	2023	2024	2025	2030
GDP ^a	-0.08%	-0.24%	-0.22%	-0.19%	-0.16%
Welfare ^b	-0.46%	-0.82%	-0.83%	-0.79%	-0.66%
Energy consumption ^a					
Coal	6.6%	-1.6%	0.3%	0.7%	-4.7%
Natural gas	-11.4%	1.9%	2.1%	3.1%	2.3%
Petroleum products	-0.7%	-4.6%	-3.9%	-2.8%	-2.0%
Electricity	-0.7%	0.2%	0.7%	0.7%	1.3%
Wholesale energy price ^a					
Coal	10.6%	26.9%	27.8%	28.0%	29.9%
Natural gas	19.4%	1.5%	1.7%	2.2%	1.5%
Petroleum products	2.5%	12.8%	12.2%	11.0%	10.6%
Electricity	2.1%	-0.5%	-1.6%	-1.4%	-2.2%
CO ₂ ETS price ^c	52	62	79	92	113
CO ₂ ESR price ^c	0	0	0	0	146

^aIn percentage relative to the current policies scenario.

^bIn percentage of households' consumption expenditure.

^cIn US\$₂₀₁₄.

NO GAS EMBARGO SCENARIO: MACRO-ECONOMIC IMPACTS

- European GDP: -0.19% in 2025 and -0.16% in 2030
- Welfare cost: -0.79% of household consumption in 2025 (-0.66 in 2030)
- Cumulative European welfare cost is evaluated to 1521\$ (2021) per European resident from 2022 to 2030

FULL EMBARGO SCENARIO

Table 4

Full embargo scenario - EU28.

	2022	2023	2024	2025	2030
GDP ^a	-0.10%	-0.46%	-0.43%	-0.38%	-0.16%
Welfare ^b	-0.52%	-1.81%	-1.74%	-1.61%	-1.29%
Energy consumption ^a					
Coal	7.9%	22.9%	24.0%	26.2%	15.9%
Natural gas	-13.4%	-33.2%	-31.9%	-30.4%	-24.3%
Petroleum products	-0.7%	-4.1%	-3.4%	-2.3%	1.1%
Electricity	-0.9%	-2.2%	-1.7%	-0.3%	1.0%
Wholesale energy price ^a					
Coal	11.1%	36.5%	36.6%	36.7%	37.7%
Natural gas	23.1%	76.6%	74.4%	69.3%	63.8%
Petroleum products	2.5%	14.1%	13.3%	11.9%	12.3%
Electricity	2.6%	7.2%	5.4%	2.0%	1.0%
CO ₂ ETS price ^c	51	43	61	75	106
CO ₂ ESR price ^c	0	0	0	0	47

^aIn percentage wrt to the current policies scenario.

^bIn percentage of households' consumption expenditure.

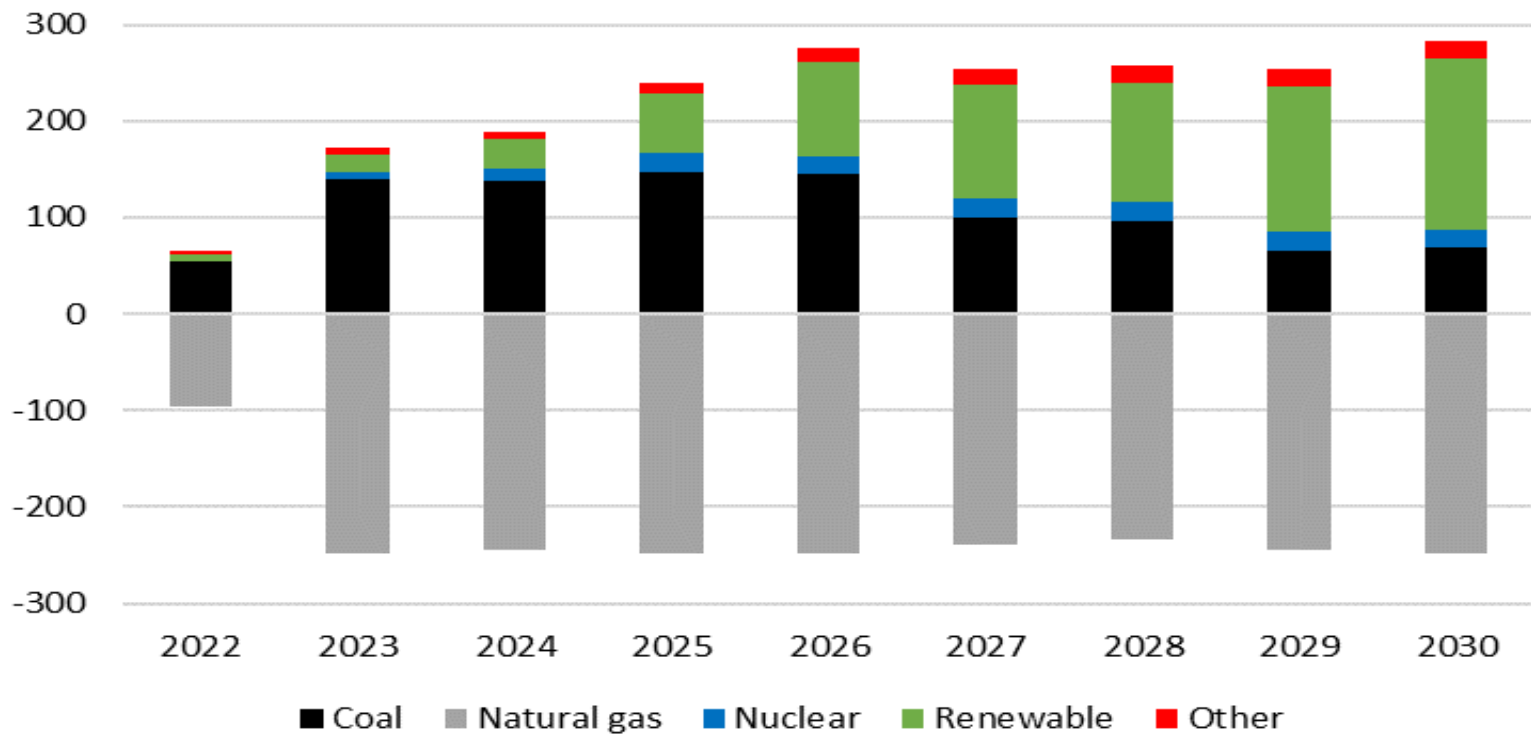
^cIn US\$₂₀₁₄.

FULL EMBARGO SCENARIO: EUROPEAN ENERGY IMPACTS

- Wholesale gas price increase: +69% in 2025, +64% 2030
- In 2025, European gas consumption decrease by 134 bcm (87 bcm in 2030): Electricity generation -51, residential -31, energy intensive industries -21, other sectors -31
- Natural gas partly replaced by coal (+26% in 2025) domestically produced and imported
- Embargo moderates CO2 ESR price, and have less impact on CO2 ETS price

FULL EMBARGO SCENARIO: ENERGY IMPACTS EU ELECTRICITY GENERATION TOWARDS RENEWABLES

Change in TWh wrt to current policies scenario

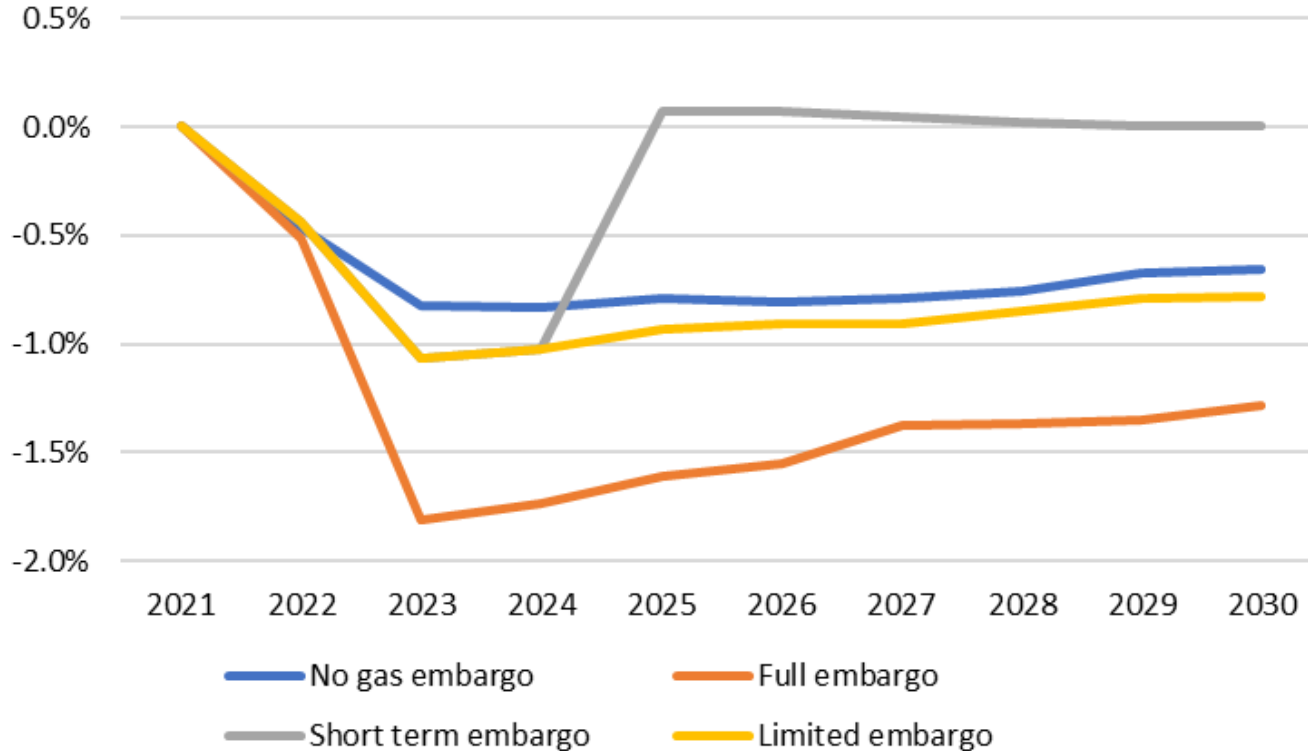


FULL EMBARGO SCENARIO: MACRO-ECONOMIC IMPACTS

- European GDP: -0.38% in 2025 and -0.16% in 2030
- Welfare cost: -1,61% of household consumption in 2025 (-1,29% in 2030)
- Cumulative European welfare cost is evaluated to 3205\$ (2021) per European resident from 2022 to 2030

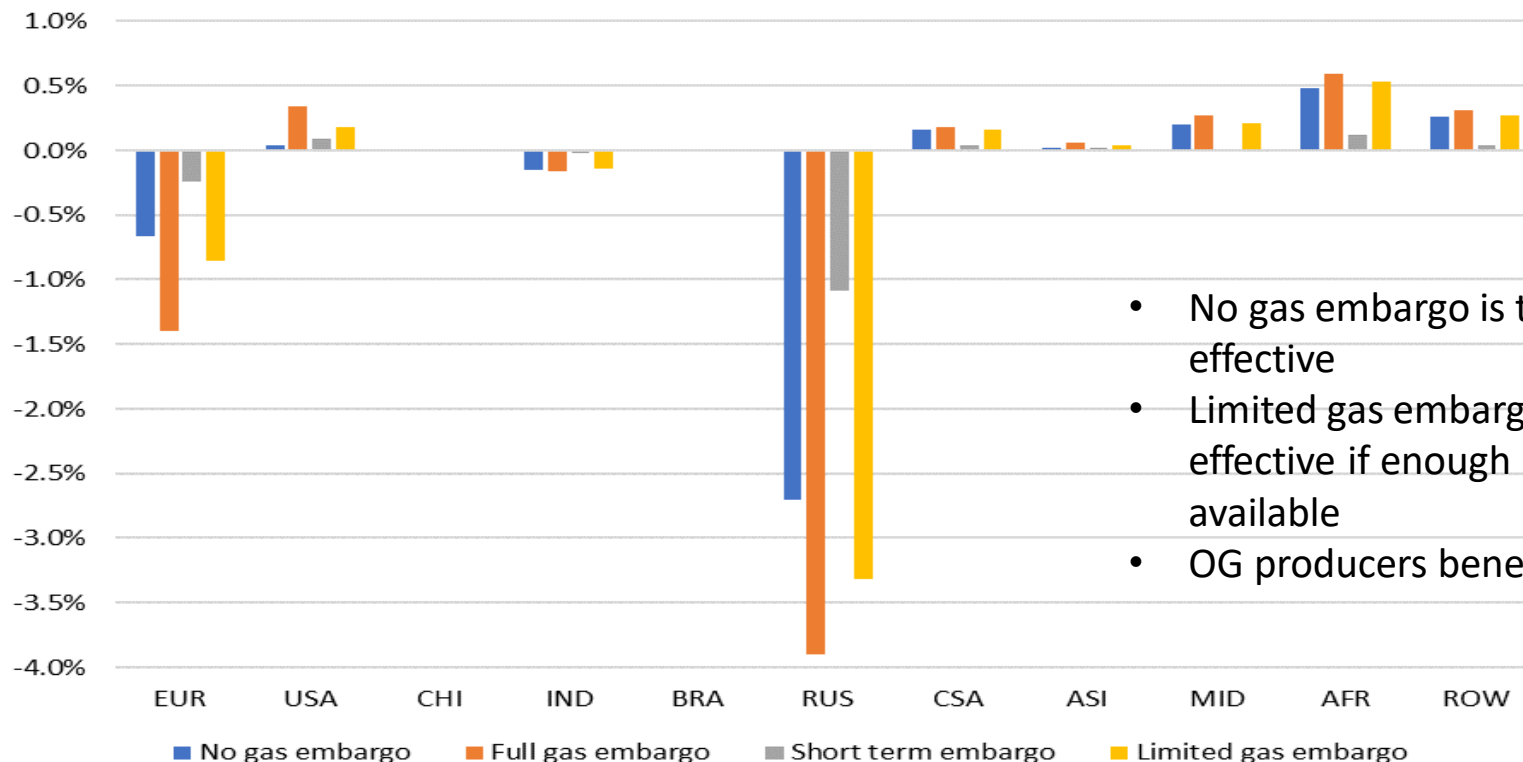
COMPARISON BETWEEN SCENARIOS

European welfare change in % of household consumption



WELFARE CHANGE IN OTHER REGIONS

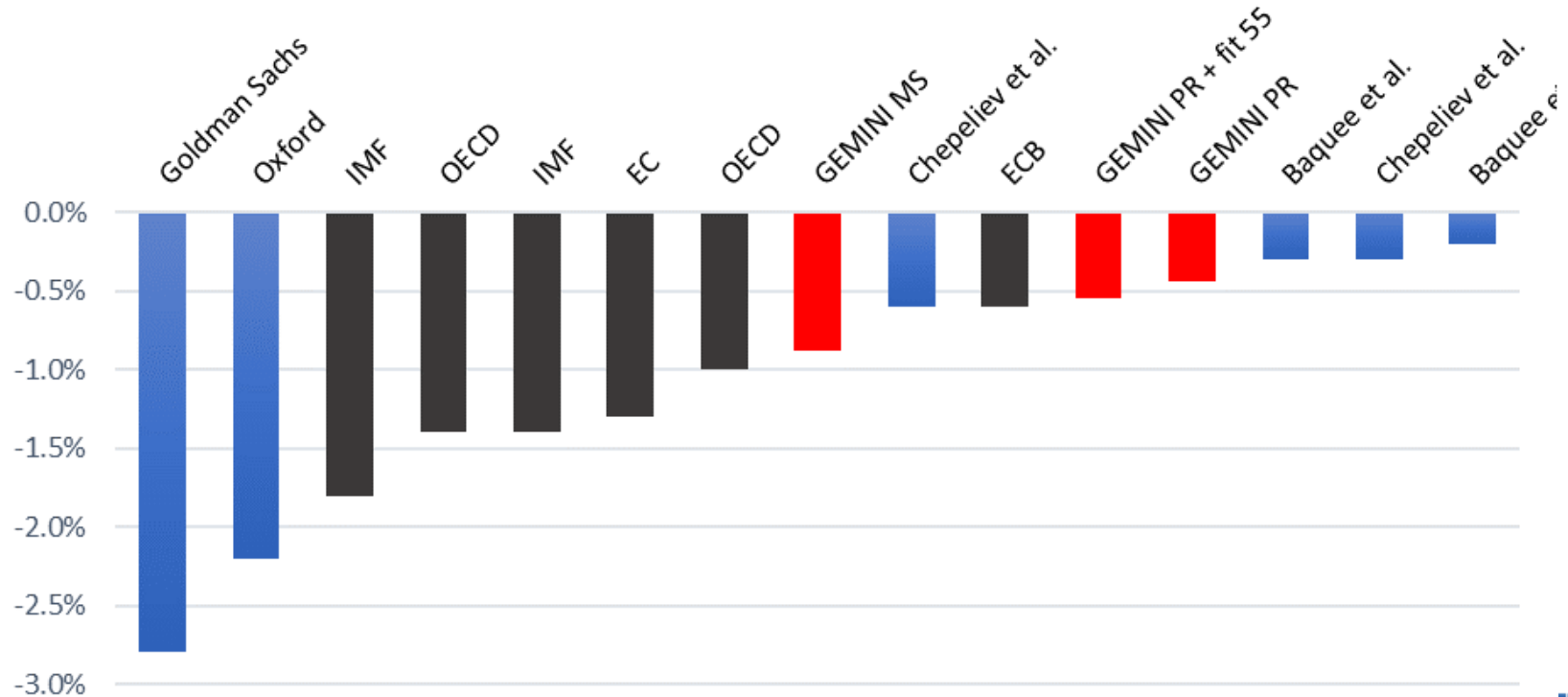
Cumulative welfare change in % of Households consumption



- No gas embargo is the most effective
- Limited gas embargo is effective if enough LNG is available
- OG producers benefit

COMPARISON WITH OTHER STUDIES

Short term European GDP loss in %



MAIN FINDINGS AND POLICY IMPLICATIONS

- The cost of current EU 5th and 6th energy restriction packages is substantial (=1521 \$2021 per European resident)
- An embargo on natural gas doubles this cost
- Coal plays a significant role in short term especially in electricity generation due to substitution
- Embargo is always detrimental to Russia but full gas embargo costs more to EU than to Russia
- Policy implications
 - Supply side: Diversification & overcoming bottlenecks → investment in natural gas infrastructure
 - Demand side: Demand adjustment
 - Solidarity between Member States
 - Weaponisation but cutting as well as by reestablishing
- Limits and going further:
 - Cost burden sharing introduction
 - Infrastructure bottlenecks introduction



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PARIS REINFORCE final event, Sorbonne, Paris, November 15, 2022

The cost of phasing out Russian fossil fuels

Marc Vielle, Sigit Perdana (*Ecole Polytechnique Fédérale de Lausanne*) and Maxime Schenckery (*IFPEN*)

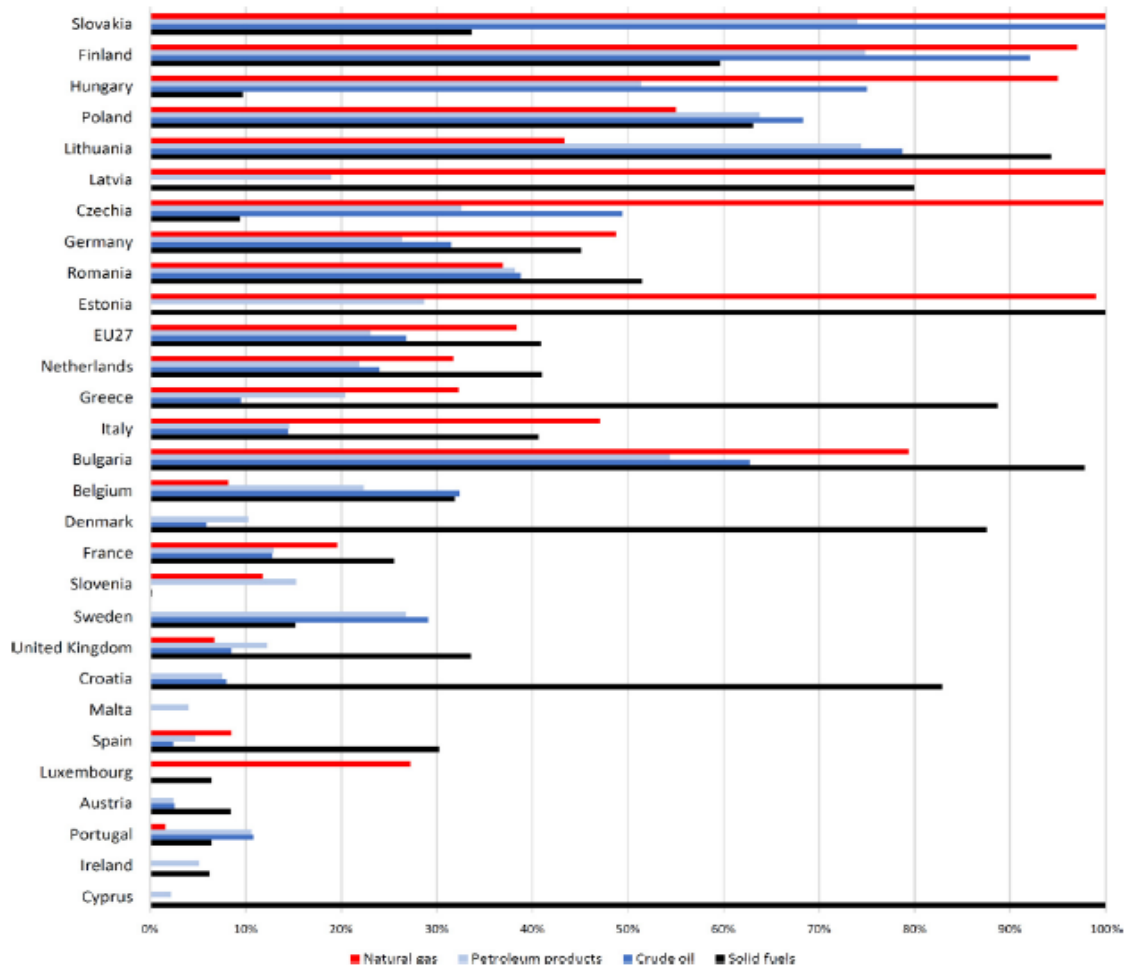


Fig. 1. Share of Russian imports in fossil energy imports by country (%) year 2020 (sorted according to total share of Russian energy imports).
Source: Eurostat Database.

LINK TO ARTICLE

- <https://www.sciencedirect.com/science/article/pii/S2211467X22002000>