



NEW CHALLENGES TO CLIMATE POLICIES

PIIE Conference June 5, 2023

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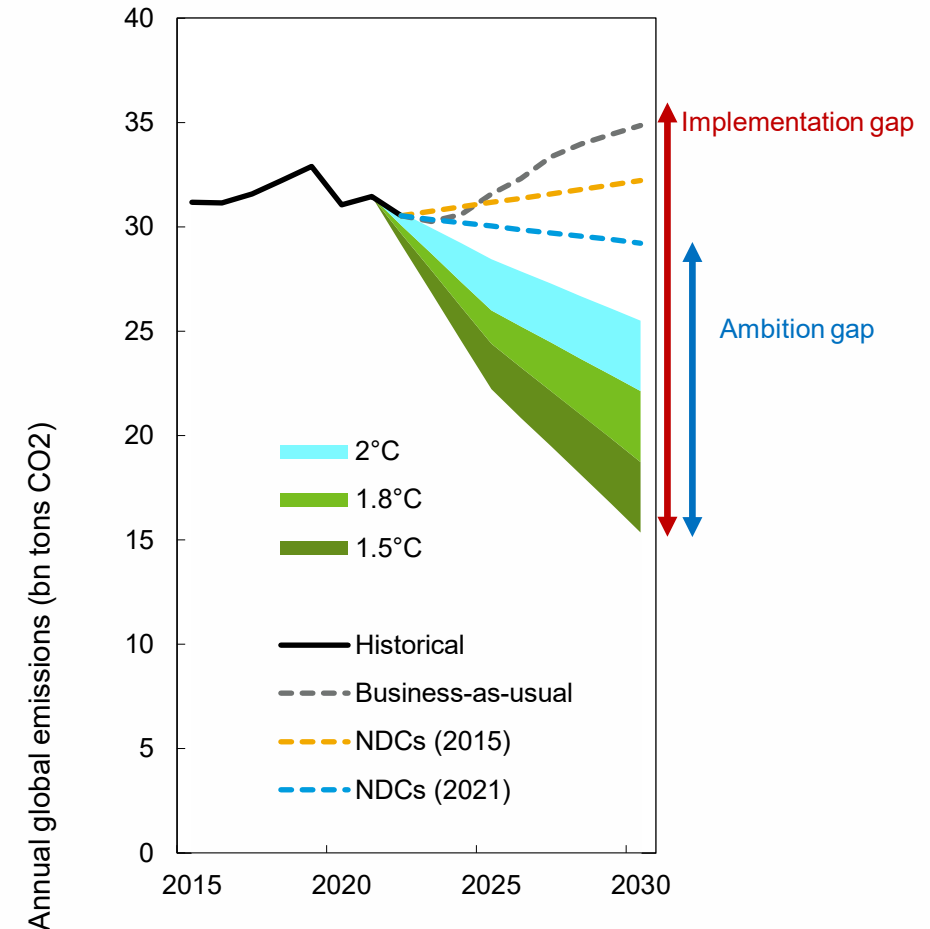
Background: ambition and implementation gaps

Commitments so far

- Paris Agreement in 2015: **voluntary** commitments to reduce emissions compared to business as usual
- COP26 in 2021: strengthened commitments
- Latest commitments fall significantly short of target for containing the temperature increase to 1.5°C

Two gaps define climate policy change

- Ambition gap defines missing *commitments* to reach 1.5°C
- Implementation gap defines missing *policy action* to reach 1.5°C
- Both gaps are still large



Old (but still existing) policy challenges

- Climate policy action so far insufficient
- An ambitious new global effort required to align with Paris Agreement
- Debate on relative contribution by advanced economies and EMDEs
- EMs wary of economic/political costs of carbon pricing, but lack fiscal space for major subsidy program

Transition costs are **small in the first best scenario**

Small transition costs in the first best

- Carbon taxation first best (from the public finance point of view)
- The receipts can be used to lower distortionary taxes on labor
- In the first-best also all agents take consistent and forward-looking decisions
- Carbon taxation is also easy to compare across countries (so facilitating coordination)
- Estimated global costs of between 0.15 and 0.25 percentage point of GDP growth

But ... we do not live in the first best

- Moreover, several shocks drove the world further away from the first best

New shocks lead to new policy challenges

New Shocks

- Populism
- Covid-19 pandemic shock
- Lukewarm medium-term growth
- Increasing protectionism
- Russian invasion of Ukraine

New Policy Challenges

- Focus on **energy security** may distract from **green transition**
- Different political constraints result in **different climate policy macro approaches**
- International political and economic **fragmentation** make international cooperation difficult

Three key topics for this talk

Energy security and green transition

- Russia's war has rekindled concerns about energy security, especially in Europe

Different approaches to the transition

- EU climate policy is based mainly on pricing
- US policy is based on subsidies

Technological progress

- Technology is key but we still know little on how to foster it.

Energy security

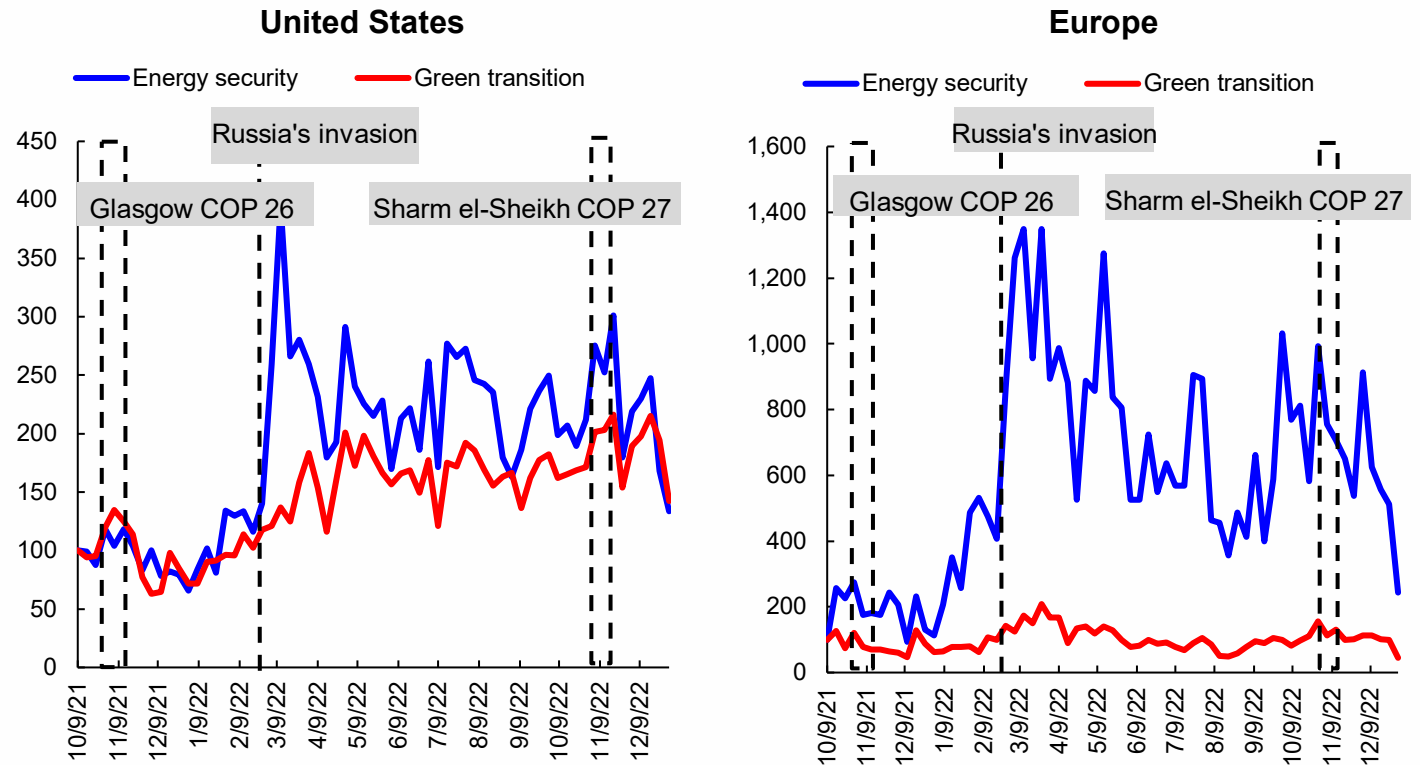
The urgent vs. the important

Energy security cannot be taken for granted

Energy security concerns are back

- Historical antecedents with 1973 energy crisis
- Russian invasion of Ukraine
- Effect strong in Europe but also pronounced in US

Weekly number of newspaper articles
(10/9/2021 = 100)



Source: ProQuest; IMF staff calculations.

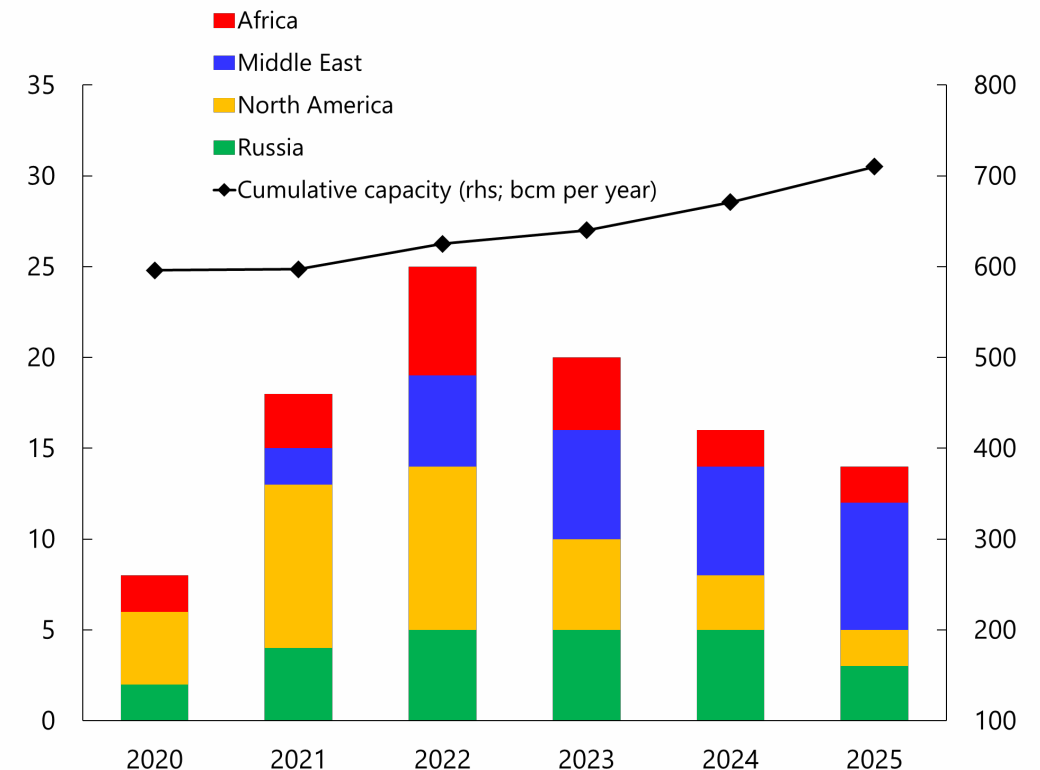
Note: The graph displays an index of weekly number of newspaper articles in which the terms “energy security” and “green transition” appeared. The green transition line consists of “green transition”, “energy transition”, and “low-carbon transition”.

Short-term solutions with long-term implications

Current choices with long-term implications

- Rush to buy LNG led to new investment in LNG and natural gas extraction
- Retired coal power plants have been reactivated
- Waste of Russian natural gas through flaring, pipeline explosion

Investment in New LNG Capacity, 2020-2025
(sanctioned projects plus Qatari expansion plans)



Sources: IEA; Haver Analytics; and Staff Calculations.

The urgent versus the important

Long-term policy certainty needed

- Electricity production is shifting to renewable energy
- Investments in new infrastructure needed: pipelines for green hydrogen, electricity grids
- But large investments need certainty of future policies

Positive and negative interactions

- Negative:
 - ▶ war in Ukraine causes additional investments in natural gas infrastructure
 - ▶ revival of coal
 - ▶ with new cheap brown energy availability, China and India have less incentives to green policies
- Positive:
 - ▶ war also accelerated investments in solar power, heat pumps etc.

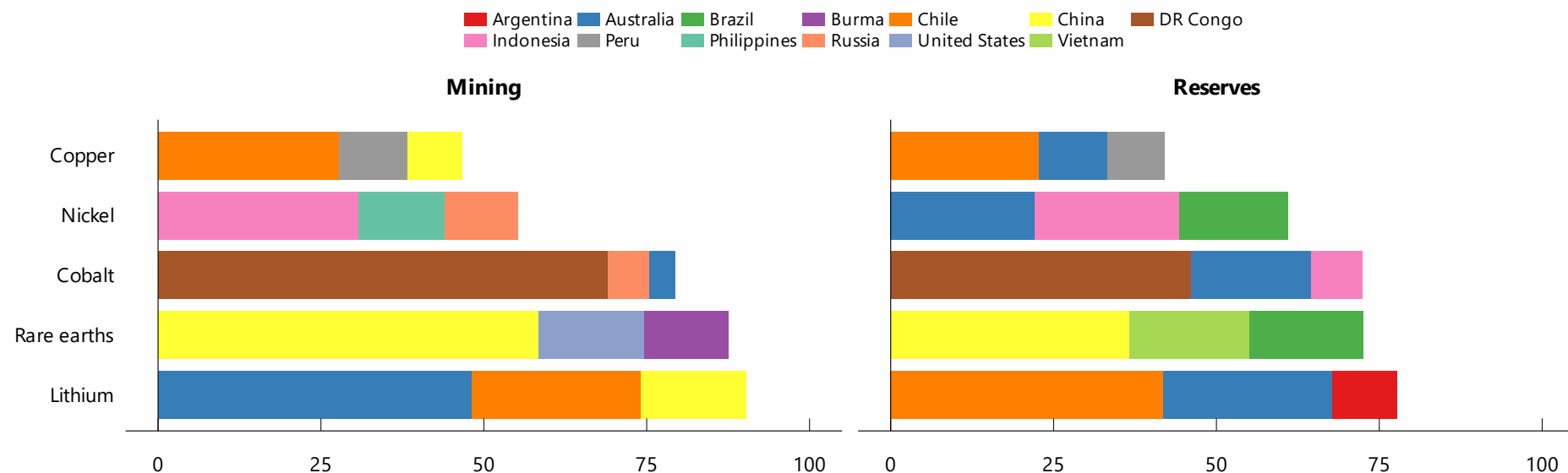
Some transition metals are in countries with high political risk

Mining and reserves for transition metals

- Transition metals are needed to expand renewable energy production
- Some transition metals are concentrated in countries with high political risk

Share of the production of top three producers to global total, 2021

(percent)



Source: U.S. Geological Survey, Mineral commodity summaries 2022; and IMF staff calculations

Making energy security compatible with the green transition

In the long run energy security and energy transition are complements

- The green transition will decrease demand for each type of fossil fuel, increasing diversification of sources. Three effects:
 - ▶ Supply of fossil fuels will become more concentrated in few countries
 - ▶ But overall energy sources will be more diversified
 - ▶ Renewable energy is produced domestically, thus inherently increasing security

Caveats:

- Renewable energy uses metals which are concentrated in few countries
- International energy grids will play a bigger role

Topic II: The “clashes of approaches”

Different approaches
The EU sticks vs. the US carrots

US policies: The Inflation Reduction Act – the (subsidy) carrot

Inflation Reduction Act, Aug 22

- Estimated to reduce emissions by an additional 10 pp
- Still short 10 pp of Paris target

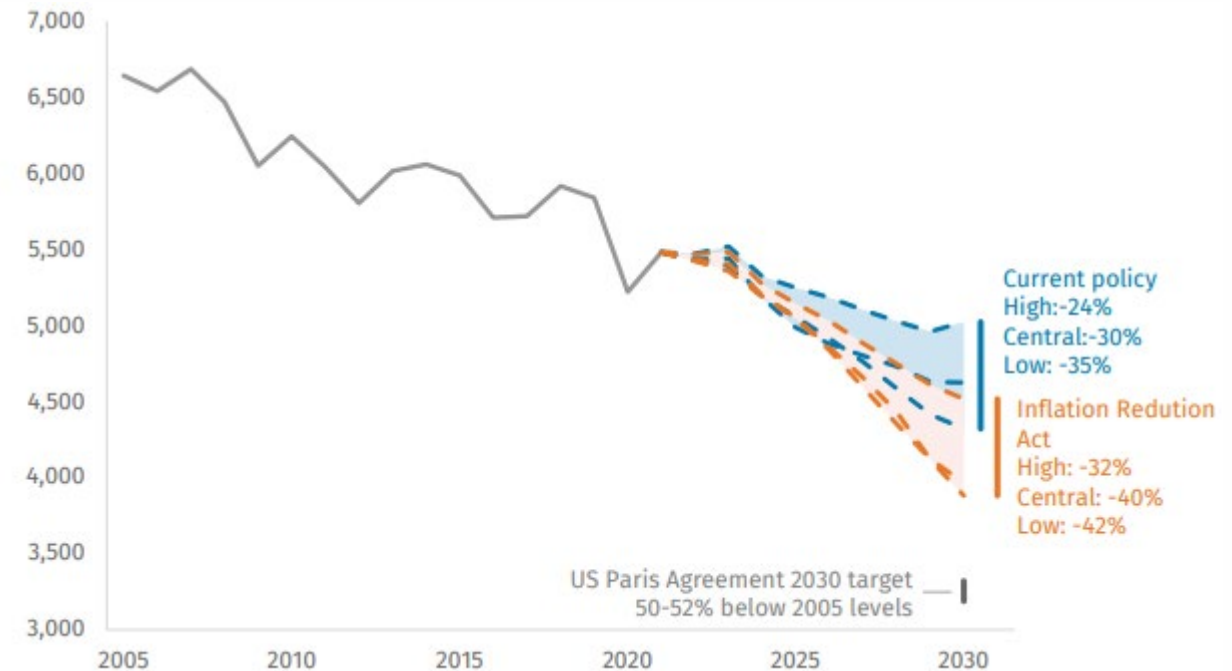
Climate policy

- **Focus on subsidies** (\$391 billion) on low-carbon technology across sectors
- **Industrial policy measures**

Fiscal effect

- **Increased spending on energy**
- Offset by expenditure cuts and tax increases

US greenhouse gas emissions (Net million metric tons (mmt) of CO₂e)



Source: Rhodium Group (2022), [A Turning Point for US Climate Progress](#)

Note: The range reflects uncertainty around future fossil fuel prices, economic growth, and clean technology cost

EU climate policy: The European Green Deal – the stick

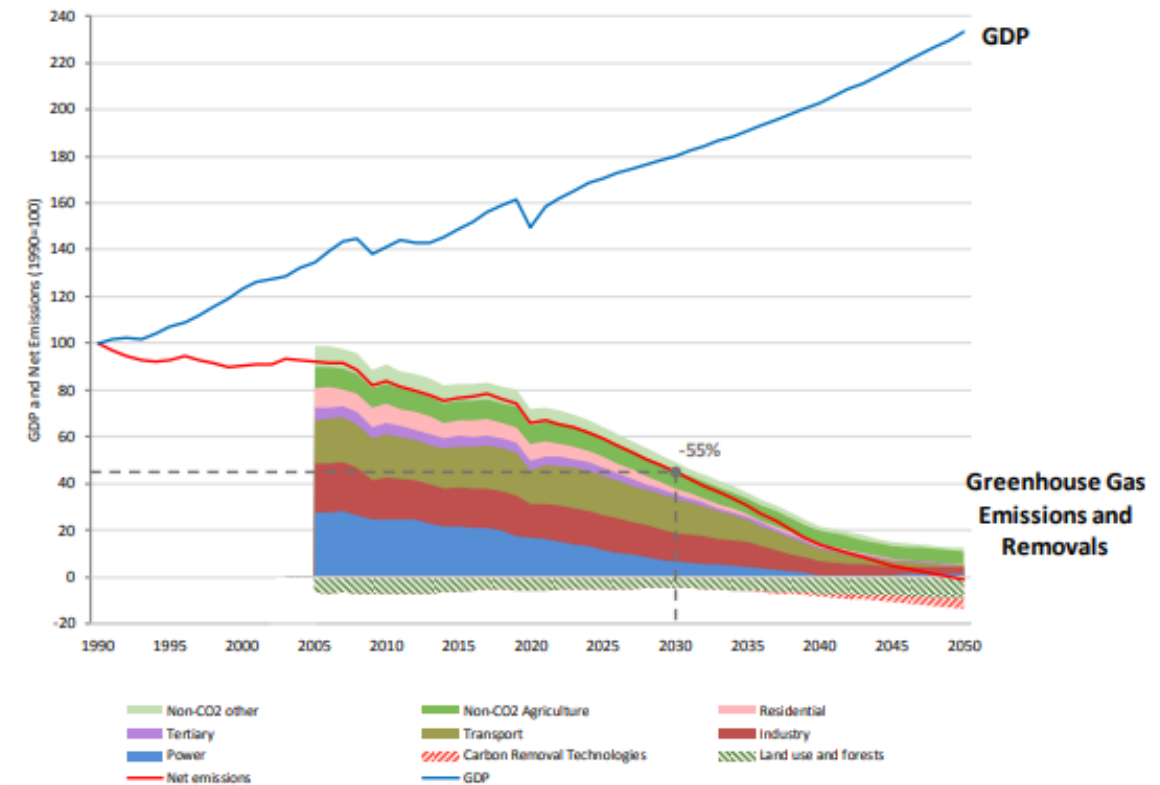
Policy aim

- Reduction of emissions by 55% compared to 1990 until 2030

Main policy measures

- **Reduction of permits** for EU Emissions Trading System
- **Revision of fossil fuel subsidies** and tax exemptions for aviation and shipping
- Circular economy action plan
- **Sectoral policies** for agriculture, transport, and forestry
- European Green Deal Investment Plan expected to mobilize €1 trillion over the next decade

Emission and GDP projections for the EU (index, 1990=100)



Source: European Commission (2020), [Stepping up Europe's 2030 climate ambition](#)

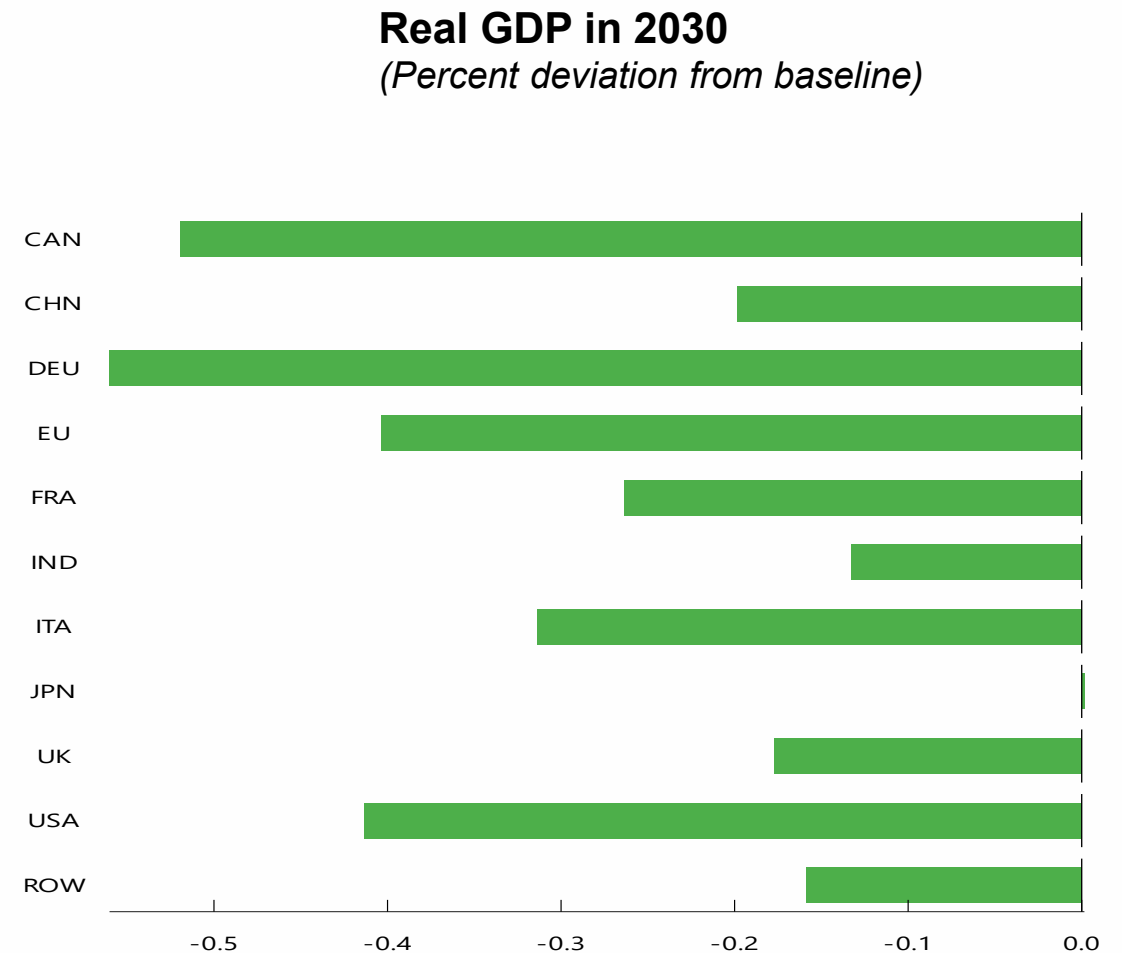
Comparison of EU and US policies

GDP

- GDP effect is similar in EU and US but very different policies
- Costs are minor for both economies

Trade effects

- Both the EU and US would fare better if both regions use carbon taxation instead of subsidies



Source: IMF-ENV model

Implications for trade

EU: Carbon Border Adjustment Mechanism (CBAM)

- CBAM has been adopted by the European Parliament
- It is planned to start in 2026

US: Domestic content regulation

- Subsidies in the IRA are linked to domestic content requirements
- EU accuses US of breaking WTO rules

Effect of climate policy on fiscal stance

- IRA is designed to reduce the US deficit (non climate part)
- The European Green Deal includes tax increases but also investments

Risks:

- (Bad) industrial policies
- Rising protectionism

Technology

The government's role in R&D

DARPA: a successful example

- US Defense Advanced Research Projects Agency (DARPA)
- Key role in enhancing research, including GPS and the internet
- Distributed money to the private sector, universities, and government labs
- Focus on outcomes, strict oversight of projects, insulated from politics and lobbying

A green R&D agency for Europe?

- Proposal by Blanchard, Gollier, and Tirole
- European research alliances started to foster cross-EU public-private collaboration
 - ▶ for batteries (since 2017)
 - ▶ for clean hydrogen (since 2020)
- Robust governance structure: independent managers, funding based on peer-review
- Open to all types of researchers and technologies

Success story of solar energy (with a caveat)

The development of solar energy

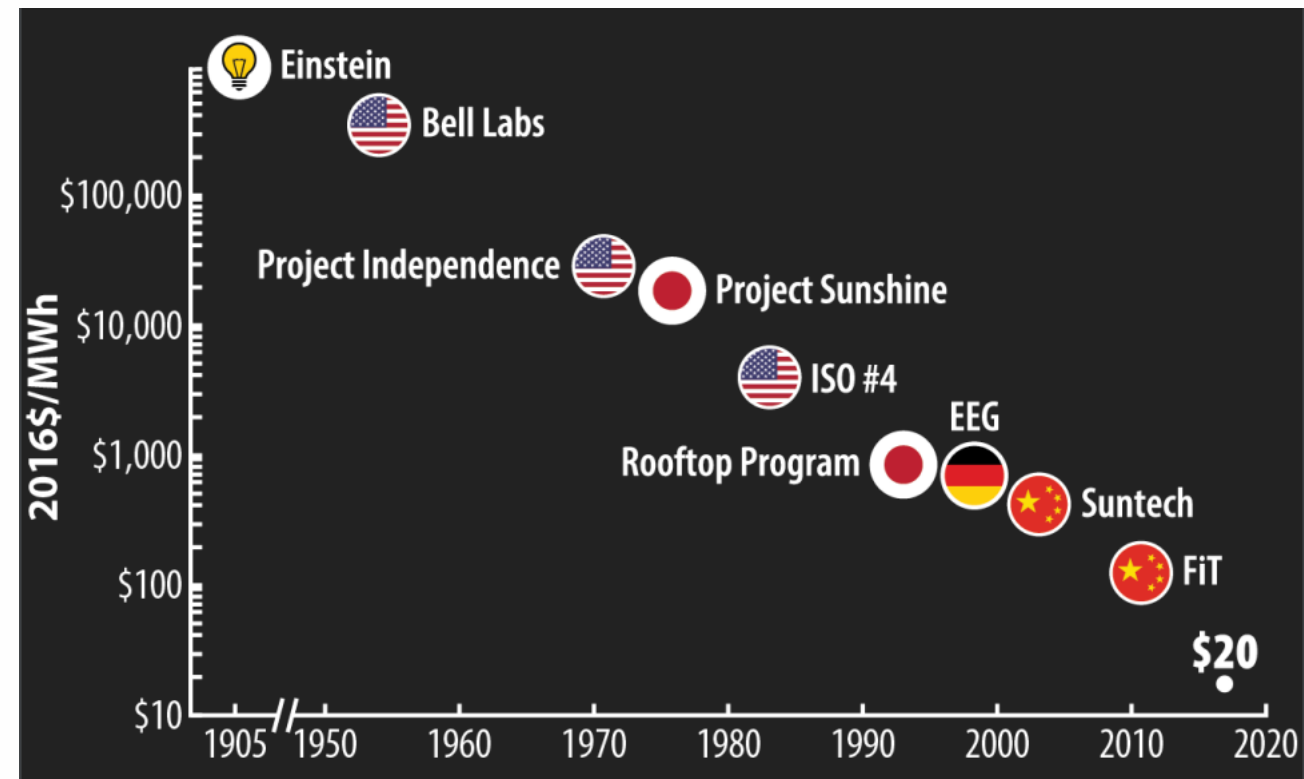
- The cost for solar energy declined dramatically for decades
- It is now competitive with fossil fuels for electricity generation
- Key milestones were reached through R&D support by different governments

Lessons learned

- Government support was temporary but decisive
- Faster technology development requires more persistent support
- Long lag between R&D and effective commercial widespread use
- The “torch” passed to many countries
- US protectionist measures

Milestones for the cost of solar energy

(2016\$/MWh)

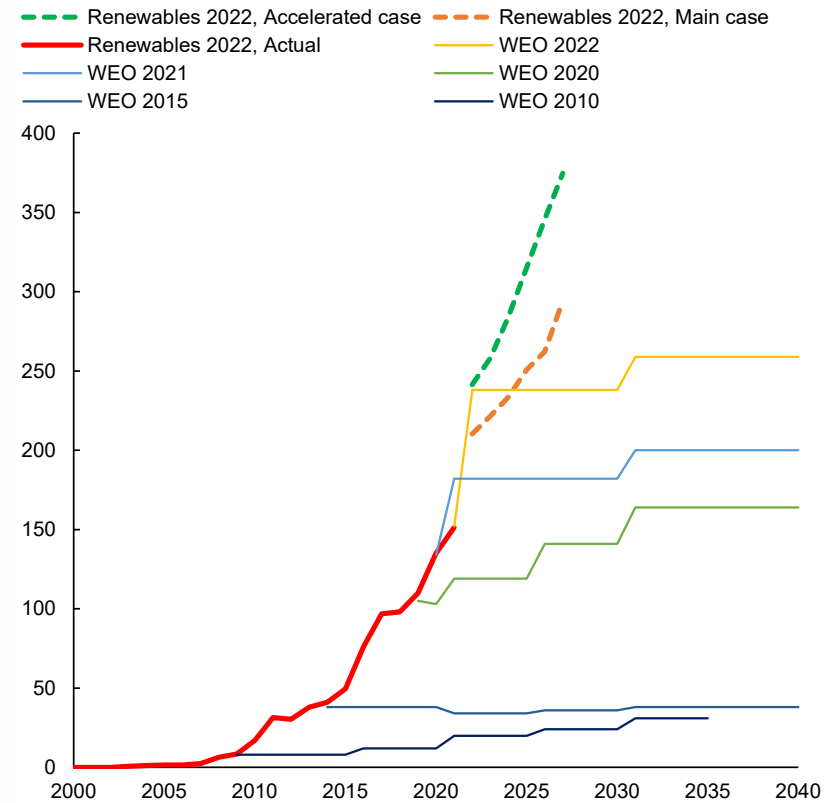


Source: Nemet 2019, How Solar Energy Became Cheap: A Model for Low-Carbon Innovation

Solar energy: the big surprise

- Solar power is growing exponential
- This has been (continuously) underestimated

Added Capacity of Solar Power (Gigawatts)



Source: International Energy Agency

Note: The chart represents added electricity capacity of solar PV and CSP from (IEA 2022c) and historical World Energy Outlook (WEO) publications. Due to data limitations, annual numbers are computed by total increase in capacity divided by the number of years for each reported period

Caveat: patents in climate mitigation are declining

Reasons for drop in share after 2013

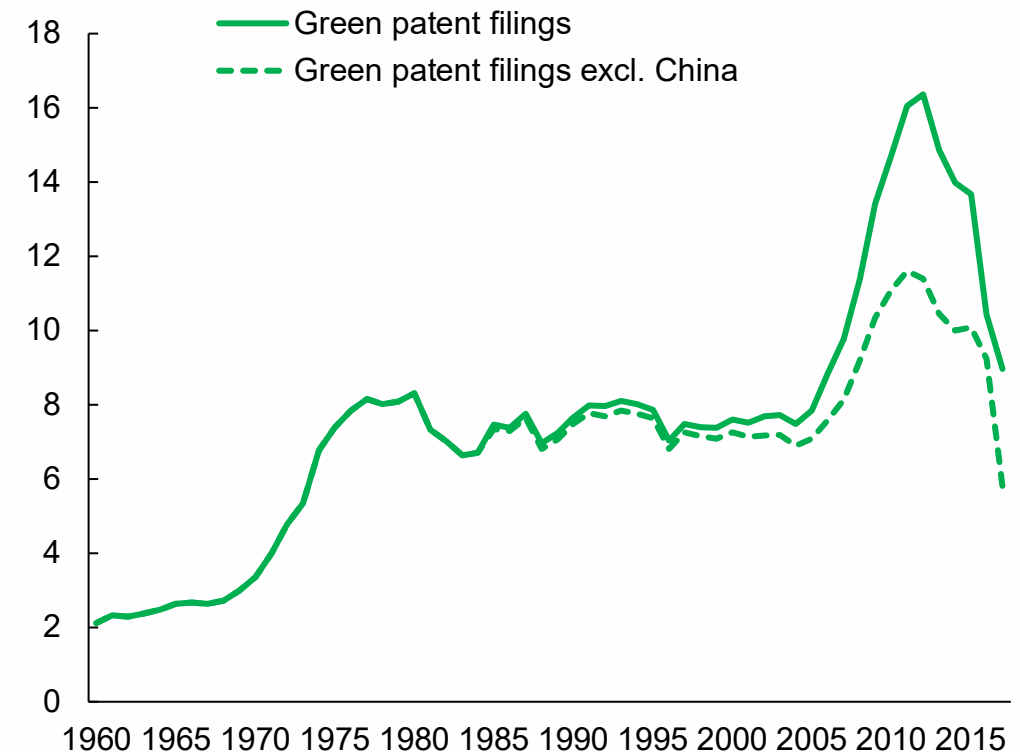
- declining fossil fuel prices
- low carbon prices
- increasing technological maturity for some technologies
- availability of public funding ?

Highly concentrated

- still highly concentrated in the US, Germany, and Japan

Number of patents in climate mitigation technologies

(Percent of total patents)



Source: PATSTAT Global 2020 Spring; and IMF staff calculations.

Note: This chart counts the number of all patent families, including and excluding China, respectively. All patents with "Y02" tag in CPC classification are classified as green patents.

Conclusions

Energy security and green transition

- Russia's war has raised energy security concerns, especially in Europe
- Energy security concerns could slow green transition in the **short term**. However, reasons for optimism in the **medium term**

Different approaches to the transition

- EU vs. US policies
- Both approaches have controversial features: CBAM in EU, domestic content in US
- Are some industrial policies and protectionist measures worth the price? Faustian Bargain
- Need for a code of conduct for new industrial policies?

Technological progress

- Future technology development will require government support
- International cooperation can bring a further boost (covid vaccine experience)

The end

Thanks