Economic impacts of decarbonisation

Pierre Wunsch | JOCO 2024

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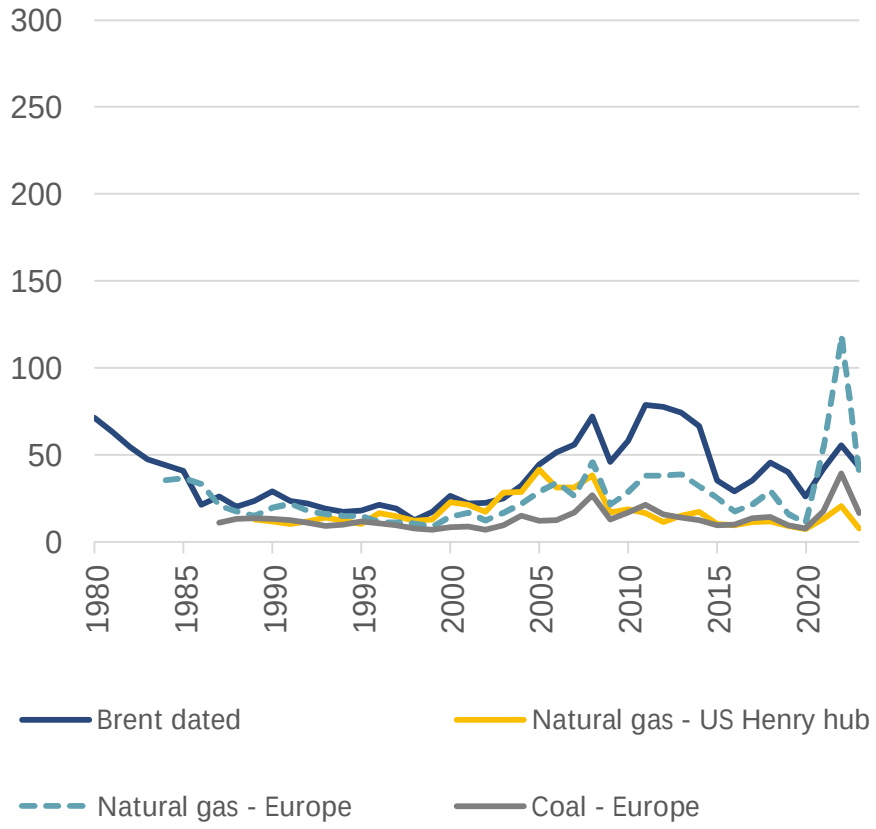
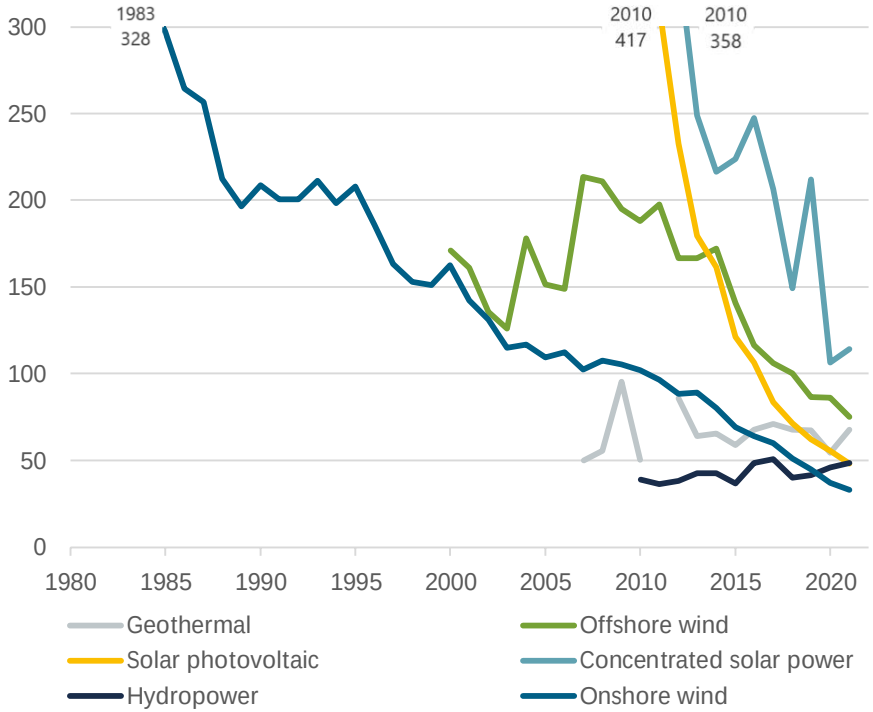
Banque Nationale de Belgique / Bank van België
Eurosystem

Setting the scene: Back to cheap energy?!

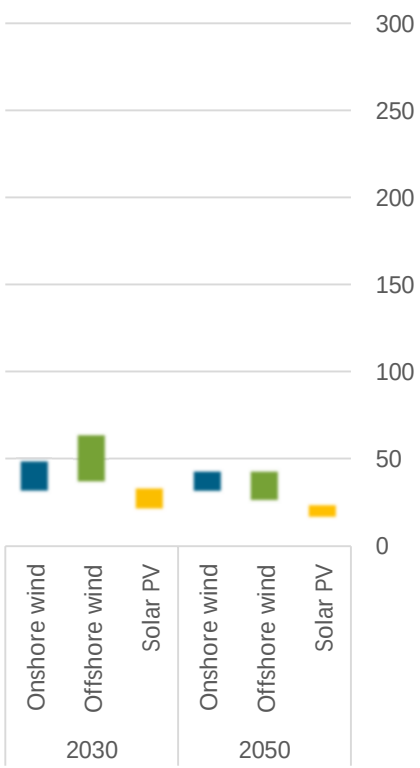
Fossil fuel prices
(in $2021/MWh)



Levelised costs of renewable generation today...
(in $2021/MWh – worldwide)



... and in 2030-2050



Min. onshore wind = US

Min. offshore wind = Europe

Min. solar PV = China

Source: BP statistical review of world energy (June 2022) – Our world in data based on "IRENA Renewable power generation costs in 2021" – "IEA World energy outlook 2022".

Cheap fossil fuels will be replaced by cheap renewables (and some more)…
…but they are not perfect substitutes

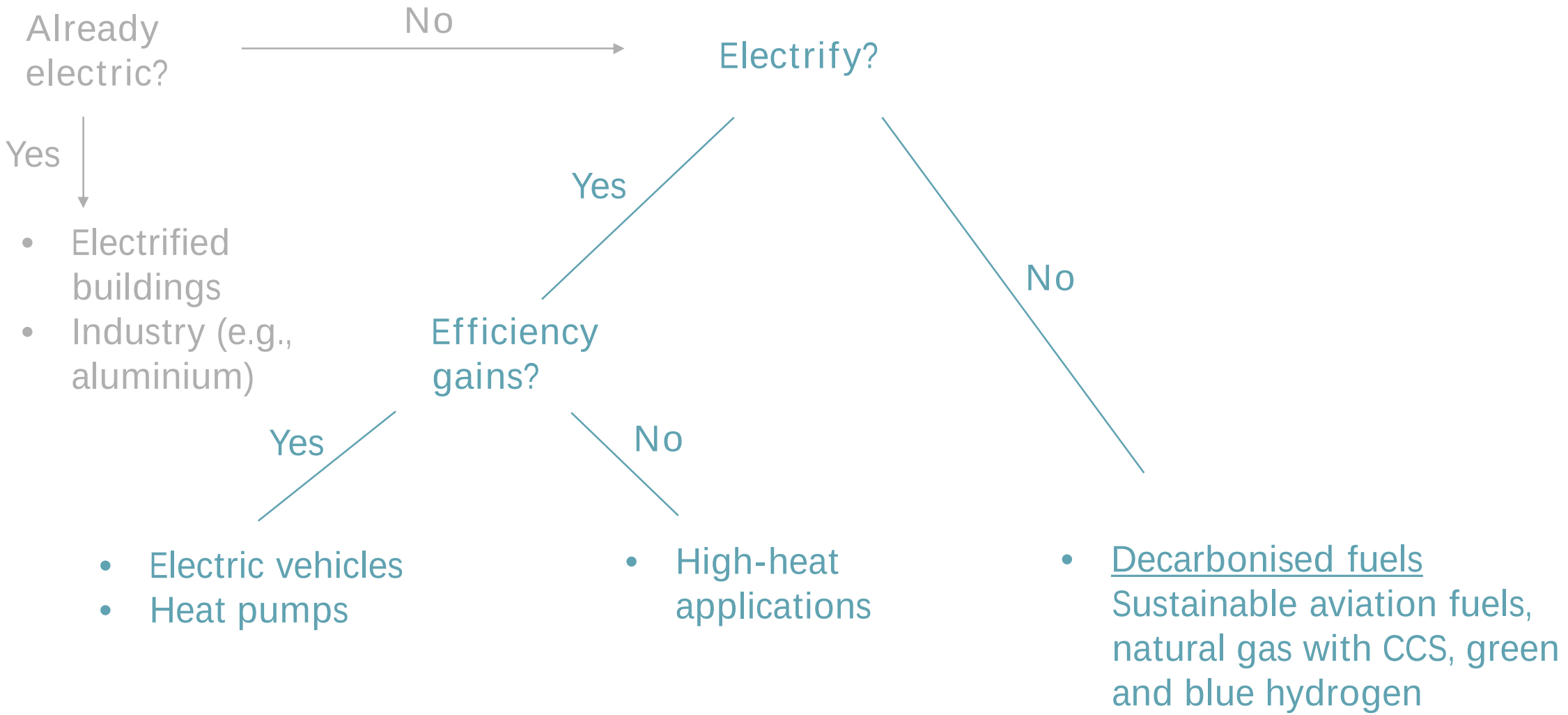
The not so good

- (Most) rewenables are intermittent
- Electricity is not easy to store
- Batteries are heavy and bulky
- Potential bottlenecks in the sourcing of materials

And the better

- Electric cars are 300-400% more efficient than combustion engine cars
- Heat pumps are 300-400% more efficient than gas or oil boilers
- Increasing electrification of heating and transport will increasingly allow for grid balancing via demand-side management
- Phase-out of fossil fuels leads to substantial, immediate air quality co-benefits
- Reduced fossil fuel import bill improves trade balance and allows for flexible foreign policy

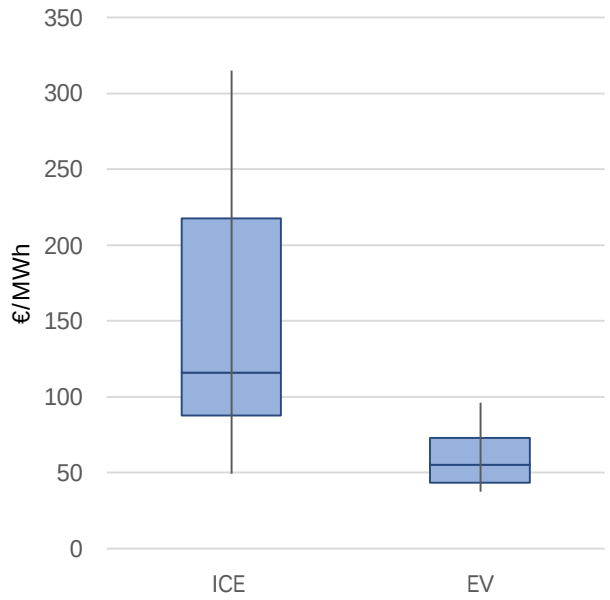
Mitigation of greenhouse gases in the next decade: electrification



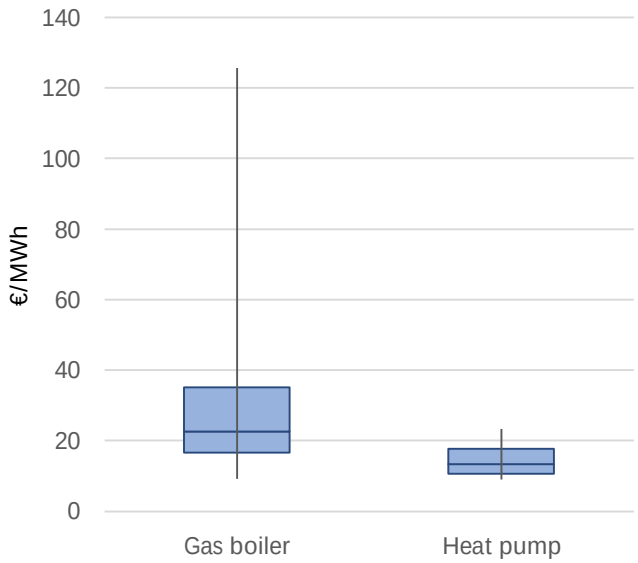
Source: NBB analysis.

Technological progress has made decarbonization close to cost-competitive for key sectors such as road transport and heat provision in buildings

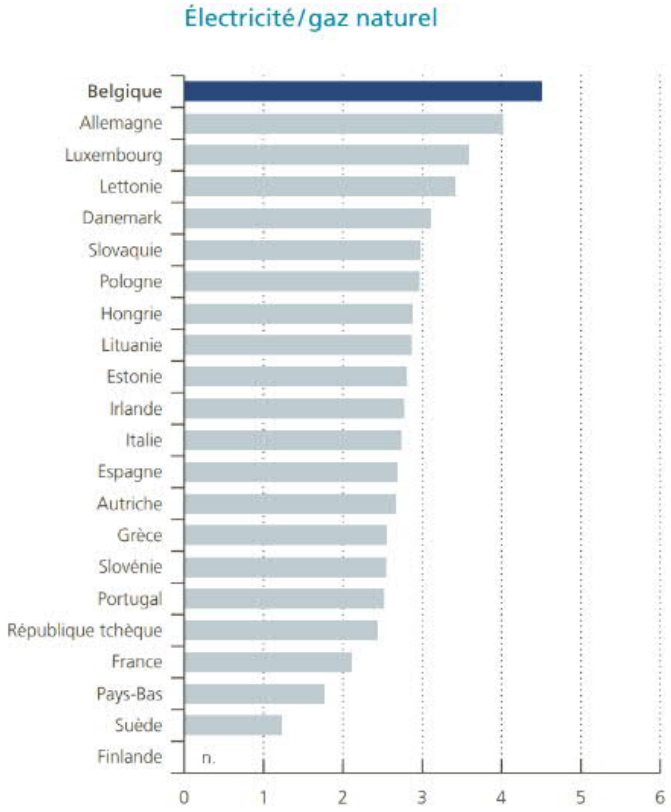
Road transport



Buildings



Key for roll-out: end consumer price ratio of electricity to fossil fuel price



Source: NBB analysis as well as IEA database. The graphs depict mobility-equivalent and heat-equivalent costs per MWh of energy used. Graph based on wholesale energy price data shown in previous slide. Efficiency of ICE at 25%, EV at 85%, gas boiler at 95%, and heat pump at 350%.

But some decarbonization still comes at a cost, notably in high-heat industry

Mitigation technology	Competitive at a carbon price of	Remaining barriers to scale
Renewables	~0-100 €/$tCO_2eq.$	Seasonal storage. Public acceptability.
Heat pumps		Space, listed buildings, supply chain.
Energy efficiency		Non-monetary. Credit constraints.
Methane from waste and energy		MRV and enforcement.
Electric vehicles		Network effects. Raw materials
Electrification of heat in industry		Relative cost of electricity.
Land-based carbon removals	~100-200 €/$tCO_2eq.$	MRV and legal certainty.
Agricultural practices		Observability.
Lab-grown meat		Public acceptability.
Light electric trucks		Battery technology.
Blue H_2		Acceptability. High gas prices.
Small modular nuclear with heat		Lack of commercial availability.
Carbon capture and storage (CCS)		Storage. Acceptability. Investment.
Green H_2 in industry and storage	~200-300+ € /$tCO_2eq.$	Availability. Transport.
Direct air capture (DAC)		Regulatory framework. Investment.
Sustainable aviation fuels		Regulatory framework.
Small modular nuclear		Lack of commercial availability.

Source: National Bank of Belgium.

Is the transition macro critical ? Pisany-Ferry (2021) as a starting point

How big? “(Keynesian) new growth strategy“ view vs “(large) negative supply shock“ view

- Size of supply shock is essentially in line with oil shock of the 70^{ies}: 3-4% of GDP (based on a Worldwide carbon tax of 75-100€)
- …but spread over 30+ years…and not as sudden: more predictability

With, as a result:

- Need for major resource reallocations (workers and investments)
- Higher aggregate investments (~2% of GDP on a net basis)
- Higher r* (and inflation ?)
- Lower consumption

And also:

- Significant distributional - and therefore fiscal - consequences (vs. « double dividend » argument)

Source: See, e.g.,: Pisani-Ferry, Jean “Climate Policy is Macroeconomic Policy, and the Implications Will Be Significant“, POLICY BRIEF 21-20, Peterson Institute, August 2021.

Is it macro critical? Some remarks

Level of CO_2 price OK as a first approximation of macro impact

- The price of carbon will have to rise to the marginal cost of the most expensive decarbonisation technology, implying a steep marginal abatement cost curve. Ultimately, probably direct air capture for negative emissions (>300€/ton CO_2)
- A better measure of the supply shock is the integral under the (increasing) carbon price. Or the *average cost of abatement per ton of CO_2eq*
- Overlapping instruments caveat: not only carbon prices will be used to get there (subsidies, standards…)

My take on the average cost of abatement

- ~175€/ton $CO_{2eq.}$ = 3,5% of 2020 GDP in Belgium (high income/high emission); 2,5% of 2050 GDP
- This corresponds to ~0,1% GDP growth per year and is, indeed, comparable to the impact of an oil shock
- The cost for lower income countries could be higher but they typically have a higher growth potential → two years of growth looks like a good first approximation

Main issue on other macro impacts: additionality vs. crowding-out

- What other productive investments does climate action replace? How does it affect technological progress?

Actuaries can play key analytical role in managing transition to climate neutrality

We need to ensure decarbonization happens at lowest possible cost

- My presentation so far: focus on likely cost of transition to climate neutrality. The tentative conclusion is that likely cost appear manageable.
- What about low probability-high impact events? Could these make the transition overly risky – and if so, can markets help hedge agains climate transition risk?

Insurance is a stabiliser for the economy – and actuaries enable markets to price climate risks correctly

- Contributes to efficient capital allocation within the economy, thereby enhancing the overall efficiency of the financial markets.
- Enables economic activity by providing risk transfer and risk mitigation
- Role for actuaries in gauging physical climate risk is clear – where can they add on transition risk?

Risk-based analysis of transition to climate neutrality

- Evaluate risk: Large-scale sectoral transformations, uncertainty about both technology and policy environment, compound or non-linear climate transition risk across sectors, space, or time?
- Price insurance products accurately: Possible need for climate transition risk adjustments
- Forward-looking perspective helps insurers anticipate changes in risk environment, incl. legal climate risks

Main issue 1 : There is little time left!

Public economics 121 on externalities

1. Set a Pigouvian price
2. Pay attention to distributional issues (of course!)
3. … enjoy your holidays

But

- The carbon price necessary to reach net zero GHG emissions is quite high (again, DAC >300€/ton) → Not politically feasible in one “jump“
- Increasing the carbon price progressively implies that there is no movement on all fronts (see previous slide) → Unless one assumes perfect markets and foresight, time is quickly running out

Therefore

- An increasing carbon price can be seen as the wave that will ultimately lift all boats in an efficient way
- But other instruments (subsidies, regulation, R&D support) will be needed to move on all fronts in time

Still

- Waiting is not always bad: one should not roll-out technologies before they are cheap enough
- A carbon price allows to focus first on the most efficient technologies, which makes sense

Main issue 2: Keeping the (voting) public on board

Do not overestimate popular support

- Many people have been told the « great economic opportunity story », not the « significant supply shock » one
- Surveys that estimate public climate policy support often fail to mention trade-offs

Current discussions

- Cost of renovations of private dwellings could be a substantial part of overall mitigation cost for Belgium (cf. McKinsey 2023).
- Future of energy-intensive industry in Europe: CBAM vs. gas price differences with major trading partners such as the US.
  - Cf. Ongoing European discussions linking industrial policy and climate policy

Main issue 3: Carbon price vs. subsidies?

"If the problem is overfishing, subsidizing chicken will not solve it.*"

Still, well calibrated subsidies are part of the solution

- In order to support clean R&D or "learning by doing" (cf. Acemoglu et al. 2012)
- In order to deal with "political realities", myopia or network economies

But beware of the rebound effect…

- German real estate federation report: more than 340 BEUR invested in insulation from 2010 to 2022.
- No reduction in energy consumption over the period
- Compared to minus 31 % between 1990 et 2010, (*Le Monde*, 07/10/2020)

Source: *John Hassler at NBB seminar in 2023.
Acemoglu, Aghion, Bursztyn, and Hemous (2012): "The Environment and Directed Technical Change", *American Economic Review*, 102(1): 131-166.

Impact on monetary policy?

Back to impact on r* and inflation

- “We need to invest“ vs. assimilation of a carbon price to a form of oil shock (without terms of trade)
- Not even sure investments will go up

If investments do go up, r* should go up

- By how much is less than clear (as in any discussion on r*)
- The supply shock implies higher costs of ~0,1% GDP growth per year
- But, in theory, higher costs do not necessarily imply higher inflation

We start from a period of high energy prices and inflation

- Energy prices should be lower in 2050 than in 2022, at least in Europe
- Volatility will come less and less from fossil fuels and more and more from bottlenecks in materials or expert skills

Some measurement issues may blur the picture at the margin

- Electric vehicles are more expensive than internal combustion cars but their price is dropping faster
- This will have a *negative* impact on inflation as the share of electric cars in consumption goes up
- This is because new goods, even though close substitutes, typically enter the price index as different items, and the chain-linked methodology of price indices removes any level effects (NB: solar panels and batteries for domestic use are considered investment goods, however)

Central banks will NOT make the difference but have a part to play

- The no brainer: study the impact of climate change on the macroeconomy
  - But should we also ”open the black box of the proprietory models” on abatement cost?

    → Get a detailed understanding of the abatement cost per technology
  - I believe it is an investment worth making to inform policy: climate policy is now core economic policy, and central bank expertise on estimating the macroeconomic cost of climate neutrality is sorely needed

- The conceptually clear but maybe overblown: understand the impact on risks (of default)
  - Climate change implies risks… like fossil fuel price volatility, wars, innovation…
  - Not clear that the markets/rating agencies would not be able to quantify this risk
  - In any case, avoid double counting and focus on long duration asset. Stop assuming static portfolios to 2050. Need for more realistic assumptions

- The controversial: act on relative prices
  - Tilting of monetary policy portfolio; green supporting factors in capital regulation
  - Here, the Atlantic divide is HUGE, which is a first indication that the issue has a political dimension

What falls under ECB's remit? Article 3

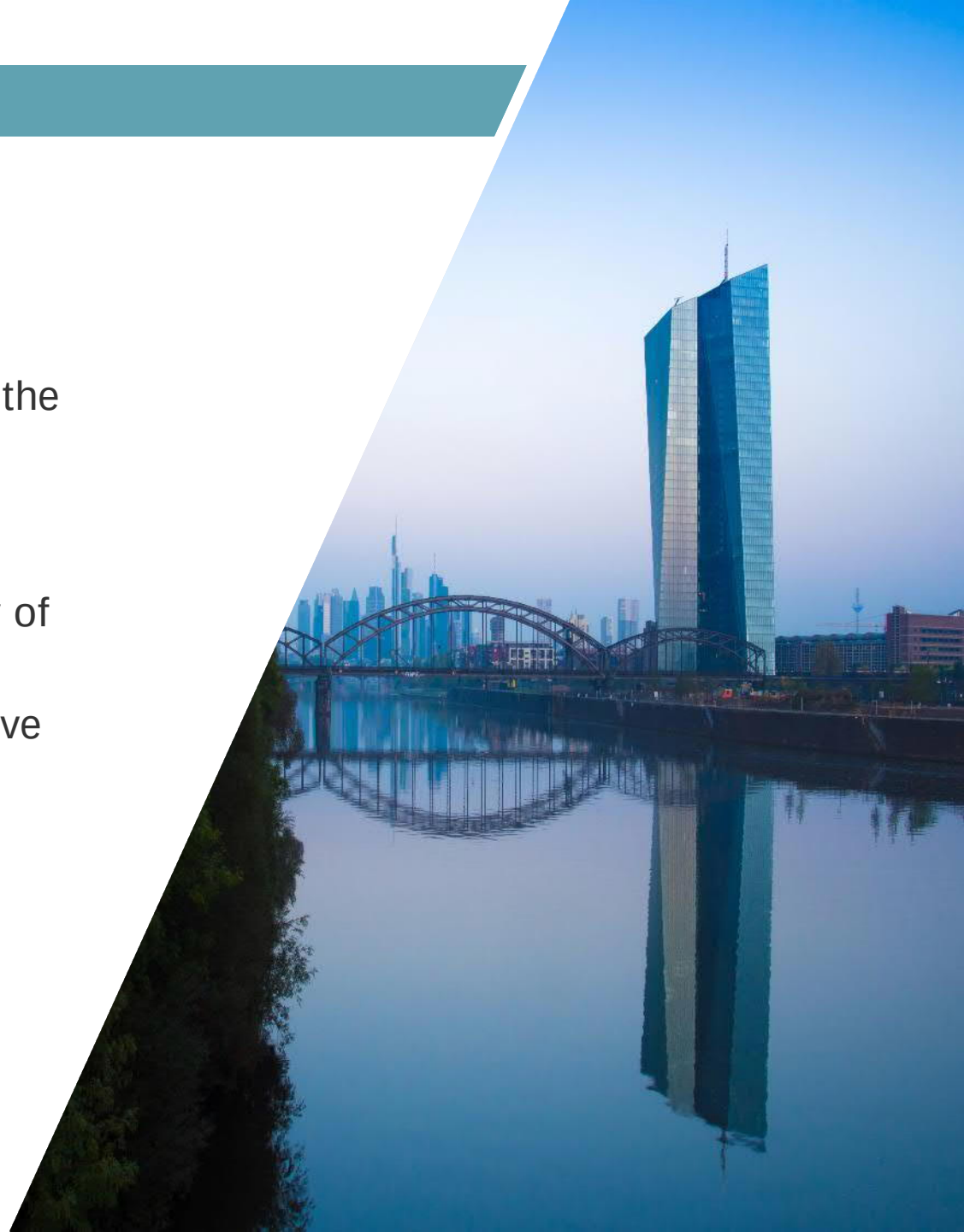
ECB mandate is anchored in the EU Treaty:

- price stability is the primary objective
- without prejudice to that objective, support the general economic policies in the EU with reference to Article 3 of the Treaty

Article 3 lists many objectives:

- a high level of protection and improvement of the quality of the environment …
- … but also balanced economic growth, a highly competitive social market economy, full employment, social progress, scientific and technologic advance, social exclusion and discrimination, equality of women and men, …

→ Risk of cherry picking : "Animal Farm" reading of the Treaty ("All animals are equal but some are more equal than others")



Key role of carbon pricing: the relative price changes needed to fully decarbonize need to come from the elected fiscal policy makers

Is central bank's involvement in climate policy about supporting policy or correcting policy failures?

- The second one would clearly be problematic
- At the end of the day, the question is whether central banks have an instrument that is not available to policy makers and that is part of the first or second best solution
- Textbooks: generally no role for central banks in allocative efficiency

In Europe, the EU Emissions Trading System (EU ETS) is close to a first best solution

- What is the point of asking which firms are (more or less) "Paris-aligned" when all firms in the EU will be forced to be ?
- Discrimination between firms that fall under the EU ETS (tilting against some of them) is against the objective of an efficient allocation of the effort → flirting with autonomous policy making
- Discrimination against firms that operate in jurisdictions that are not « Paris compatible » may be closer to supporting EU policy → Depends on the efficiency of the Carbon Adjustment Mechanism (CBAM), and on whether firms operate in sectors covered by CBAM

Communication issue : Dealing with symbols

”Tinbergen’s rule” vs. ”We all need to do our part to save the planet”

Many people believe central banks are just… another kind of banks

- Tilting for climate contributes to the communication challenge that, no, we cannot save the planet and finance the transition

Admittedly, just saying that carbon pricing will take care of it all is… a bit boring. Still, enable one needs to settle on a consistent view of what the transition to climate neutrality amounts to:

- ”The great opportunity / party time” narrative…
- … and the ”Risks are huge, and banks do not get it” one

Concluding thoughts

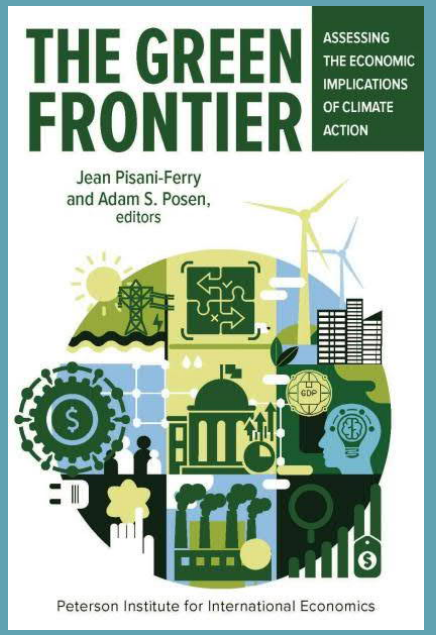
- Energy prices in 2050 will be higher than in the 1990^{ties} but could be lower than current high levels
- The state of technology suggests an average abatement cost of ~175€/ton, in line with a (permanent) oil shock and a ~0,1% hit on productivity per year
- Most activities could be decarbonized for a cost/carbon price of less than 200€ per ton. Abatement costs are very uneven across sectors.
- Given efficiency gains and expected costs reductions, electric vehicles and heat pumps should have low to negative green premia
- Decarbonized fuels in hard-to-abate sectors and negative emissions will be significantly more costly.
- Political economy hurdles may complicate the transition. It is therefore desirable to achieve it at minimum cost.
- As we are running out of time, we cannot rely solely on a carbon price to got to net zero.
- But tolerance for a broader set of tools should not unduly relax the focus on cost minimization.
- Actuaries and insurances can help by pricing climate risk, both physical and transition risk.

Thank you

Pierre Wunsch

23 September 2024

More detail in chapter 10 here:



Role of Insurance supervisors in addressing physical climate risks

Supervisors should make sure insurers are well prepared to cope with all sustainability risks e.g. importance of climate scenario analysis.

Insurance supervisors also play a crucial role in addressing natural catastrophes protection gaps by:

1. Assessing insurance protection gaps
   - Identify and evaluate gaps in coverage.
2. Improving consumer financial literacy and risk awareness
   - Educate consumers on natural catastrophes risks and insurance options.
3. Incentivising risk prevention and reduction
   - Encourage measures to minimize insured losses.
4. Enabling regulatory environment
   - Create policies that support insurance availability and coverage uptake.
5. Advising government and industry
   - Facilitate PPPs and innovative insurance schemes.