Bank of England

Climate policy and monetary policy: interactions and implications

Environmental Economics Seminar, University of Oxford

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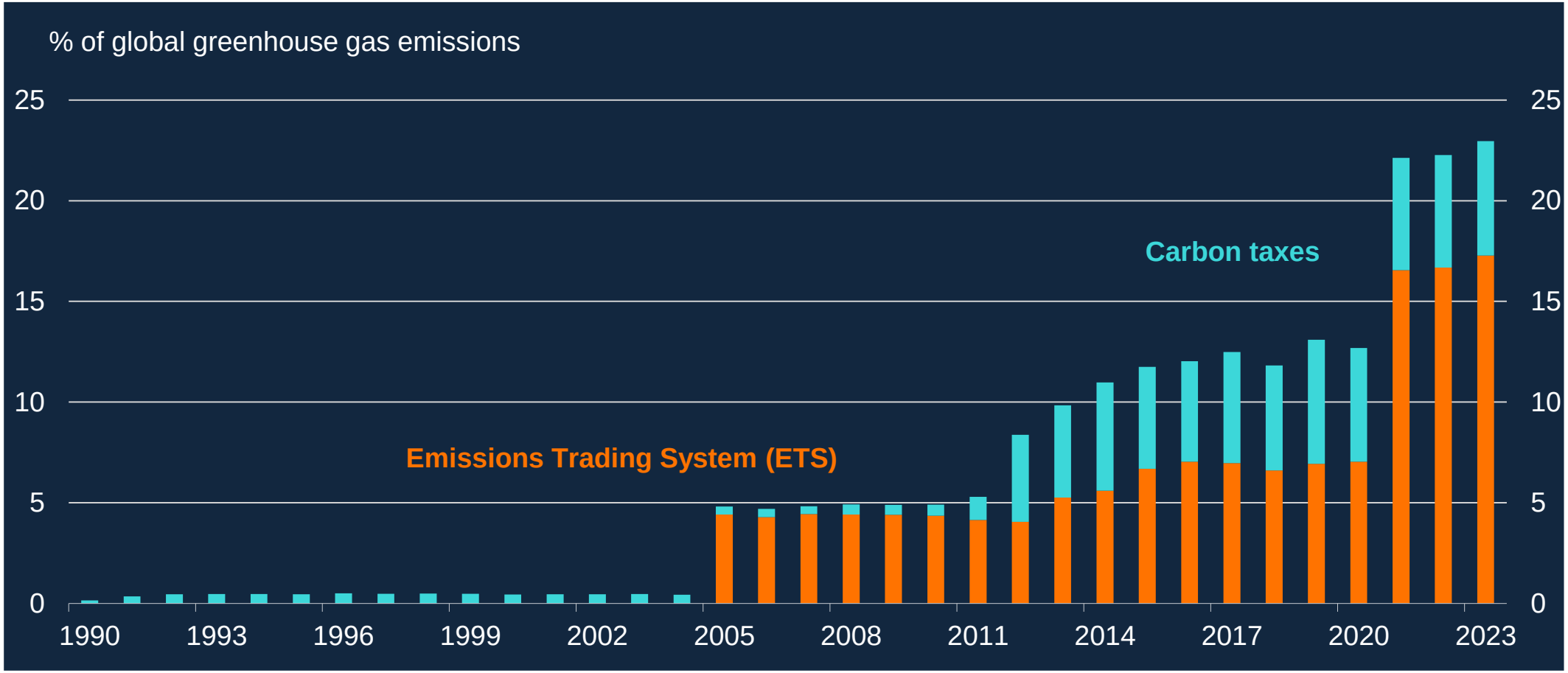
Catherine L. Mann
External member of the Monetary Policy Committee

Overview and road map

- **Mechanics of climate mitigation policies**
  - Quantities-based vs. price-based policies differ for emissions and for macroeconomic variables
  - Overview of recent UK energy experience
  - Highlight on uncertainty and volatility
- **Research on the macroeconomic effects of climate mitigation policies**
  - Carbon price shocks are more persistent than oil price shocks
  - Degree of ‘forward-lookingness’ and ‘attentiveness’ matter for macro outcomes
  - Under ETS vs carbon tax, central banks at home and abroad face different challenges

Around 25% of global greenhouse gas emissions are currently covered by some form of carbon pricing mechanism

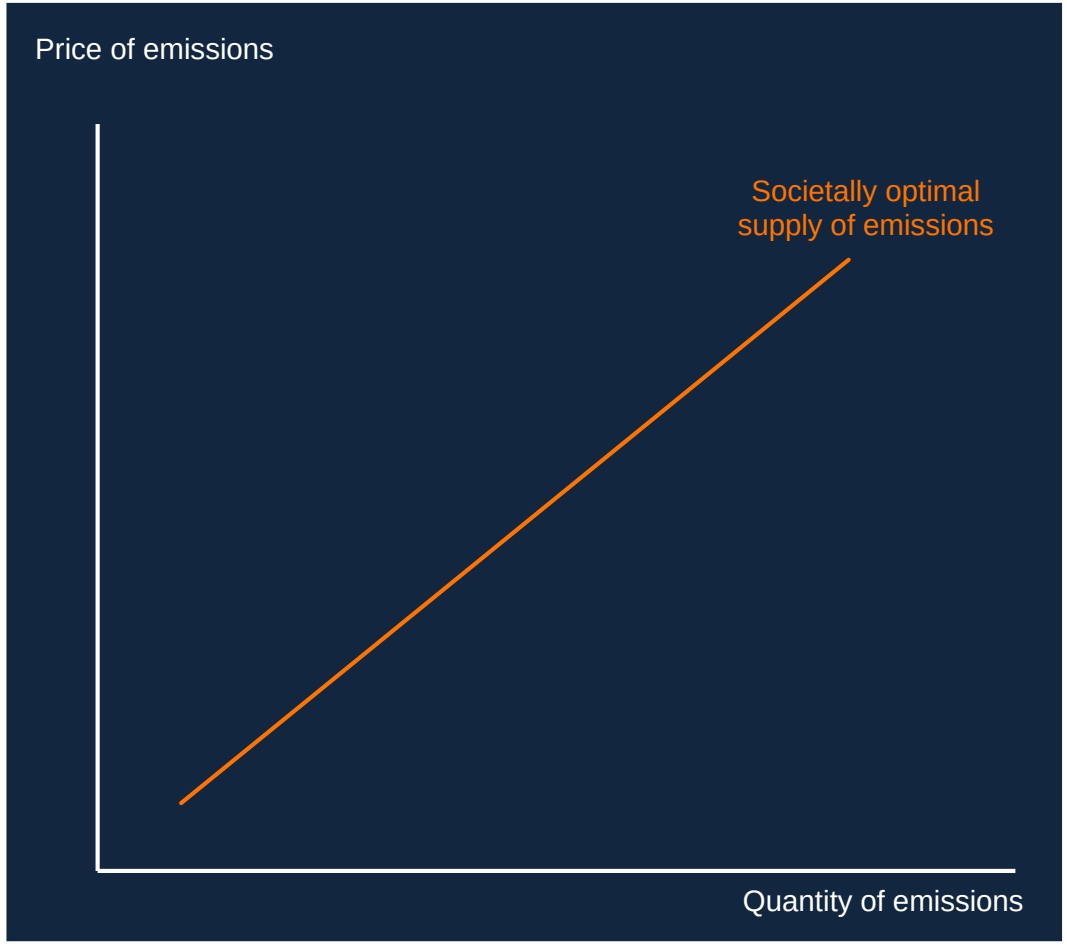
Share of global greenhouse gases covered by ETS and carbon taxes



Source: **World Bank (2023)** and Bank calculations.

Perturbations look different under different policy regimes

First, on the market for emissions, there exists an optimal supply schedule of carbon emissions – it is upward sloping to reflect the fact that a high level of emissions implies large societal costs

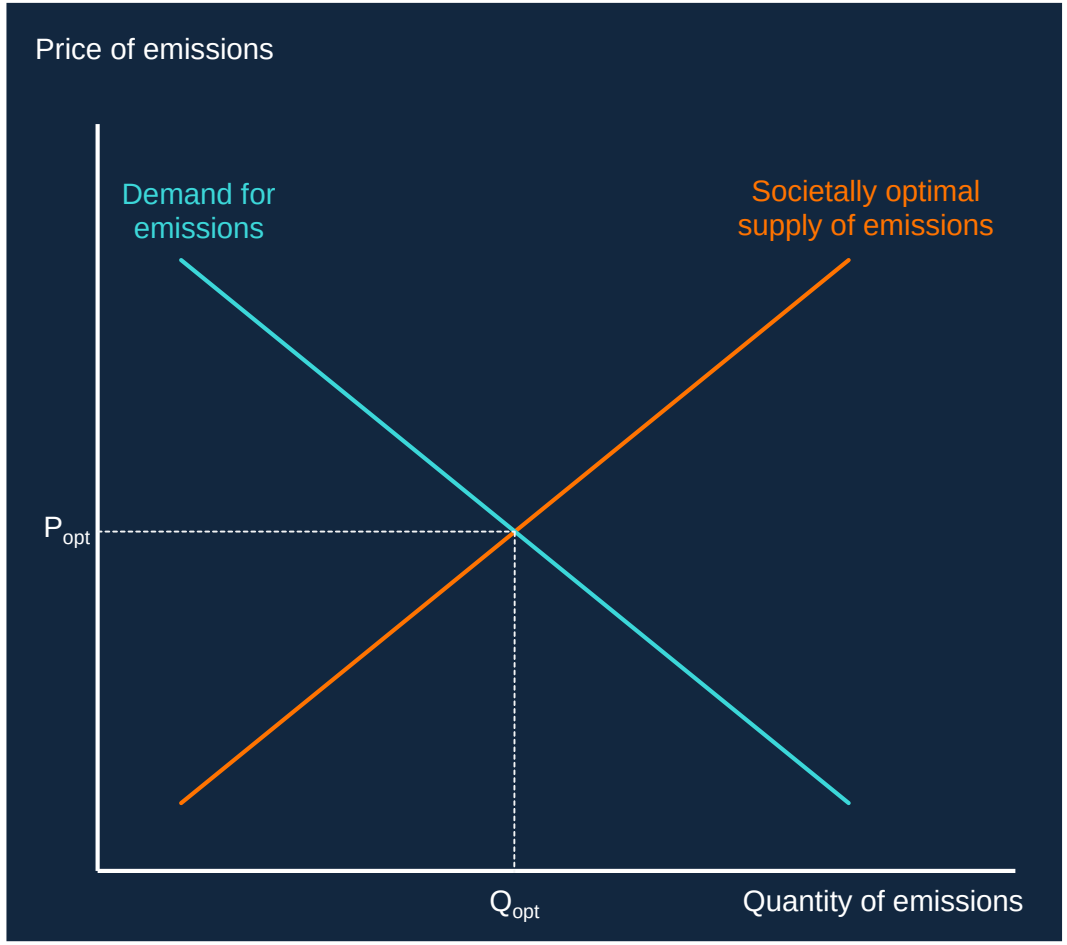


(a) carbon tax

Market for emissions

Perturbations look different under different policy regimes

At the intersection of the carbon supply schedule and the demand curve for emissions lies the societally optimal level of emissions and its associated carbon price

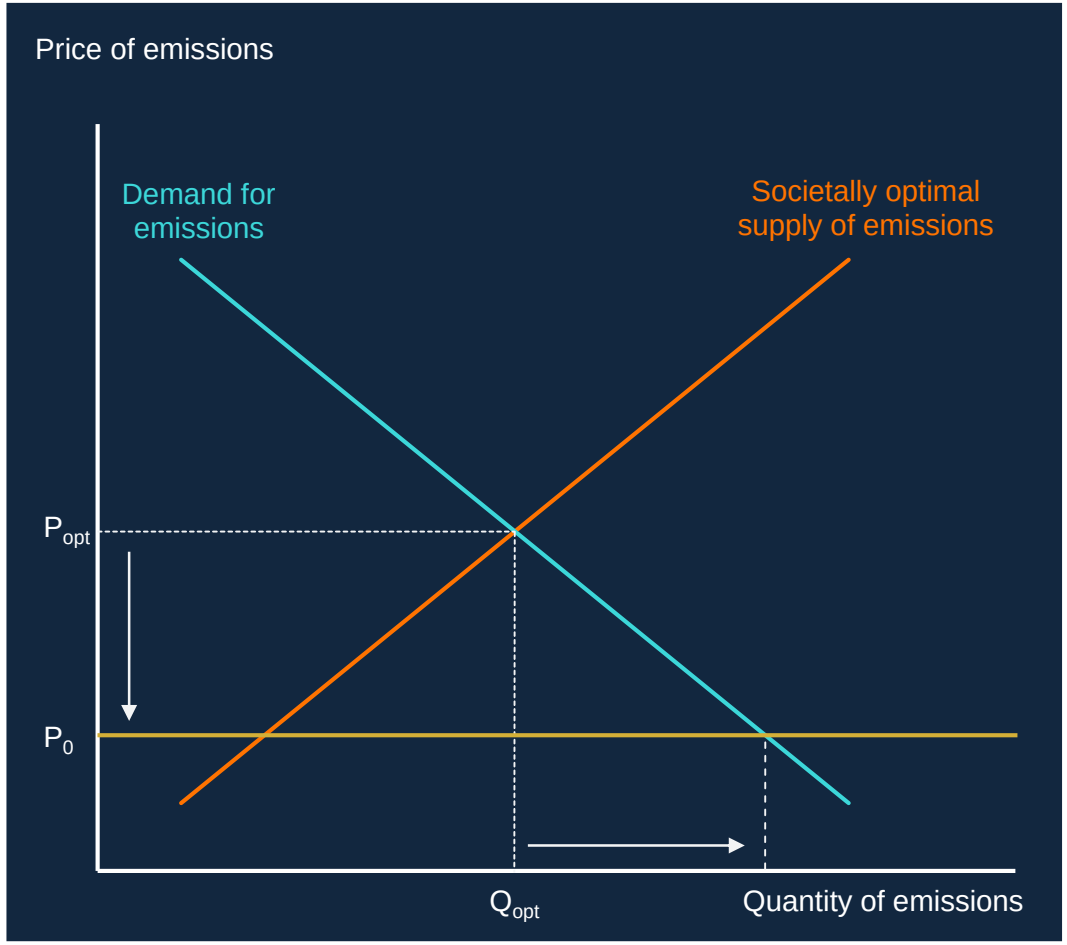


(a) carbon tax

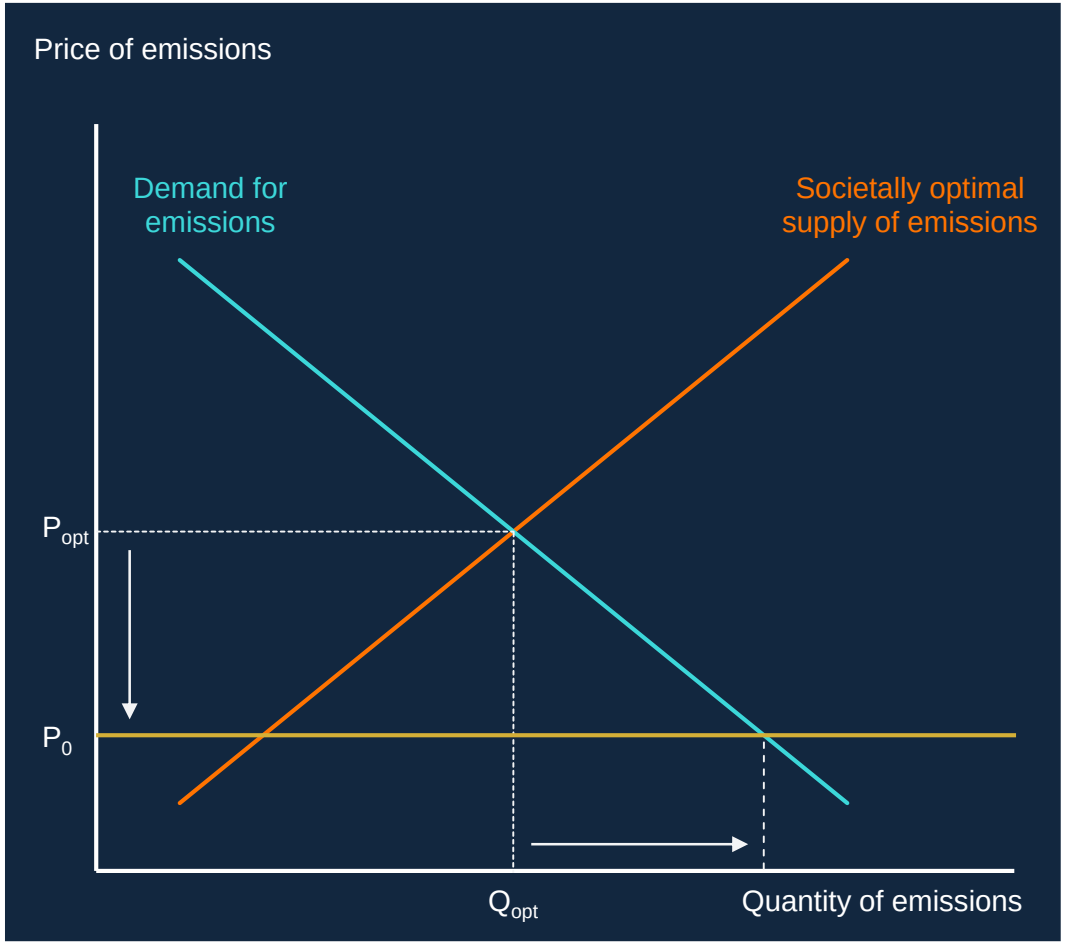
Market for emissions

Perturbations look different under different policy regimes

However, because market participants don't internalise societal costs, the pre-intervention supply schedule under both tax and ETS is flat, leading to over-production of emissions



(a) carbon tax

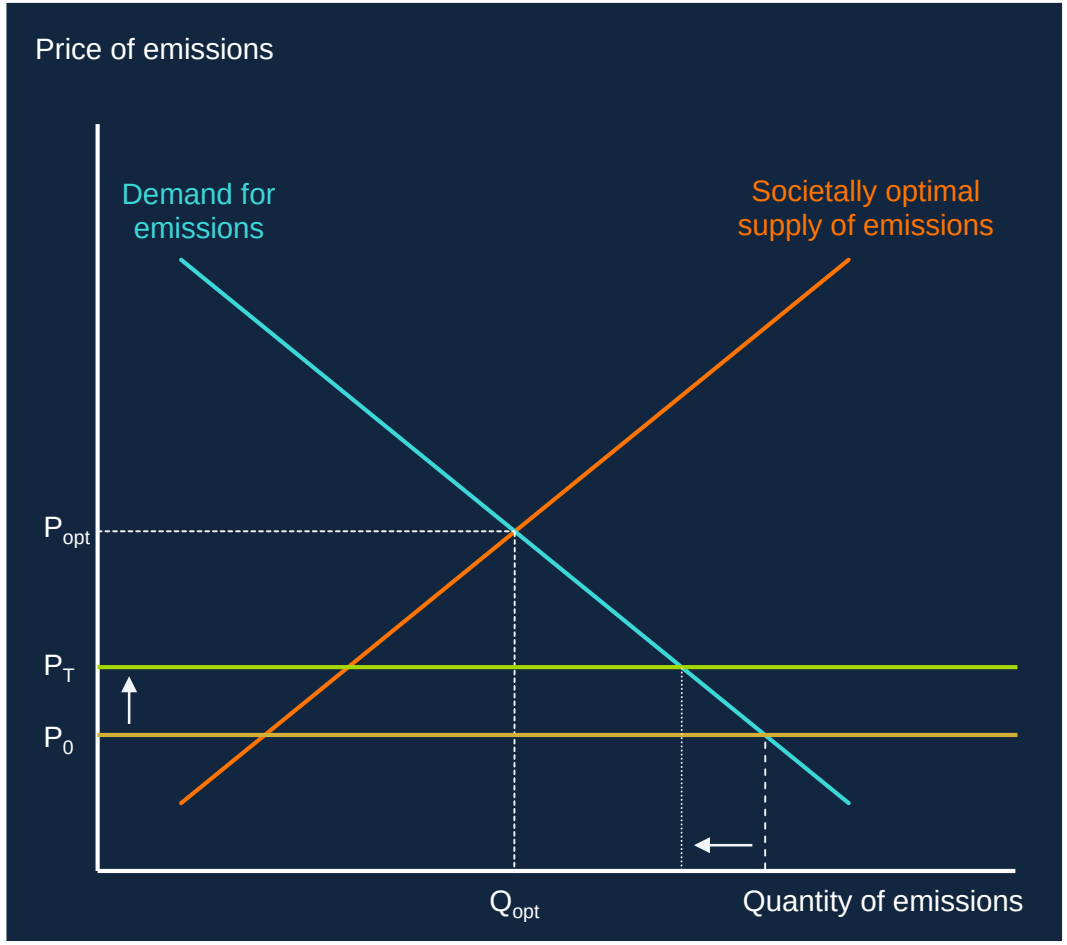


(b) ETS

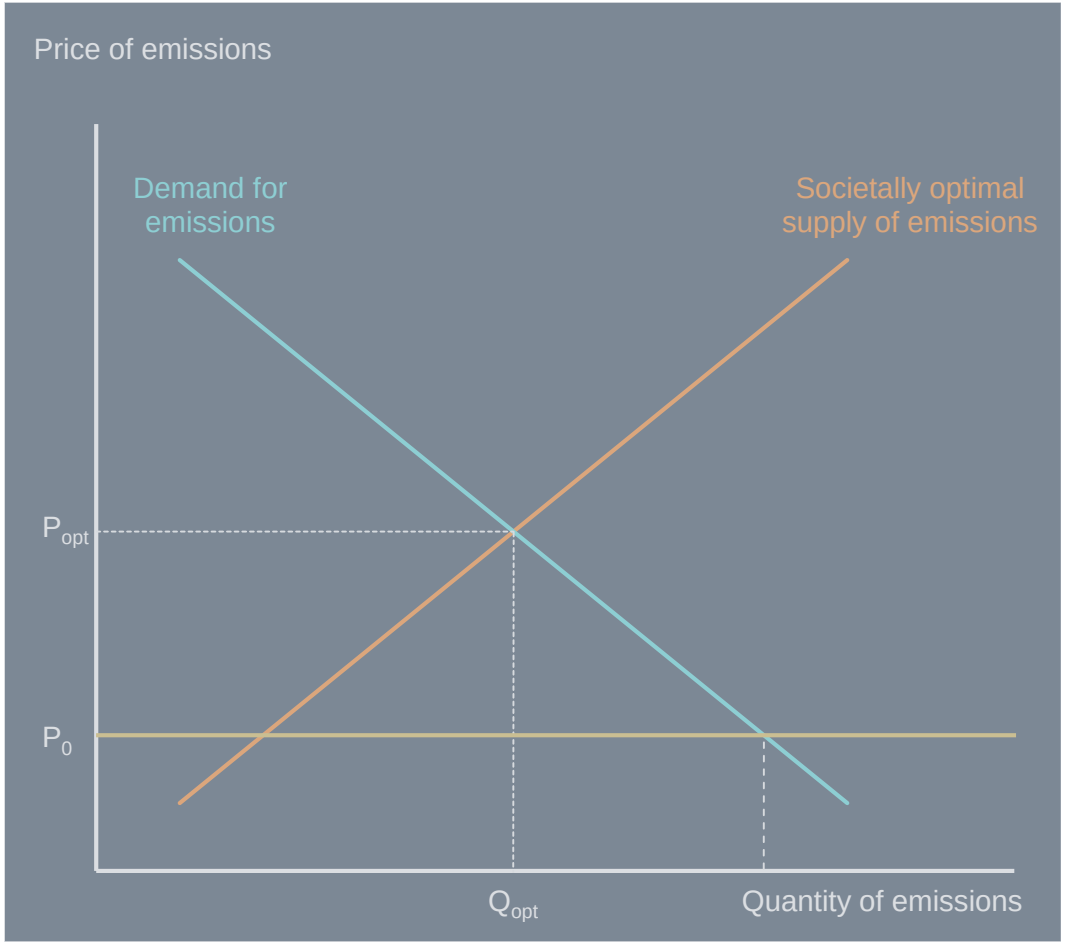
Market for emissions

Perturbations look different under different policy regimes

With a carbon tax, the price of emissions gets fixed at a higher point than without the policy, leading to lower quantities



(a) carbon tax

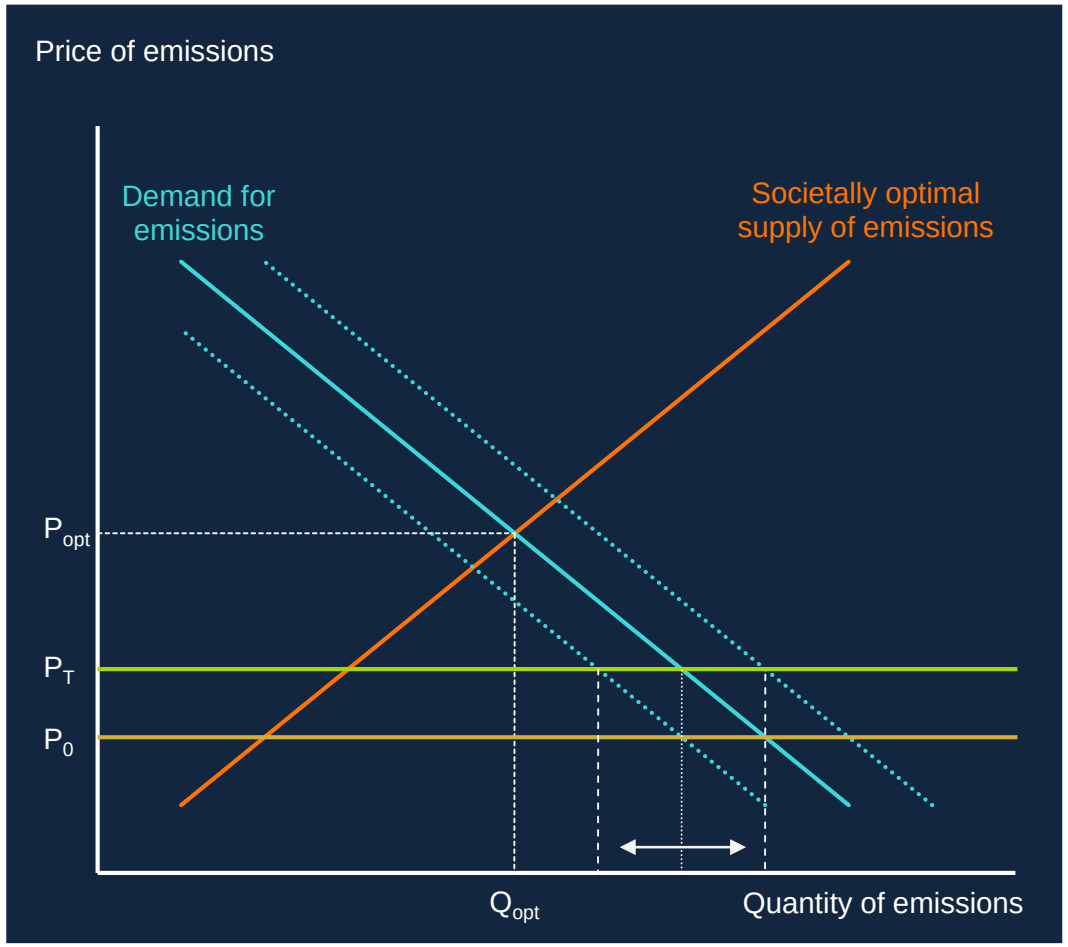


(b) ETS

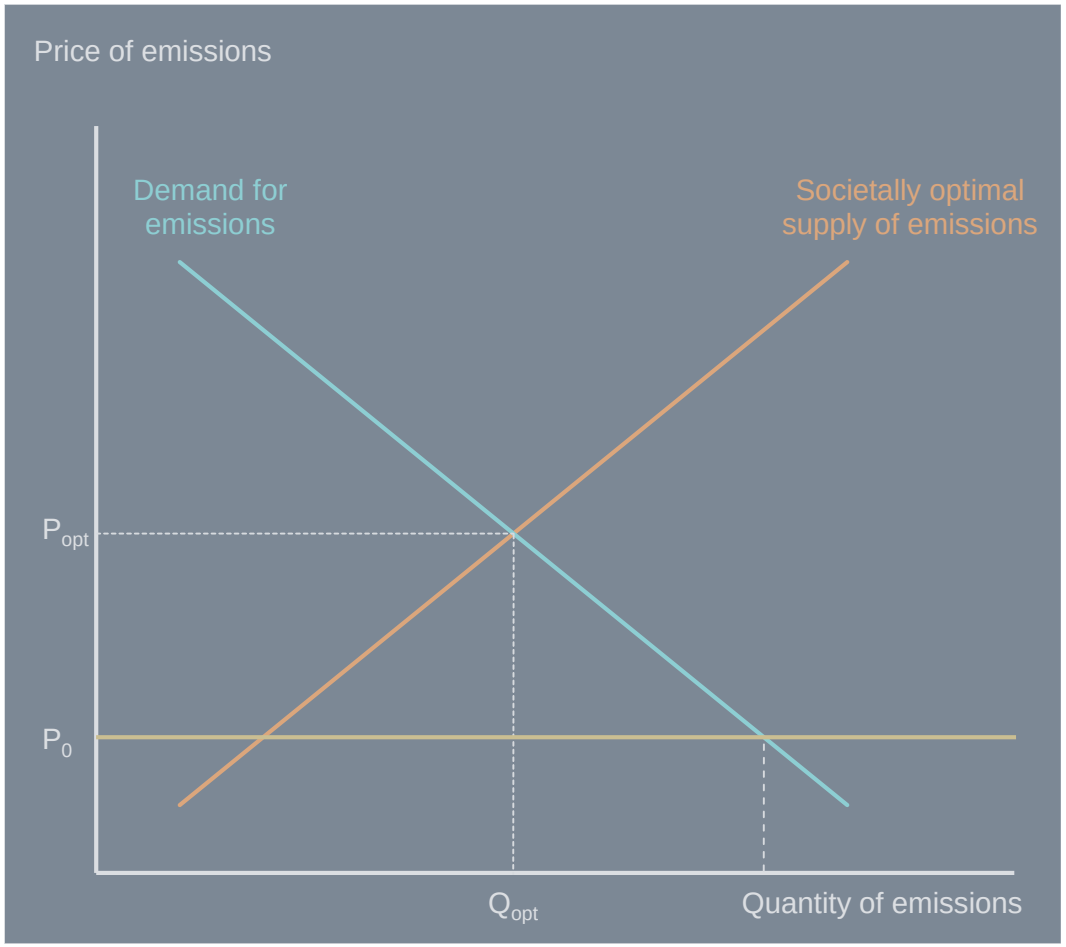
Market for emissions

Perturbations look different under different policy regimes

Under this regime, perturbations to the demand of emissions change quantities, but the price stays fixed at the level P_T



(a) carbon tax

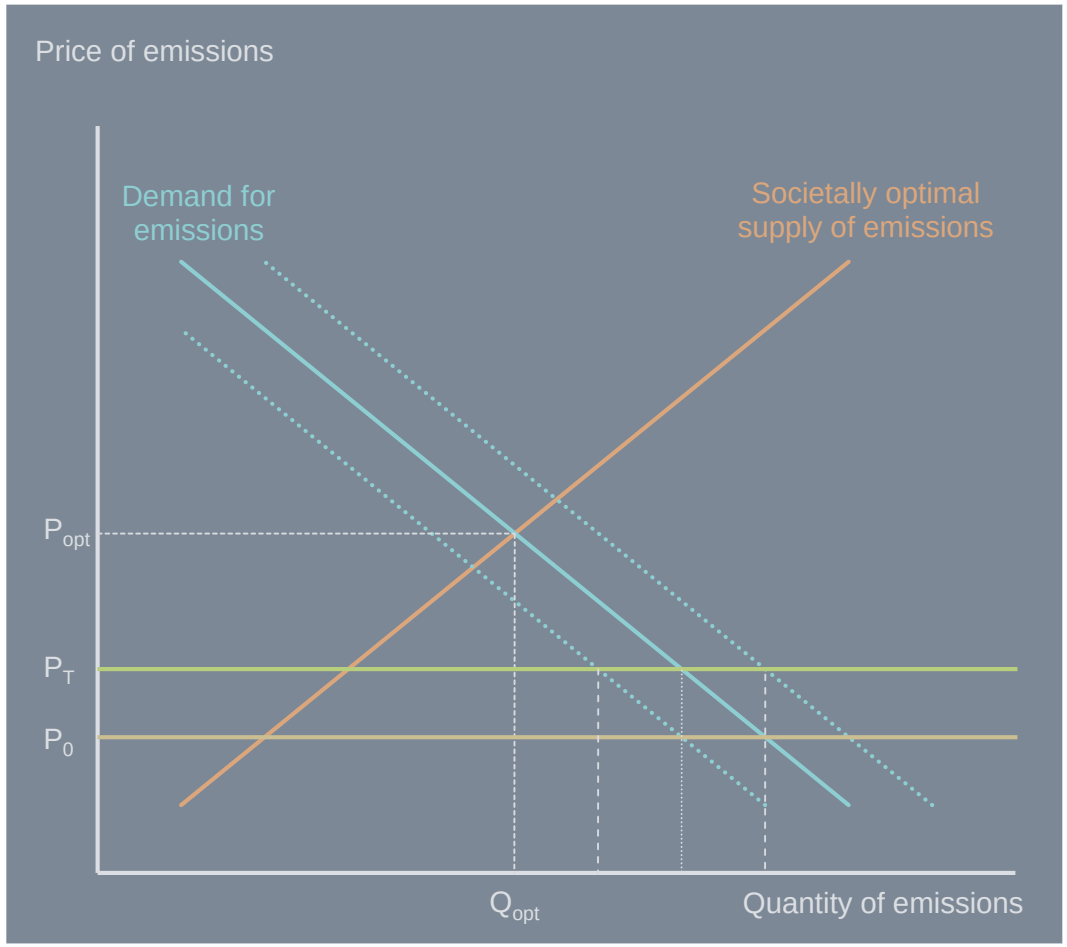


(b) ETS

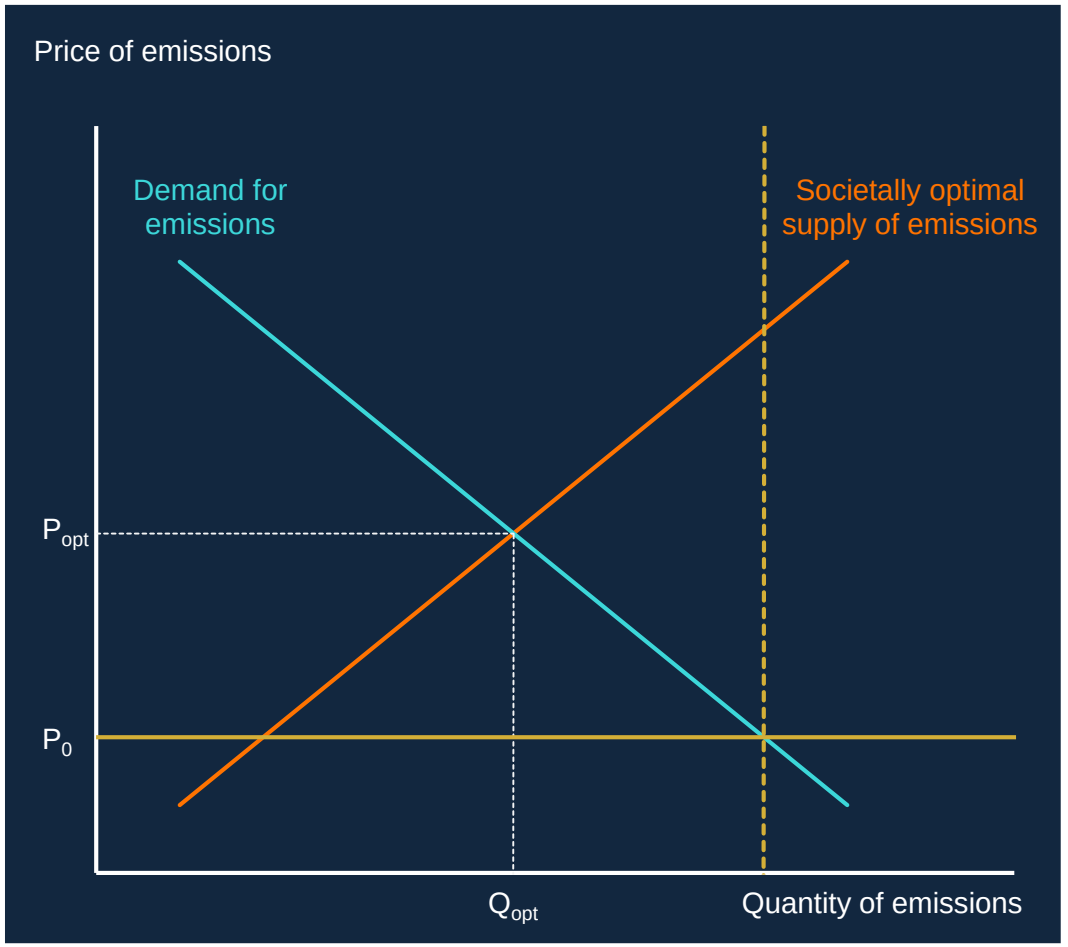
Market for emissions

Perturbations look different under different policy regimes

Under an ETS, quantities are capped at a maximum amount while prices can fluctuate.
If that maximum is larger than the pre-intervention quantity of emissions, the price will stay at P_0



(a) carbon tax

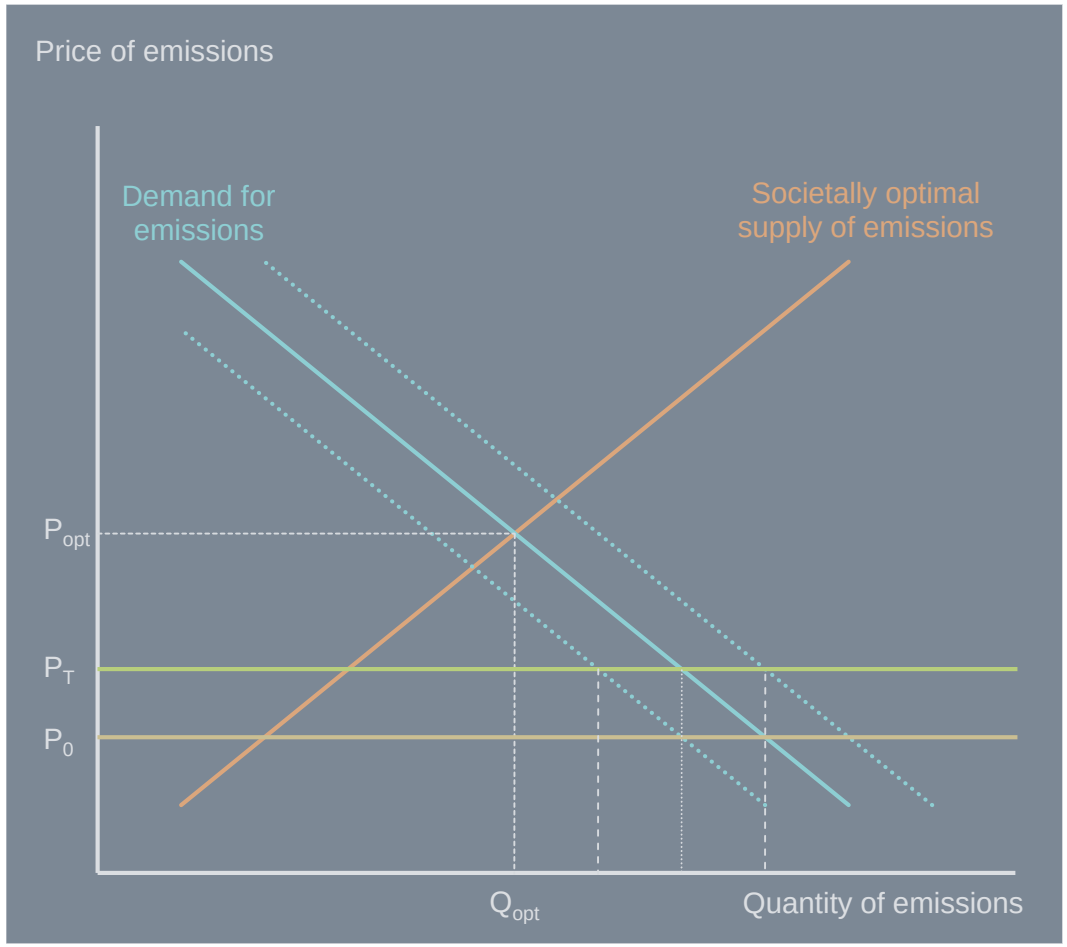


(b) ETS

Market for emissions

Perturbations look different under different policy regimes

In a static world, we can exactly replicate the price of emissions under a carbon tax by setting the ETS cap to the tax-equivalent level of emissions



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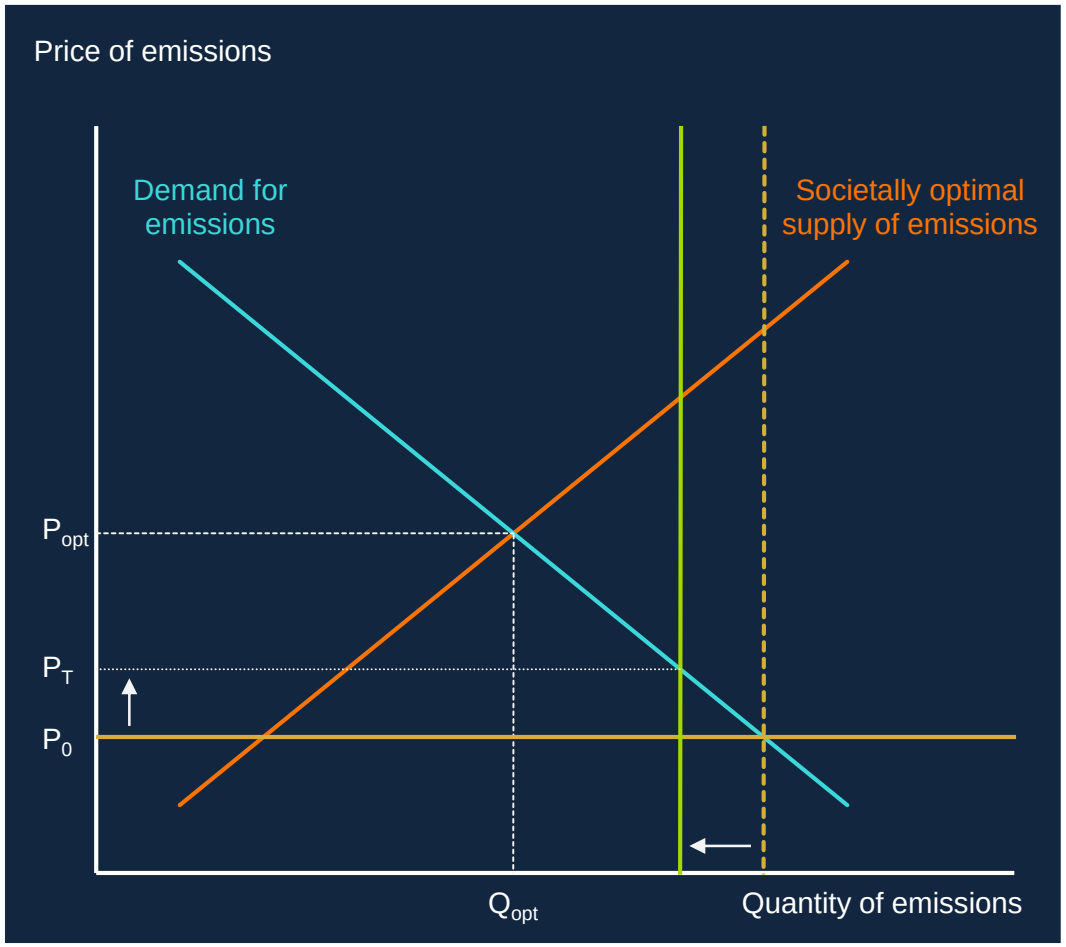
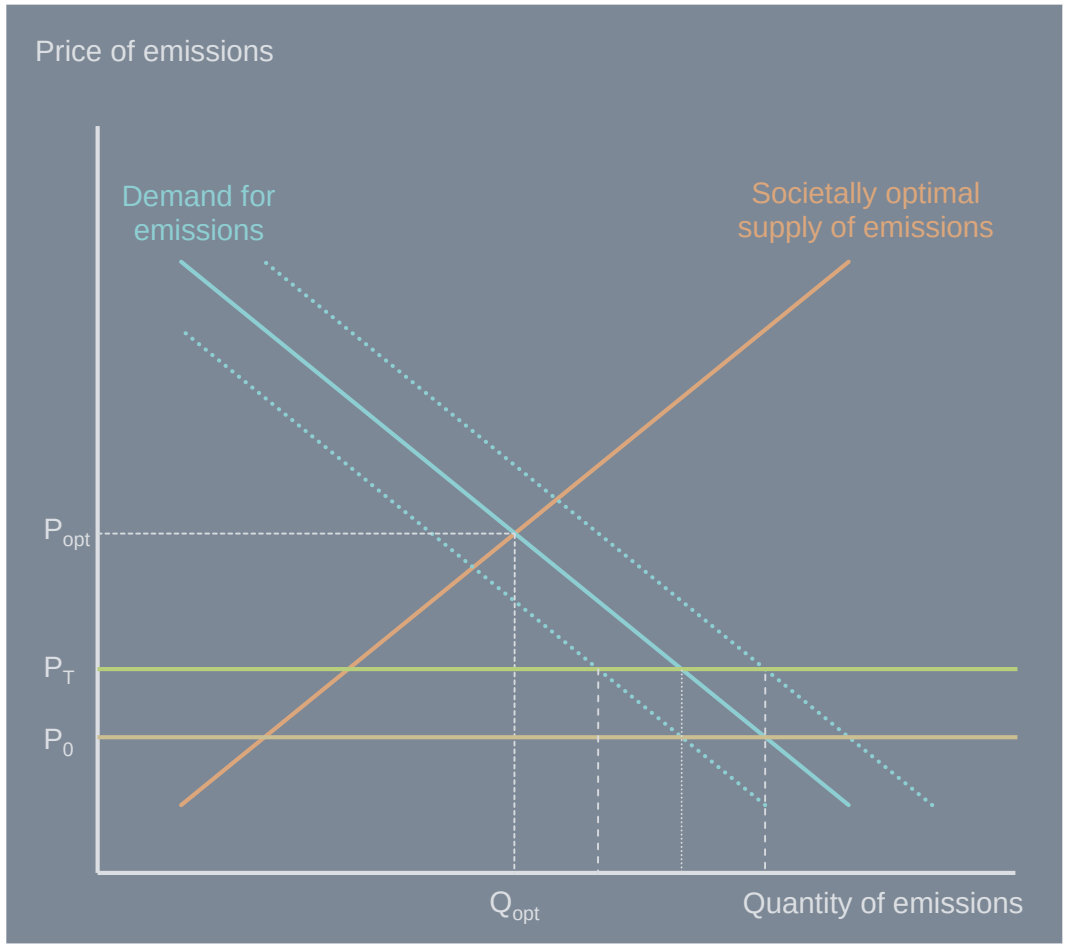


(b) ETS

Market for emissions

Perturbations look different under different policy regimes

However, under the ETS, when demand for emissions fluctuates, as long as we are sufficiently far from the ‘kink’, prices will fluctuate while the quantity of emissions stays the same



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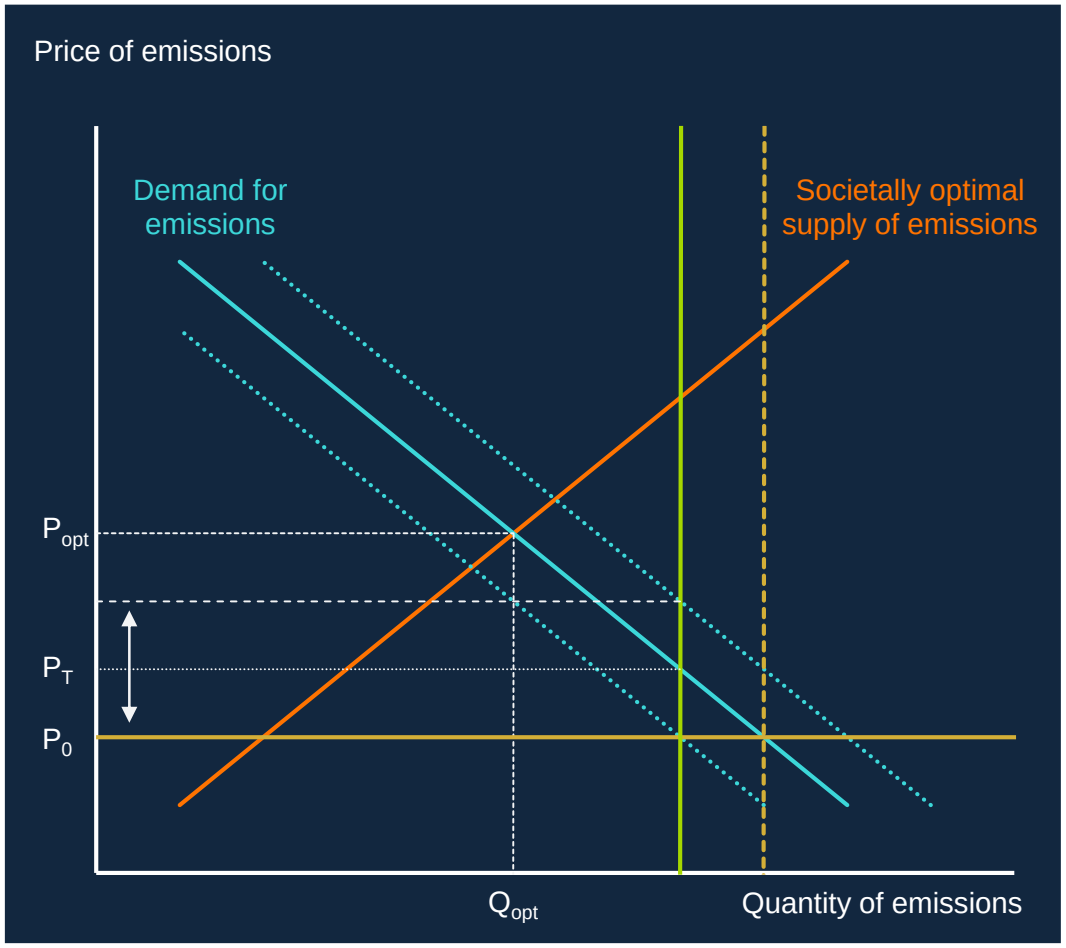
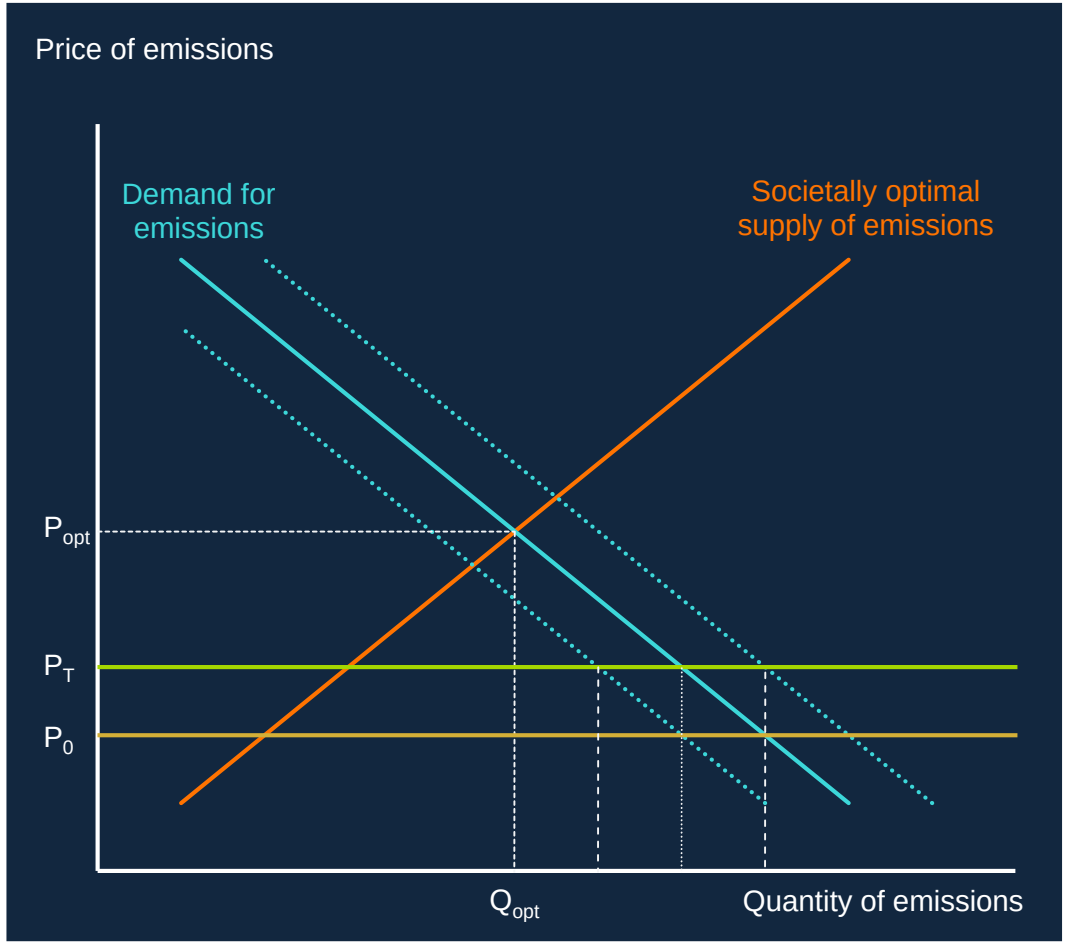


(b) ETS

Market for emissions

Perturbations look different under different policy regimes

Bottom line: On the market for emissions, carbon taxes fix prices and let quantities adjust, while an ETS fixes quantities but lets prices vary



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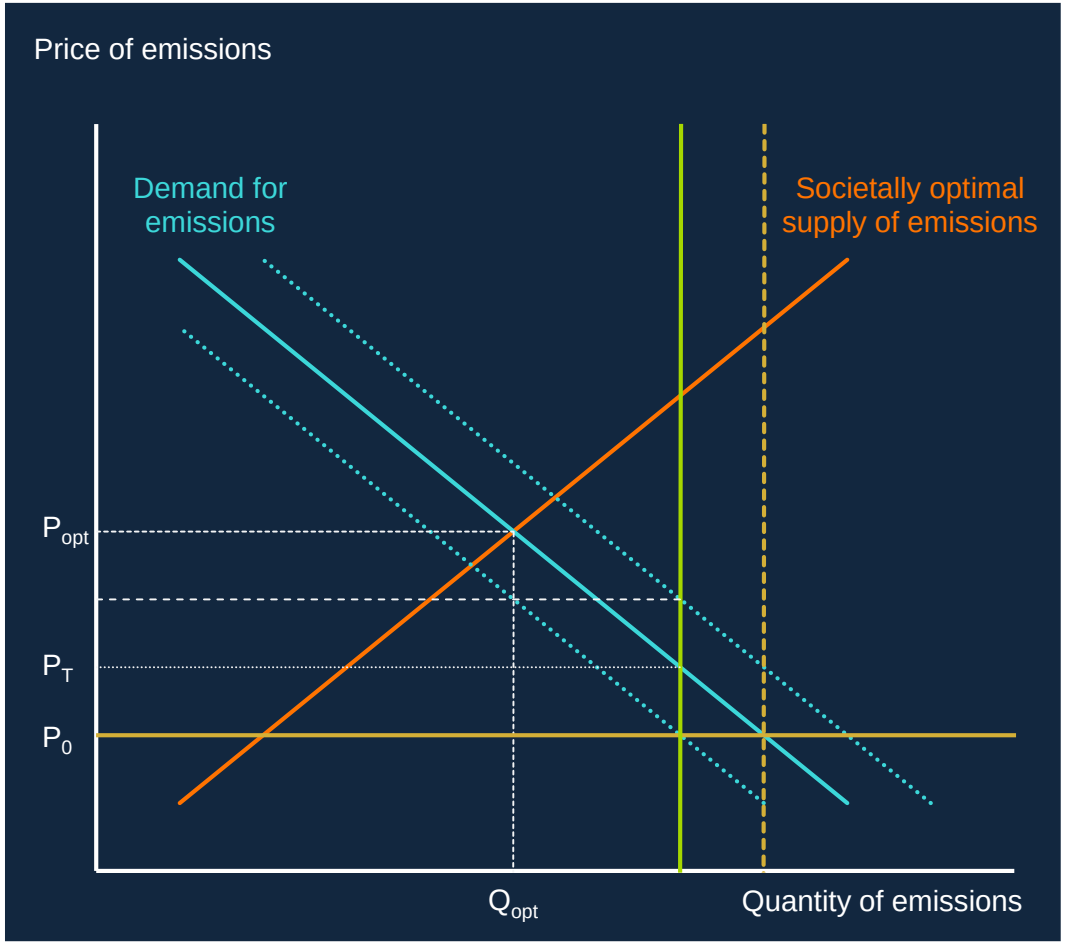
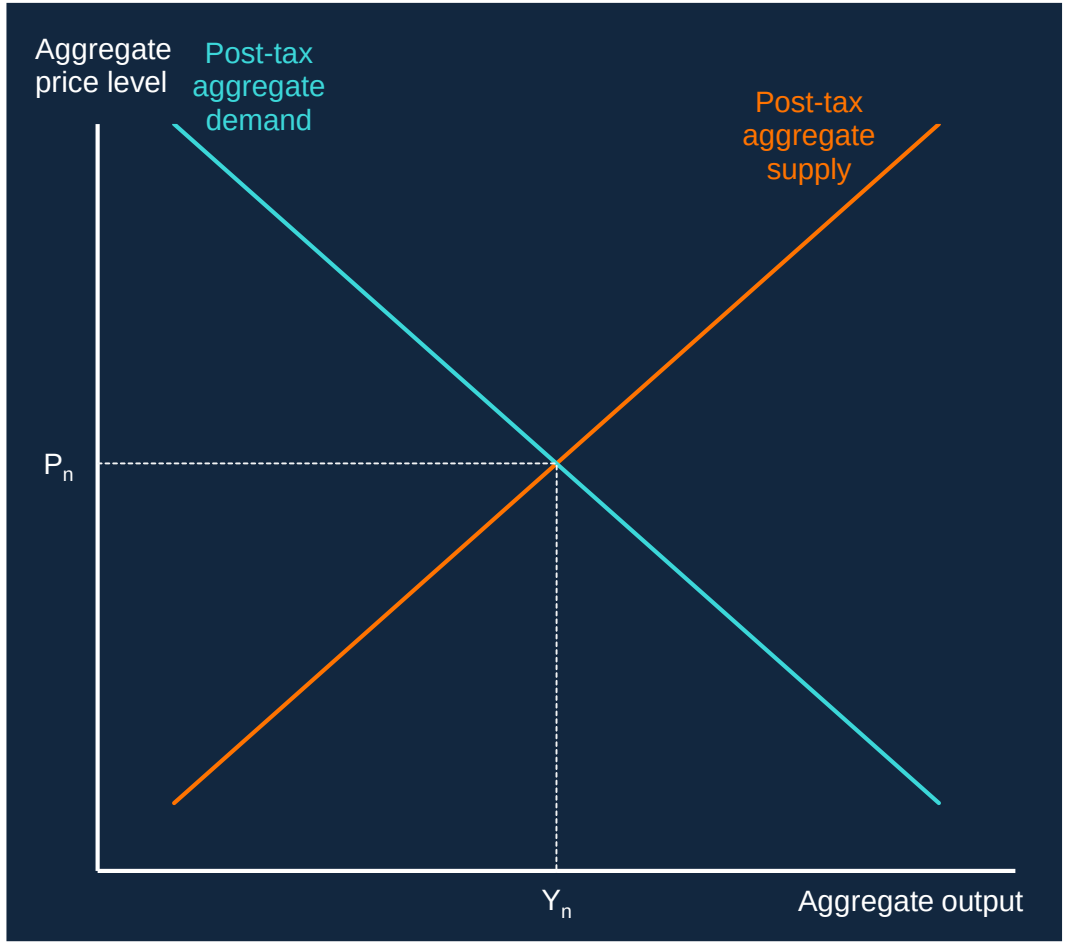


(b) ETS

Market for emissions

Perturbations look different under different policy regimes

After the introduction of either carbon taxes or an ETS,
let's assume that we reach the same goods market equilibrium



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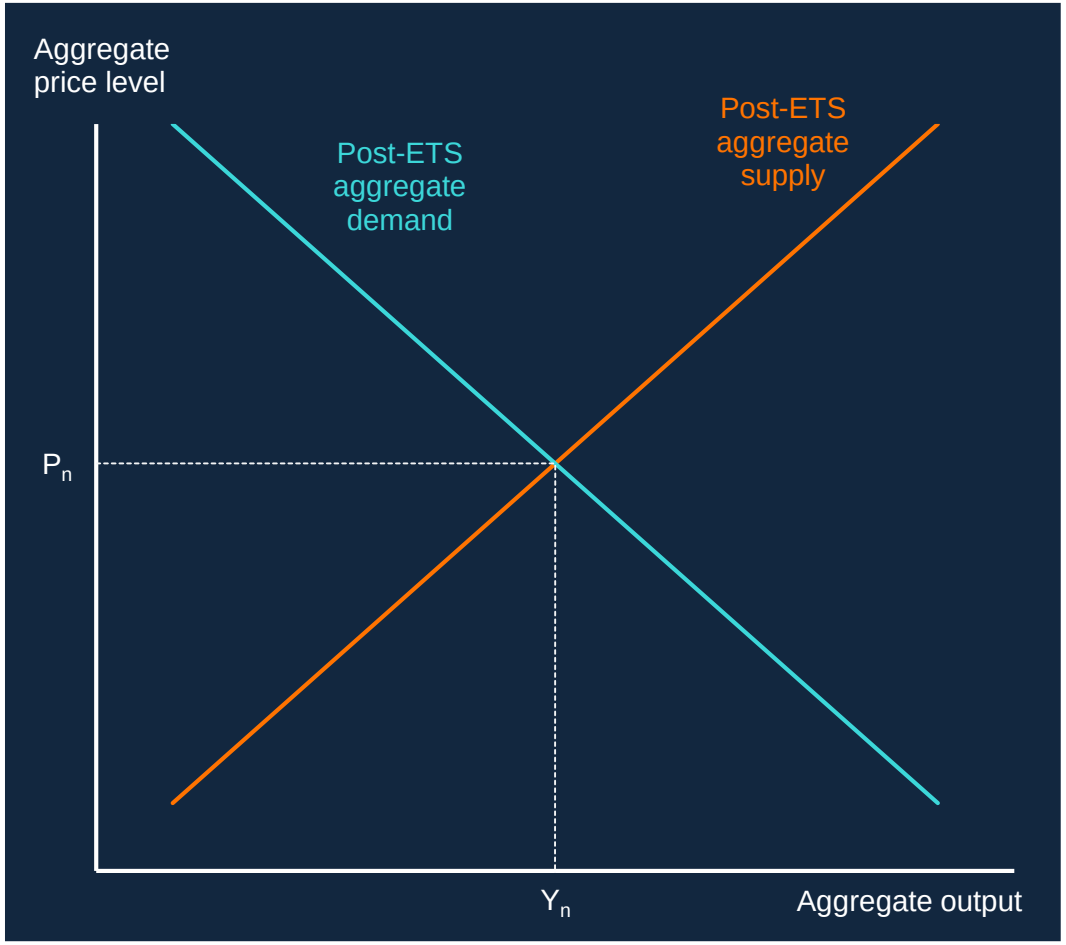
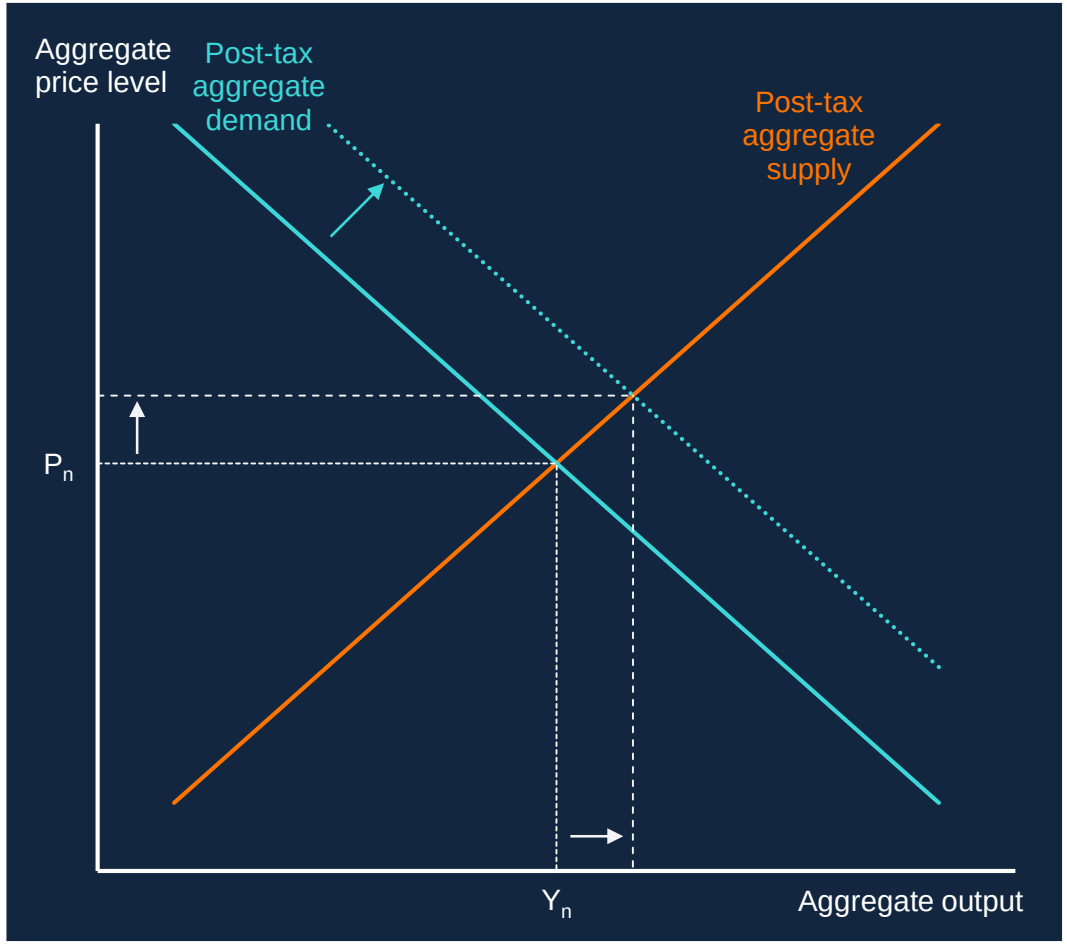


(b) ETS

Perturbations look different under different policy regimes

Under a carbon tax, expansionary demand shocks cause output to rise in the short run and lead to a rise in the price level



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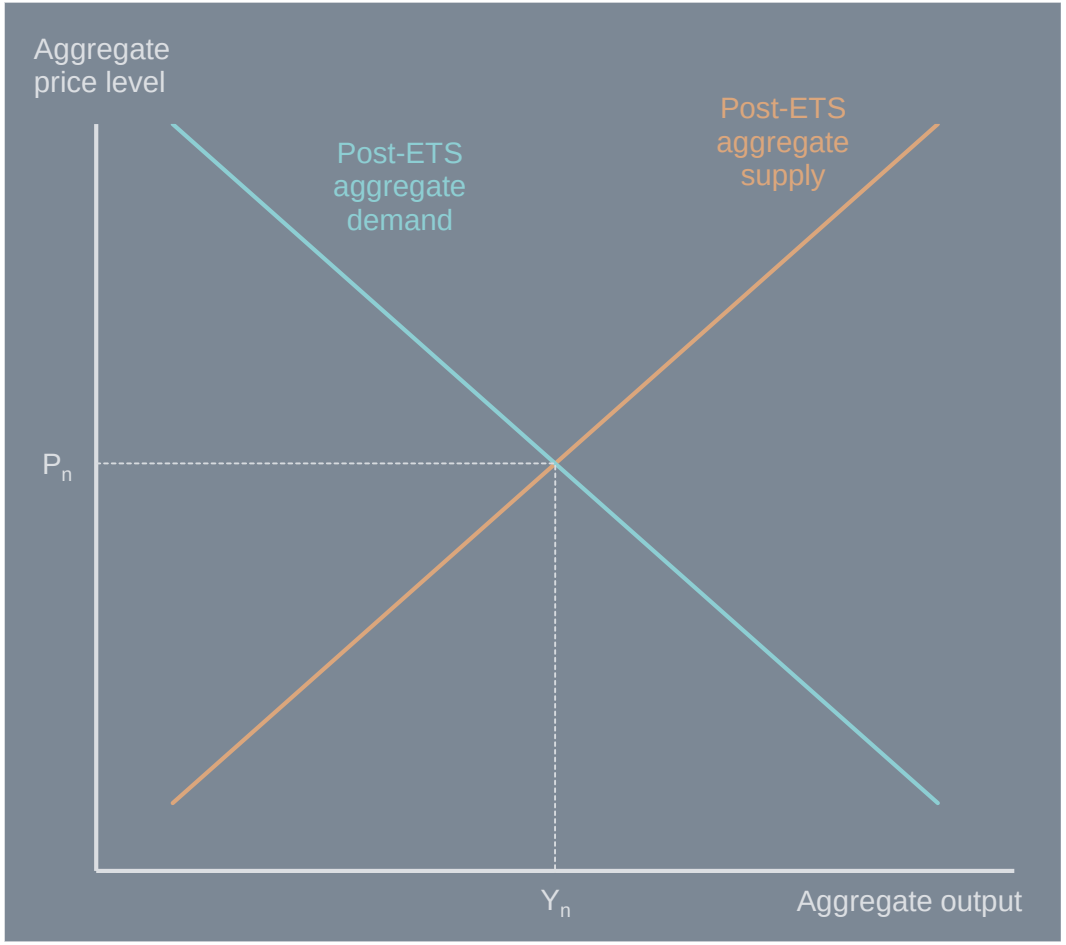
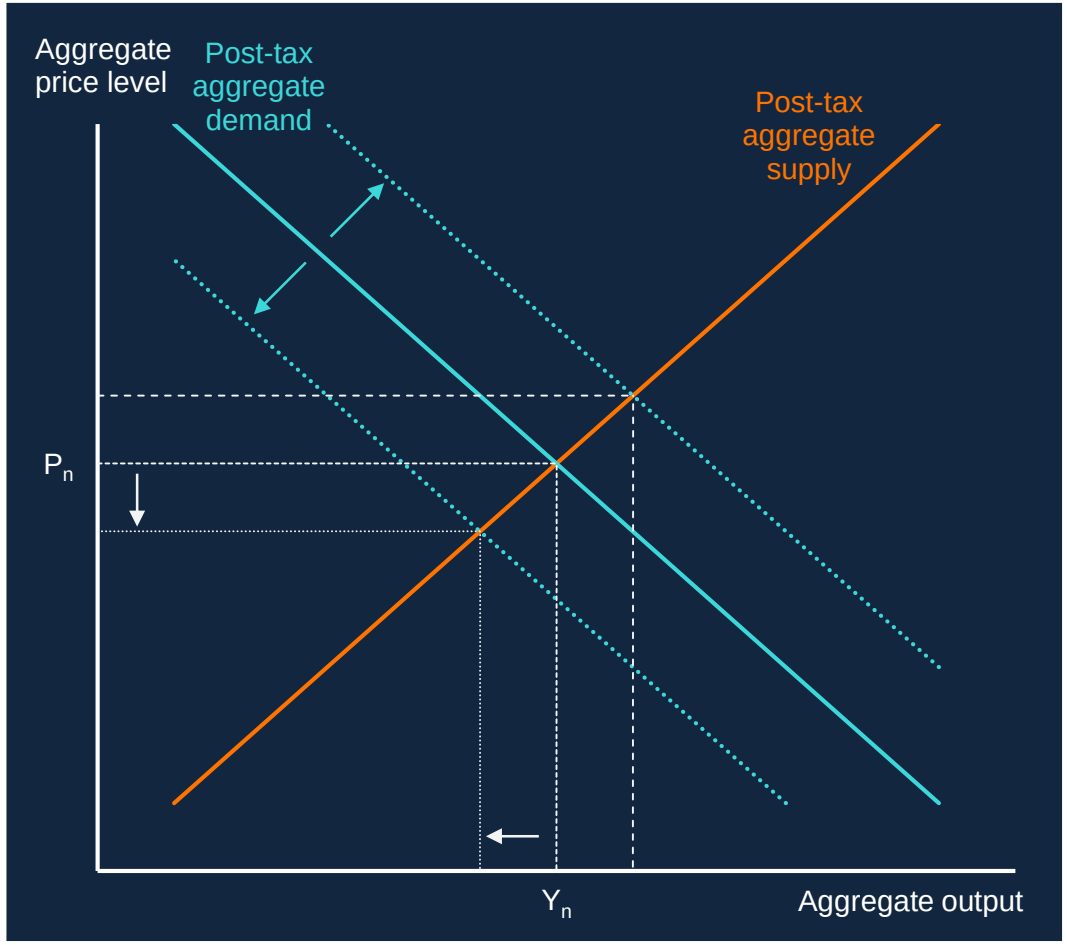


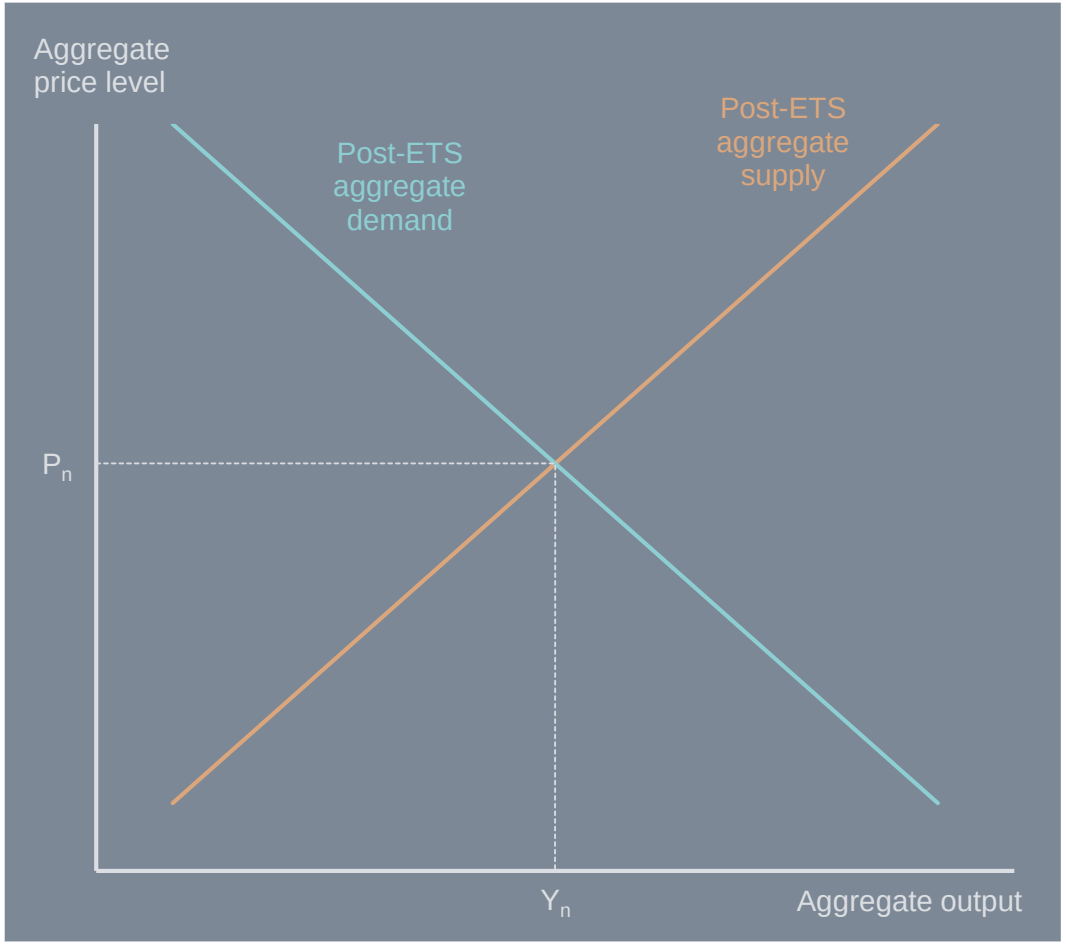
(b) ETS

Perturbations look different under different policy regimes

Contractionary demand shocks, on the other hand, cause output and prices to fall in the short run



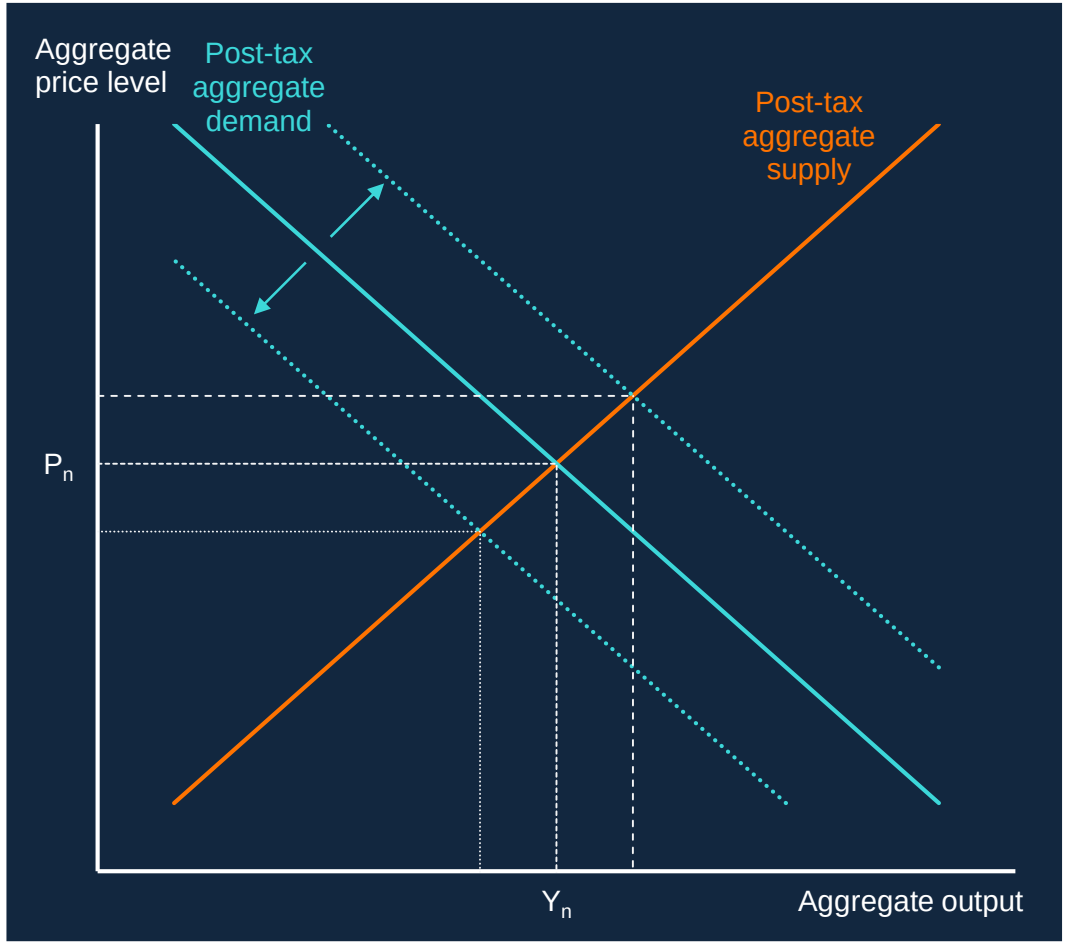
(a) carbon tax



(b) ETS

Perturbations look different under different policy regimes

Under a carbon tax, demand fluctuations cause proportional fluctuations in output and prices with the same sign



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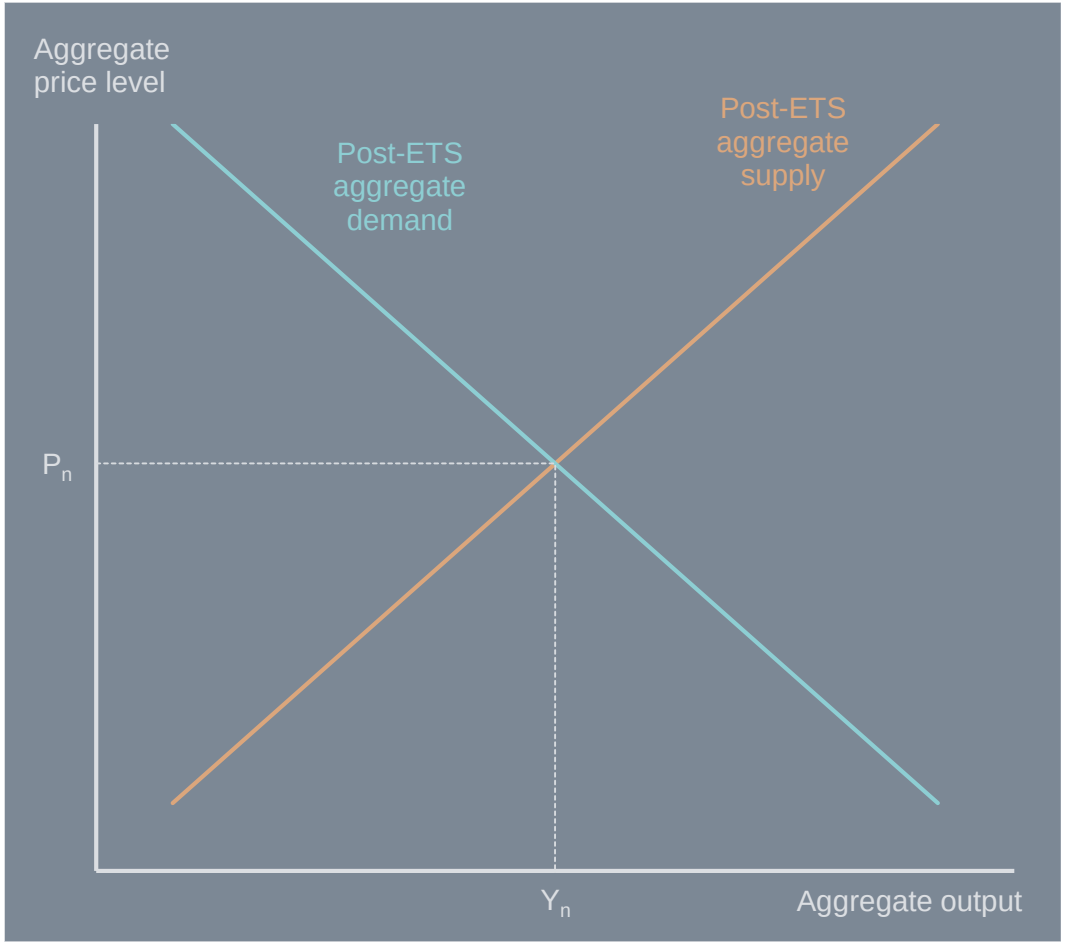
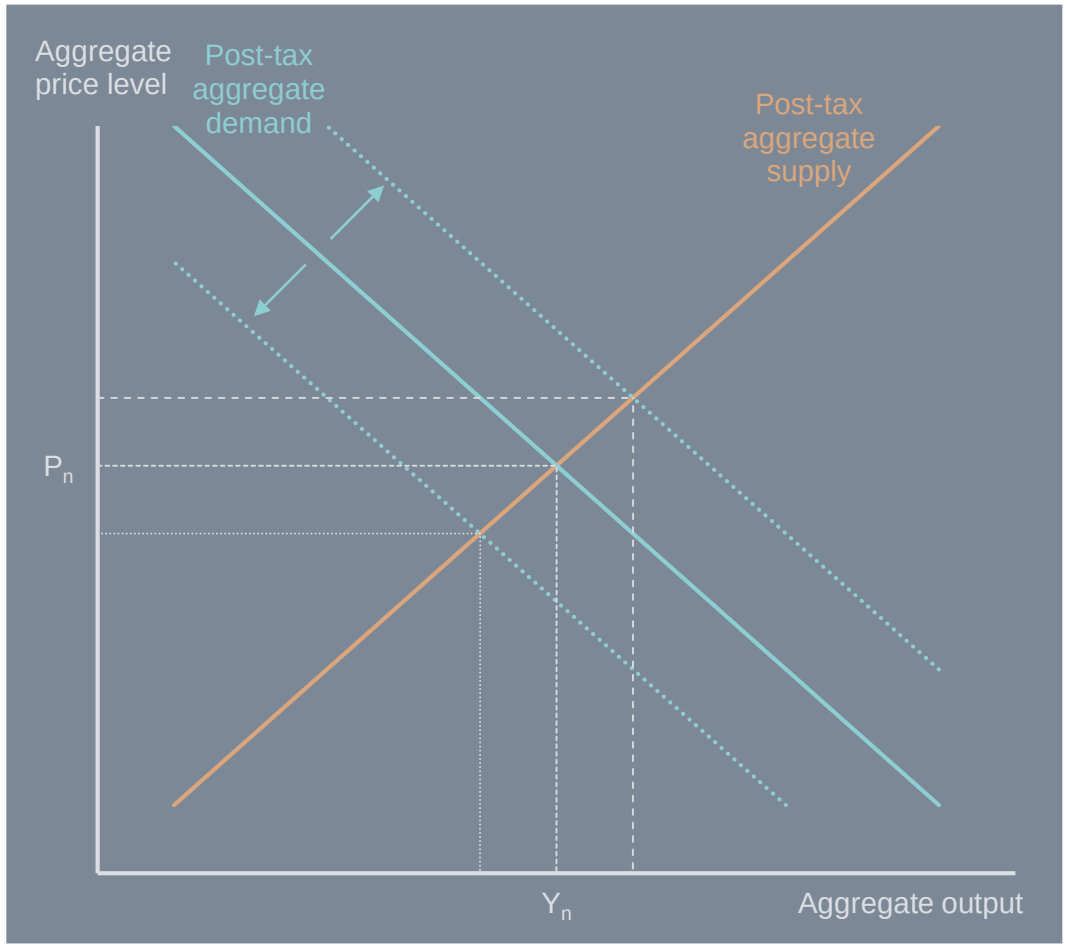


(b) ETS

Perturbations look different under different policy regimes

Under an ETS regime, however, the shift in the demand curve is not enough to characterise the new equilibrium



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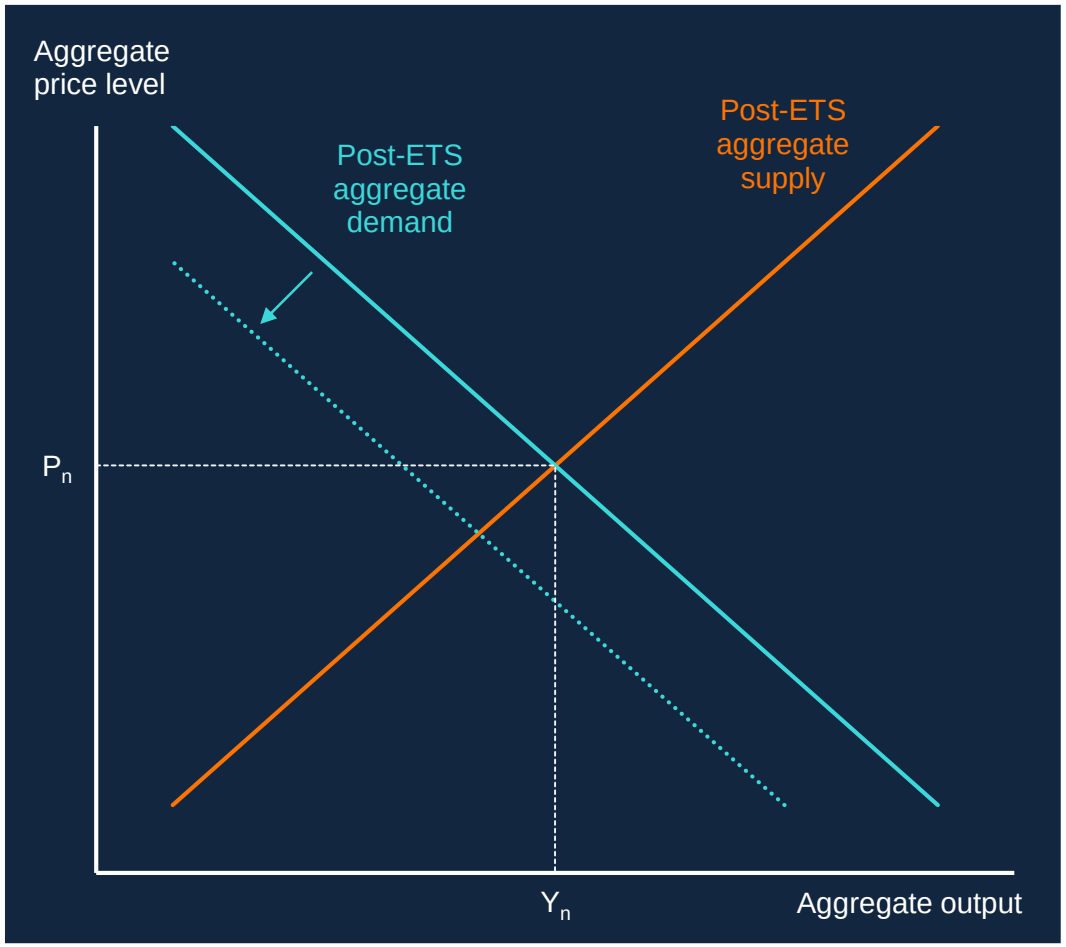
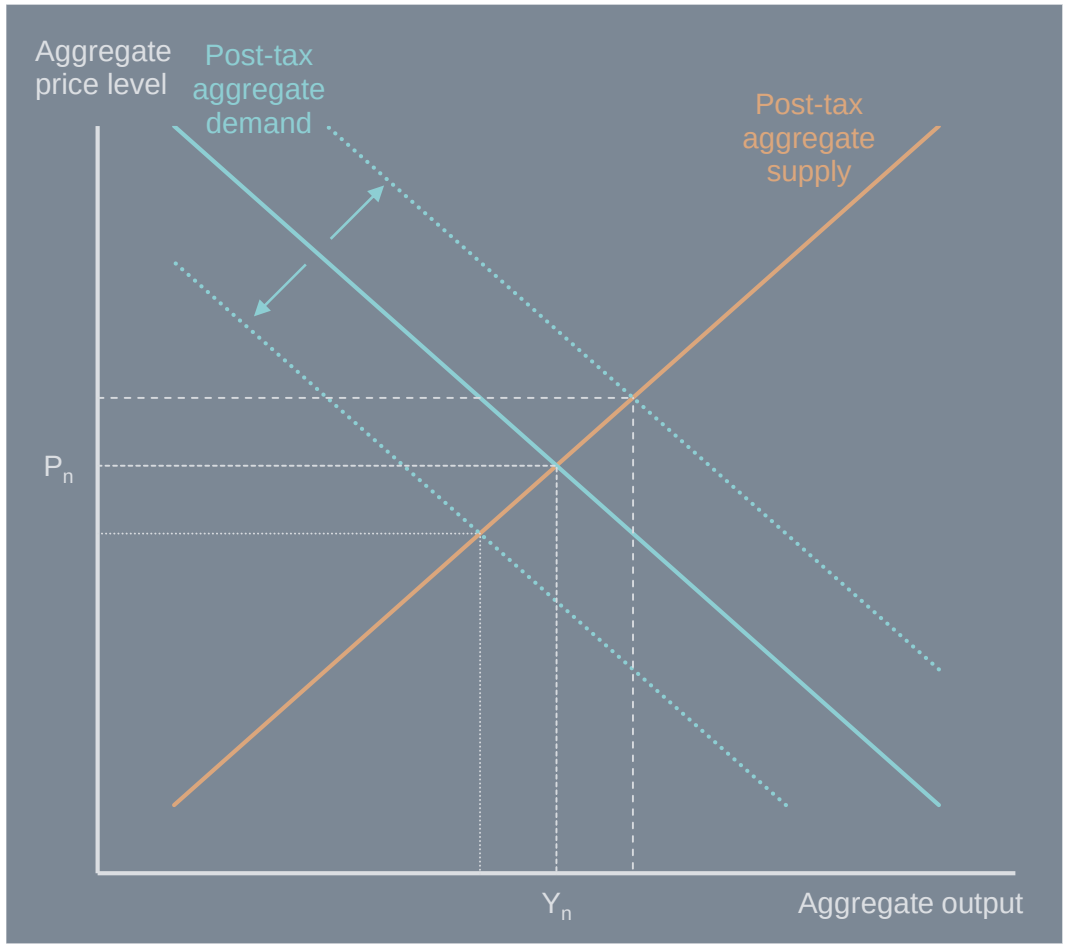


(b) ETS

Perturbations look different under different policy regimes

Because of the decrease in ETS prices and, therefore, the decrease in marginal costs, prices fall by more and output by less than in the case of carbon taxes



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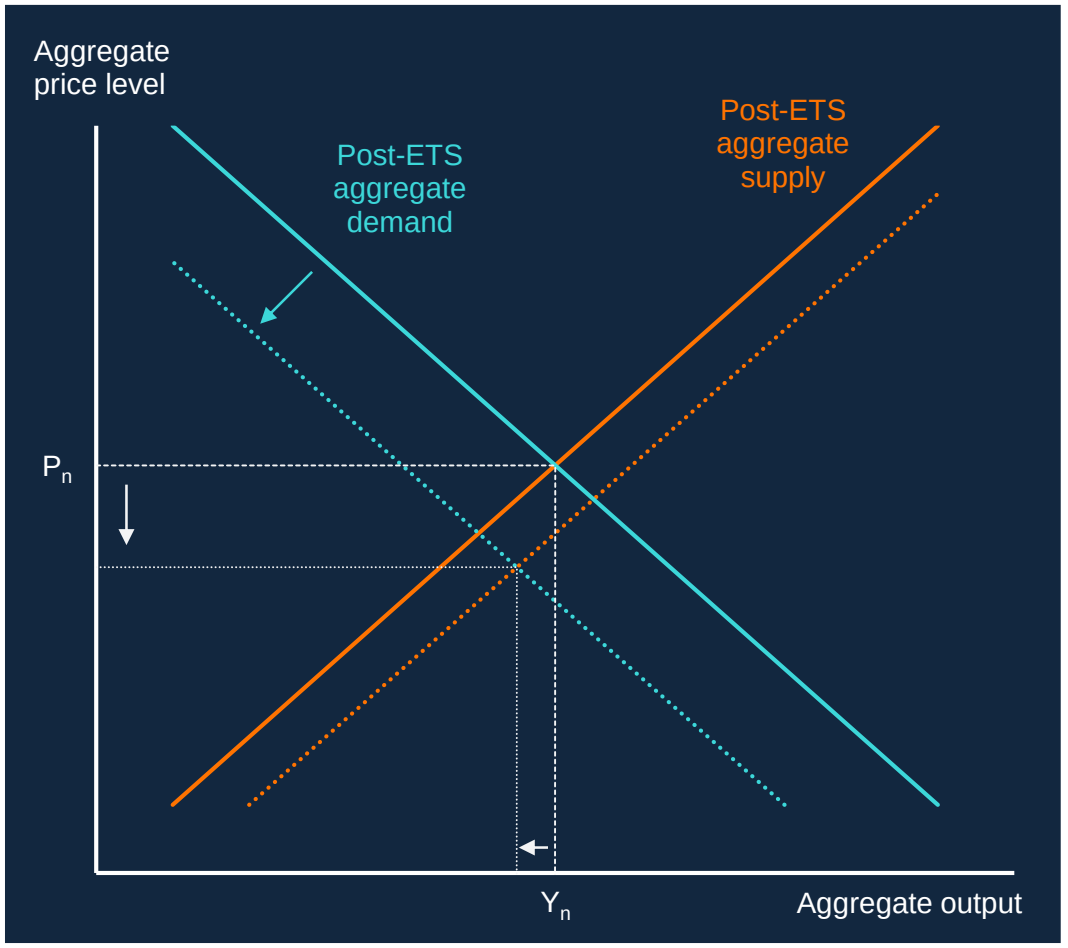
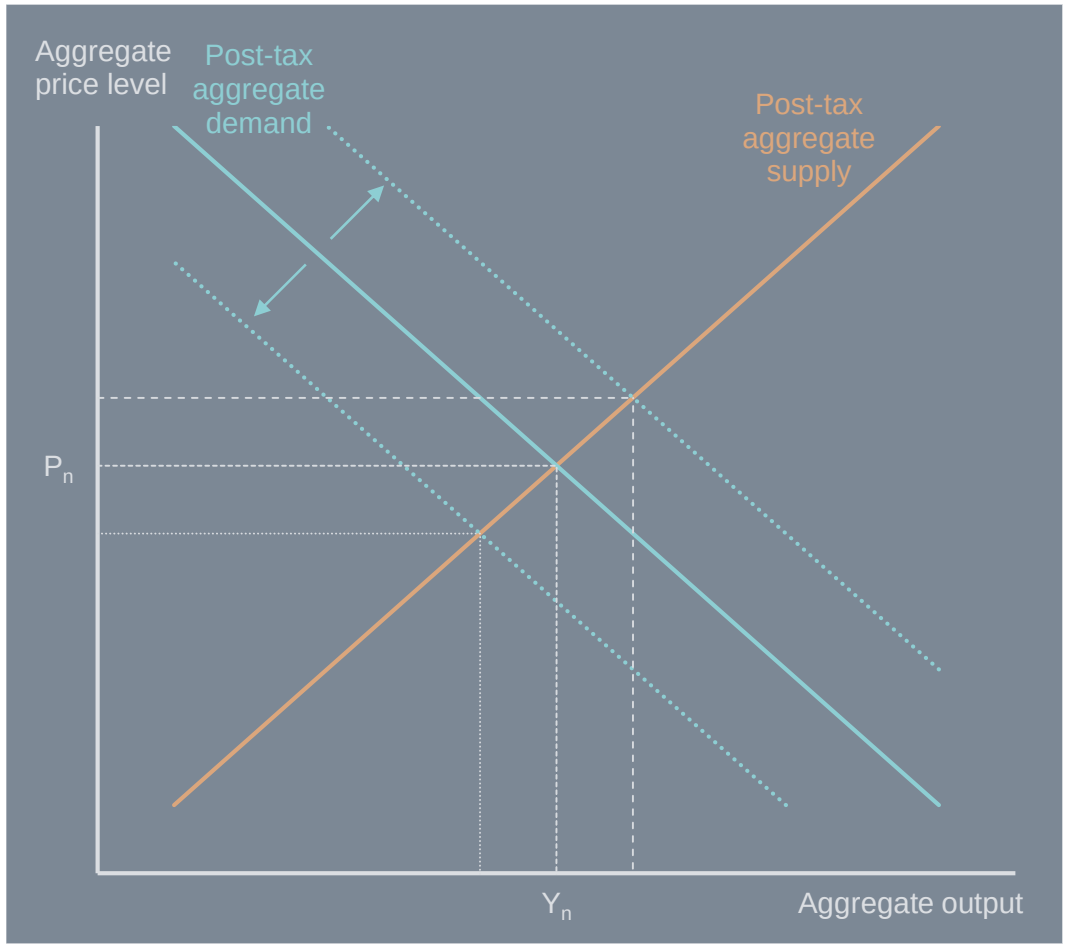


(b) ETS

Perturbations look different under different policy regimes

But, the sign of the output effect is not determinate: if the supply curve shifts far enough, output can even expand alongside a larger fall in the price level



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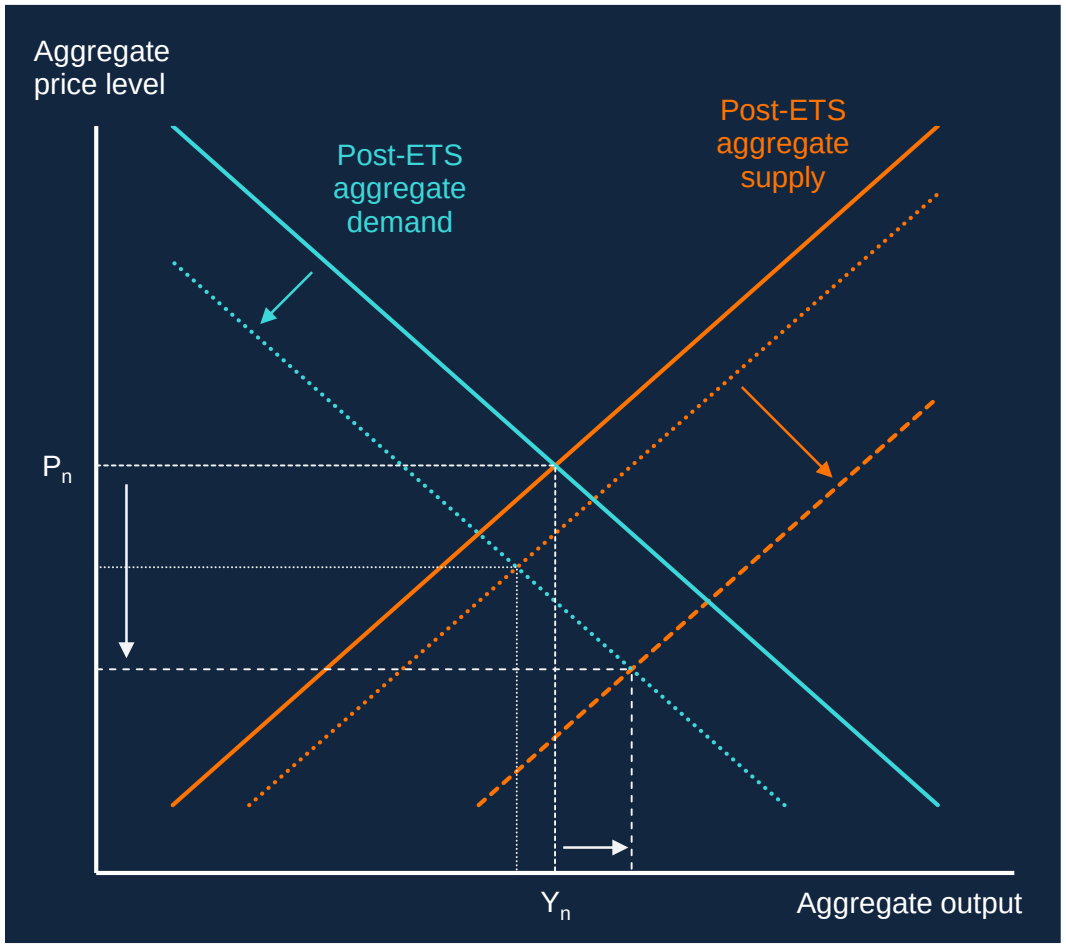
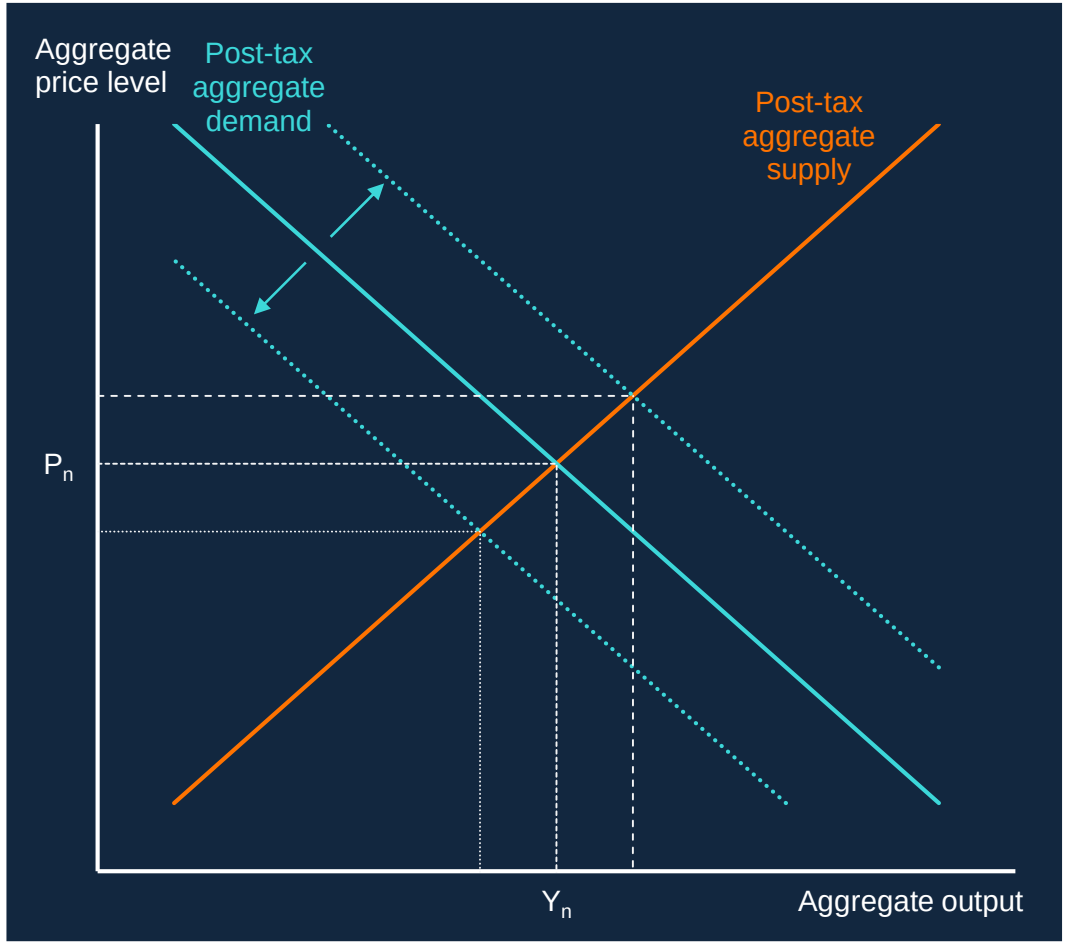


(b) ETS

Perturbations look different under different policy regimes

Compared to the carbon tax regime, the same shock under an ETS will induce a larger change in prices and an attenuated or even opposite response in aggregate output



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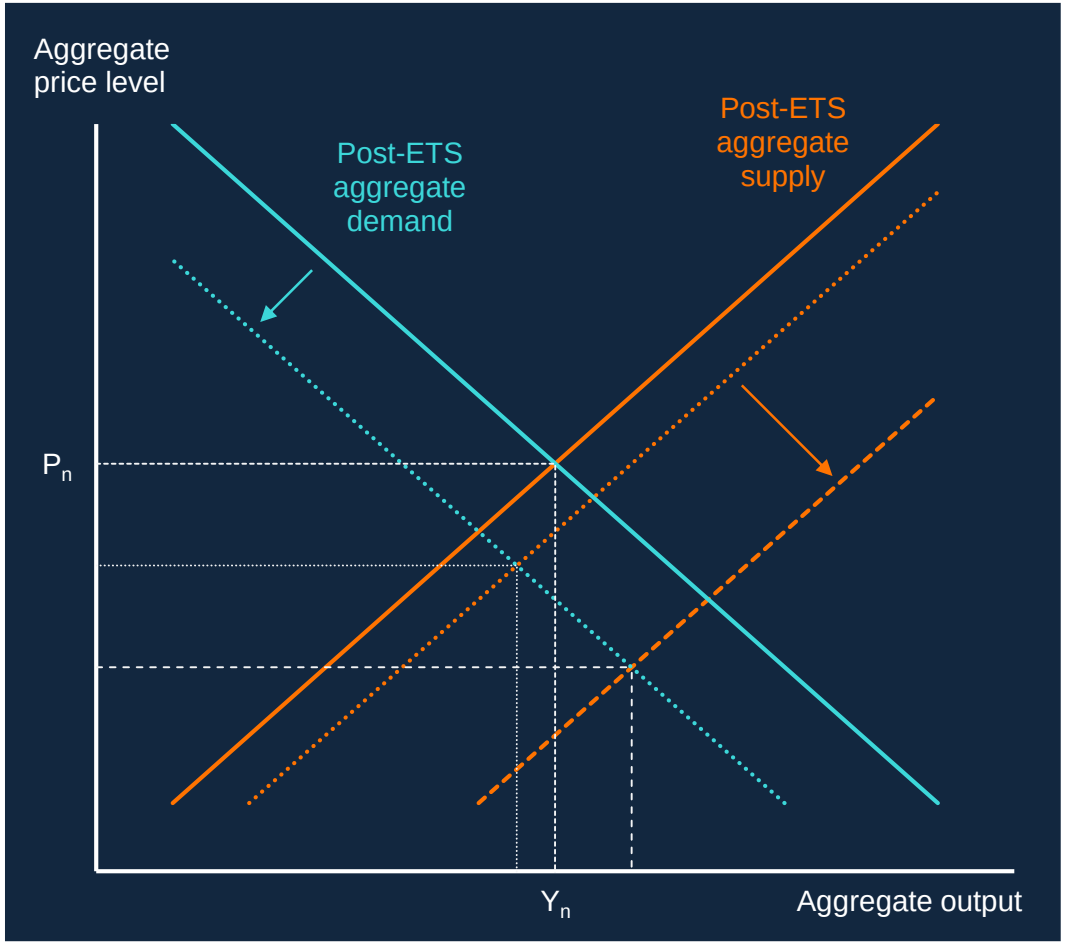
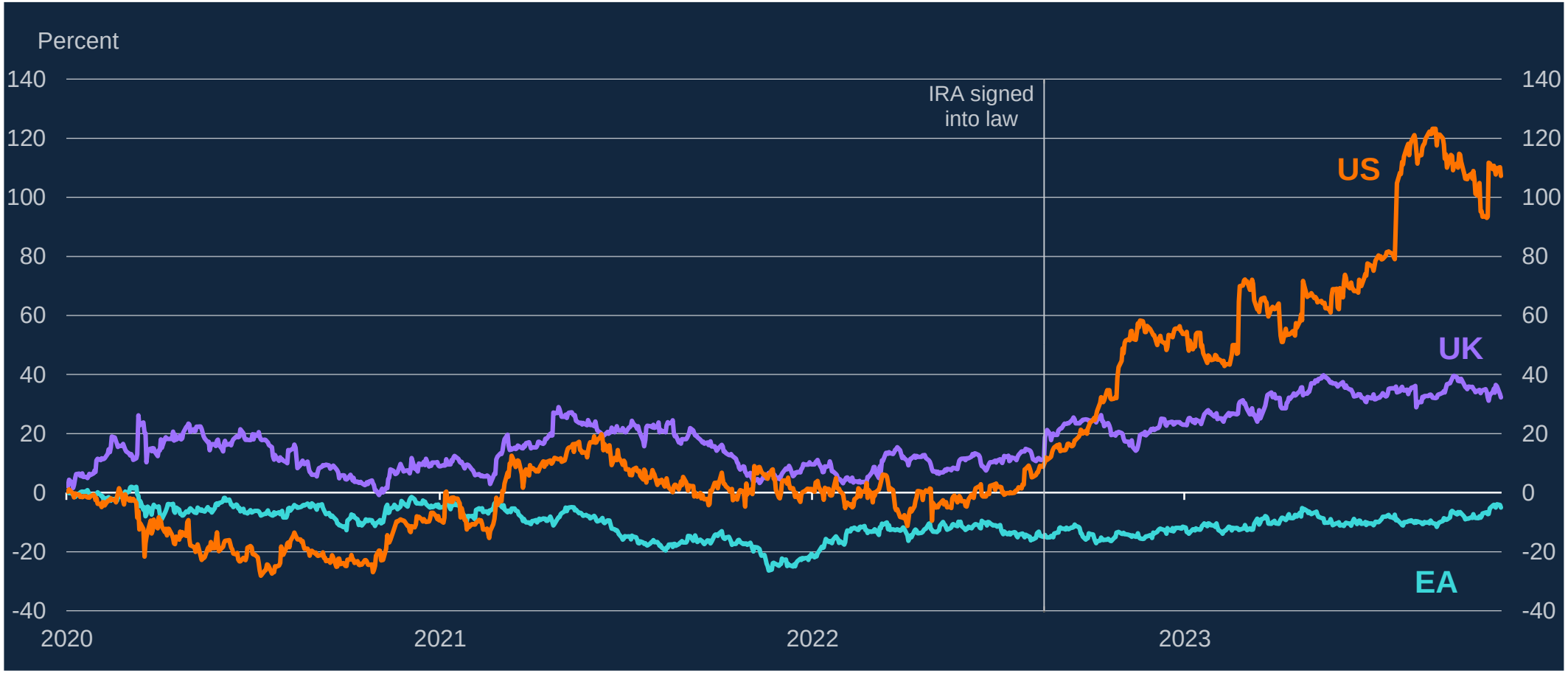


(b) ETS

The IRA has supported US construction industry outperformance

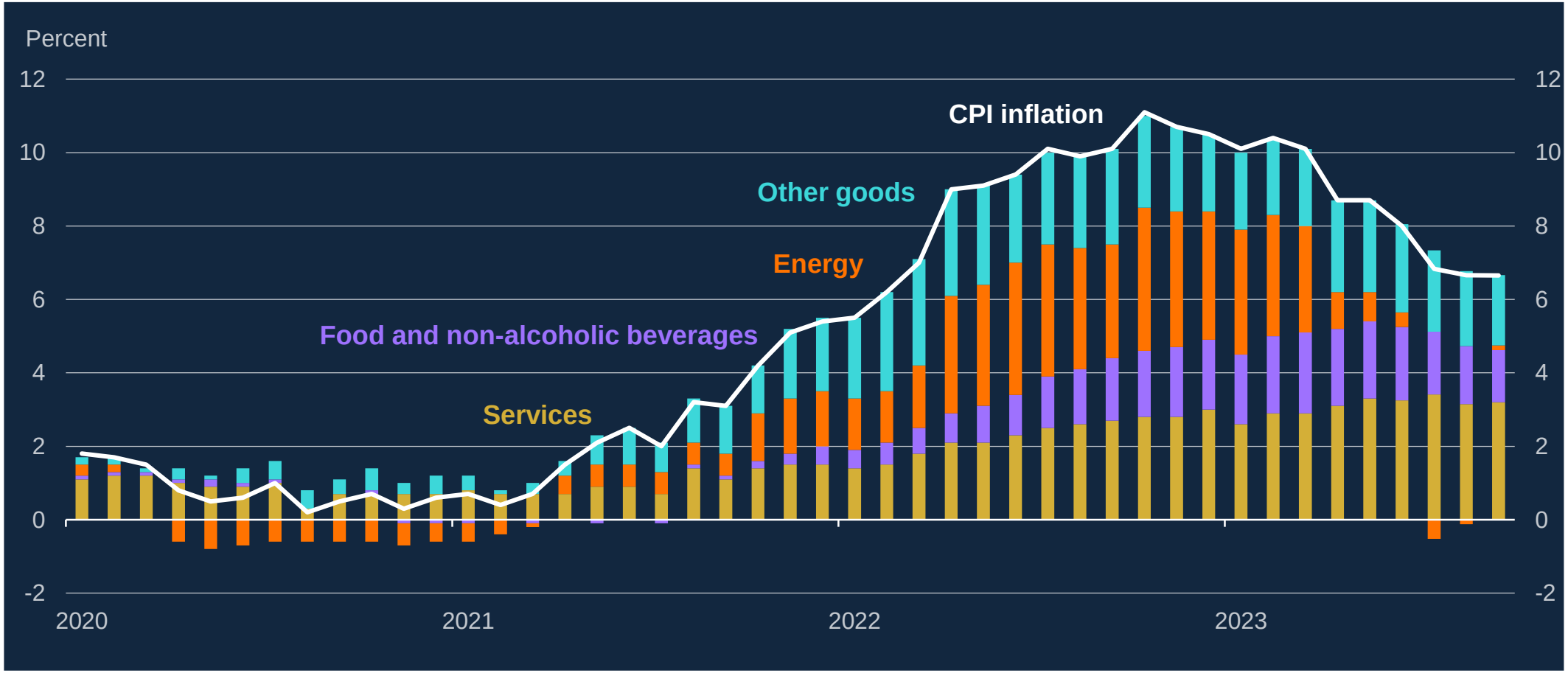
Equity price performance of construction sector relative to the market



Source: LSEG Datastream

Shocks to widely-used intermediate goods can have pervasive and long-lasting effects across all goods and sectors

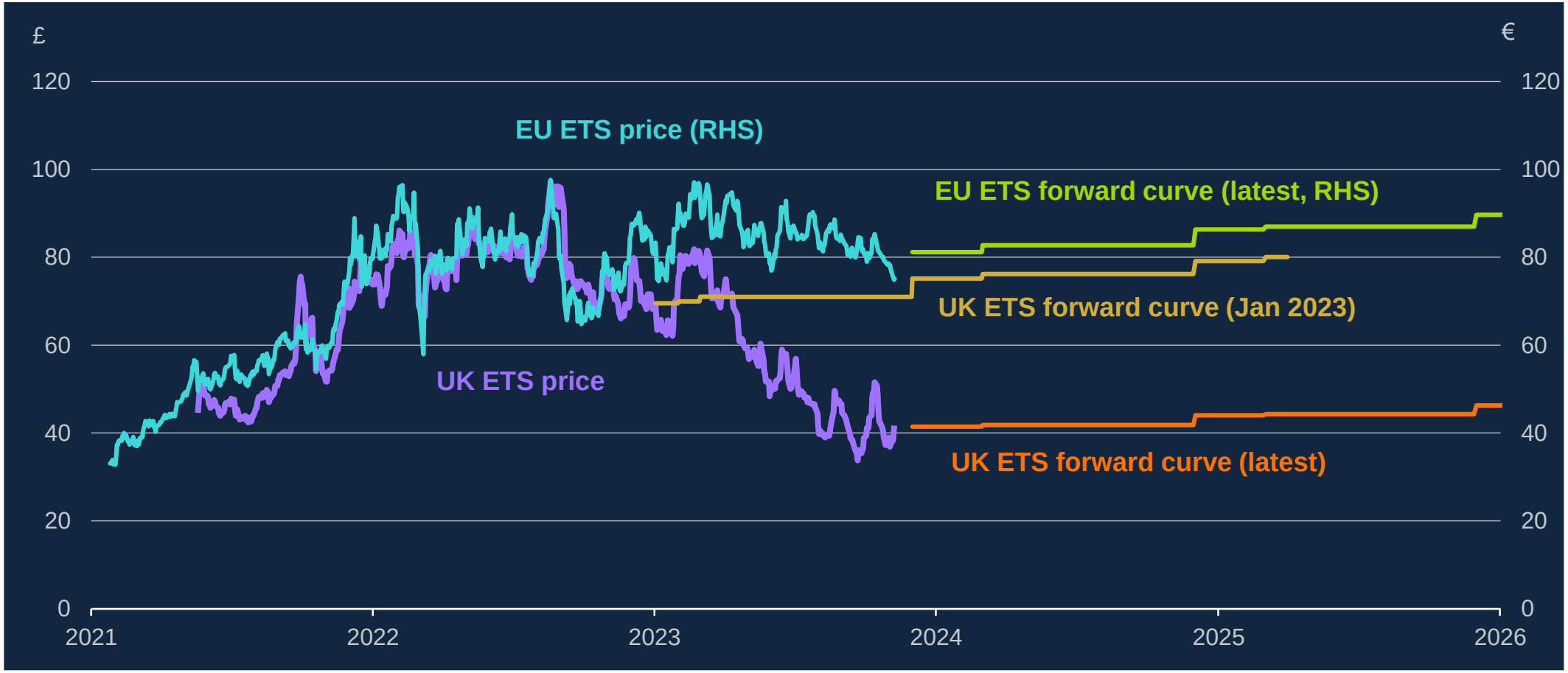
Contributions to annual consumer price inflation



Source: **November 2023 Monetary Policy Report**.

UK ETS prices have reversed their 2021-2022 increases

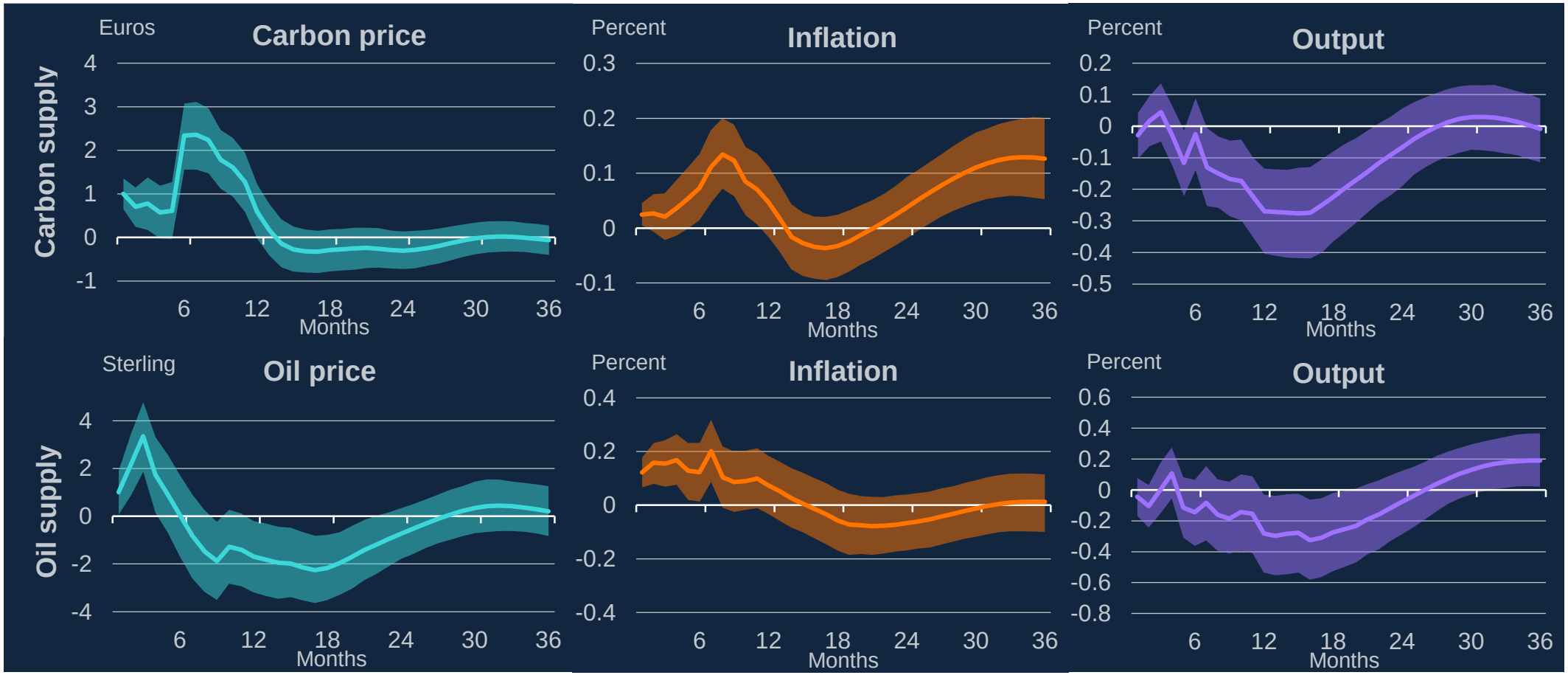
UK and EU Emissions Trading System spot and futures prices



Source: LSEG Datastream and Bank calculations

Carbon price shocks are more persistent and volatile than oil price shocks

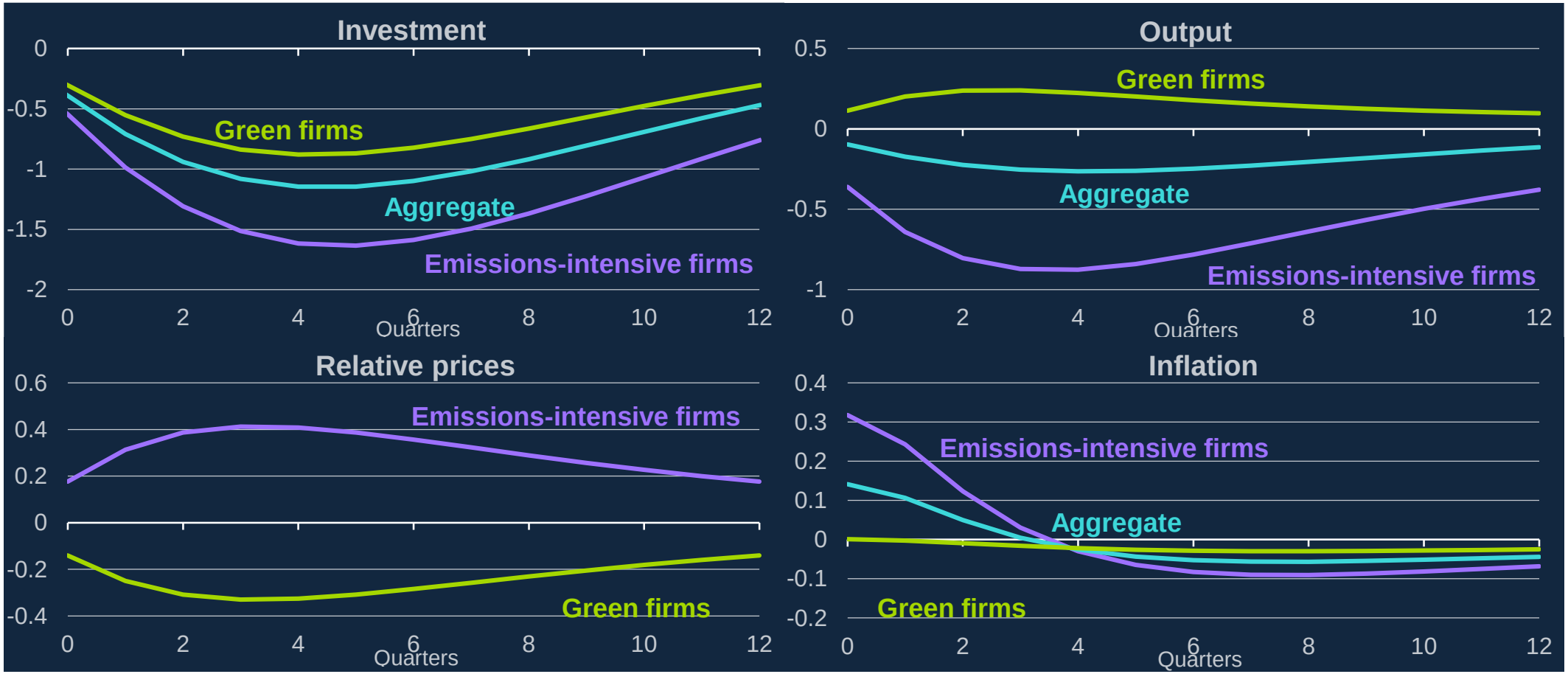
Impulse response functions to a carbon policy supply shock



Source: Bank calculations

Inflation rises after a carbon price shock, driven by the rising costs of emissions-intensive goods

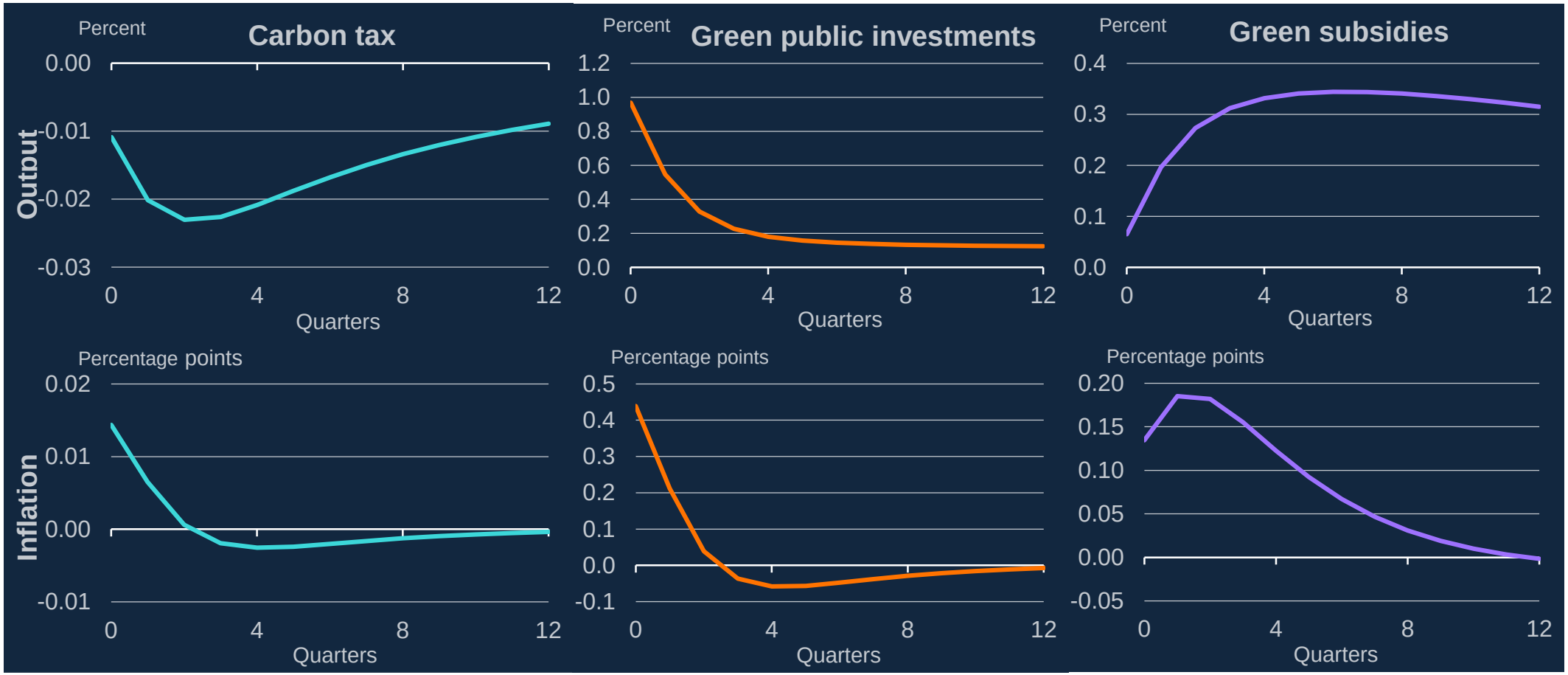
Impulse response functions to a carbon pricing shock



Source: Berthold et al. (2023)

Green investment and subsidies transmit as positive demand shocks, carbon taxes resemble a negative supply shock

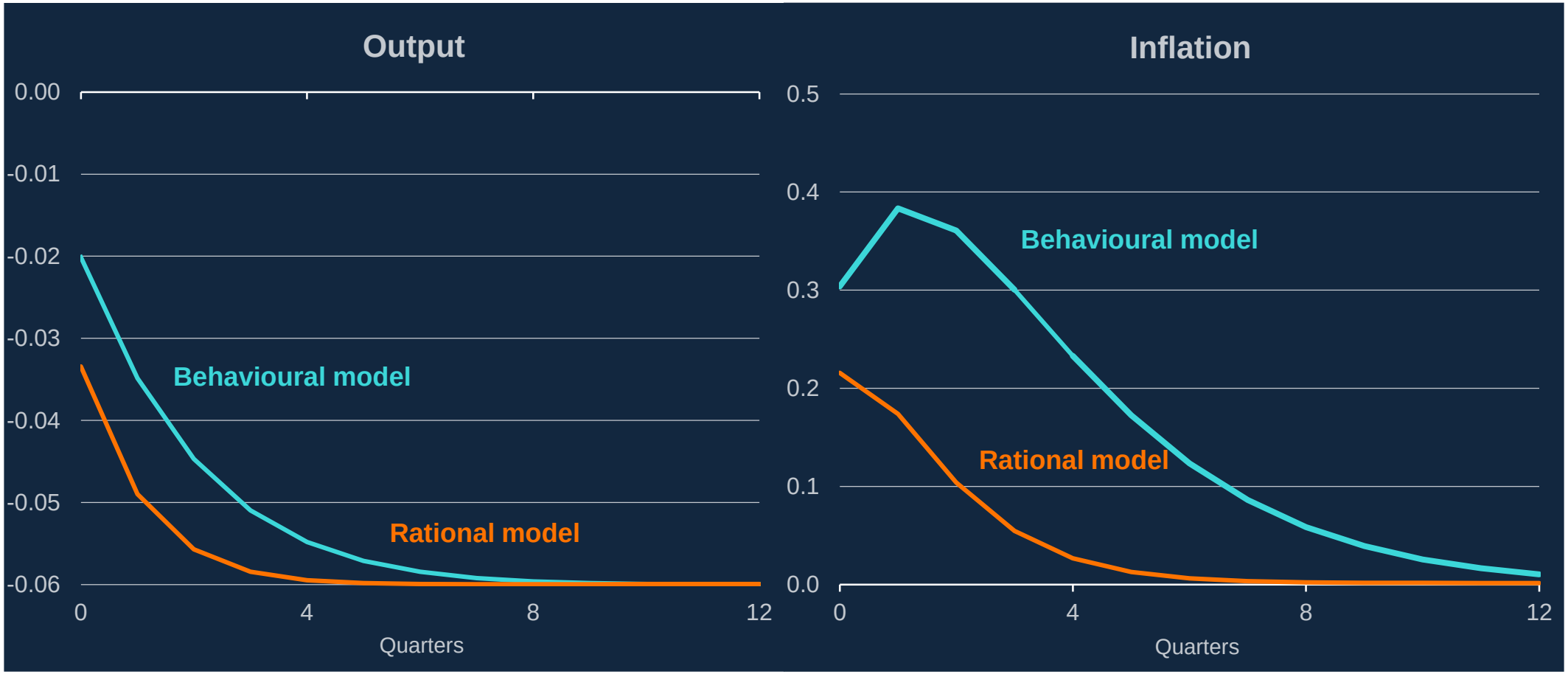
Impulse response functions to different climate policy shocks



Source: Diluiso (2023)

Fully rational agents more fully internalise the hit to permanent incomes from a permanently higher carbon price

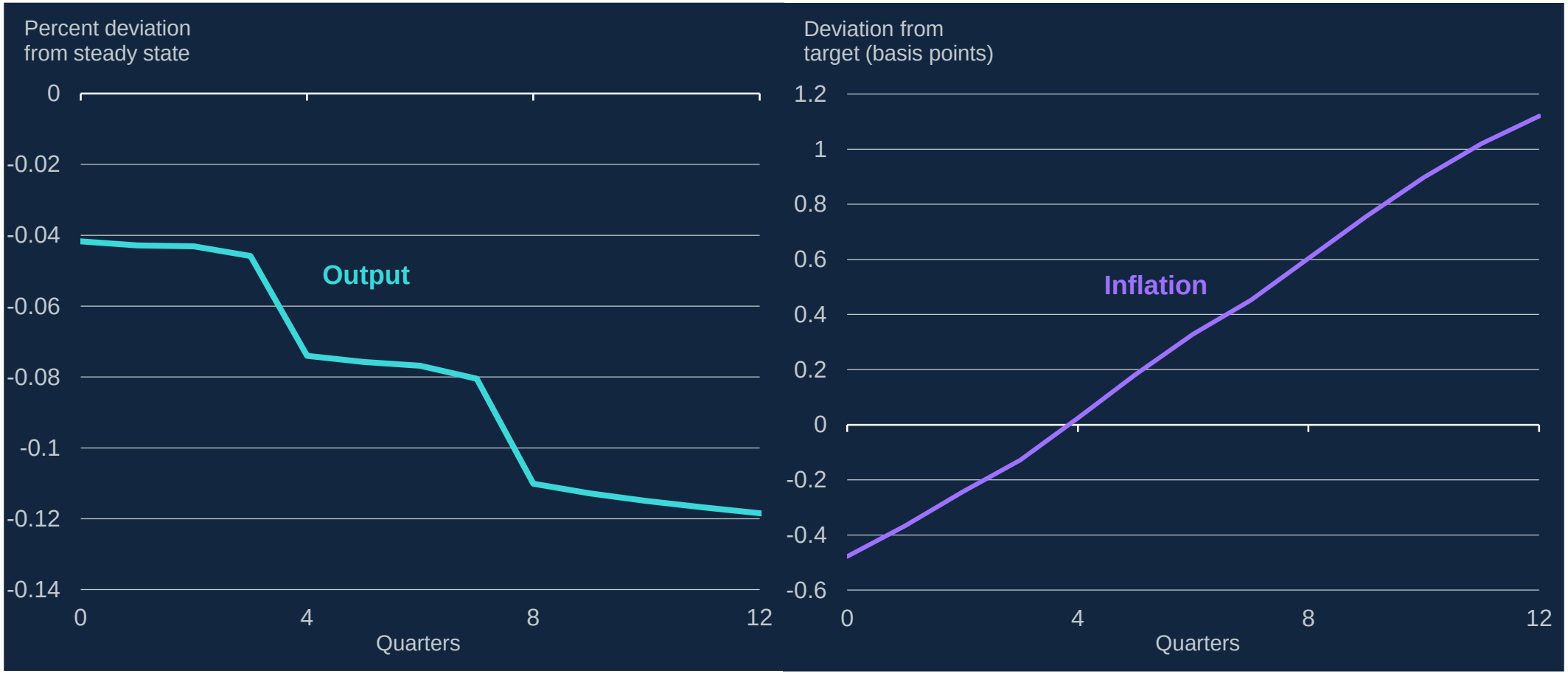
Impulse response functions to a permanent increase in carbon price



Source: Annicchiarico, Di Dio, and Diluiso (2022)

Under rationally inattentive agents, upwards inflationary forces become persistent, as their expectations are slow to react

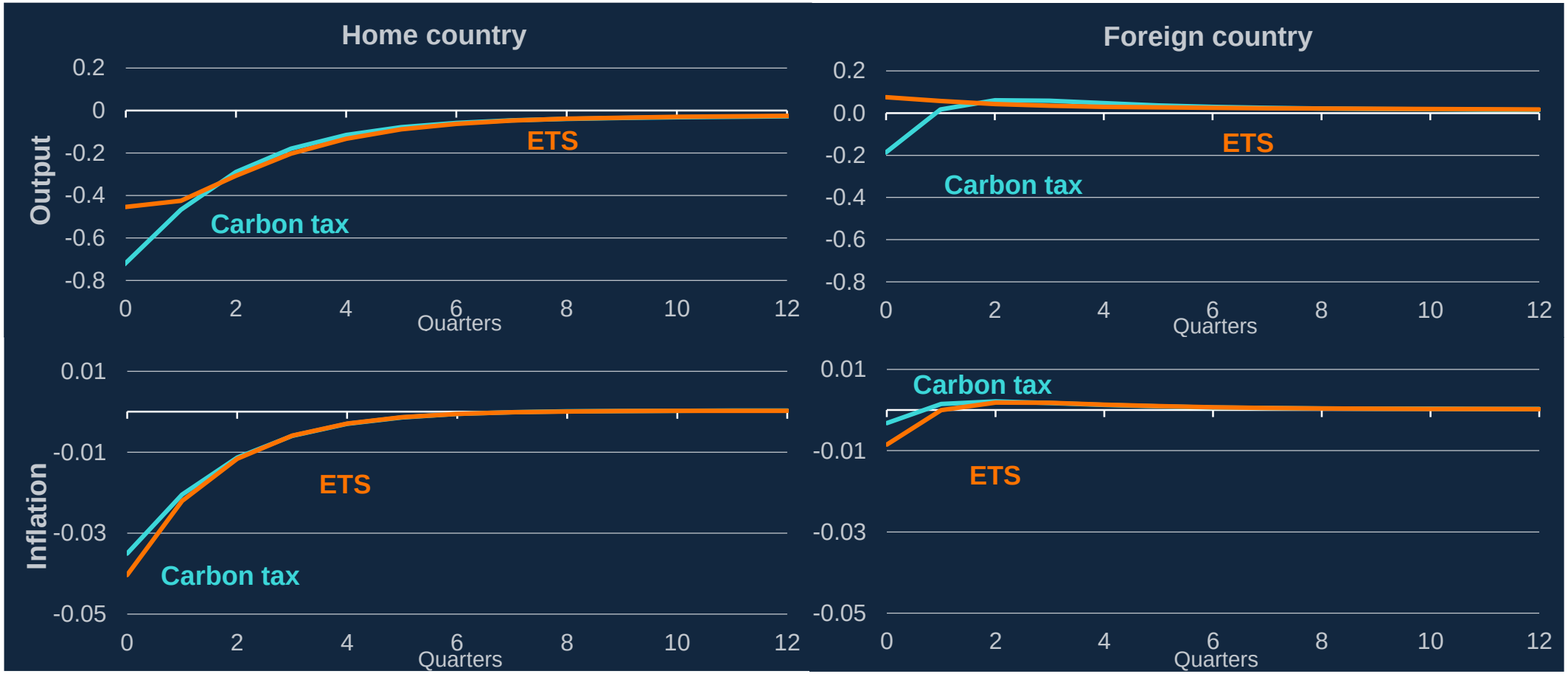
Impulse response functions to a sequence of permanent increase in carbon prices with rationally inattentive agents



Source: Naylor (2023)

Monetary policy shocks transmit differently under a carbon tax and ETS

Impulse response functions to a 50 basis point monetary policy shock



Source: Annicchiarico and Diluiso (2019)

Concluding thoughts

- **Inflation persistence**
  - Is higher under carbon price shocks than under oil price shocks
- **Inflation volatility**
  - Is elevated in the case of an ETS system relative to a carbon tax
- **Inflation is higher**
  - If agents are boundedly rational or inattentive
- **Heterogenous climate policies**
  - Generate spillovers that affect the transmission of a monetary policy shock
- Many related policies, e.g. redistribution, funding of subsidies, will matter for monetary policy decisions