ELABORATION DES COMPTES TRIMESTRIELS DES ÉMISSIONS DANS L'AIR

Roberto Astolfi
Head of EEA Units, SDD, OECD

19ème colloque de l'Association de Comptabilité Nationale 11 et 12 juin 2026

Outline

WHY do we produce Q-AEA

WHO currently produces the Q-AEA

WHAT is the scope of the project

HOW do we estimate Q-AEA

WHY

- Timeliness
- Frequency
- Comparability

WHO

- Production of quarterly emission estimates
  - International Organisations
    - Eurostat
    - IMF
    - OECD
  - National Statistical Offices
    - Netherlands
    - New Zealand
    - Slovenia
    - Spain
    - Sweden
  - Ministries & Energy Agencies
    - Australia
    - Ireland
    - Netherlands

Who does what? Subsidiarity principle

National estimates (NDL, NZL, ESP, SLO, SWE)

Eurostat (EU countries)

OECD (OECD non–EU countries)

IMF (Rest of the World)

International cooperation
Joint methodological development

Task Team of IOs (est. 2021)

- Avoid duplication of efforts
- Share common methodology and experiences

Possible approaches

Direct approach

- Same methodology as for annual data
- Year is the sum of the four quarters
- Requires complete information set at Q

Indirect approach

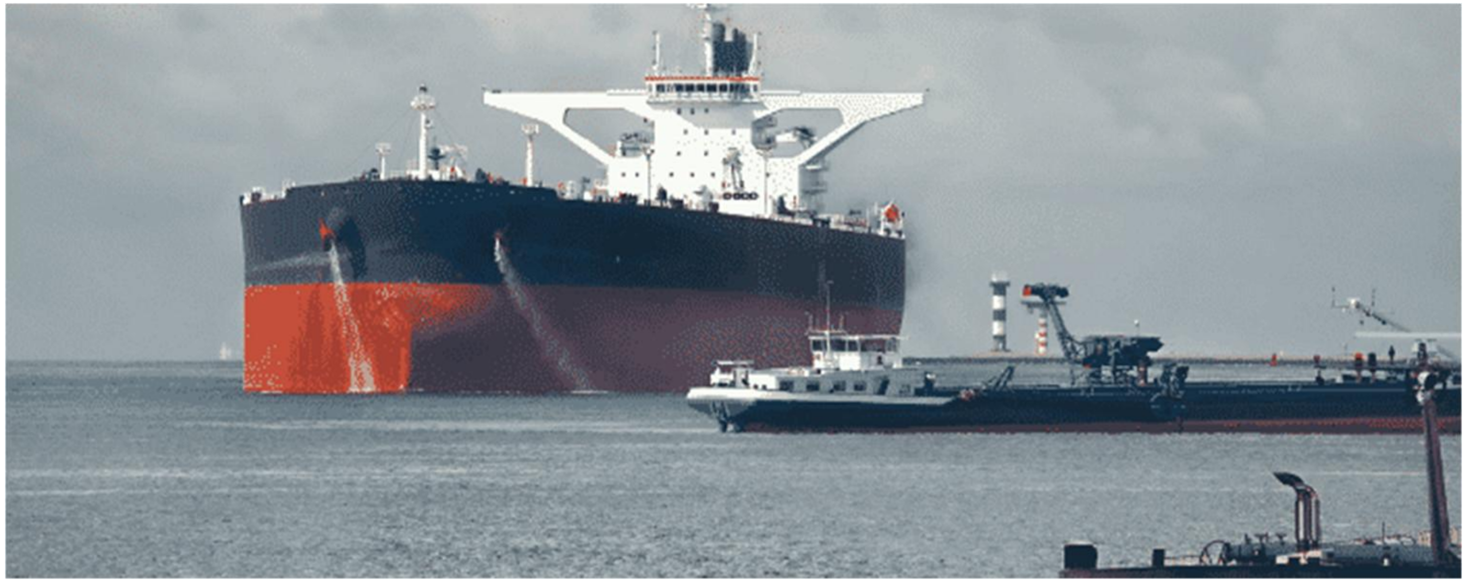
- Quarters are estimated by interpolating the in-sample annual figures and extrapolating out of sample
- Accounting constraint are imposed-> S quarters = annual value

Combination of direct and indirect

- Some aggregated may be estimated directly while others indirectly

Direct approach

OECD databases on air emissions from **air and maritime transport**

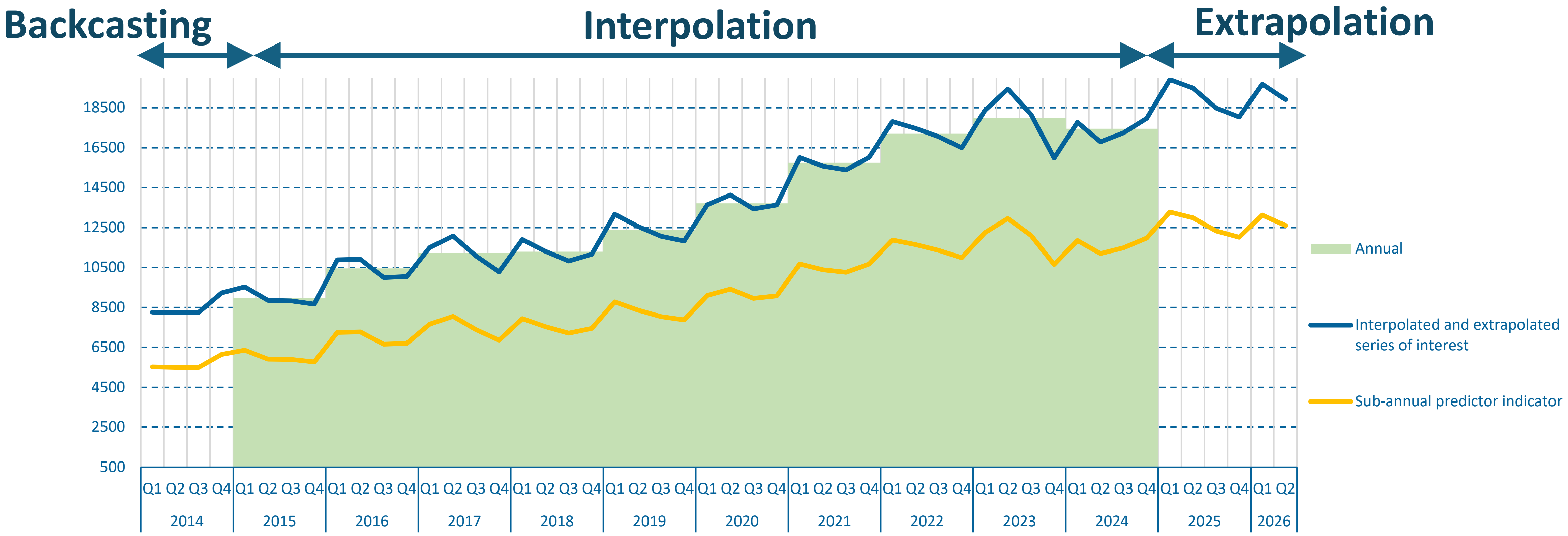


Estimates based on monthly data

Quarters = Σ Months

Annual = Σ Quarters

Indirect approach



Estimates are based on quarterly predictor-indicators

Important conceptual distinction

Temporal disaggregation

- **Intuition:** Annual known, quarterly to be estimated
- Sub-annual data (predictor-indicators) are of **different nature** from the annual
- Y: Value added of ISIC-C M: industrial production
- Estimate missing information

Benchmarking (univariate or multivariate)

- **Intuition:** Quarterly known but the aggregated annual values do not match with known annual data. Adjustment needed to eliminate the discrepancies
- Time series data measure the **same target variable**
- **But at different frequencies** (e.g. Y & Q) and with different levels of accuracy
- Eg: VAT reported monthly or quarterly vs annual
- Eliminate discrepancies and constrains the Q series to match the Y

Reconciliation

- Both temporal and contemporaneous (accounting) constraints

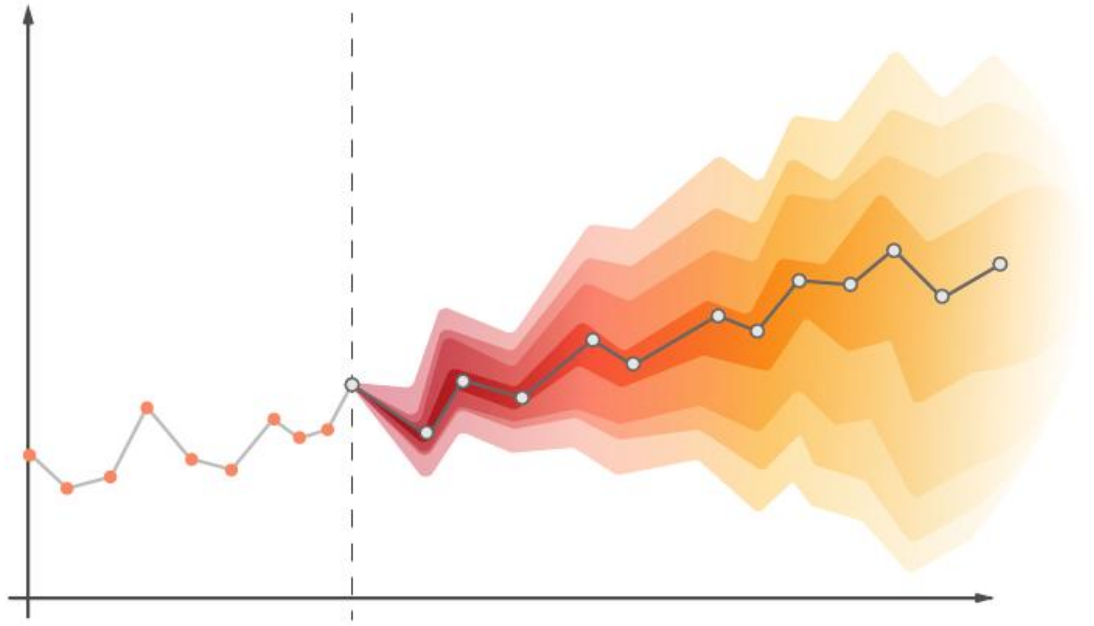
Performance at the end of the sample

<u>Cholette Dagum</u> proportional method

Most accurate extrapolations

when the indicator and the annual

benchmarks move along the same trend.



<u>Denton proportional</u> and **<u>Chow-Lin</u>**
regression-based

May perform better when the quarterly

indicator temporarily deviates from the

target series.

- *Source:* M. Marini (2016)

Identification of predictor-indicators

Candidates typically include:

- Quarterly National Accounts
  - Value added by ISIC/NACE activities

    (Not all countries have a complete set of QNA)
  - Final consumption expenditure of households
- Real Indicators
  - Index of Industrial Production
  - Turnover in wholesale and retail trade
- Energy data
  - Electricity generation by type of energy
- Emissions by air and maritime transport (OECD databases)
- Deterministic variables (e.g. constant or linear trend)

How to select the predictor-indicators?

- The **true** relationship between emissions and predictor-indicators is:
  - **Unknown** at the quarterly level
  - Only observable at the **annual** level

Criteria

- Economic plausibility
- Highest correlation

Estimation strategy: Bottom-up & indirect approach

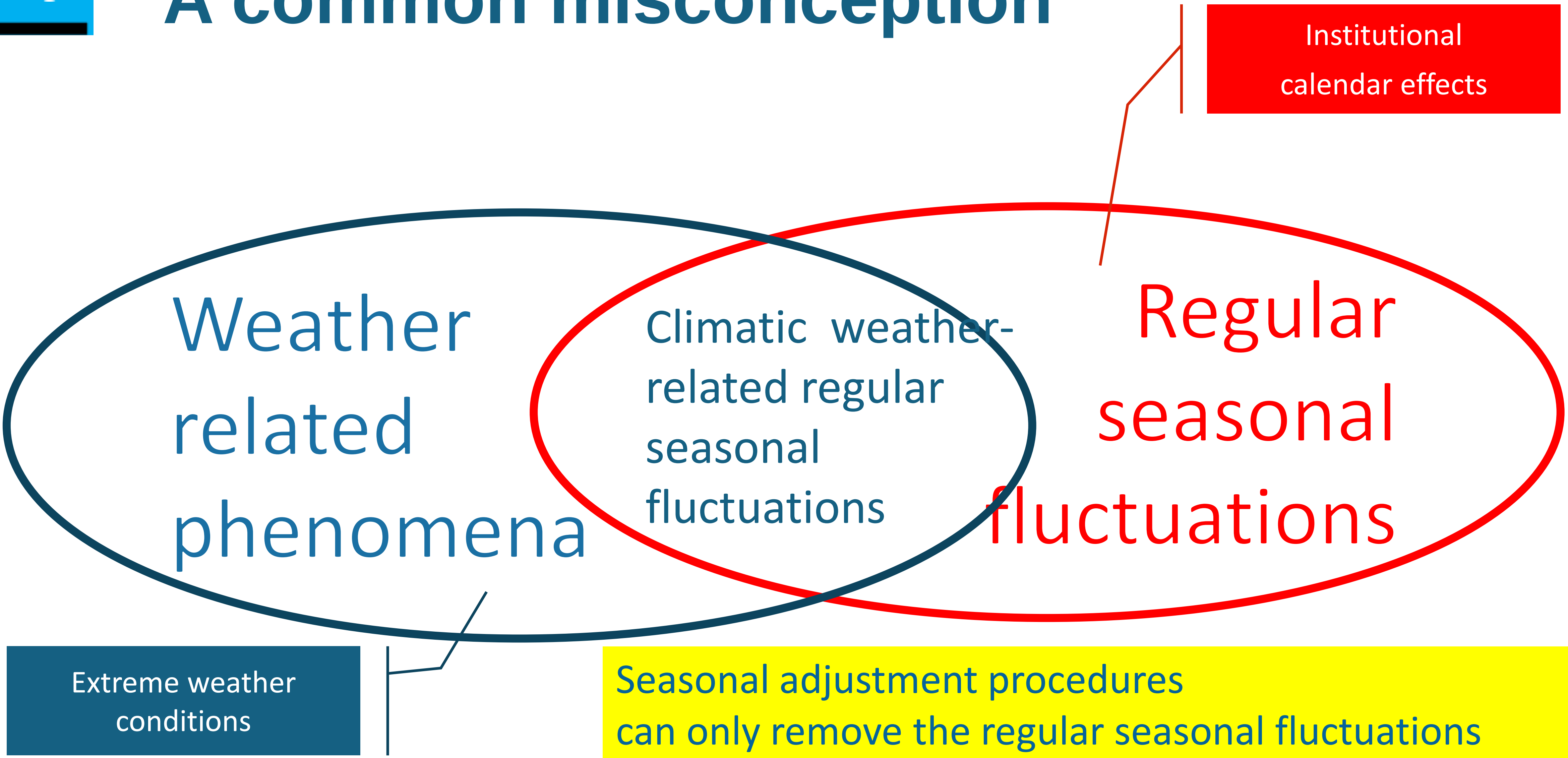
- For each ISIC (section/division) & pollutant
  - **Seasonal adjustment:** predictor-indicators (monthly if available)
  - **Temporal disaggregation:** Double → Actual and SA predictor-indicators
    - Preserve the annual constraints
- Lower-level series → aggregate levels (from child to parent)

Seasonal adjustment and weather normalisation

Actual (unadjusted/raw) time series can be broken down into four main elements:

Long-term trend (T)	Cycle (C)	Seasonal (S)	Irregular (I)
		• Regular natural • institutional • the calendar effects	• extreme weather conditions • outliers

A common misconception



Seasonal adjustment procedures
can only remove the regular seasonal fluctuations

Seasonal Adjustment Practices

- Statistical SA (X-13 / TRAMO-SEATS):
  - New Zealand, Australia (in transition), UK (hist.)
- No SA / alternative adjustments:
  - Ireland, Spain, Netherlands, Slovenia
- Tools:
  - JDemetra+ (Desktop App & R packages), X-13 ARIMA-SEATS

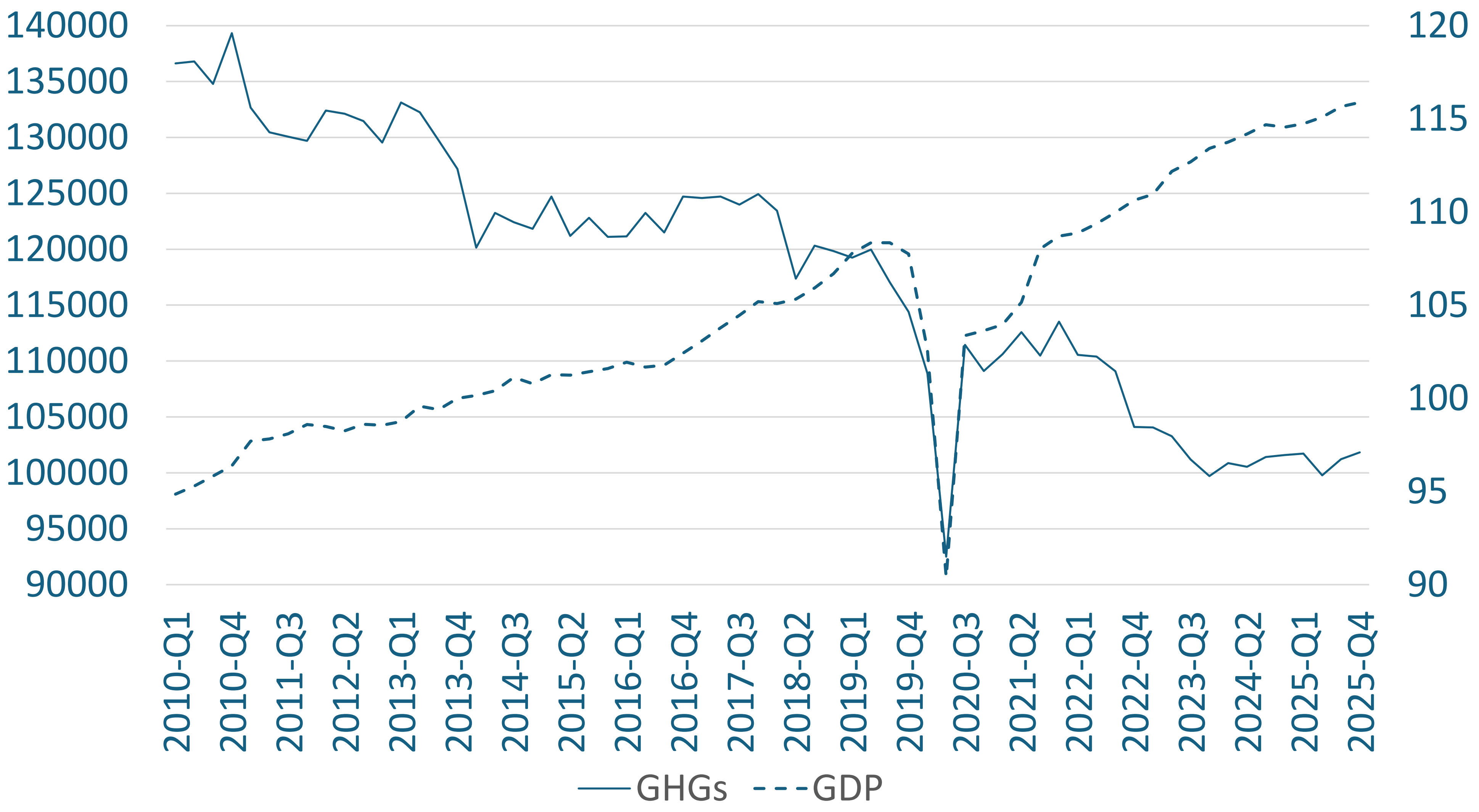
Weather & Physical Adjustments

- Distinct approaches:
  - Weather normalisation (regression): Australia
  - Physical adjustment (temperature): Sweden
- Features:
  - Heating/cooling degree days used
  - Adjusts for extreme or anomalous weather effects
- Contrast with standard SA (removes regular seasonality only)

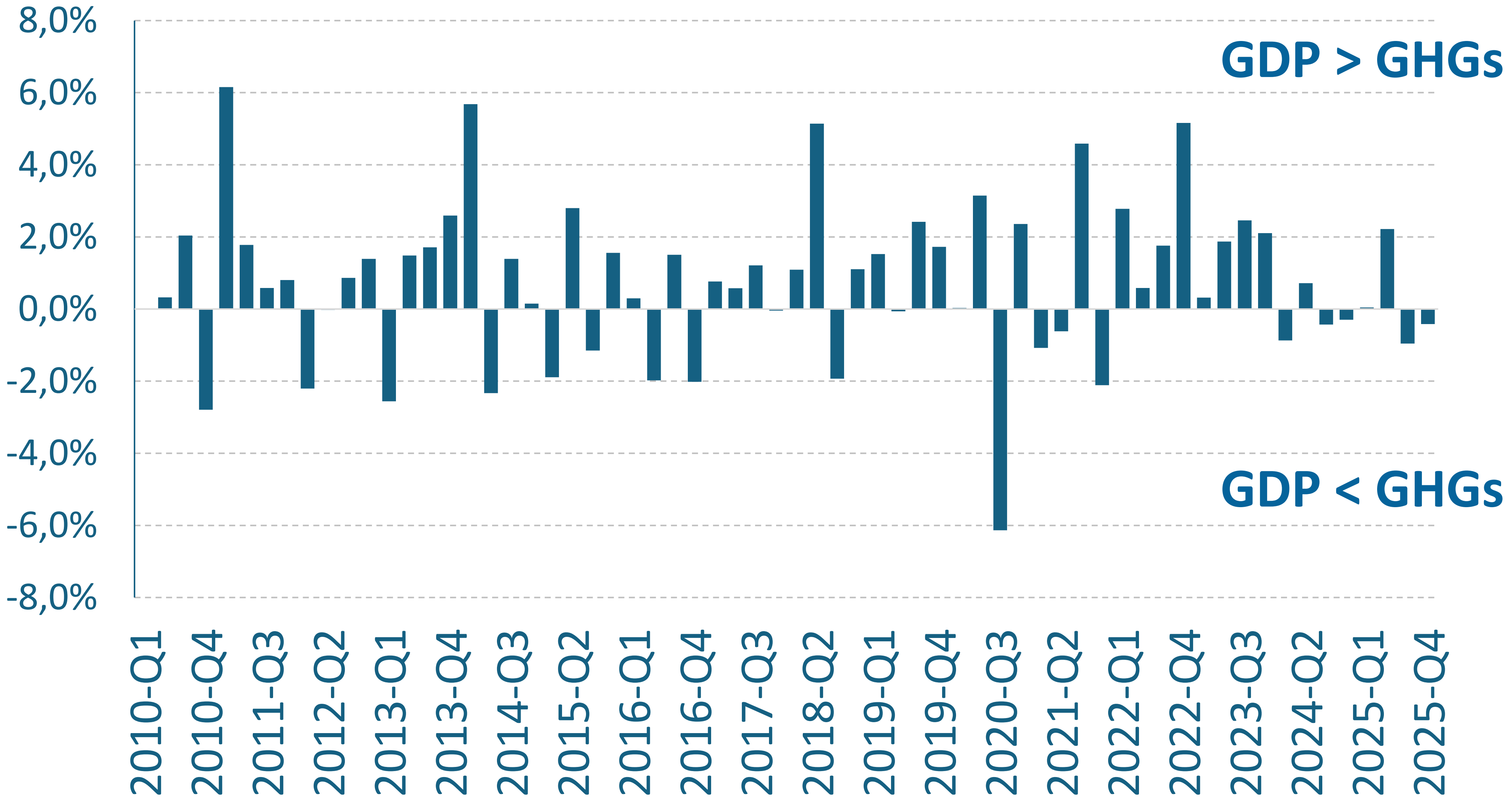
Methodological differences

- Australia
  - (SEASABS approach): Moving average + regression
  - Explicit weather correction
- UK / NZ
  - (X-13 ARIMA):Model-based time series
  - Limited use of external regressors
- Key distinction:
  - Weather-normalised vs purely statistical SA outputs

GHGs vs GDP levels, France, 2010Q1 - 2025Q4

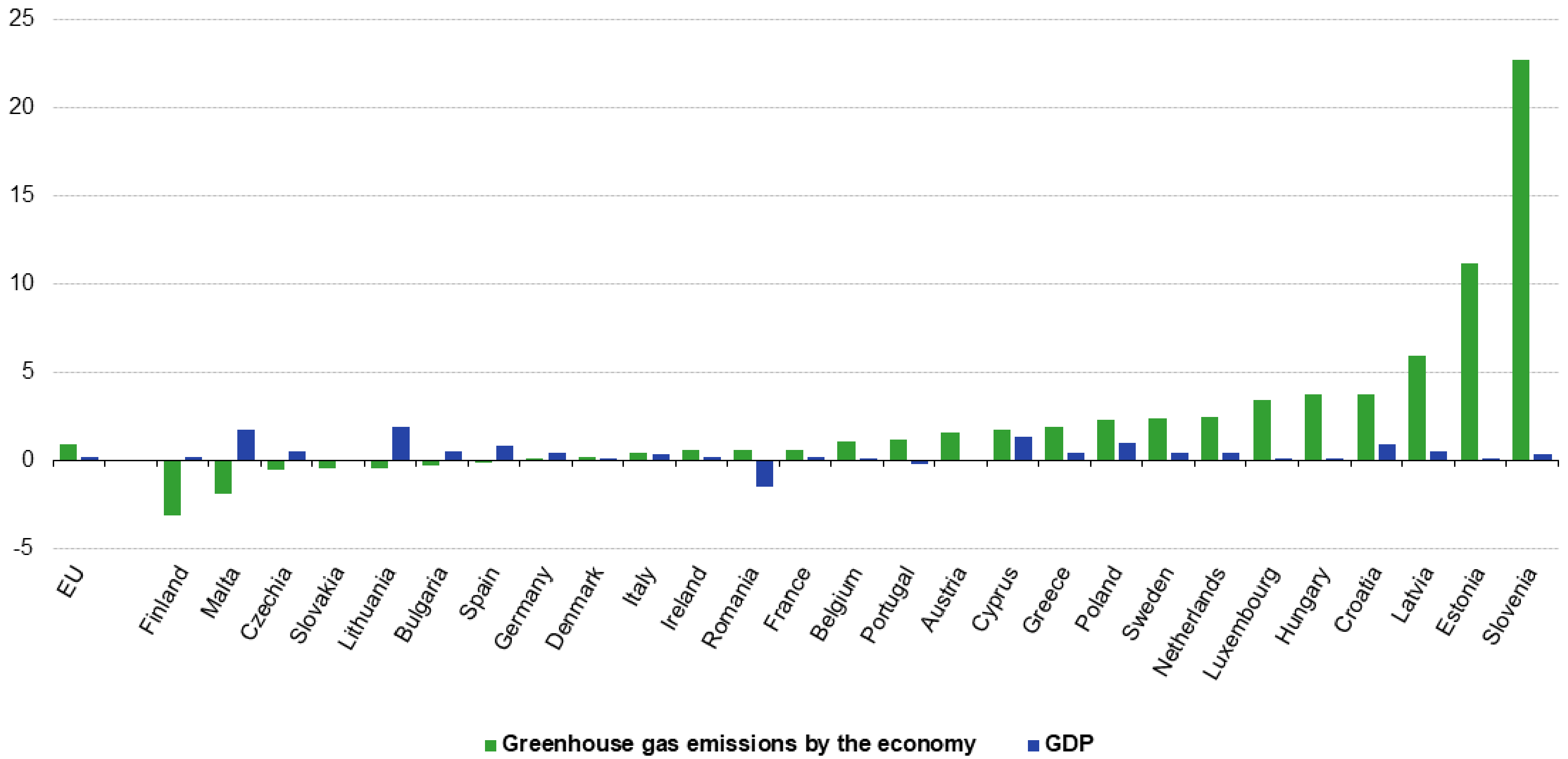


GHGs vs GDP growth rates, France, 2010Q2 - 2025Q4



GDP vs GHGs growth rates, EU

Growth rates of greenhouse gas emissions by the economy and GDP, Q4 2025
(% change compared with the previous quarter, seasonally adjusted)



Data are estimated by Eurostat, except for the Netherlands, Slovenia and Spain

Source: Eurostat (online data code: env_ac_aigg_q, namq_10_gdp)

eurostat

Summary

- Purpose (WHY)
  - Improve timeliness, frequency, and comparability of environmental-economic data
- Production system (WHO)
  - Coordinated international effort: NSOs, Eurostat, OECD, IMF
  - Subsidiarity and strong inter-agency cooperation
- Methodological approaches (HOW)
  - Indirect approach (dominant)
  - Selection of predictor-indicators (economic + energy data)
  - Bottom-up estimation by industry and pollutant
  - Annual consistency constraints preserved
  - Seasonal adjustment vs weather normalisation (distinct concepts)
- Main challenges
  - Strengthen predictor identification and selection
  - Enhance granularity
  - Broaden national compilation practice

Thank you!

roberto.astolfi@oecd.org