Development of EXIOBASE 3

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EXIOBASE database framework

A global multi-regional input-output database with a focus on environmentally relevant activities

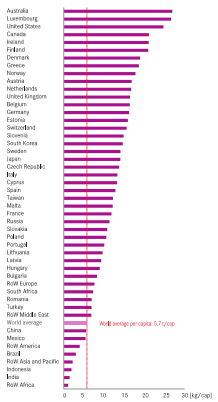
- High sector detail
- Connect to other global environmental databases
- Large amount of environmental satellite accounts
- Within SEEA guidelines

Why?

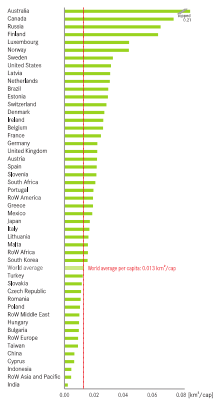
Questions we want to answer:

- Role of consumers?[1]

Carbon footprint per capita



Land footprint per capita



Water footprint per capita

[1] Tukker et al 2014. The Global Resource Footprint of Nations. http://bit.do/exiobook

[2] UNEP 2011. Decoupling natural resource use and environmental impacts from economic growth. Paris

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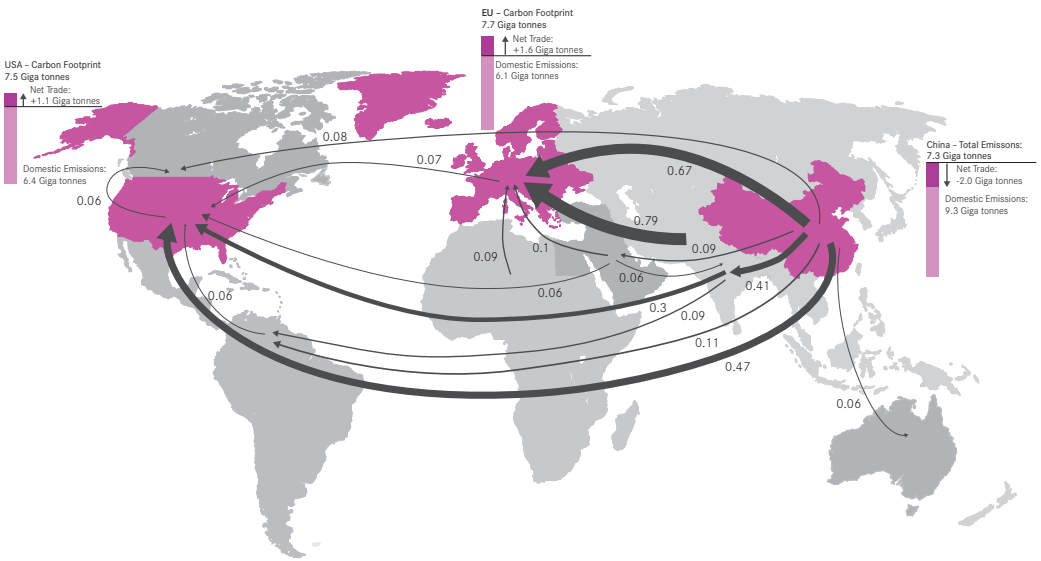
- Role of consumers?[1]
- Where do environmental impacts occur?[1]



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Why?

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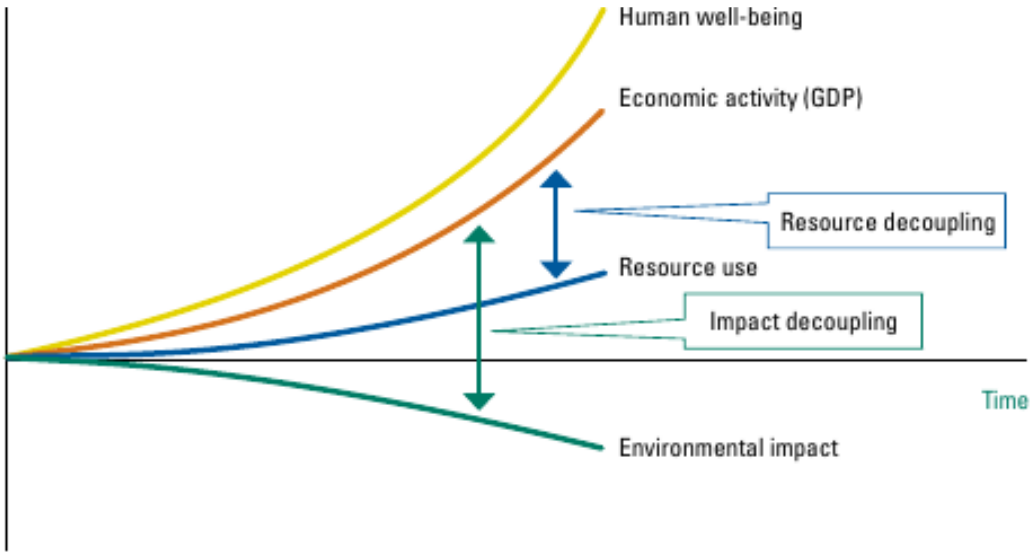
- Role of consumers?[1]
- Where do environmental impacts occur?[1]
- Dynamics/Decoupling?[2]



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EXIOBASE Versions and History

	EXIOBASE 1
Base-years	2000
Products	129
Industries	129
Countries	43 (EU 27 + 16 other)
Rest of the world regions	1
Water accounts	Green and Blue (47 activities)
Material accounts	48 (Used extractions) 48 (Unused extractions)
Energy products (supply/use)	58
Land accounts	14
Social accounts	6 (Employment)
Emissions	26 (combustion)

- EXIOBASE 1 - EXIOPOL (fp6)[1]

  A New Environmental Accounting Framework Using Externality Data and Input-Output Tools for Policy Analysis

[1] Tukker et al. 2013. Exiopol - Development and Illustrative Analyses of a Detailed Global MR EE SUT/IOT. Economic Systems Research 25(1)

[2] Wood et al 2014. Global Sustainability Accounting - Developing EXIOBASE for Multi-Regional Footprint Analysis. Sustainability 7(1)

[3] Stadler et al. in prep

EXIOBASE Versions and History

	EXIOBASE 1	EXIOBASE 2
Base-years	2000	2007
Products	129	200
Industries	129	163
Countries	43 (EU 27 + 16 other)	43 (EU 27 + 16 other)
Rest of the world regions	1	5 (Europe, Asia, Africa, America, Middle East)
Water accounts	Green and Blue (47 activities)	Green and Blue (172 activities)
Material accounts	48 (Used extractions) 48 (Unused extractions)	48 (Used extractions) 48 (Unused extractions)
Energy products (supply/use)	58	59 (emission relevant/gross)
Land accounts	14	15
Social accounts	6 (Employment)	6 (Employment)
Emissions	26 (combustion)	26 (combustion, incl. fd) 11 (non-combustion) 3 (HFC, PFC, SF6)

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- EXIOBASE 2 - CREEA (fp7)[2]

  Compiling and Refining Environmental and Economic Accounts

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EXIOBASE Versions and History

	EXIOBASE 1	EXIOBASE 2	EXIOBASE 3
Base-years	2000	2007	1995 – 2012
Products	129	200	200
Industries	129	163	163
Countries	43 (EU 27 + 16 other)	43 (EU 27 + 16 other)	43 (EU 28 + 16 other)
Rest of the world regions	1	5 (Europe, Asia, Africa, America, Middle East)	5 (Europe, Asia, Africa, America, Middle East)
Water accounts	Green and Blue (47 activities)	Green and Blue (172 activities)	Green and Blue (194 activities)
Material accounts	48 (Used extractions) 48 (Unused extractions)	48 (Used extractions) 48 (Unused extractions)	222 (Used extractions) 222 (Unused extractions)
Energy products (supply/use)	58	59 (emission relevant/gross)	69 (emission relevant/gross)
Land accounts	14	15	15
Social accounts	6 (Employment)	6 (Employment)	14 (Employment per skill level and gender; vulnerable employment)
Emissions	26 (combustion)	26 (combustion, incl. fd) 11 (non-combustion) 3 (HFC, PFC, SF6)	27 (combustion, incl. fd) 28 (non-combustion incl. N/P, waste, agriculture) 3 (HFC, PFC, SF6)

- EXIOBASE 1 - EXIOPOL (fp6)[1]

  A New Environmental Accounting Framework Using Externality Data and Input-Output Tools for Policy Analysis

- EXIOBASE 2 - CREEA (fp7)[2]

  Compiling and Refining Environmental and Economic Accounts

- EXIOBASE 3 - DESIRE (fp7)[3]

  Development of a System of Indicators for a Resource efficient Europe

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[2] Wood et al 2014. Global Sustainability Accounting - Developing EXIOBASE for Multi-Regional Footprint Analysis. Sustainability 7(1)

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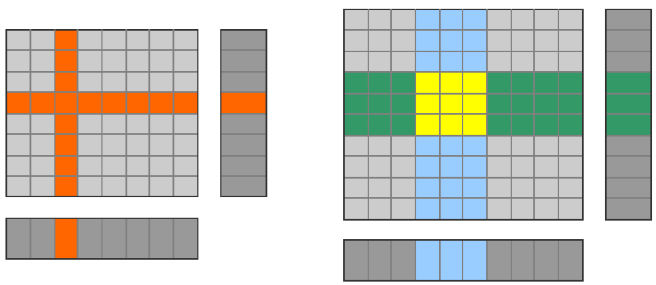
Development decisions

All EXIOBASE versions use SUT in the background.

EXIOBASE 2[1]

- Starting point: National SUT
- Disaggregation based on:
  - Detailed IO/SUT
  - FAOstat (Agriculture)
  - IEA (Energy)
  - Mining databases
  - LCA data
  - ...



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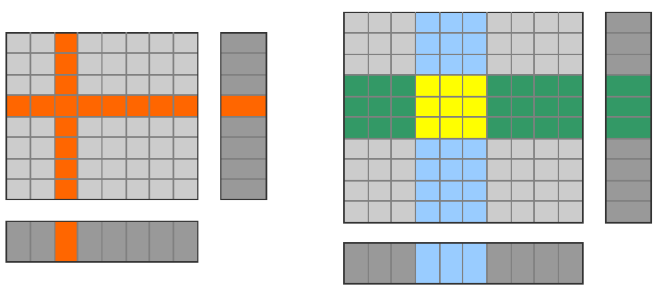
EXIOBASE 3

- Starting point:
  - Macro Economic Time Series
  - EXIOBASE 2 tables
- Structural change based on national SUT/IO



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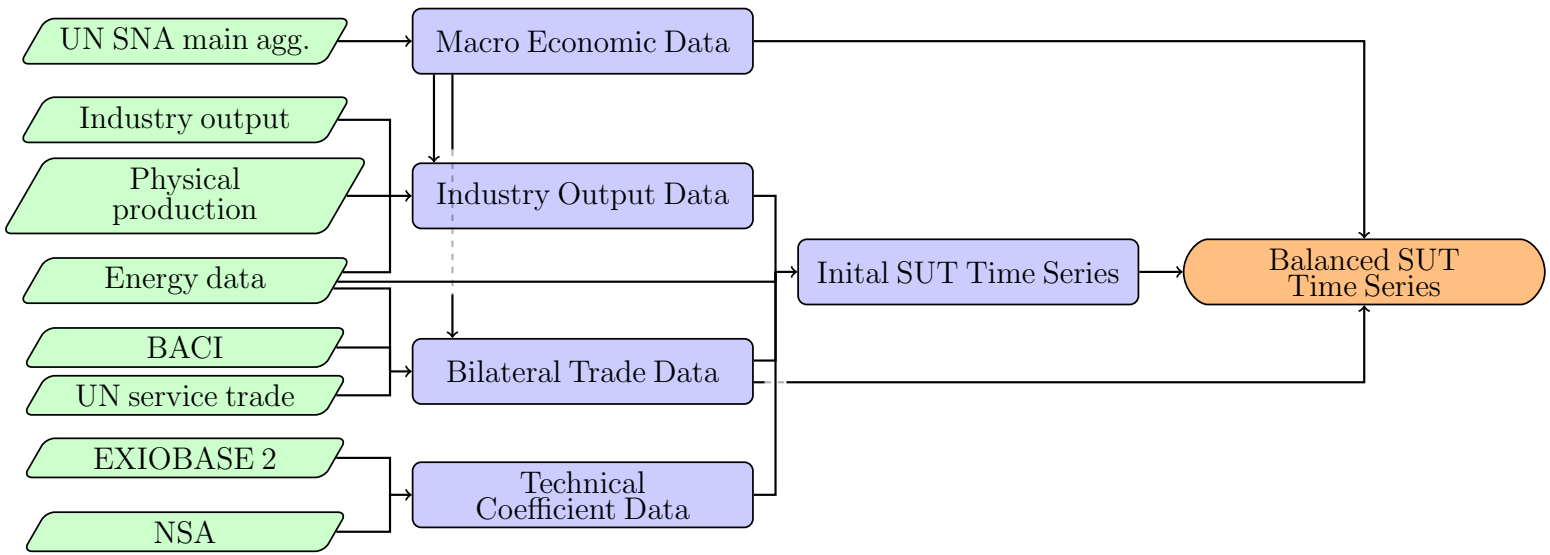
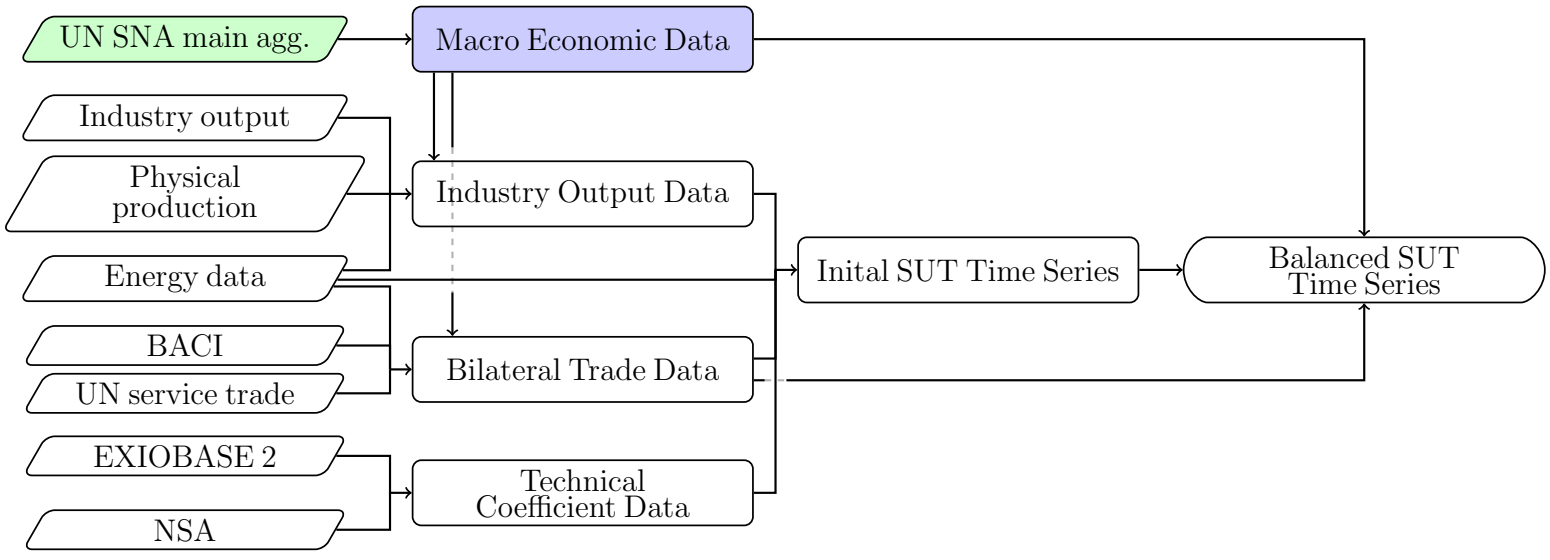
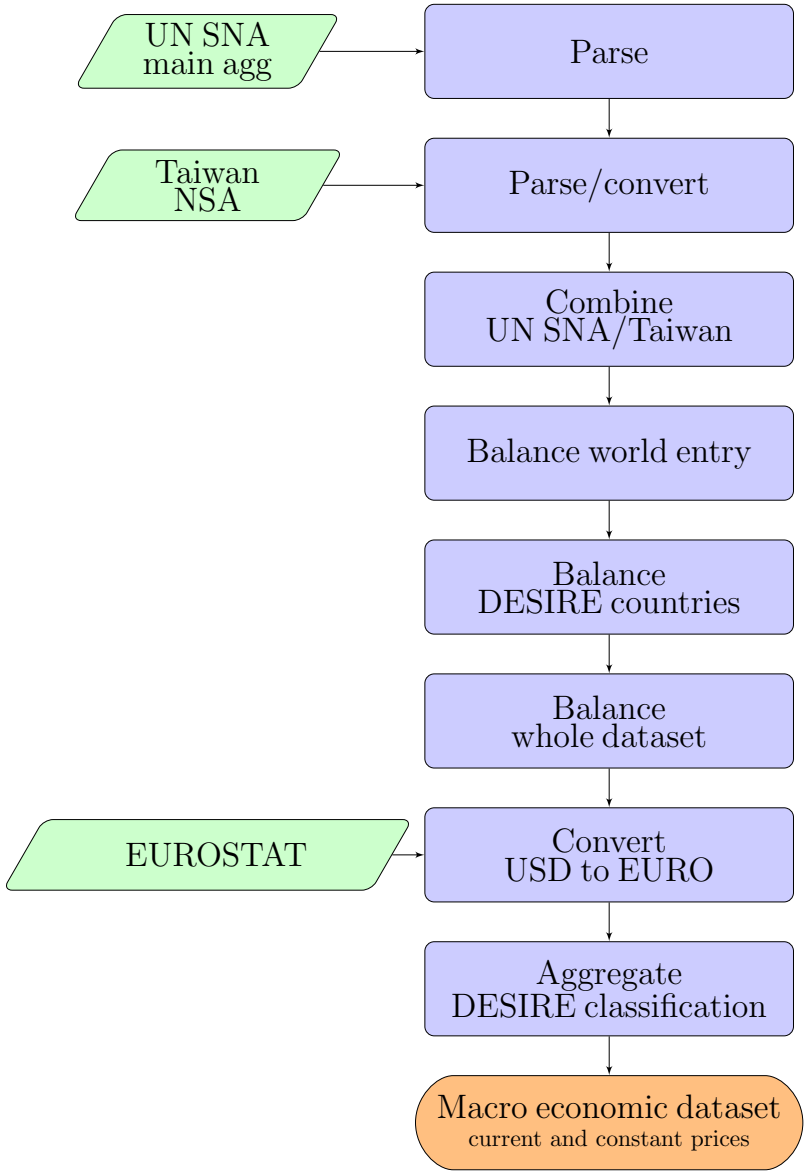
Top - Down approach



Overview



Macro Economic Time Series



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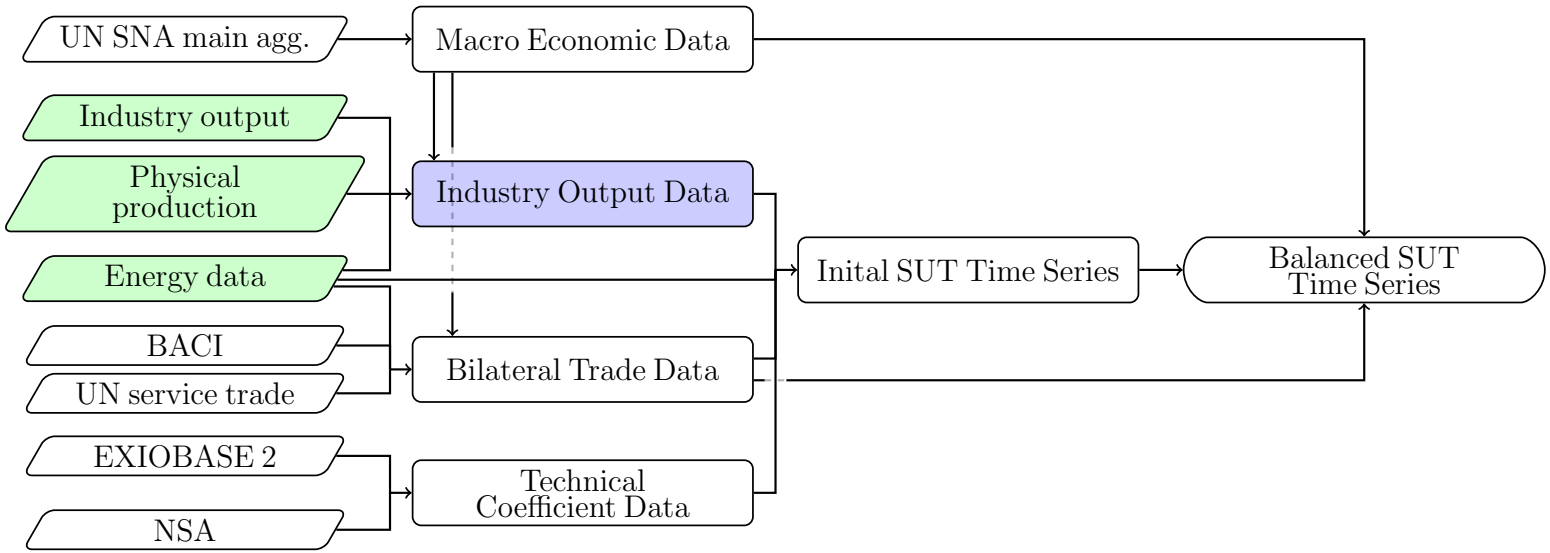
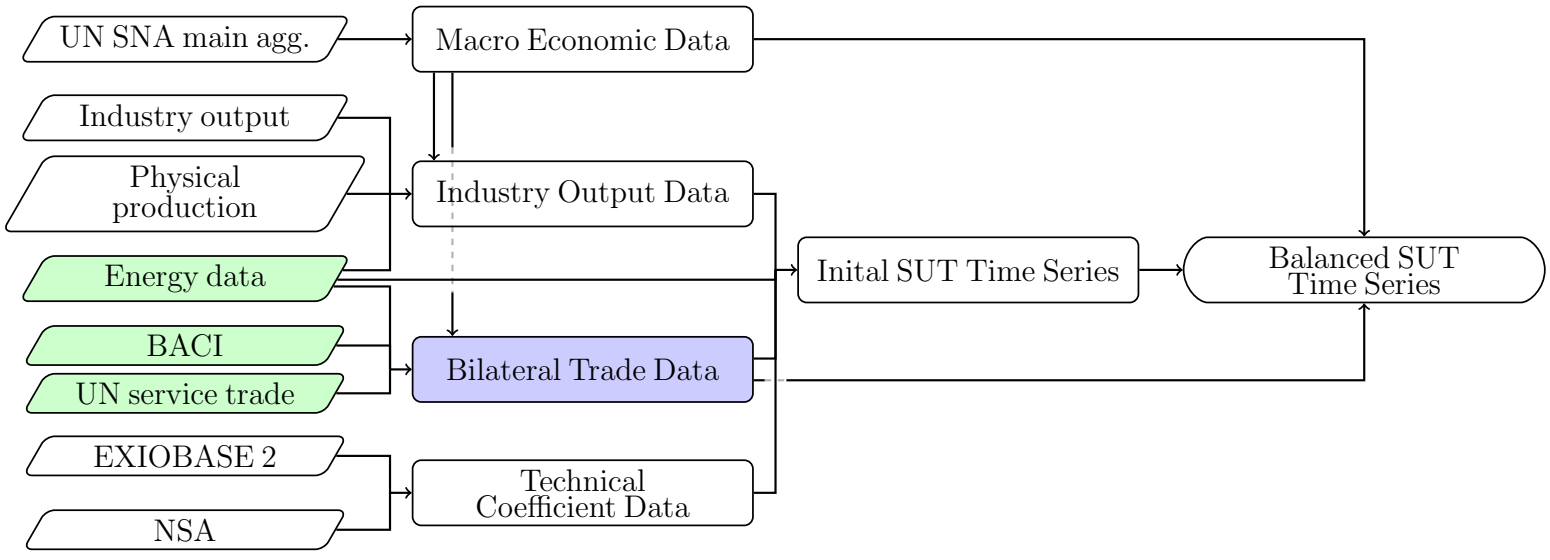


Industry Output

Order	Dataset Name
1	Default assumption based on EXIOBASE2 (mainly for waste products)
2	Selected mining and mineral data*price
3	Product output data from available country national accounts
4	Product output data from available country SUT
5	FAO Monetary data
6	Detailed IEA energy balance data*energy prices
7	Macro database of industry output for 7 product groups

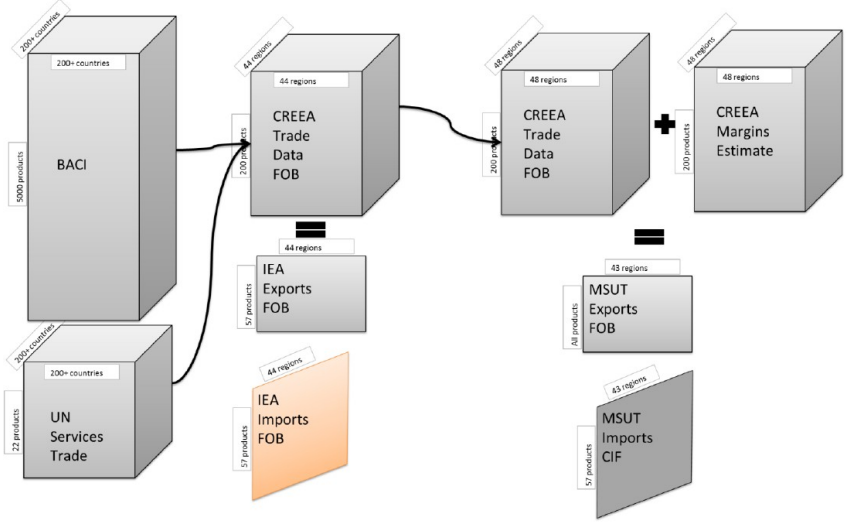
Overview



Trade

Datasources

- BACI (based on UN Comtrade)
- UN service trade
- IEA



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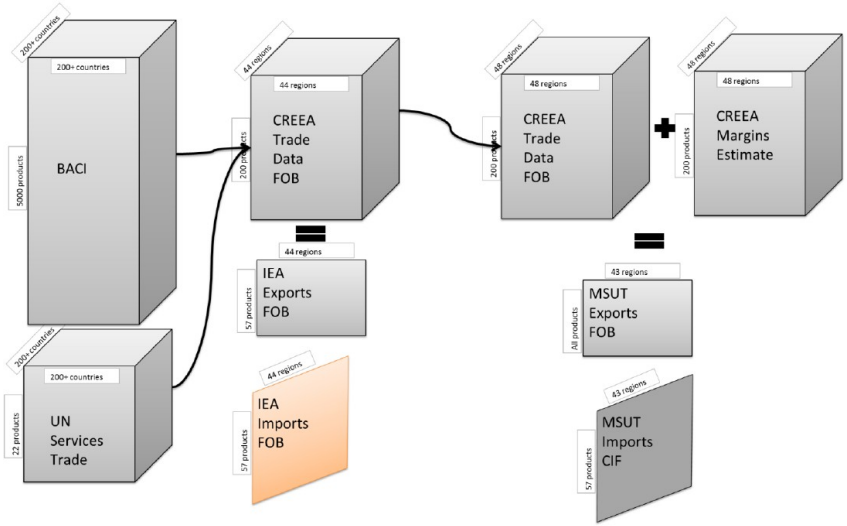
Approach

- Full trade link for every year
- Benchmarked to EXIOBASE 2 base year
- Balancing constrained to the macro-economic trade data



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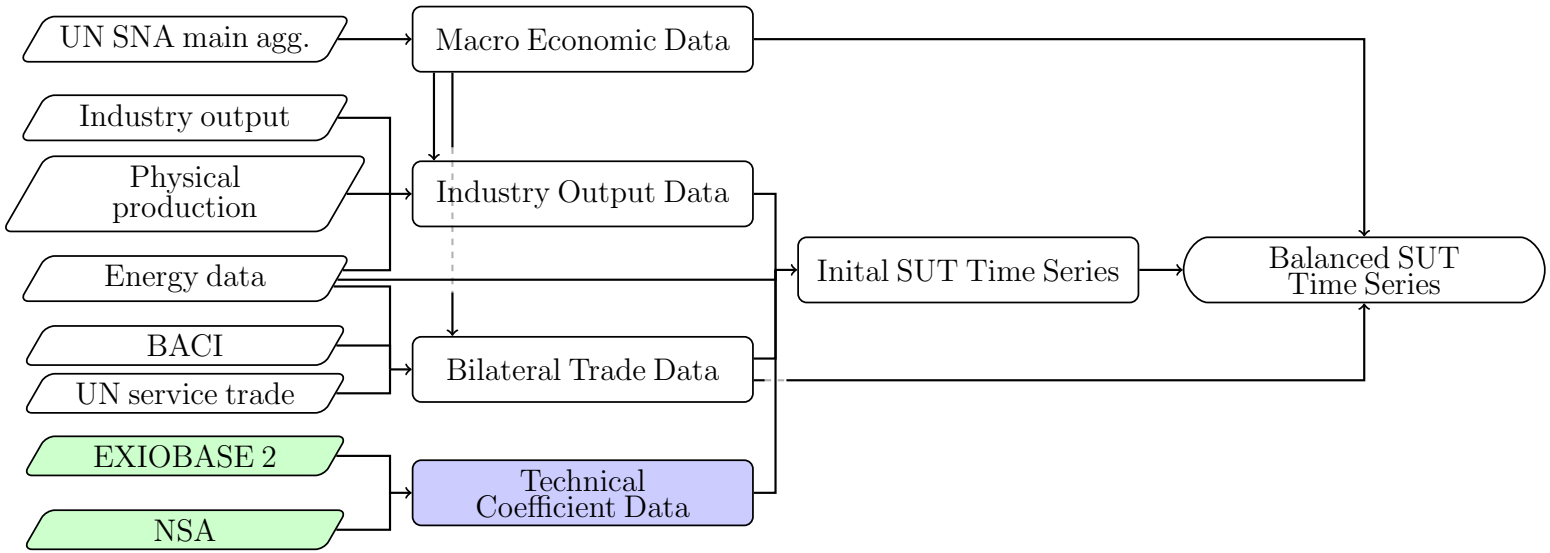

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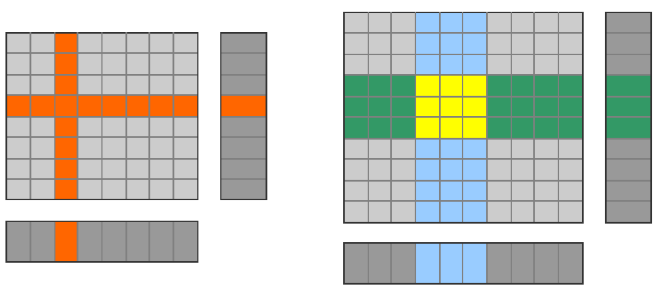

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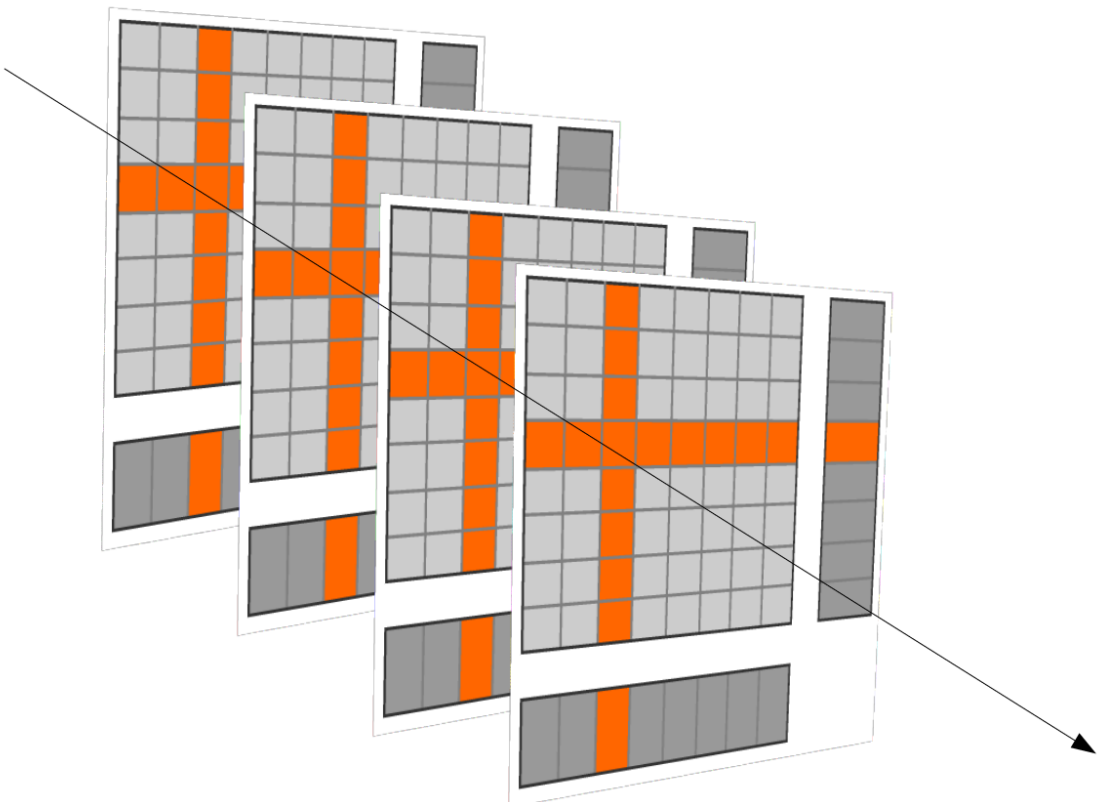
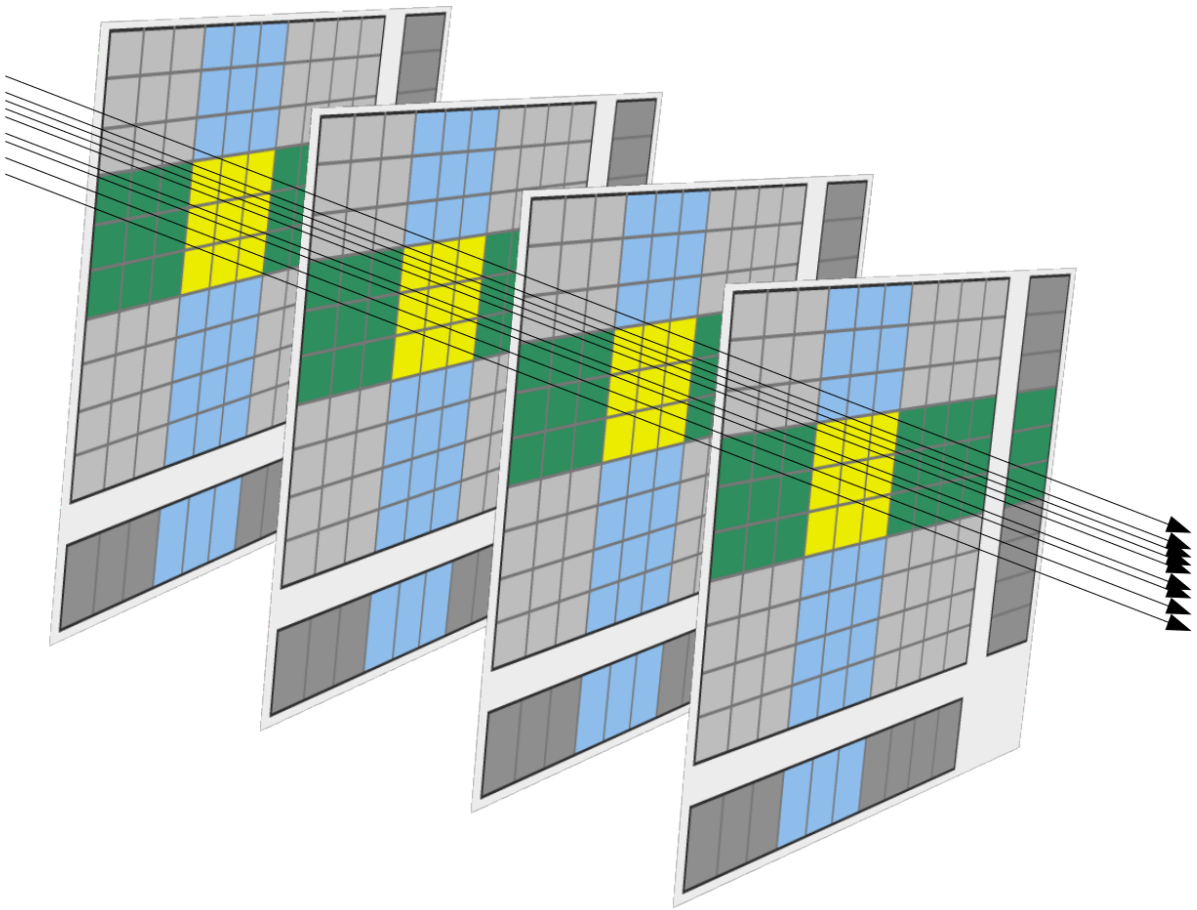
EXIOBASE 3 - structural change

- Structural changes based on national SU/IO tables

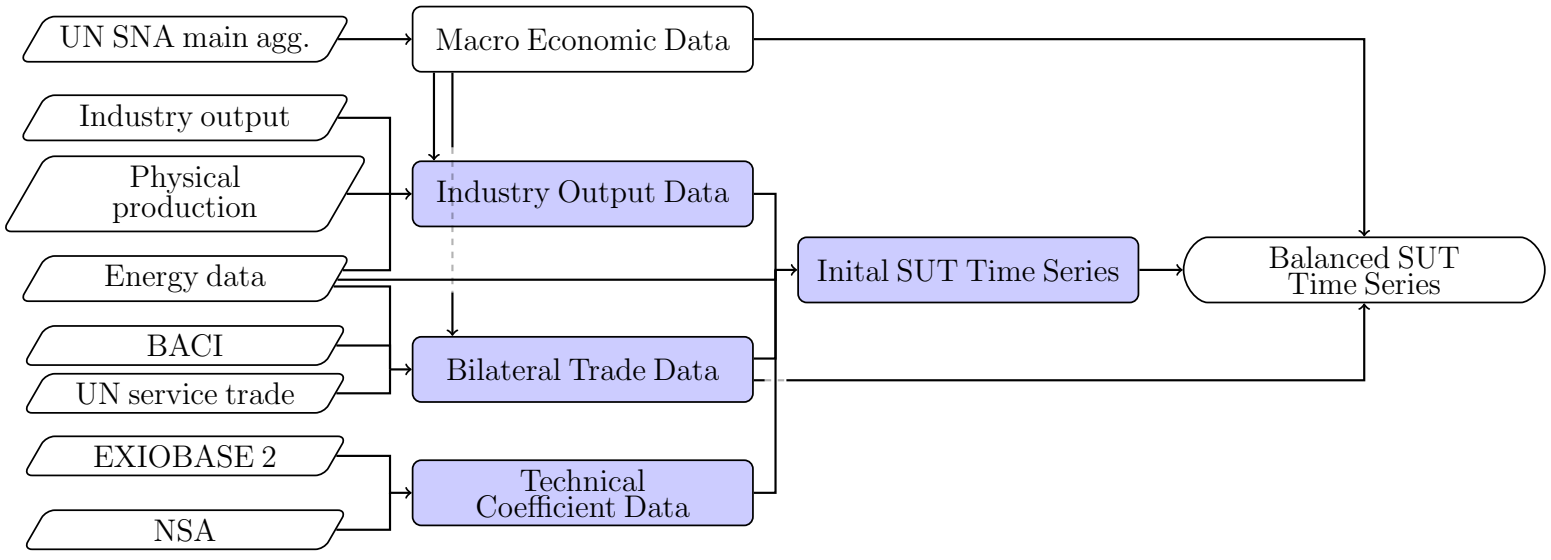


EXIOBASE 3 - structural change

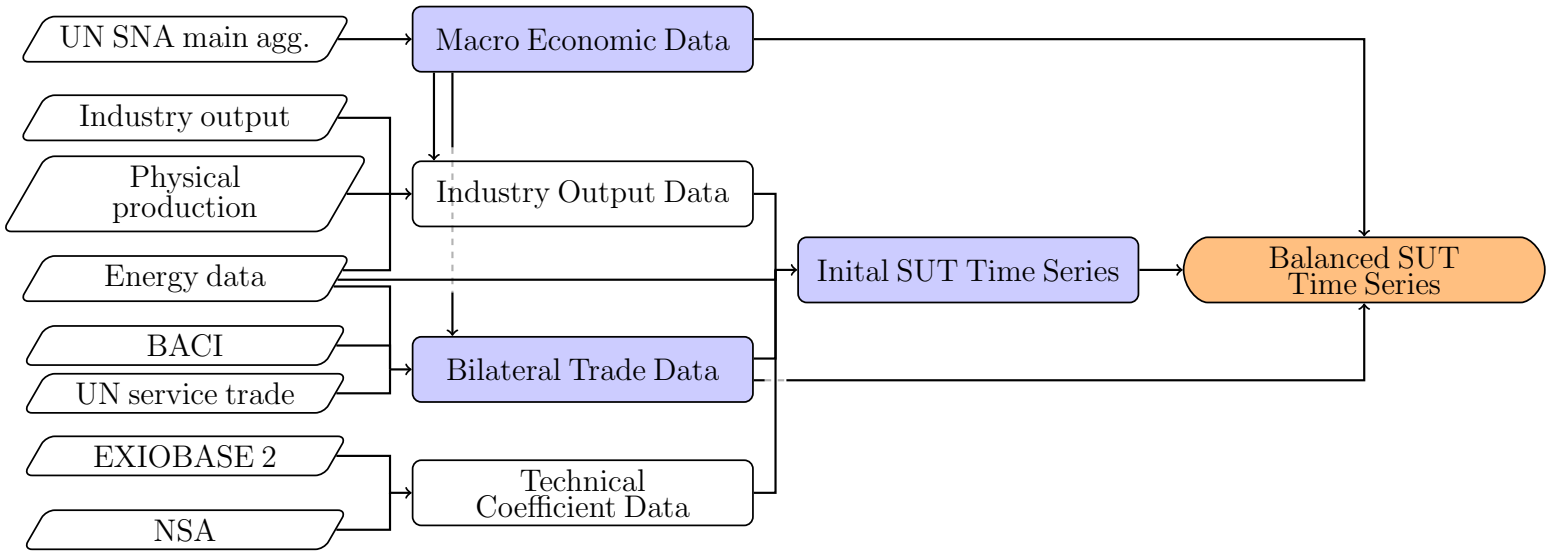
- Structural changes based on national SU/IO tables
- Apply to benchmark year



Initial SUTs



Balancing



Balancing - Decisions

- Pre-processed SUT respect all auxiliary data
- Unbalanced

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RAS

- Fix row/column sum

\+ Fast

\- High certainty on uncertain industy/product output

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Math. programming

- Minimize information gain

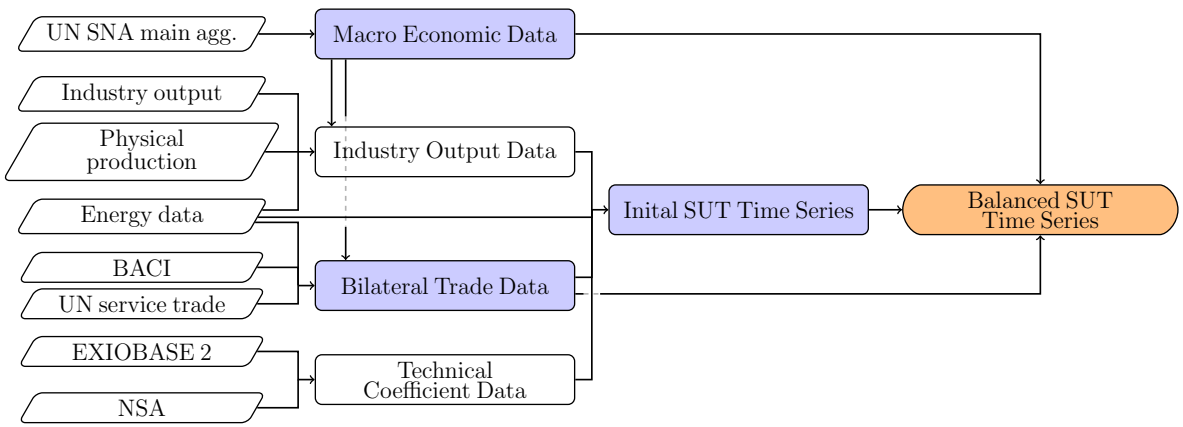
\+ Respects balancing constraints
  - Macro economic parameters
  - Trade vectors

\- No guaranteed solution (conflicting constraints)

\- Relatively slow

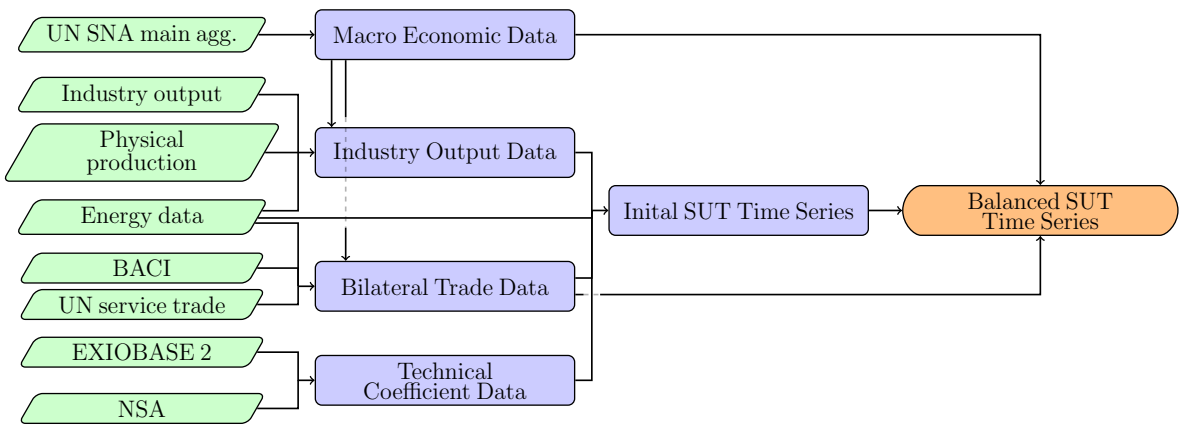
Balancing - Method

- QP target function
- Minimize difference between initial and final table
- Respect constraints
  - Prod/Ind output equal in Supply/Use
  - Import/Export vectors
  - Macro-Economic parameters
- Each SUT/year separate

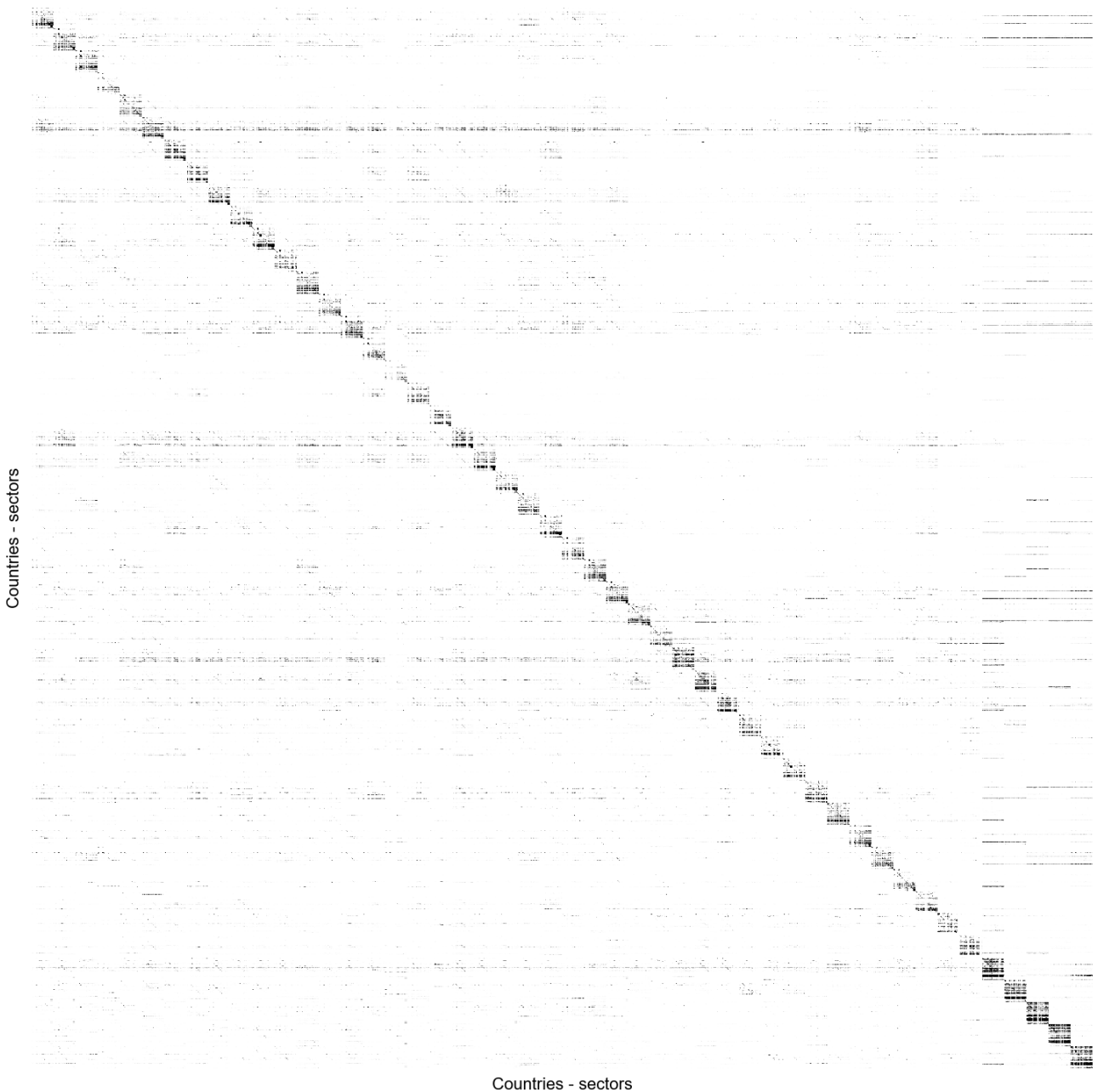


Constant prices

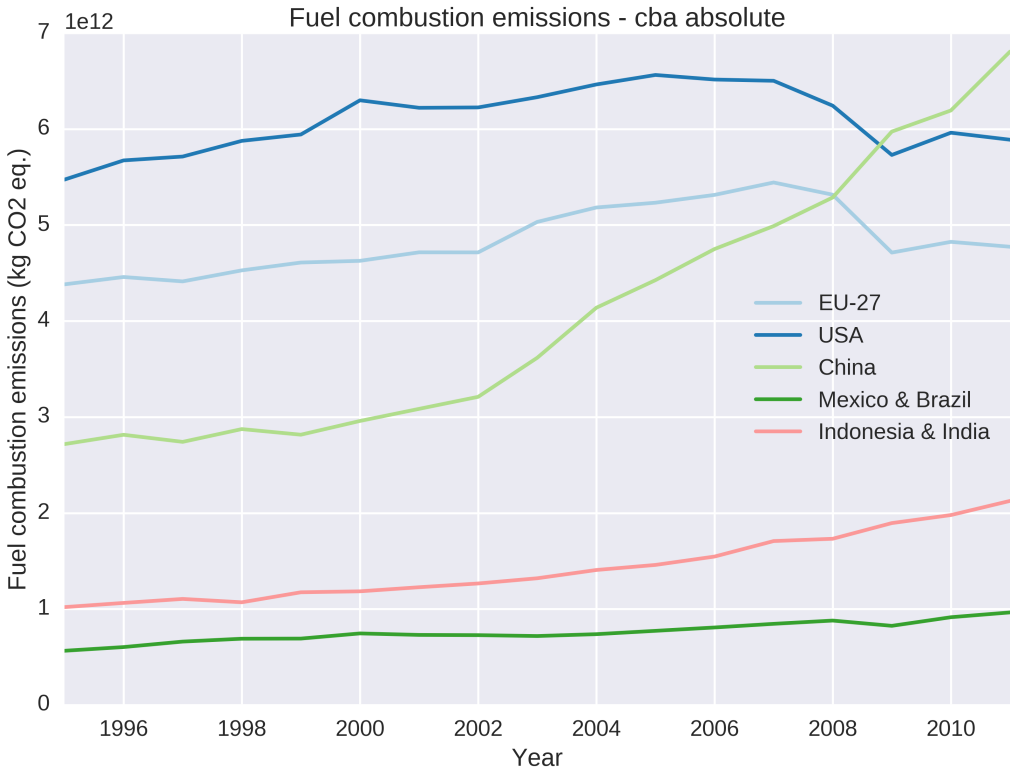
- Macro-economic time series (UN SNA main agg.)
- Deflators
  - IEA
  - FAO
  - National Accounts
  - WIOD
- Error checking, gap filling, repeat
  - Remove single year jumps (100% cutoff)
  - Remove extreme jumps (400% cutoff)
  - Interpolate (if enough values)
  - Proxy countries



EXIOBASE map



Analysis - a glimpse



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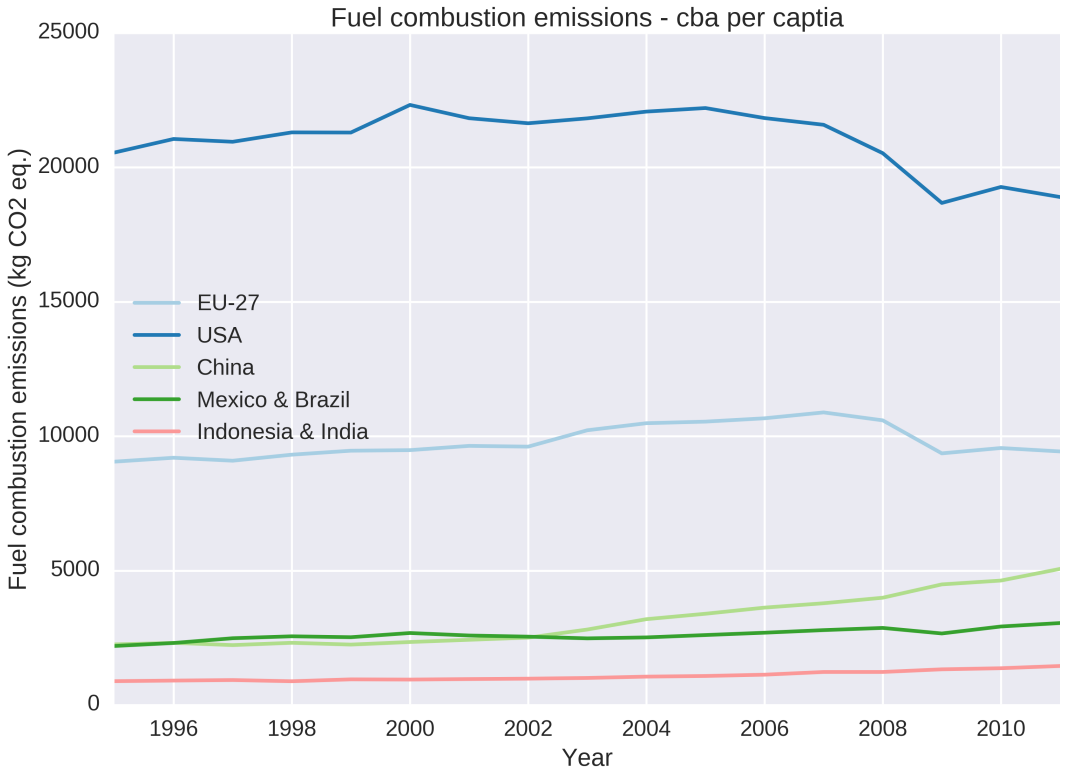

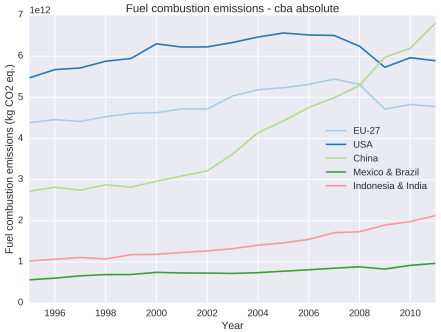

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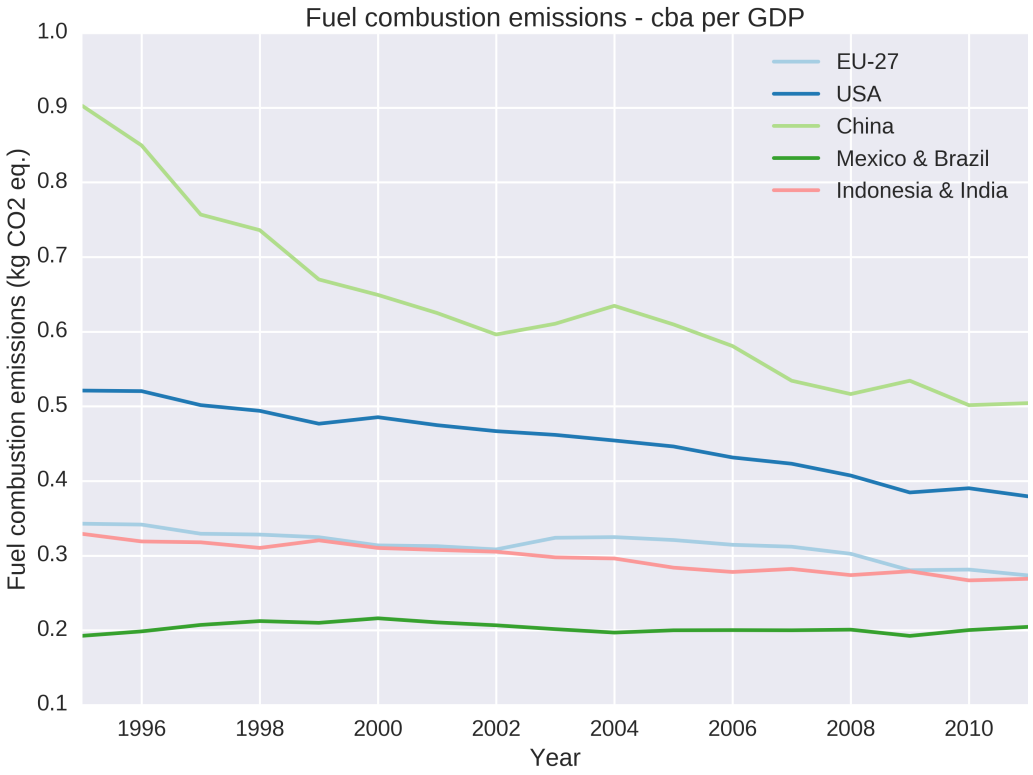

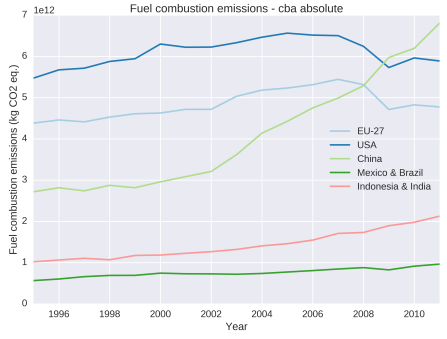

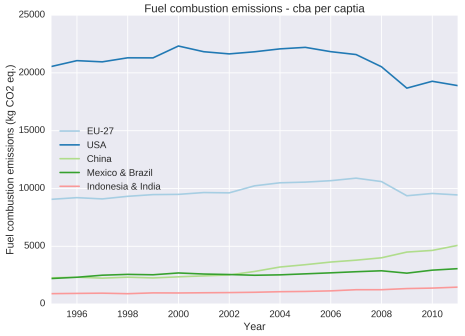

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