The Eora MRIO tables

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ISA, The University of Sydney
Australia

funded by the Australian Research Council

Guiding principles

- **Detail**: 187 countries, 15000 sectors ➔ LCA and footprint
- **Dynamics**: Time series 1990-2009 ➔ trends and scenarios
- **Flexibility**: Basic prices, margins and taxes
- **Transparency**: Close adherence to the raw data
- **Uncertainty**: Standard deviation estimates ➔ decision-making
- **Reliability**: Info on constraint violations ➔ quality assurance
- **Timeliness**: Delay of 2 years
- **Budget**: 12 person-years initially, < 2 person-years /y continually;
- **Openness**: Public, free availability for research

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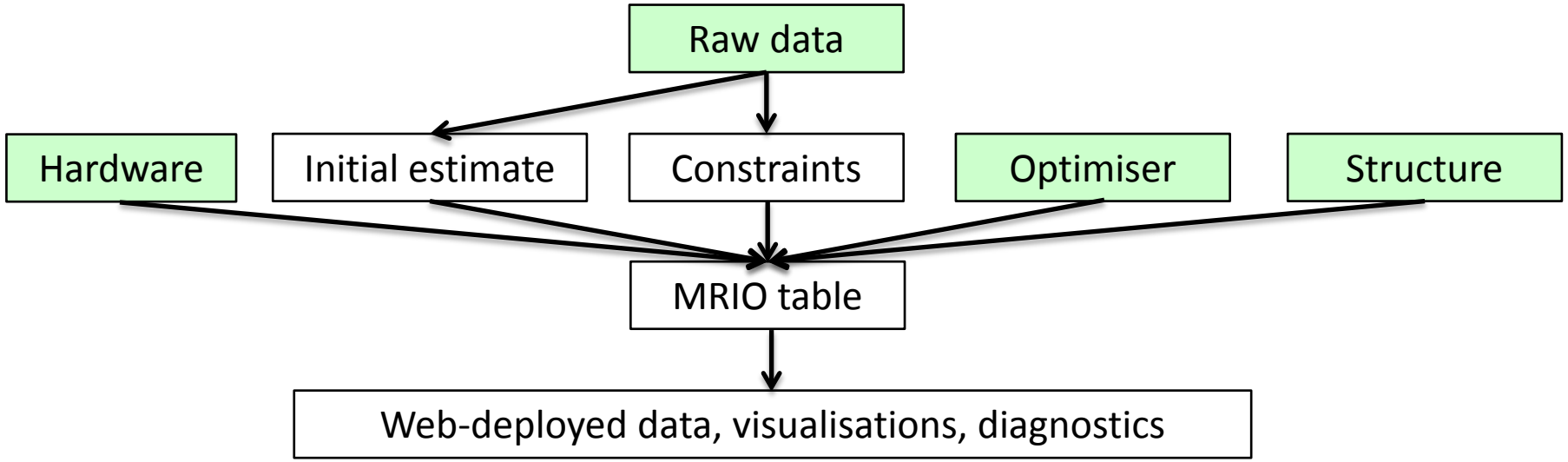
Conceptual framework



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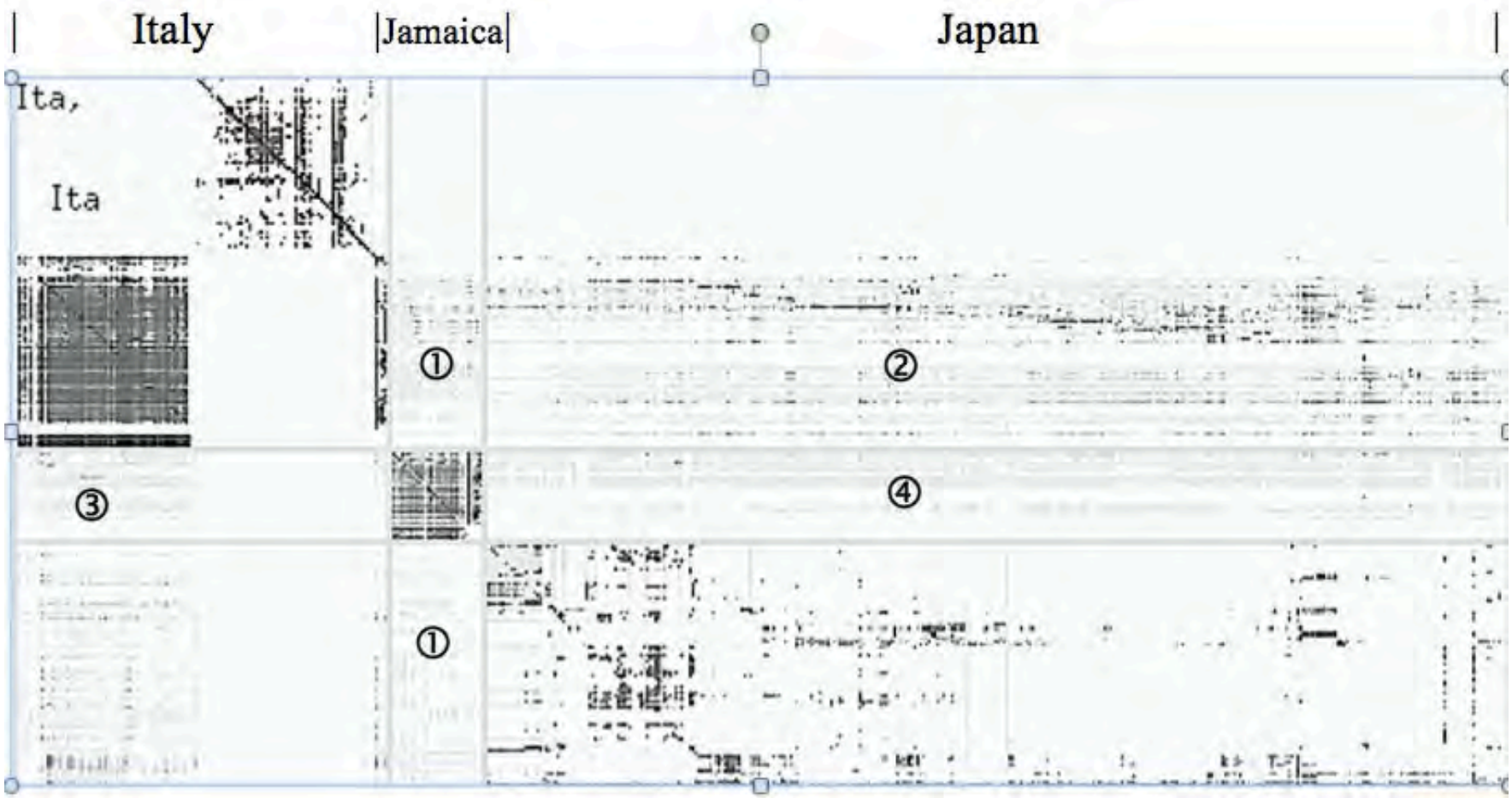
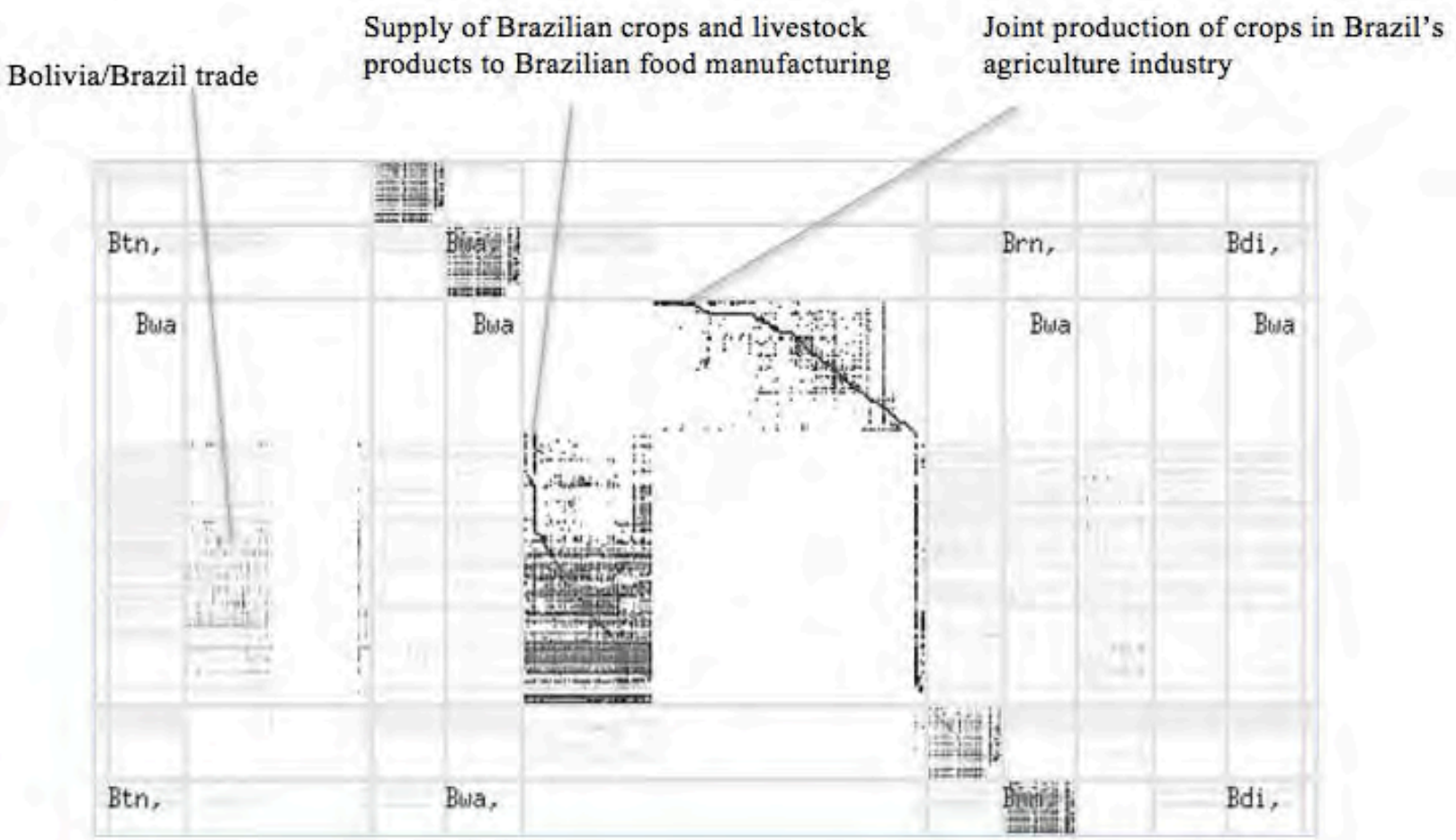
Structure



Original sectors – rectangular matrices



Hardware

Design considerations

Number and speed of CPUs
RAM vs disk storage
Data type
Sparsity
Multithreading
Scheduling
Communication overheads
Shared vs distributed memory

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Raw data

Input-output tables from 74 national statistical offices,
Input-output data from Eurostat, IDE-JETRO and OECD,
UN National Accounts Main Aggregates Database,
UN National Accounts Official Data,
UN Comtrade international trade database
UN Servicetrade international trade database

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Initial estimate

$$T_{ij}^{ss(v)} = \frac{\tilde{T}_{ij}^{ss(v)}}{\tilde{T}_{..}^{ss(\mathrm{pu})}} \frac{T_{..}^{ss(\mathrm{pu}),\mathrm{OC}}}{v_{..}^{ss(\mathrm{ba}),\mathrm{OC}}} v_{..}^{ss(\mathrm{ba}),\mathrm{MA}} = \underbrace{\frac{\tilde{T}_{ij}^{ss(v)}}{\tilde{T}_{..}^{ss(\mathrm{pu})}}}_{\text{sector structure and valuation scaling}} \underbrace{\left(\frac{x_{..}^{ss(\mathrm{ba}),\mathrm{OC}}}{v_{..}^{ss(\mathrm{ba}),\mathrm{OC}}} - 1\right) v_{..}^{ss(\mathrm{ba}),\mathrm{MA}}}_{\text{magnitude}}$$

$$y_{ik}^{ss(v)} = \underbrace{\frac{\tilde{y}_{ik}^{ss(v)}}{\left|\tilde{y}_{.k}^{ss(\mathrm{pu})}\right|}}_{\substack{\text{supply structure} \\ \text{and valuation scaling}}} \underbrace{\frac{y_{.k}^{ss(\mathrm{pu}),\mathrm{OC}}}{y_{..}^{ss(\mathrm{pu}),\mathrm{OC}}}}_{\substack{\text{use} \\ \text{structure}}} \underbrace{y_{..}^{ss(\mathrm{pu}),\mathrm{MA}}}_{\text{magnitude}}$$

$$v_{lj}^{ss(\mathrm{ba})} = \underbrace{\frac{\tilde{v}_{lj}^{ss(\mathrm{ba})}}{\left|\tilde{v}_{l.}^{ss(\mathrm{ba})}\right|}}_{\substack{\text{use} \\ \text{structure}}} \underbrace{\frac{v_{l.}^{ss(\mathrm{ba}),\mathrm{OC}}}{v_{..}^{ss(\mathrm{ba}),\mathrm{OC}}}}_{\substack{\text{supply} \\ \text{structure}}} \underbrace{v_{..}^{ss(\mathrm{ba}),\mathrm{MA}}}_{\text{magnitude}}$$

$$V_{ij}^{ss(\mathrm{ba})} = \underbrace{\frac{\tilde{V}_{ij}^{ss(\mathrm{ba})}}{\tilde{V}_{..}^{ss(\mathrm{ba})}}}_{\substack{\text{matrix} \\ \text{structure}}} \underbrace{\frac{x_{..}^{ss(\mathrm{ba}),\mathrm{OC}}}{v_{..}^{ss(\mathrm{ba}),\mathrm{OC}}} v_{..}^{ss(\mathrm{ba}),\mathrm{MA}}}_{\text{magnitude}},$$

Oosterhaven, Stelder & Inomata
ESR 2008

Bouwmeester & Oosterhaven
IO Seville 2008

Tukker *et al*
Ecol.Econ. 2009

Lenzen, Kanemoto *et al*
IO Sydney 2010

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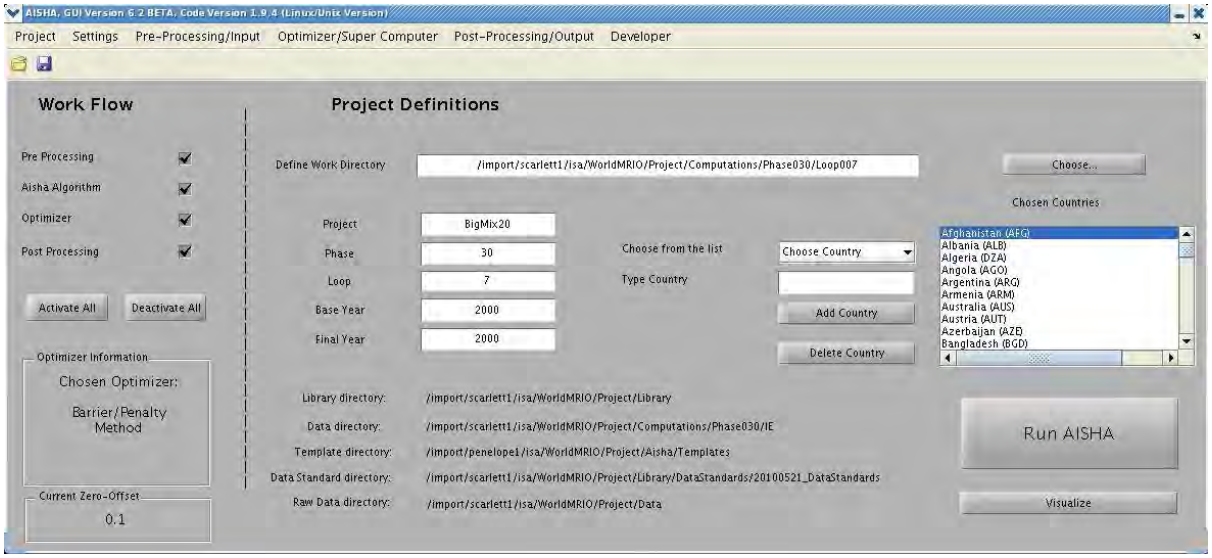
Constraints



AISHA

Geschke *et al*
IO Alexandria 2011

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Optimiser

$$\mathbf{p} = \begin{pmatrix} \mathbf{a} \\ \boldsymbol{\varepsilon} \end{pmatrix} \sim \mathrm{D}\left[\begin{pmatrix} \mathbf{a}_0 \\ 0 \end{pmatrix}, \begin{pmatrix} \boldsymbol{\Sigma}_\mathbf{a} \\ \boldsymbol{\Sigma}_\mathbf{c} \end{pmatrix}\right] = \mathrm{D}\left[\mathbf{p}_0, \boldsymbol{\Sigma}\right]$$

Minimise $f = (\mathbf{p} - \mathbf{p}_0)' \ \hat{\boldsymbol{\Sigma}}^{-1} (\mathbf{p} - \mathbf{p}_0)$, subject to $\mathbf{C}\,\mathbf{p} = \mathbf{c}$

$$\mathcal{L} = (\mathbf{p} - \mathbf{p}_0)' \ \hat{\boldsymbol{\Sigma}}^{-1} (\mathbf{a} - \mathbf{a}_0) + \boldsymbol{\lambda}(\mathbf{C}\mathbf{p} - \mathbf{c})$$

$$\sigma_{c,i} = \sqrt{\sum_j \left(G_{ij}\sigma_{P,j}\right)^2} \ \forall i$$

RAS, GRAS

SUT-RAS

LAD

KRAS

QP

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The Eora tables:

187 countries, 15909 sectors
5 valuations, 20 years

= 3 Terabytes of information

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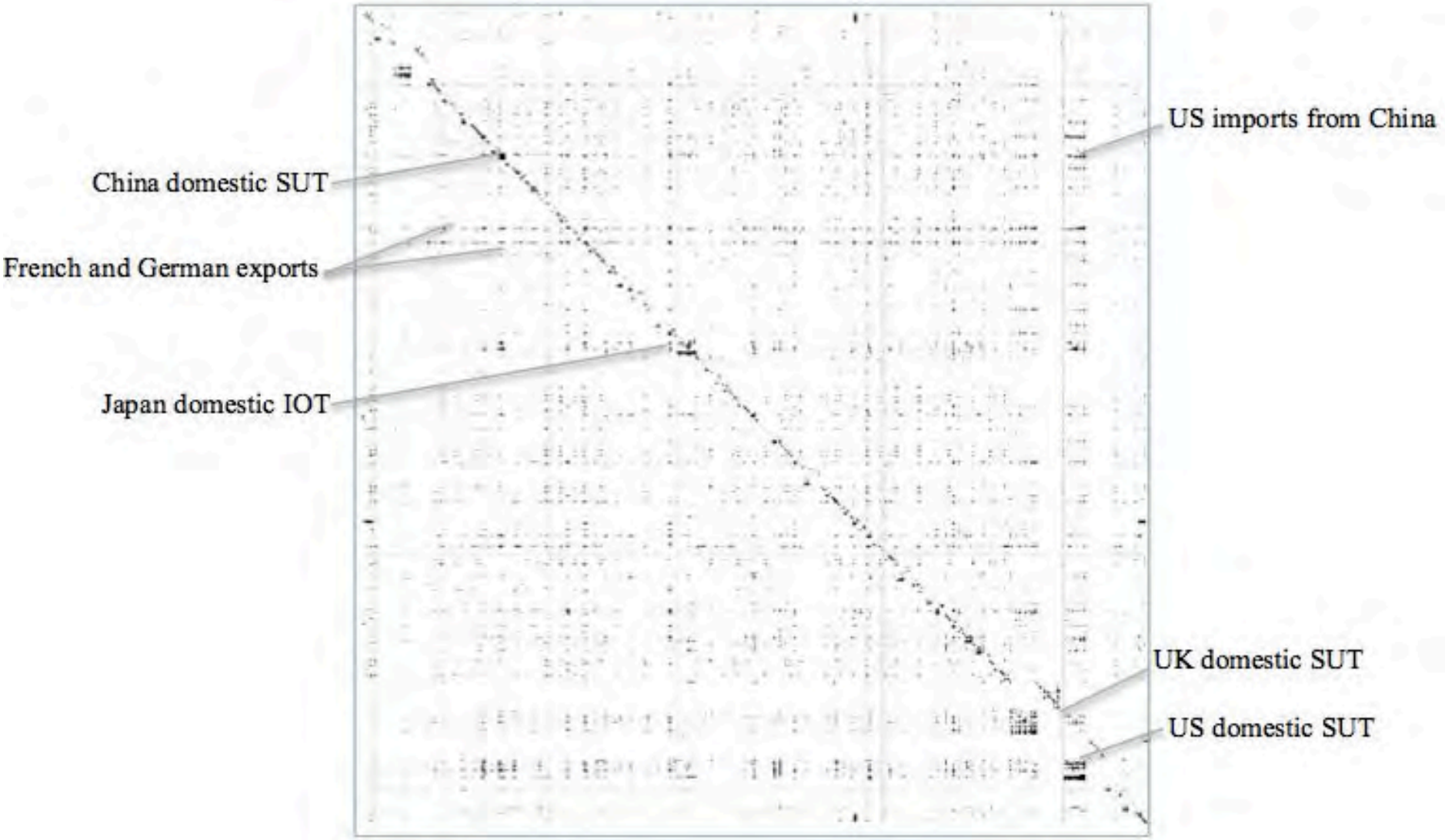
US imports from China
China domestic SUT
French and German exports
Japan domestic IOT
UK domestic SUT
US domestic SUT

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Safari File Edit View History Bookmarks Window Help Mon 12:43 PM Manfred Lenzen

Eora – Country IO Tables

http://www.globalcarbonfootprint.com/national/co.jsp?tab=IOTABLE

Google

ESR-MC SydneyForecast UNICOM 131500 UniDirectory Library XChRates Movies Ut2mp4 ITsupport Loucos Eora AISHA capISA SHEN Uke Yahoo maps time

Eora – Country IO Tables

Home | World MRIO | Country IO tables | Analysis | Data quality | Eora MRIO tables dataset PROVISIONAL BIGMIX v199.38

Valuation:
Basic Price

Country:
Belgium

To export destination

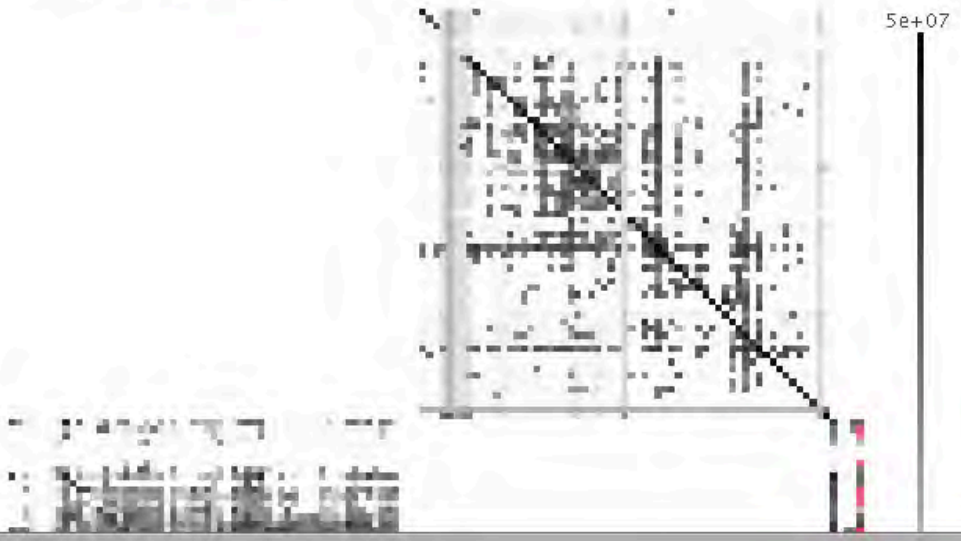
Year:
2000

IO Table | Satellite Indicators | Balancing Checks | Confidence | Statistics | Bulk Data

Belgium Input-Output table

An input-output table contains the monetary value of commodities supplied by one sector of an economy to another.

Download for BEL:



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Eora – Country IO Tables

http://www.globalcarbonfootprint.com/national/co.jsp?tab=IOTABLE

ESR-MC SydneyForecast UNICOM 131500 UniDirectory Library XChRates Movies Ut2mp4 ITsupport Loucos Eora AISHA capISA SHEN Uke Yahoo maps time

Eora – Country IO Tables

Home World MRIO Country IO tables Analysis Data quality Eora MRIO tables dataset PROVISIONAL BIGMIX v199.38

Mail

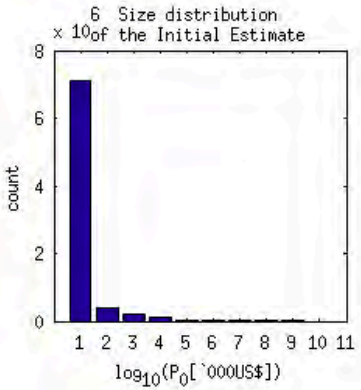
Valuation:
Basic Price

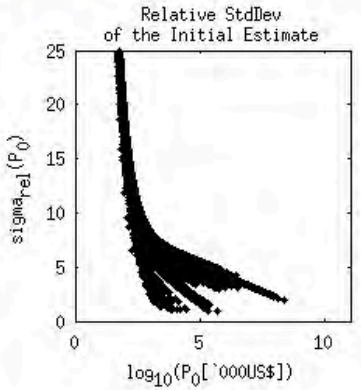
Country:
Germany

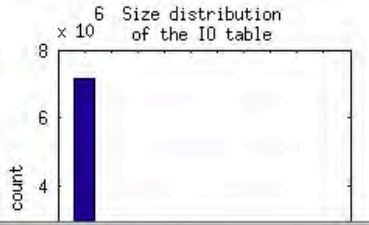
To export destination

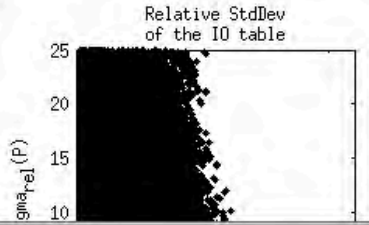
Year:
2000

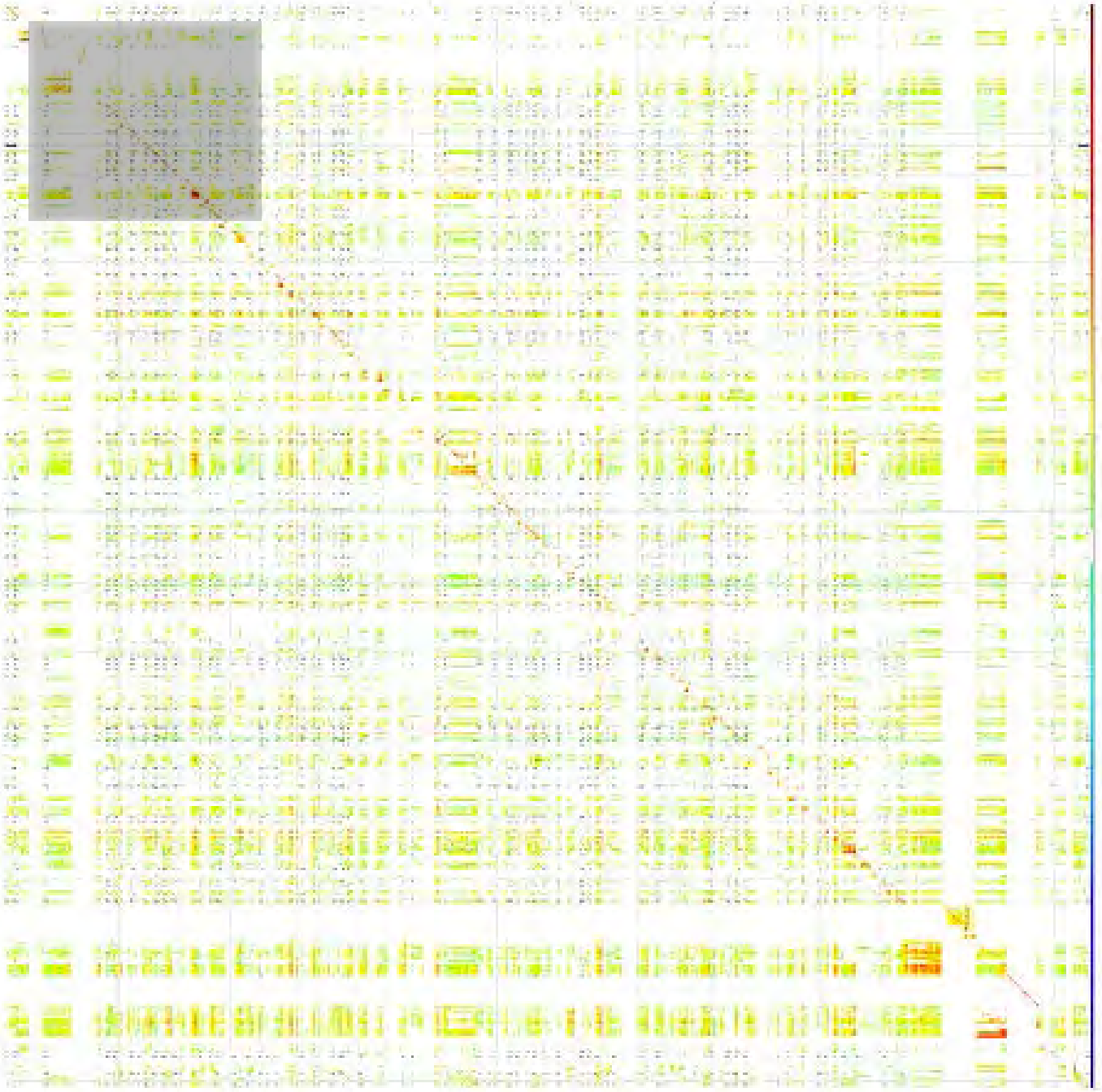
IO Table | Satellite Indicators | Balancing Checks | Confidence | **Statistics** | Bulk Data

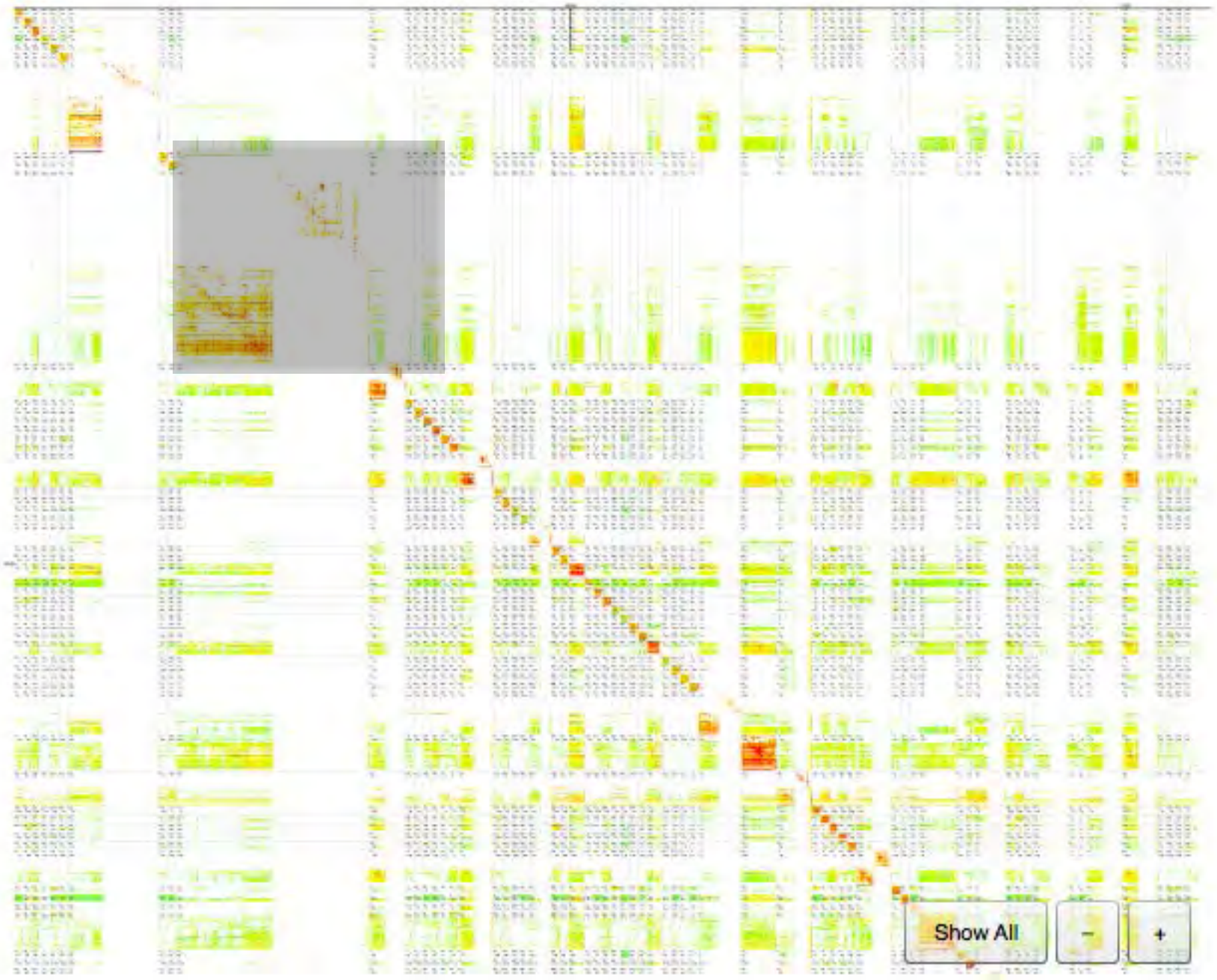








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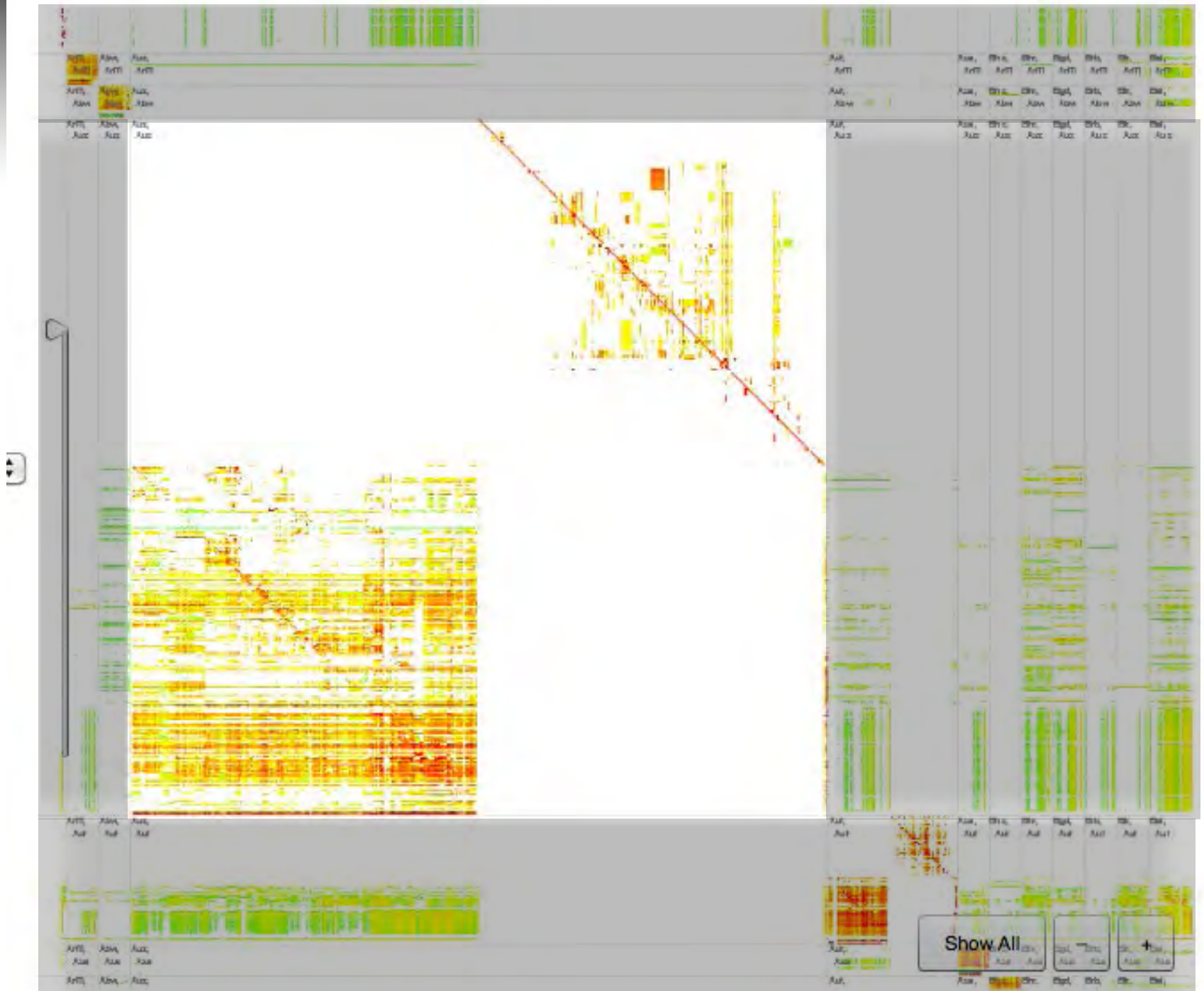
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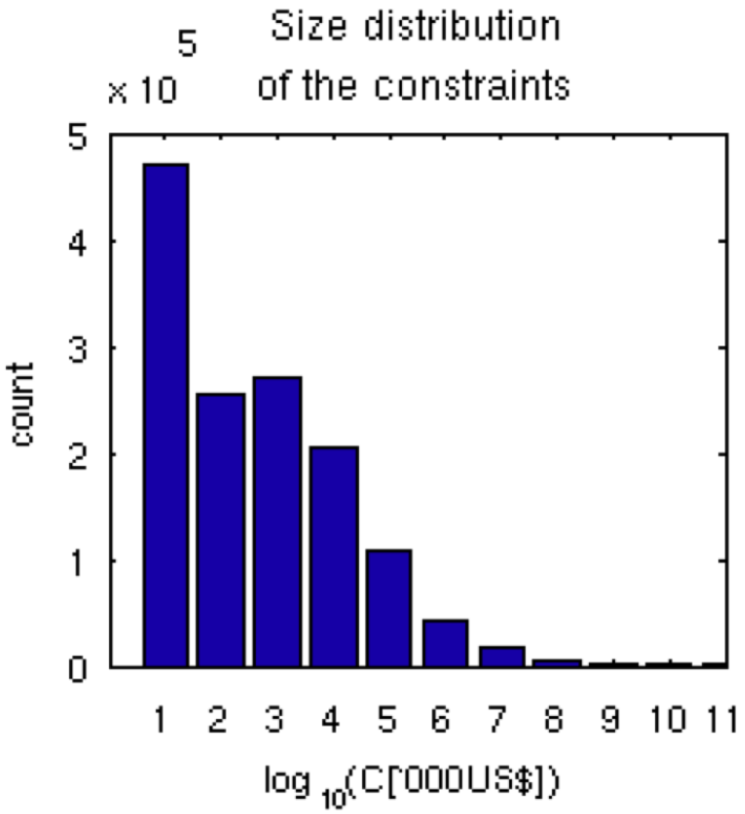
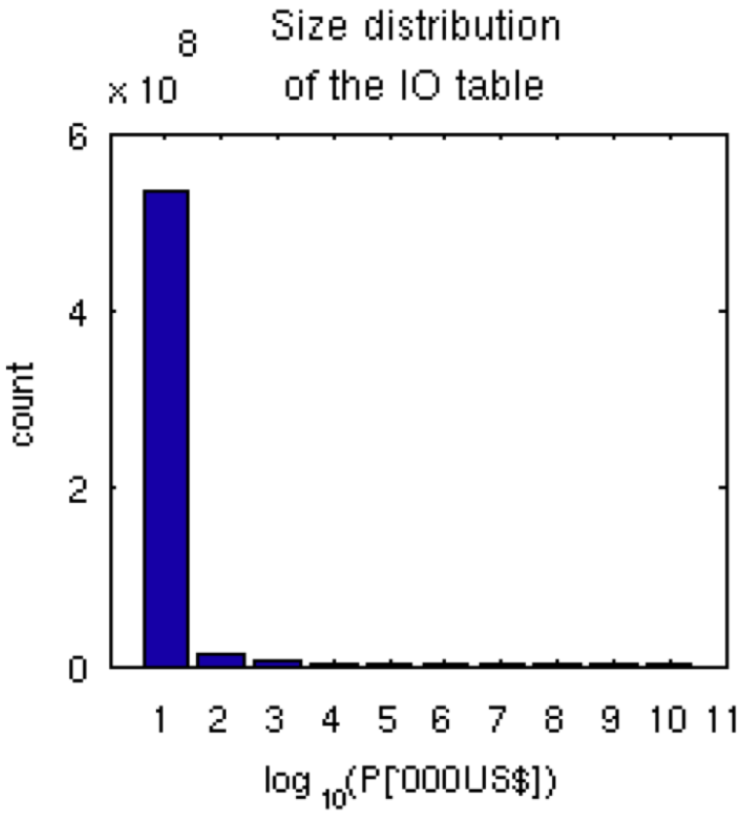
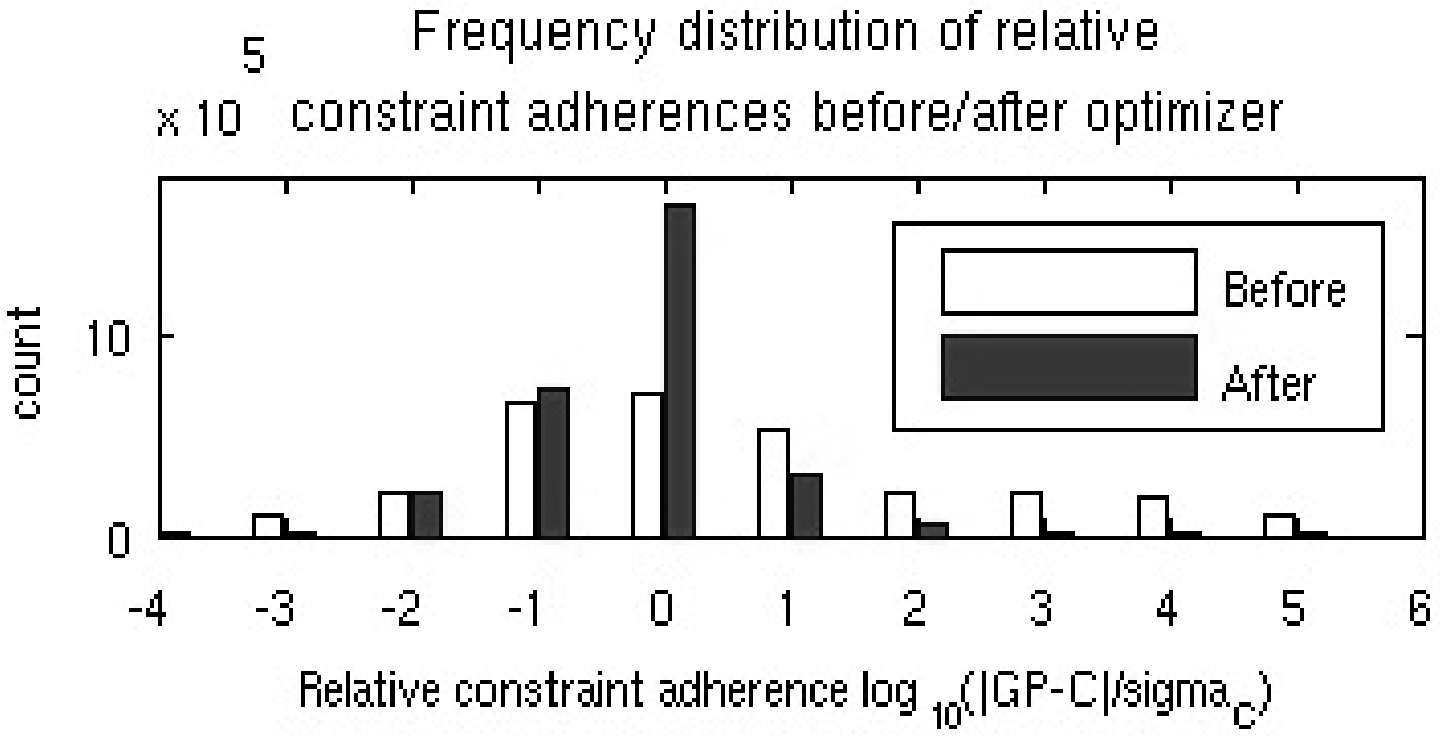
Data profile

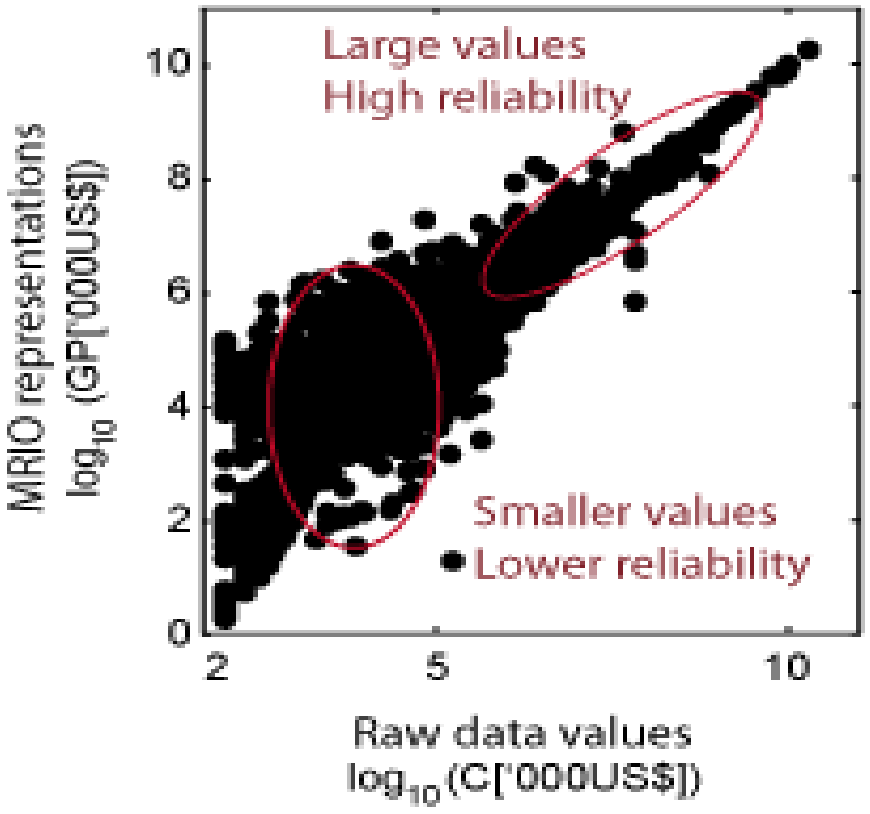




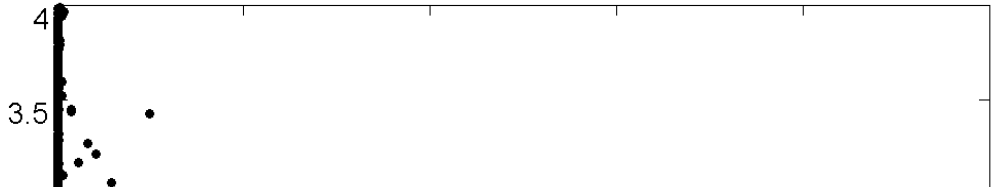
Optimisation run diagnostics

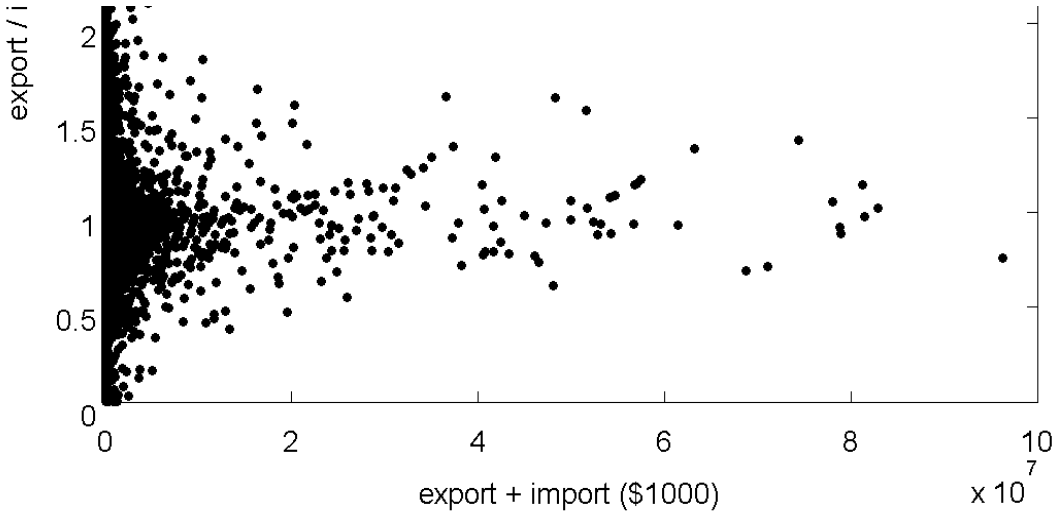


Uncertainty



Data conflict





All Comtrade exports SNA & imports def

Also: balancing exports SNA & imports def

Thank you !

www.isa.org.usyd.edu.au

www.worldmrio.com

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The use of MRIO tables for global environmental policy

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Li Gao, Director of the Department of Climate Change in China's National Development and Reform Commission

''We produce products and these products are consumed by other countries, especially the developed countries. This share of emissions should be taken by the consumers but not the producers''

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UK in 'delusion' over emissions

Is the UK deluded over its claim to be cutting greenhouse gases?

02.26 05.30

The UK has been deluded over its claim to be cutting greenhouse gases, according to two reports that will shake the climate change debate. Dr John Barrett, from the Stockholm Environment Institute at the University of York who wrote the report, and environment minister Phil Woolas discuss the report.

Carbon footprint of the UK

Economic Systems Research
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713421471

A CARBON FOOTPRINT TIME SERIES OF THE UK - RESULTS FROM A MULTI-REGION INPUT-OUTPUT MODEL

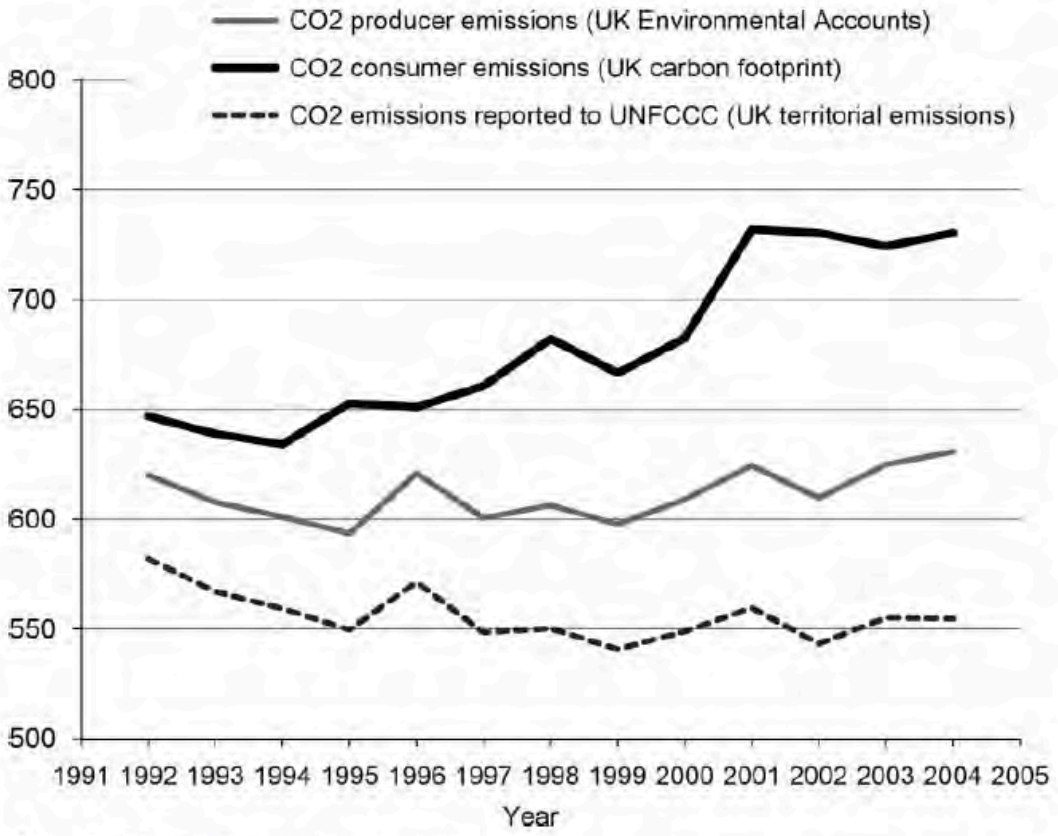
Thomas Wiedmann[a]; Richard Wood[bc]; Jan C. Minx[ad]; Manfred Lenzen[b]; Dabo Guan[ef]; Rocky Harris[g]
[a] Stockholm Environment Institute, University of York, UK [b] ISA - Centre for Integrated Sustainability Analysis, University of Sydney, Australia [c] Industrial Ecology Programme (IndEcol), NTNU, Trondheim, Norway [d] Department for the Economics of Climate Change, Technische Universität Berlin, Germany [e] Electricity Policy Research Group, Judge Business School, University of Cambridge, UK [f] Department of Land Economy, University of Cambridge, UK [g] Department for Environment, Food and Rural Affairs (DEFRA), Environmental Statistics and Indicators, London, UK

Online publication date: 13 May 2010

Trend analysis

Trend analysis: UK carbon footprint

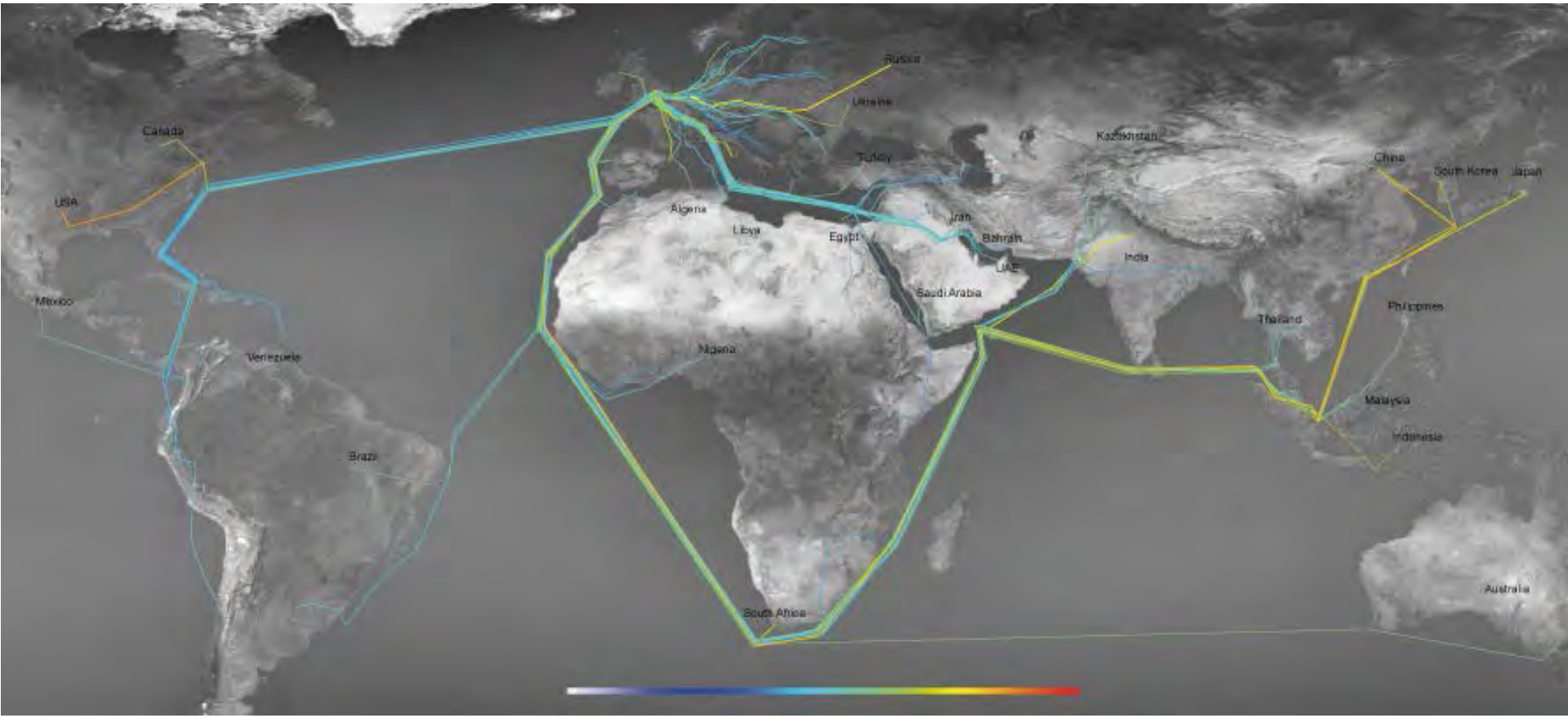
FIGURE 2. Total UK CO_2 emissions from 1992 to 2004 according to different accounting principles.



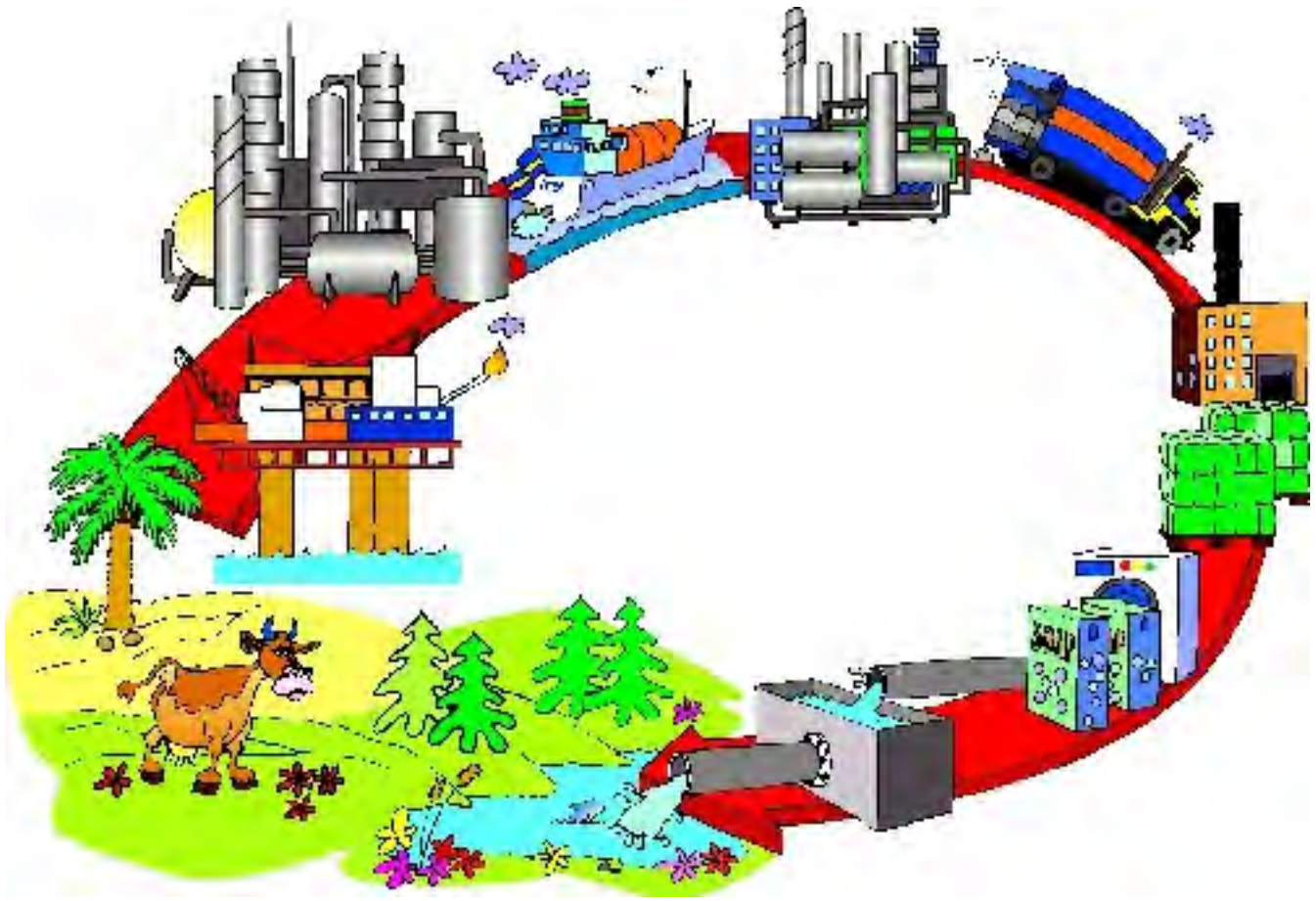
Note: the vertical scale does not start at zero.

Supply-chain analysis

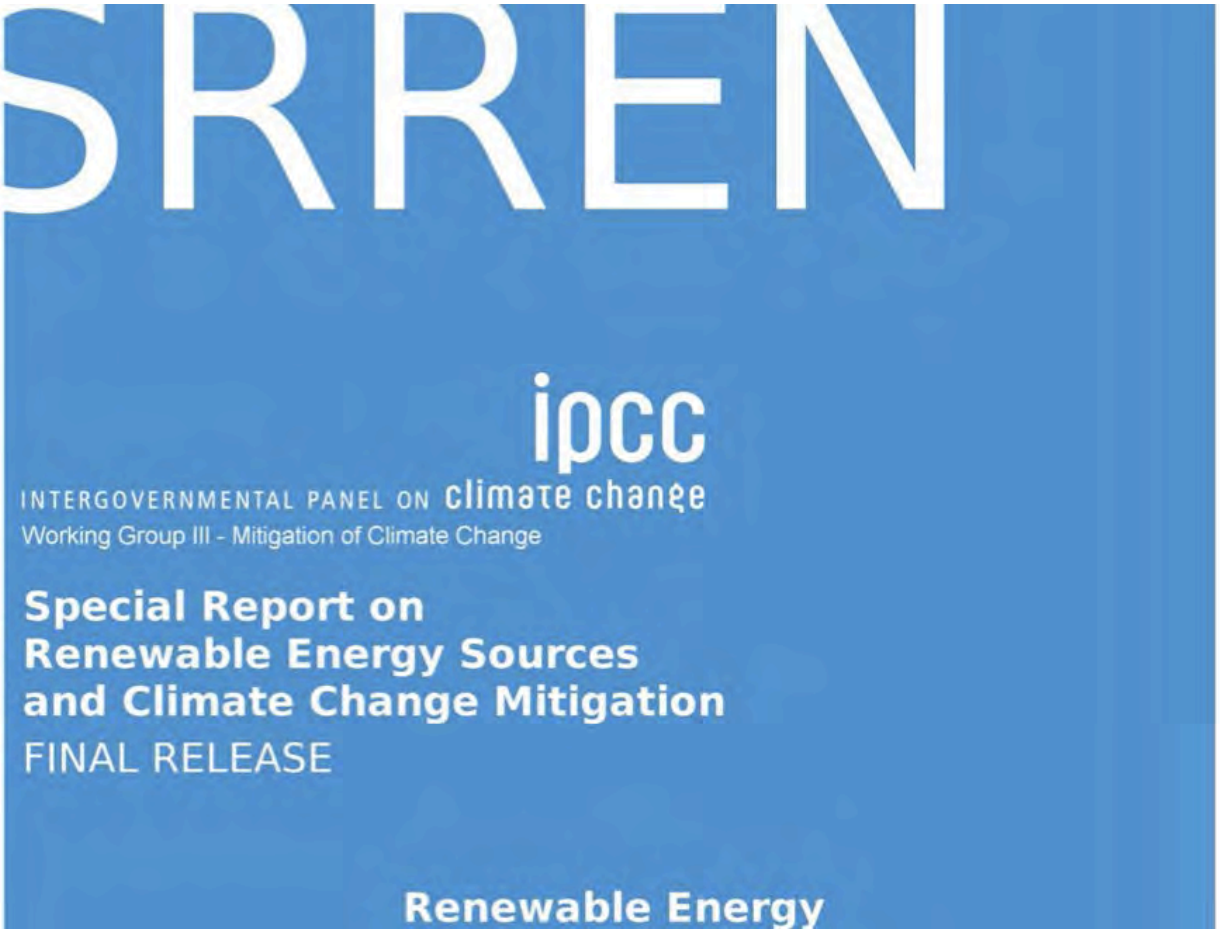
Supply-chain analysis: UK Carbon footprint



Life-Cycle Assessment



Life-Cycle Assessment: Renewable power



Product carbon labelling