

INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Welcome from the Editor



Dear **IIOA** member,

I am very pleased to release the latest issue of the *International Input-Output Association Newsletter*. Many thanks to all of you that have contributed by sending your inputs.

This issue contains a presidential message from our new president Sanjiv Mahajan, the latest ESR articles, highlights in Journals and recent I-O books, updates in the OECD databases, and the announcements of several events happening this year! You can also find a call for a couple of Special Issues, job positions and other news from the I-O world. The Social Accounting Corner brings this time conversations with Moana Simas and former president Satoshi Inomata. It is an issue full of interesting news that I hope you will enjoy!

Any feedback, comments or suggestions are greatly appreciated. I also welcome contributions to future issues.

Andre Carrascal Incera

IIOA Newsletter Editor

University of Oviedo, Spain

Newsletter E-mail: newsletter@iioa.org

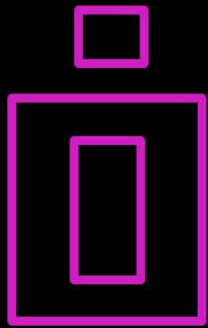
Personal E-mail: carrascalandre@uniovi.es

Would you like to contribute to the IIOA
newsletter?

Send us your news at newsletter@iioa.org

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Newsletter
Number 51, February 2022

INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Welcome from the president



Welcome from the new President – Sanjiv Mahajan

Dear IIOA Member,

Most importantly, hope you and your families are all well as the world undergoes heightened uncertainty from the COVID-19 pandemic to climate change to other evolving events. Time is flying by, and we are already in March 2022!!

Moving to IIOA matters.

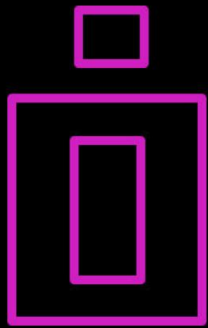
Firstly, I would like to thank **Satoshi Inomata** for his continued service to the IIOA in various forms, particularly for the last three years as President of the IIOA. Satoshi is a dedicated, proud and enthusiastic contributor to the field. I have personally enjoyed working on the Council under his Presidency.

I am delighted, humbled and excited to have been chosen as President of the IIOA for the next three years. For the first time in IIOA history, there was a **competitive election for the President post** within the frame of the IIOA Bylaws - Bart Los (an excellent candidate) and I have pioneered a different, open and healthier approach for future such elections.

Several people have since expressed interest in **my journey to becoming the IIOA President**. As many of you know, I have been pro-active member of the IIOA for many years. I was an IIOA member, on and off from 2001 but a continuous member from 2005, when I attended my first IIOA Conference in Beijing, China.



Over the years, I have supported many IIOA colleagues, provided various presentations, chaired sessions, been involved with the ISIOA since its inception and provided training modules, Keynote Speeches (2009, 2016), made various web improvements, member of the Council influencing many IIOA strategies / improvements and way of working, SPC member for several conferences, LOC Chair of the 2019 Glasgow Conference, etc. I have a one-pager covering some successes in the IIOA arena along the way, let me know if you would like the one-pager. Hopefully, this can also provide inspiration and motivation to younger scholars and others of what is possible.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Welcome from the president

Since taking up the post of President, various discussions and meetings have been held, including the completion of a new, open and transparent election process to select two **Vice-Presidents: Kirsten Wiebe and Norihiko Yamano.**



Congratulations to both Kirsten and Norihiko. I look forward to working with them together with two really effective, dedicated and long-serving members supporting the key operations of the IIOA: the **Secretary, Oliver Fritz** and the **Treasurer, Christof Paparella.** For those who may not be aware, the President and the two Vice-Presidents together with the Secretary and the Treasurer form the **IIOA Council Executive.**

As part of the election process, I described my vision and ideas of how this vision could be delivered in detail. As mentioned, the open and transparent theme will continue wherever possible.

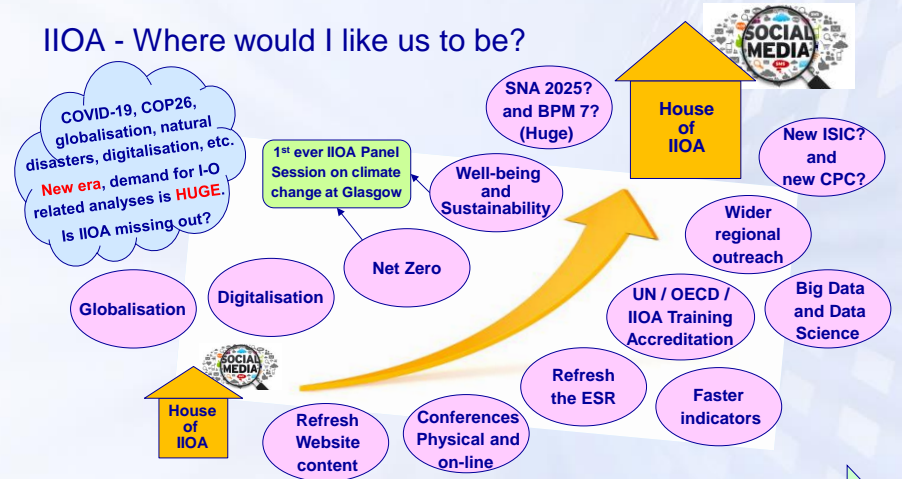
Sanjiv's Vision

"A dynamic IIOA with a significantly wider analytical and training outreach ensuring the IIOA is bigger, better and more engaged to serve the wider community."

Presentation for President of the IIOA Sanjiv's Vision

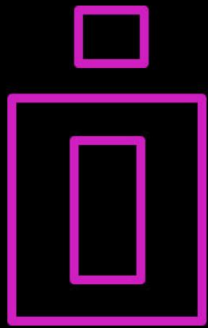


IIOA - Where would I like us to be?



Vital to develop a more representative producer / user balance
.... otherwise opportunities will be lost and the IIOA becomes dated.

ONWARDS
and
UPWARDS



Newsletter
Number 51, February 2022

INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Welcome from the president

Conference

On the IIOA Conference – which is our top issue for now. As you know the last physical conference was in Glasgow 2019, which I was proud to organise – the Glasgow Conference set many records. Pandemic circumstances permitting, I want us to get back to such events as it is a vital heartbeat of the IIOA and its future. Last week, the IIOA Council agreed that we would continue to pursue a **physical conference in Malaysia** during 28th August to 2nd September 2022, on the Langkawi Island. Mohd Yusof Saari (LOC Chair) and his team have a significant challenge and we will support them along the journey.

Picture of the way forward for SUTs, IOTs and related themes

The SUTs domain has come a long way in the past 25+ years **and SUTs are now at the heart of the System of National Accounts** and produced by many countries. Many analytical opportunities have materialised through the development of Extended SUTs; Digital SUTs and Physical SUTs.

With the increasing demand for SUTs, this has in turn **reinvigorated the need for IOTs** and new products based on IOTs such as Global Value Chains (GVCs); Full International and Global Accounts for Research in Input-Output analyses (FIGARO); and Trade in Value Added (TiVA).



For the next update of the SNA (likely to be called the 2025 SNA), the SUTs will remain central and IOTs and other products have a supporting link.

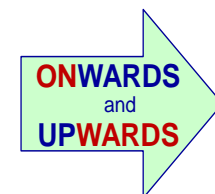
The demands to generate more analyses and to better understand the phenomena of globalisation, digitalisation, well-being and sustainability provide vast opportunities for I-O related analyses. The **demand for such analyses is huge and ever-growing**, especially climate change as seen in COP26. In turn, these developments provide for a healthy future for the IIOA community and the need to embrace technology and innovation to capitalise on these and other opportunities.

Therefore, the need to also continue developing initiatives like the ISIOA, Development Programme, Webinars, etc. are crucial to **developing more younger scholars**.

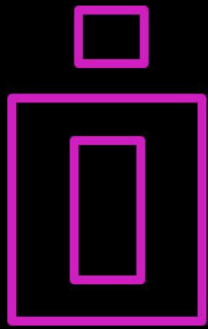
The future for the IIOA is bright, let us take the IIOA to the next level.

Best regards

Sanjiv Mahajan



(Sanjiv Mahajan - President of the IIOA)



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Events

SHAIO events



9th Spanish Conference on
Input-Output Analysis



Dear colleagues,

We are glad to announce the **9th Spanish Conference on Input-Output Analysis** of the Hispanic-American Input-Output Society (SHAIO) that will take place in **Aveiro, Portugal, on the 22nd and 23rd of September 2022.**

It is going to be a great pleasure to visit the **University of Aveiro** and enjoy the fantastic Conference organized by the GOVCOPP (Research Unit on Governance, Competitiveness, and Public Policies) together with CeBER (Centre for Business and Economics Research of the University of Coimbra) and the CARME (Centre of Applied Research in Management and Economics of the Polytechnic Leiria).



The University of Aveiro, placed in the lovely Aveiro, the Portuguese Venice, is one of the fastest-growing institutions in Portugal and one of the most prestigious institutions that combine spatial planning, economics, and other social sciences. Aveiro, located between the historical cities of Coimbra and Oporto, is an energetic city with excellent restaurants and a landscape shaped by the Aveiro lagoon.

The Conference's official languages will be English and Spanish; however, as this meeting will be held in Portugal, we will also have special sessions in Portuguese. The program will include the fourth edition of the Spanish School of Input-Output Analysis (ESAIO), plenary and parallel sessions, the Emilio Fontela Award ceremony, and some other amazing surprises that will make this event a perfect opportunity to know this area of Portugal.

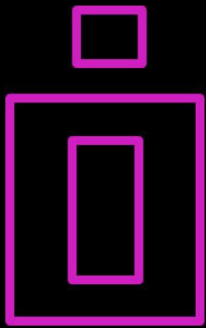
Please save the key dates and join us in Portugal!

Key Dates:

- **Abstract submission** → May 15, 2022
- **Special sessions proposals deadline** → May 15, 2022
- **Notification of acceptance** → June 10, 2022
- **Full paper submission** → July 30, 2022
- **Registration for the Spanish School deadline** → July 30, 2022
- **Submission Emilio Fontela Prize deadline** → July 30, 2022
- **Early bird registration deadline** → July 30, 2022
- **Regular registration deadline** → August 11, 2022
- **Spanish School of IOA** → September 21, 2022
- **Spanish Conference on IOA** → September 22-23, 2022

More information at: <http://io9.shaio.es/en/>

See you in Aveiro!



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Events

CIOA events



The 12th Annual Conference of Chinese Input-Output Association May 28-29, 2022, Changsha, Hunan, China

The 12th Annual Conference of Chinese Input-Output Association (CIOA) will take place (on site and online) on May 28-29, 2022, in Changsha, China. CIOA organized conferences every year, including regular conferences every three years, and interim meetings on certain topics in other years. The conference will be organized by the School of Economics and Trade of Hunan University. The aim of this conference is to promote the development of input-output techniques through the academic exchanges among researchers and to better help solve the current social and economic problems.

The details of the call for papers are as follows.

I. Submission Topics

The topics for the conference include (but are not limited to) the following areas:

- 1) Global value chains, regional value chains and the Chinese economy
- 2) Dual circulation and new development paradigm
- 3) Innovation, technological progress and productivity growth
- 4) High-quality development and economic structural transformation
- 5) Resource constraints and environmental protection
- 6) The carbon peak and neutrality targets and economic development
- 7) Regional economic integration and coordinated development
- 8) Compilation of the input-output tables and updating approaches
- 9) Basic theories and methods of input-output techniques
- 10) CGE model and its application
- 11) Input-output techniques and structural equation model in trade

II. Special Notes

The conference will set up an online English conference venue, in order to promote globally academic exchanges among experts and scholars in the field of input-output techniques. The online English conference venue will be announced later.

III. Important Dates

Deadline for abstract submission: **March 30, 2022.**

The abstract should contain: the title, an abstract of not less than 300 words, authors and contact information.

IV. Submission Requirements

- 1) Papers should be submitted through the online submission system <https://cioa2022.casconf.cn/> (The English version of the website can be accessed by clicking "EN" on the left navigation menu). Please register firstly if you use this system for the first time.
- 2) Paper submission should contain the paper title, author names, the paper body, references, and abstract and keywords. The authors' information should be attached, including: institute or organization, postal code, Email address, landline or cell phone number, date of birth, etc
- 3) Authors of accepted abstracts/papers will receive the conference announcement by **April 15, 2022.**

V. Contact Persons

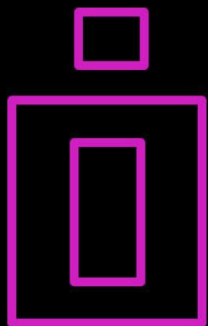
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For more information, please contact
<https://cioa2022.casconf.cn/>
<http://cioa.ruc.edu.cn/>

We sincerely invite you to participate in the 12th Annual Conference of Chinese Input-Output Association.

Chinese Input-Output Association
School of Economics and Trade of Hunan University



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Related IO courses

The **School of Physics at the University of Sydney** runs a postgraduate unit on input-output analysis: PHYS5033: Environmental Footprints and IO Analysis. The unit was first taught in 2012 with 3 students, and has seen a drastic rise in enrolments, reaching about 180 in 2021, with postgraduate students from a range of disciplines (economics, science, engineering, business and health) recognising the importance and power of the input-output technique for calculating impacts embodied in supply chains.

This unit provides students with practical skills for carrying out footprint calculations for individuals, companies and nations. In particular, students gain an understanding of input-output analysis for identifying impacts embodied in regional, national and global supply chains, with a focus on contemporary environmental applications such as emissions, energy-use, water, land, biodiversity threats; and social applications such as employment, poverty and child labour. The unit first explores national and global economic and environmental accounting systems and their relationships to organisational accounting. Second, it presents cutting-edge techniques enabling the global analysis of environmental and social impacts of international trade. Third, it offers hands-on practical activities for mastering the input-output techniques conceived by Nobel Prize Laureate Wassily Leontief, and provides a step-by-step recipe for undertaking boundary-free environmental and social footprinting for sectors and organisations. Students walk away from this unit equipped with useful skills needed to calculate footprints, and are given hands-on experience in preparing sustainability reports, using bottom-up data, economic input-output tables and environmental accounts. This unit nicely complements the Life-Cycle Analysis (PHYS5034), Industrial Ecology (PHYS4801), Quantitative Disaster Analysis (PHYS4802) and Techniques for Sustainability Assessment (PHYS5032) units, which are also run by the School of Physics at the University of Sydney.

Students who have completed this unit have successfully transitioned to careers in academia, industry, environmental consulting and policy making.

PHYS5033 is offered in both Semester 1 and Semester 2 at the University of Sydney, as a remote or an in-person option: <https://www.sydney.edu.au/units/PHYS5033>

Databases

The OECD recently released a new, 2021 edition, of **Inter-Country Input-Output (ICIO)** tables (<http://oe.cd/icio>) and, sets of indicators for analysis related to globalisation. Notably:

- **Trade in Value Added (TiVA)** indicators, <http://oe.cd/tiva>;
- **Trade in Embodied CO2 (TECO2)** e.g. carbon footprint indicators, <http://oe.cd/io-co2>; and,
- **Trade in Employment (TiM)** indicators, <http://oe.cd/io-emp>.

The coverage has increased significantly. The ICIO tables and indicators now have **45 unique industries** (based on ISIC Rev.4), and 24 years, **1995 to 2018**.

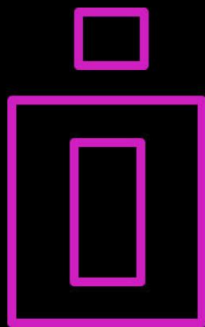
The databases now have 66 countries, plus Rest of the World, including all OECD, all G20, all European Union and all ASEAN economies.

The updated OECD databases can also be accessed from the IIOA IO-Data page:

<https://www.iioa.org/news/io-data.html>

Queries about ICIO and TiVA can be addressed to:

icio-tiva.contact@oecd.org



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Published papers and books in Input-Output Analysis and related methods

Latest ESR articles

[Economic Systems Research](#)

[Journal of the IIOA](#)

[Volume 33, Issue 4, 2021](#)



Tobias Emonts-Holley, Andrew Ross & Kim Swales

[Estimating induced effects in IO impact analysis: variation in the methods for calculating the Type II Leontief multipliers.](#)

Economic Systems Research.

Type II input-output (IO) multipliers are frequently used for impact analysis. Unfortunately, there is no standard way to calculate these. The fundamental issue is that these multiplier methods endogenise household consumption but all have drawbacks because the IO accounts are missing key information required to consistently link household income and consumption to domestic economic activity. Using compatible regional and national data sets, we evaluate the values for various IO Type II multipliers to a benchmark value calculated with the aid of social accounting matrix data. The results suggest that the variation in Type II IO multiplier values generated by these alternative methods is an empirically non-trivial issue.

Maria Llop

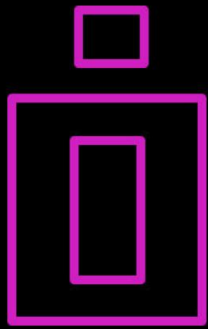
[Defining prices in an inter-regional SAM system.](#)
Economic Systems Research.

The literature of inter-regional social accounting matrices (SAM) focuses on quantity-oriented models that determine the transmission of income impacts. This paper develops a price version to identify the channels of price transmission at the inter-regional (or inter-country) level. The method proposed divides the total multiplier effects into intra-regional price multipliers (i.e. the cost impacts within a region), open loop inter-regional price multipliers (i.e. the cost impacts from one region on another by quantifying all the within-region impacts), and closed loop inter-regional price multipliers (i.e. the circular cost impacts transiting through the accounts in the other region and returning to the starting region). In addition, the intra-regional multipliers are divided into the intra-account, the inter-account and the cross-account (circular) effects. The empirical application, which uses a bi-regional SAM that distinguishes the United States (USA) and China (CHN), highlights the importance of the within-region interdependences for explaining price impacts.

Ángela García-Alaminos, Mateo Ortiz, Guadalupe Arce & Jorge Zafrilla

[Reassembling social defragmented responsibilities: the indecent labour footprint of US multinationals overseas.](#)
Economic Systems Research.

Multinational corporations (MNEs) have been at the forefront of the geographical disintegration of production chains in search of lower salaries, among other reasons, which led to a global race to the bottom in labour standards. Therefore, significant amounts of indecent work are currently embodied in MNEs' global value chains, compromising not only the brands' corporative image but also the achievement of the Sustainable Development Goals. In this work, we shed light on this matter by estimating the indecent-work-conditions related impacts linked to the foreign activities of MNEs from the United States. Using a socially extended MRIO model that integrates three social indicators (forced labour, fatal and nonfatal occupational injuries), we found that these activities show increasing trends between 2009 and 2013 on indecent labour, contributing with 1.1%–1.3% of the global cases. United States affiliates located in India, China and Brazil, show the highest ratios per unit of value-added.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Bartłomiej Rokicki, Oliver Fritz, Jonathan M. Horridge & Geoffrey J. D. Hewings

Survey-based versus algorithm-based multi-regional input-output tables within the CGE framework – the case of Austria.

Economic Systems Research.

Spatial CGE models rely on detailed multi-regional input-output (MRIO) tables. This paper compares two different approaches to compiling MRIO tables for Austria – an algorithm-based approach that regionalizes national input-output tables (IOT) and generates trade estimates using a predefined set of regional variables (i.e. Horridge's algorithm), and a hybrid approach that uses as much regional and inter-regional data as possible. We investigate whether we observe differences in CGE simulation results that use them. Results from an aggregate simulation are surprisingly similar. So the algorithmic approach is, in fact, effective in making an MRIO from a national IOT. But noticeable differences appear at the sectoral level. They seem mainly due to differences in calibration rather than in regionalization.

Jorge A. Garcia-Hernandez & Roy Brouwer

A multi-regional input-output optimization model to assess impacts of water supply disruptions under climate change on the Great Lakes economy.

Economic Systems Research.

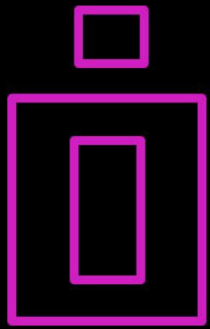
This paper presents a water-restricted multi-regional input-output model to evaluate the economic impacts of water supply reductions in the Canadian Great Lakes Basin (GLB), one of the largest freshwater reservoirs in the world. The proposed model, first of its kind applied to the GLB, aims to minimize the impact of water supply disruptions on the GLB-economy, measured by the loss of GDP. A new flexible economic optimization procedure is introduced, capable of imposing resource constraints and ensuring minimal supply levels for intermediate and final consumption at the same time. The model accounts for inter-regional trade between different lake regions. The impacts of two climate change scenarios on water security and the economy are investigated, with and without additional food and energy security restrictions. The proposed economic optimization model holds promise as a new tool for resource-restricted Input-Output analyses.

José Firmino de Sousa Filho, Gervásio Ferreira dos Santos & Luiz Carlos de Santana Ribeiro

Structural changes in the Brazilian economy 1990–2015.

Economic Systems Research.

This paper analyses the structural changes in the Brazilian economy from 1990 to 2015 by applying structural decomposition analysis (SDA). The production structure of emerging economies is an important field of research because it enables the assessment of sectoral policies and technological progress to support sustained economic growth in the long-term. The investigation described here was conducted using input-output matrices for a short and long-term analysis which enabled us to verify the importance of twelve aggregate sectors regarding changes in production, final demand and technological coefficients. This topic could be used for such analyses in any other country. The results indicate that the production structure of Brazilian economy remains fragile and dependent on demand shocks for its growth. Furthermore, manufacturing industry remains the major sector capable of promoting structural changes in production.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

**Andrea Bonfiglio, Silvia Coderoni, Roberto Esposti
& Edoardo Baldoni**

[The role of rurality in determining the economy-wide impacts of a natural disaster.](#)

Economic Systems Research.

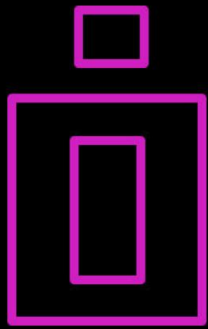
Rural areas may be highly vulnerable to natural disasters because of their lower economic diversification and a higher incidence of sectors that may suffer from a larger impact produced by these adverse events. In addition, because of their trade dependence, local effects can be transmitted to neighbouring regions more diffusely so amplifying total impacts. This paper aims to quantify the economy-wide impacts generated by the earthquake sequence that mostly hit a markedly rural area of Central Italy in 2016–2017. To this purpose, a non-linear programming model based on a multi-regional IO table with a mixed territorial scale is adopted. Results indicate that some negative effects are transmitted outside the seismic area and a few positive effects are also produced. Moreover, they confirm that rural areas are more vulnerable to disasters and that the effects of disasters in these areas are more likely to be transmitted to the neighbouring space.

Cristian Mardones & Claudio Brevis

[Constructing a SAMEA to analyze energy and environmental policies in Chile.](#)

Economic Systems Research.

In this study, a social accounting matrix with environmental accounts (SAMEA) for Chile is built based on the 2016 input-output tables, socioeconomic household survey, expenditure survey, among other information sources. The SAMEA has high disaggregation of the electricity sector that is not currently available in national accounts. Complementary information on the operating costs of different electricity subsectors (thermoelectric, solar, wind, hydro, and biomass) from national and international studies are obtained. Then, intersectoral indicators, accounting multipliers, and simulations of shocks (subsidy on the non-conventional renewable energy subsectors and environmental taxes) are calculated. The main findings of the study show that each electricity subsector has different production technology and emission intensity. In consequence, energy and environmental policies simulated with intersectoral models that do not disaggregate the electricity sector would produce significant biases in the results.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

[Economic Systems Research](#)

Journal of the [IOA](#)

[Latest articles](#) (up to 27th of Feb)



Huiwen Liu, Huibin Du, Zengkai Zhang, Huimin Wang, Kunfu Zhu, Yaling Lu & Xi Liu

[Trade heterogeneity and virtual water exports of China](#)

China is facing serious water scarcity, and the effects of international trade on its water resources have been widely examined. Processing exports account for nearly half of China's gross exports. Adopting China's multi-regional input-output table that captures processing exports, we enrich the literature on virtual water exports by accounting for trade heterogeneity. The results show that China's virtual water exports show a significant trade heterogeneity. Normal and processing exports are attributed to 86.7% and 13.3% of the Agriculture sector's water use induced by exports respectively. Conversely, normal and processing exports are attributed to 31.8% and 68.3% of the Communications Equipment, Computers sector's water use induced by exports respectively. In addition, a cross-regional compensation is needed to deal with the unequal regional distribution of water uses and economic benefits related to exports.

Lena Kilian, Anne Owen, Andy Newing & Diana Ivanova

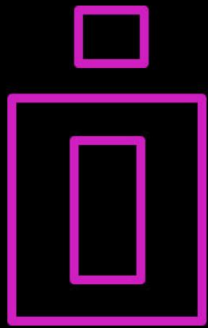
[Microdata selection for estimating household consumption-based emissions](#)

To estimate household emissions from a consumption-perspective, national accounts are typically disaggregated to a sub-national level using household expenditure data. While limitations around using expenditure data are frequently discussed, differences in emission estimates generated from seemingly comparable expenditure microdata are not well-known. We compare UK neighbourhood greenhouse gas emission estimates derived from three such microdatasets: the Output Area Classification, the Living Costs and Food Survey, and a dataset produced by the credit reference agency TransUnion. Findings indicate moderate similarity between emission estimates from all datasets, even at detailed product and spatial levels; importantly, similarity increases for higher-emission products. Nevertheless, levels of similarity vary by products and geographies, highlighting the impact microdata selection can have on emission estimates. We focus our discussion on how uncertainty from microdata selection can be reduced in other UK and international contexts by selecting data based on the data generation process, the level of disaggregation needed, physical unit availability and research implications.

Daniel Herrero & Adrián Rial

[Productive linkages in a segmented economy: the role of services in the export performance of German manufacturing](#)

This article analyzes the causes that affect the export performance of the German manufacturing sector. By applying a subsystem approach to input-output analysis, we take into account the interlinkages between manufacturing and services. In particular, we consider two types of relationships that influence manufacturing competitiveness: the wage squeeze in services due to institutional factors and outsourcing; and the role played by knowledge-intensive business services (KIBS) as innovation drivers. Taking vertically integrated sectors as units of analysis, an export model is estimated. We find that labor costs play only a minor role for international competitiveness, while non-price factors are the main drivers of German exports. Therefore, although the wage squeeze in services is the centerpiece in the unit labor costs and export prices moderation, it is of minor importance for export growth. Conversely, the growing integration of KIBS provides a strong stimulus for non-price competitiveness and export growth.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Yuwan Duan, Erik Dietzenbacher, Bart Los & Cuihong Yang

[Processing trade in Chinese interregional input-output tables: construction and application](#)

We construct new interregional input-output tables for China, which can be used to analyze changes in the interindustry linkages within and between eight Chinese regions, and their consequences. We claim that analyses based on these tables yield more accurate results than analyses using existing interregional input-output tables for China, because our tables explicitly account for a typical feature of the Chinese economy: the importance of processing exports activities. These activities rely heavily on imported inputs and much less on inputs sourced from domestic regions. Accounting for such differences between processing exports and other production activities reduces aggregation biases. We illustrate the usefulness of the tables by computing supply chain fragmentation indices for China and quantifying the biases that are avoided by using our input-output tables instead of conventional ones. We make our tables (for 2002, 2007 and 2012) publicly available.

Luis Enrique Pedauga, Agustin Velazquez & Elvis Hernández-Perdomo

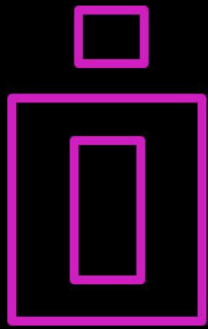
[Systemic risk and macro-financial interconnectedness using an FSAM framework](#)

We provide a general framework to assess the traceability of systemic risk and macro interconnectedness to understand the financial risk transmissions channels. Our contribution help address the information need established in the DGI-2 in a FSAM-based model that fully captures the interconnectedness between real and financial sectors. Recent developments in the field of IO and SAM evaluations have led to a renewed interest in the usage of linkage analysis to measure the role that a sector play within the economy. Focusing on the backward and forward linkage, hypothetical extraction method, and structural path analysis, we show how feasible it is to include heterogeneous financial institutions to study risk interactions effects on macroeconomic outcomes. This paper's proposal may be useful for thinking about how micro-data and macro-aggregates can be incorporated into the set of financial soundness indicators, allowing to obtain an idea of the vulnerabilities of the financial sector.

Rayan Wolf, Angelo C. Gurgel, Leonardo C. B. Cardoso, Ian M. Trotter, Marcos S. Nazareth & Erly C. Teixeira

[Welfare impacts of a negative income tax on regions of Brazil](#)

This paper aims to analyze the effects of a public policy based on negative income tax (NIT) ideals as an alternative to the current social programs of income transfer in Brazil. A multiregional applied computable general equilibrium model of Brazil's economy is used to analyze the impacts on households' welfare, split into 10 income classes, and 2 factors (capital and labor) for each of 5 major regions. By analyzing two scenarios for the proposed policy, we show that the NIT could be more effective than the current social programs as well as resulting in longer lasting outcomes.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Óscar Dejuán, Ferran Portella-Carbó & Mateo Ortiz

[Economic and environmental impacts of decarbonisation through a hybrid MRIO multiplier-accelerator model](#)

This paper analyses the impacts of decarbonisation in three energy-intensive sectors/institutions (electricity generation, road transport, and household consumption) on four economic and environmental variables (value added, employment, energy consumption, and emissions). In our basic scenario, the EU is supposed to complete the decarbonisation of the selected sectors in 30 years, whereas in the rest of the world these sectors will be 30% decarbonised. We hypothesise that emissions and employment will fall once renewable sources of energy replace fossil fuels. Yet, in the meanwhile, massive investments are needed to build the required infrastructure. To compute the full impact, we apply a multiplier-accelerator model to a global multiregional hybrid input-output table derived from EXIOBASE3. In the EU, such a decarbonisation reduces yearly energy consumption, CO2 emissions, and employment by 22%, 19%, and 4%, respectively. Thus, additional measures are necessary to avoid global warming and absorb unemployment.

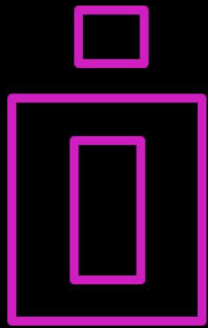
Shohei Tokito, Shigemi Kagawa & Tesshu Hanaka
[Hypothetical extraction, betweenness centrality, and supply chain complexity](#)

Two frameworks, hypothetical extraction and betweenness centrality analysis, can be used to identify environmentally important sectors in complex supply chains. This study derives an analytic expression for the relationship between hypothetical extraction and betweenness centrality analysis. Second, using the Eora and WIOD, this study analyzes the degree of difference in 'important' sectors identified by hypothetical extraction and betweenness centrality analysis. While the results obtained by rank correlation yield similarities, both methods have advantages. This study demonstrates that estimating betweenness centrality is meaningful and less computationally expensive, and can help us to understand the structural positions in the global supply chain network. The hypothetical extraction indicators can be easily computed using the betweenness centrality indicators' mathematical relationship. We conclude that the implementation of effective CO2-reduction policies through greener global supply chain engagement center around two key sectors, chemical and metal products from China, and their higher betweenness centrality should be strengthened.

Ana-Isabel Guerra, Laura Varela-Candamio & Jesús López-Rodríguez

[Tax reforms in Spain: efficiency levels and distributional patterns](#)

This paper approximates the efficiency levels of the most relevant tax categories and their distributional patterns for a European country considering Spain as an illustrative example. This is done computing the 'marginal' excess burden of these taxes, taking into account the structure of the Spanish tax system before and after the major tax reforms undertaken since 2010. In doing so we use a static applied general equilibrium model, which features heterogeneous households classified according to their taxable income. In addition, and in identical terms, another alternative tax reform is evaluated: a flat value-added tax system and a reduction in employers' social security contributions. Our results indicate that the alternative tax reform would have slightly improved the degree of efficiency of these taxes while implying a lower negative impact on aggregate income. Regarding distributive effects, we do not find significant differences between the actual and the alternative tax policies.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Radomír Mach, Milan Ščasný & Jan Weinzettel

[The role of allocation of retail trade margins across household segments on their carbon footprint calculation](#)

The homogeneity assumption, inherent to input-output (IO) analysis, implies that every euro spent within one product group is assigned the same environmental burden. We address this assumption applied to price conversion of household expenditures from purchasers' to basic prices when the carbon footprint of consumption is calculated for specific household segments by linking the IO table and micro-level household consumption data. We perform a sensitivity analysis of the different allocations of the retail trade margin of two consumption groups (Food and Goods) across household expenditure deciles. While a differently allocated retail trade margin influences the carbon footprint of household segments, it does not challenge the general finding that households with higher expenditures are responsible for higher footprints. This finding holds also for different emission intensities of retail trade margins.

Ignacio Cazcarro, Antonio F. Amores, Inaki Arto & Kurt Kratena

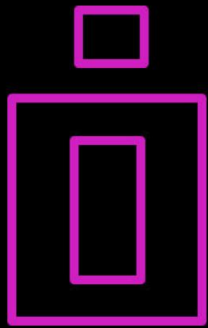
[Linking multisectoral economic models and consumption surveys for the European Union](#)

Multisectoral models usually have a single representative household. However, more diversity of household types is needed to analyse the effects of multiple phenomena (i.e. ageing, gender inequality, distributional income impact, etc.). Household consumption surveys' microdata is a rich data source for these types of analysis. However, feeding multisectoral models with this type of information is not simple and recent studies show how even slightly inaccurate procedures might result in significantly biased results. This paper presents the full procedure for feeding household consumption microdata into macroeconomic models and for the first time provides in a systematic way an estimation of the bridge matrices needed to link European Union Household Budget Surveys' microdata with the most popular multi-regional input-output frameworks (e.g. Eurostat, WIOD, EORA, OECD).

Hong-Dian Jiang, Mei-Mei Xue, Kang-Yin Dong & Qiao-Mei Liang

[How will natural gas market reforms affect carbon marginal abatement costs? Evidence from China](#)

Having recognised the significant role of natural gas in reducing carbon abatement costs, China is rapidly promoting its growth. However, obvious distortions exist in China's natural gas market, and it is unclear how these may affect abatement policies going forward. Therefore, to assess the effects of energy market distortions on the carbon marginal abatement costs (MACs) in China, this study proposes a computable general equilibrium model for China's natural gas sector, which considers the monopoly market structure, price regulation, and import restrictions. Results show that deregulation of gas prices will lead to an effective decrease in China's MACs. China's MACs are insensitive to liberalisation of the market monopoly or gas import restrictions. When all three distortions are fully deregulated, China's MACs show an obvious upward trend. Finally, this study uses China's carbon trading policies as an example to propose policy implications under different scenarios of natural gas market reform.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Claudia V. Montanía & Sandy Dall'erba

[Multi-dynamic interregional input-output shift-share: model, theory and application](#)

Shift-share decomposition has been extensively used to identify the key drivers of sectoral and regional economic growth. Traditionally, shift-share does not pay attention to any form of interregional externalities and the rare exceptions define them based on geographical proximity only. However, given the increasing role of global value chains in economic growth, this paper introduces the Multi-dynamic interregional input-output shift-share decomposition in order to capture the dynamic intersectoral relationships between a spatial unit and any other unit it trades with. The methodology is illustrated on 35 productive sectors of 15 European Union countries over 1995–2006. The results show that the most important driver of output growth in these countries are their sectoral linkages with other European countries, followed by the domestic sectoral linkages.

Bernhard Michel & Caroline Hambÿe

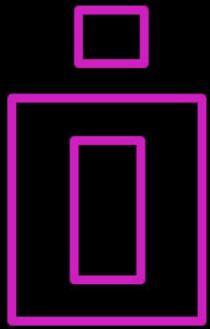
[Export-sustained employment: accounting for exporter-heterogeneity in input-output tables](#)

Exports matter for domestic employment in both export-producing firms and upstream suppliers. Their total effect can be captured through an input-output-based indicator of export-sustained employment. However, as industry classifications used in regular input-output tables are based on product similarity, they fail to account for within-industry technological heterogeneity between exporters and other firms, which may lead to a bias in results for export-sustained employment. In this paper, we describe the breakdown of manufacturing industries into export-oriented and domestic-oriented firms in Belgian input-output tables and employment data based on detailed firm-level data for industry totals and input-output structures. Based on the resulting export-heterogeneous tables, we find that 585,000 jobs or 13% of economy-wide employment in Belgium is sustained by manufacturing exports. This is overestimated by 4% with regular tables. Moreover, we identify who contributes to and who gains from exports for groups of firms rather than aggregated industries.

María T. Álvarez-Martínez, Salvador Barrios, Diego d'Andria, Maria Gesualdo, Gaetan Nicodeme & Jonathan Pycroft

[How large is the corporate tax base erosion and profit shifting? A general equilibrium approach](#)

The paper uses the computable general equilibrium model CORTAX to analyse the extent of base erosion and profit shifting (BEPS) in the EU, Japan and the US. Our approach estimates the direct fiscal losses of BEPS and accounts for the second round effects, in particular on the cost of capital and corporate investment. Our central estimates show that the net corporate tax revenue losses in the EU are €36.0 billion per year (7.7% of CIT revenues), €24.0 billion in Japan and €100.8 billion in the US (in both cases representing 10.7% of corporate tax revenues). Our estimates are comparable in size to the global tax revenue losses found using newly reported statistics on foreign affiliates. Our macroeconomic results suggest that eliminating profit shifting would slightly reduce investment and GDP and rise corporate tax revenues, which would positively affect welfare.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Andrea Bonfiglio, Silvia Coderoni, Roberto Esposti & Edoardo Baldoni

[The role of rurality in determining the economy-wide impacts of a natural disaster](#)

Rural areas may be highly vulnerable to natural disasters because of their lower economic diversification and a higher incidence of sectors that may suffer from a larger impact produced by these adverse events. In addition, because of their trade dependence, local effects can be transmitted to neighbouring regions more diffusely so amplifying total impacts. This paper aims to quantify the economy-wide impacts generated by the earthquake sequence that mostly hit a markedly rural area of Central Italy in 2016–2017. To this purpose, a non-linear programming model based on a multi-regional IO table with a mixed territorial scale is adopted. Results indicate that some negative effects are transmitted outside the seismic area and a few positive effects are also produced. Moreover, they confirm that rural areas are more vulnerable to disasters and that the effects of disasters in these areas are more likely to be transmitted to the neighbouring space.

Tesshu Hanaka, Keiichiro Kanemoto & Shigemi Kagawa

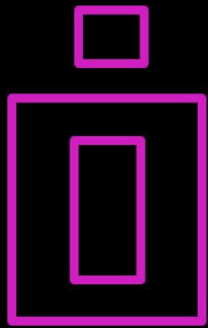
[Multi-perspective structural analysis of supply chain networks](#)

Determining the structural positions and characteristics of multi-role sectors is critical for understanding supply chain networks. Thus, in this study, we developed an attribution analysis framework to assess the structure of sectors with multiple roles in a supply chain. Subsequently, we applied the framework in a case study, where the top-ranking Japanese sectors were identified for production-oriented, betweenness-oriented, and consumption-oriented carbon dioxide emission scores. Additionally, these attribution indicators were utilized to identify/visualize the structural positions of sectors. Using company-level data, we also evaluated the structural positions of Japanese companies in relation to their carbon disclosure project (CDP) reporting practices. The results demonstrate that a company's role in the supply chain is unlikely to be related to CDP reporting.

Timon Bohn, Steven Brakman & Erik Dietzenbacher

[Who's afraid of Virginia Wu? US employment footprints and self-sufficiency](#)

Globalization has brought about concerns of domestic job losses due to outsourcing to countries like China. The 'employment footprint' concept provides new insights into the implications of trade for employment. Using this approach for the period of 1995–2008, we analyze the relation of US jobs with international trade, particularly with China. Furthermore, we compare the US employment footprint with its labor endowment to assess if the country could be self-sufficient in terms of labor. We find that the US's consumption increasingly depends on foreign workers. The country 'consumes' more labor than is nationally available; thus, self-sufficiency is not possible under realistic assumptions. Moreover, the US has benefited from jobs – especially in services – generated by the world economy. Referring to Albee's famous play about living in illusions, we use 'Virginia Wu' as a Chinese version of 'Virginia Woolf' to argue that the perceived threat of China (Virginia Wu) is only an illusion.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Christian Lutz, Maximilian Banning, Lara Ahmann & Markus Flaute

[Energy efficiency and rebound effects in German industry – evidence from macroeconomic modeling](#)

Increases in energy efficiency are reduced by the rebound effect. Efficiency gains on the micro level do not lead to proportionate reductions of energy consumption on the macro level. The German energy-economy model PANTA RHEI is applied to better understand the rebound effect. To get more robust estimates micro data from a cost structure survey of the German manufacturing sector was used to derive price elasticities of energy demand. The mesoeconomic rebound effect of an autonomous increase in energy efficiency at the industry level in manufacturing is between 7% in 2021 and 12% in 2030. The macroeconomic rebound effect lies between 12% in 2021 and 18% in 2030. Inclusion of necessary investment and assumptions of higher elasticities of substitution increase the effects. Rebound effects limit the scope of technology-driven efficiency improvements and must be considered in the design of ambitious energy efficiency programs and climate policies.

Heran Zheng, Johannes Többen, Erik Dietzenbacher, Daniel Moran, Jing Meng, Daoping Wang & Dabo Guan

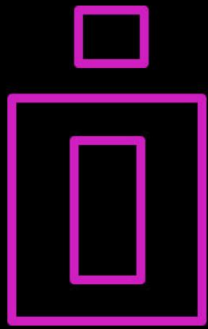
[Entropy-based Chinese city-level MRIO table framework](#)

Cities are pivotal hubs of socioeconomic activities, and consumption in cities contributes to global environmental pressures. Compiling city-level multi-regional input-output (MRIO) tables is challenging due to the scarcity of city-level data. Here we propose an entropy-based framework to construct city-level MRIO tables. We demonstrate the new construction method and present an analysis of the carbon footprint of cities in China's Hebei province. A sensitivity analysis is conducted by introducing a weight reflecting the heterogeneity between city and province data, as an important source of uncertainty is the degree to which cities and provinces have an identical ratio of intermediate demand to total demand. We compare consumption-based emissions generated from the new MRIO to results of the MRIO based on individual city input-output tables. The findings reveal a large discrepancy in consumption-based emissions between the two MRIO tables but this is due to conflicting benchmark data used in the two tables.

Rossella Bardazzi & Leonardo Ghezzi

[Large-scale multinational shocks and international trade: a non-zero-sum game](#)

International trade has improved living standards but has also become a major channel for spreading shocks on a global scale. The increasing relevance of intersectoral linkages and trade in intermediates renewed interest in input-output techniques. This paper enriches the literature on empirical trade models with an input-output/econometric approach including substitution effects and price spillovers. Our model shows that (a) trade elasticities and bilateral shares are not constant in time and differ across sectors and countries; (b) international price changes alter the relative competitiveness between competitors; (c) final demand components such as consumption and investment react to changes in international prices. Large multi-country shocks produce feedback effects in national economies as they adapt by import substitution across exporters, by changing the import content of domestic production and by adjusting final demand. These feedbacks affect the global demand producing an asymmetric non-zero-sum game.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

José L. Zofío, Julio González, Angel Prieto & Juan Vicente

[Modelling the spatial and sectoral benefits of productivity enhancing innovations using a transport oriented multiregional IO framework: the 'megatruck' in Spain](#)

We render operational the model outlined by Carter (1990) via the introduction of the research methods necessary for studying the spatial and sectoral (upstream and downstream) benefits of productivity-enhancing innovations within a real interregional input-output framework. As case study we examine the reduction in production costs derived from the adoption of longer and heavier vehicles in freight road transportation. We exploit a new Spanish regional table including a detailed disaggregation of the transportation sector. The productivity gains at the national level, resulting from a 30% reduction in transport costs, amount to 2.95% of the GVA at market prices. Results show that firms operating in this niche market appropriate most of the gross operation surplus (which increases by 10%), consistent with the existence of market power. The remaining transportation sectors see profits slightly worsened, suggesting limited substitution effects. A high regional heterogeneity exists because of the different input-output structures.

Anton Pichler & J. Doyne Farmer

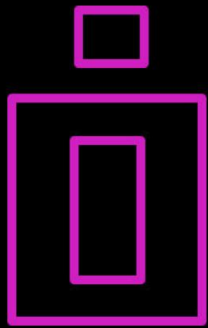
[Simultaneous supply and demand constraints in input-output networks: the case of Covid-19 in Germany, Italy, and Spain](#)

Natural and anthropogenic disasters frequently affect both the supply and demand sides of an economy. A striking recent example is the Covid-19 pandemic which has created severe disruptions to economic output in most countries. These direct shocks to supply and demand will propagate downstream and upstream through production networks. Given the exogenous shocks, we derive a lower bound on total shock propagation. We find that even in this best case scenario network effects substantially amplify the initial shocks. To obtain more realistic model predictions, we study the propagation of shocks bottom-up by imposing different rationing rules on industries if they are not able to satisfy incoming demand. Our results show that economic impacts depend strongly on the emergence of input bottlenecks, making the rationing assumption a key variable in predicting adverse economic impacts. We further establish that the magnitude of initial shocks and network density heavily influence model predictions.

Timothé Beaufiglioli & Leonie Wenz

[A scenario-based method for projecting multi-regional input-output tables](#)

Multi-regional input-output (MRIO) data are a powerful tool to analyze complex interdependencies in the international trade and supply network. Their field of application is however limited by the fact that MRIO datasets are only available for past years whereas the structure of the international trade network has been found to change profoundly over time. We here propose the SPIN method, a simple and flexible algorithm that can project MRIO tables into the future based on transparent scenarios of how gross domestic product and trade relations may evolve in that time. By combining well-established input-output techniques, namely the Leontief quantity model and an RAS-type algorithm, our method provides a straightforward mean to convert quantitative scenarios of the world economy into consistent MRIO tables. We illustrate the functioning of the SPIN method by projecting the evolution of the trade network after the 2008 financial crisis under different alternative scenarios of recovery.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Jan Weinzettel

[Aggregation error of the material footprint: the case of the EU](#)

The material footprint (raw material consumption) was proposed as a basis for monitoring SDGs 8.4 and 12.2. However, there is no institutionalized procedure providing globally consistent national material footprints. The OECD aims to institutionalize the material footprint through the development of one official inter-country input-output (ICIO) database applicable for its calculation. Inherent to input-output analysis is the aggregation error, which may impair the results. Therefore, in the case of the EU I analyze the aggregation error which can be expected if NACE rev2 classification is utilized for this ICIO database, and investigate the most important disaggregations, depending on the desired focus of the results. I conclude that the disaggregation level should reflect the intended purpose of the RME indicators. For their deeper analysis, and determination of strategies for their decrease, I conclude that NACE rev2 classification is inappropriate, and recommend high disaggregation and utilization of hybrid units.

Yoshihiro Hashiguchi, Norihiko Yamano & Colin Webb

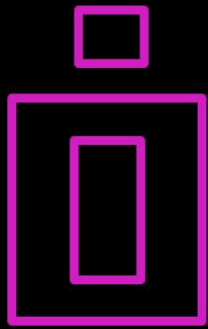
[How thick is your armour? Measuring economic resilience to shocks in global production networks](#)

When economic shocks occur, whether at home or abroad, economic agents are expected to react to reduce the negative impact or amplify the positive effects. The ability of a country to contain economic losses can be defined as the resilience to economic shocks. Using the OECD's annual Inter-Country Input-Output (ICIO) tables from 1995 to 2011, this paper investigates the relationship between changes in final demand and production structures for 61 economies. We found that, during economic downturns, countries that are able to prop up the economy through the domestic service sectors instead of domestic goods and foreign sectors are more resilient to negative shocks. Therefore, understanding the substitutability between goods and service sectors and between domestic and foreign sectors is crucial for gauging the potential risk to a country's domestic economy from shocks abroad – whether economic, environmental, health-related or political.

Arndt Feuerbacher, Scott McDonald & Karen Thierfelder

[Peasant farmers and pandemics: the role of seasonality and labor-leisure trade-off decisions in economy-wide models](#)

Pandemics attack the primary asset (labor) of peasant households and the rural poor. Peasant households must simultaneously allocate labor between farm and household activities, where the demand for agricultural labor is seasonal, which limits intra-temporal substitution, without perfect foresight. A pandemic reduces the supply of labor, through deaths and morbidity, with the scale of reductions in labor supply depending on the seasons in which a pandemic occurs. The analyses, using a recursive dynamic economy-wide model for Bhutan, demonstrate that outbreaks in high labor demand seasons cause increases in wage rates almost three times as high as for outbreaks in low labor demand seasons. Increases in wage rates induce peasant households to reallocate labor time between farm and household activities through the labor-leisure trade-off mechanism. Such changes in the allocation of labor time are important elements of peasants' mitigation responses, and can reduce the negative economic implications of a pandemic.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Paul de Boer, Jan van Daal & João F. D. Rodrigues

[Consumer preferences in CGE models when data are scarce: comparing the linear expenditure and the indirect addilog systems](#)

The linear expenditure system (LES) is a popular option for modeling consumer preferences in computable general equilibrium (CGE) models when data are scarce, since its underlying functional form is parsimonious in parameters. The goal of this paper is to compare the performance of LES against the indirect addilog system (IAS), a hardly known alternative, in terms of their theoretical properties and in a case study. Both systems are equally easy to implement and require the same information for parameter calibration. IAS, however, offers a richer description of consumer preferences. On the basis of an expenditure survey of Statistics Palestine in 1998, we find overwhelming statistical evidence that the IAS demand equations perform better than those of the LES. Simulations with a CGE model developed for disaster impact analysis applied to the intifada of the early 2000s show that the absolute value of the equivalent variation is larger for IAS than for LES.

Syeda Tasnia Hasan, Michael Oliver Wood & Simron Singh

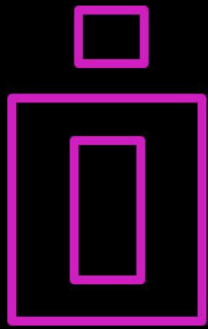
[Revealing embedded carbon emissions within the Comprehensive and Progressive Agreement for Trans-Pacific Partnership](#)

The Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), representing approximately USD 13.5 trillion of the global GDP, is one of the largest free-trade agreements in the world. This trade agreement considers many important issues yet fails to address climate change or carbon dioxide (CO₂) emissions. CO₂ emissions in trade are critical as all CPTPP parties have made significant carbon emissions reduction commitments of between 8-36% through the COP21- Paris Agreement. Herein lies a paradox. This study assesses the amount of embedded CO₂ emissions in the CPTPP through an input-output analysis of consumption-based emissions in ten carbon-intensive sectors, under three scenarios. The results reveal that as trade between partners increases, so will CO₂ emissions across those sectors. These findings are essential for policymakers who are striving to grow Partnerships (Sustainable Development Goal 17) while seeking to address Climate Action (Sustainable Development Goal 13), which appear to be conflicting goals.

Arianto A. Patunru & Prema-chandra Athukorala

[Measuring trade in value added: how valid is the proportionality assumption?](#)

For countries that have only aggregate ('competitive type') input-output (IO) tables, value added in exports is commonly estimated using the 'proportionality assumption' to separate imported-inputs from domestically procured inputs. We test the validity of this assumption using non-competitive type IO tables, which contain separately compiled domestic- and imported-input matrices, for Indonesia, Thailand, Malaysia, Taiwan, and Australia. The results show that the proportionality assumption leads to an overestimation of domestic value-added in exports, and that the magnitude of the bias becomes amplified when the export composition of a country shifts from primary products to manufactured goods through integration into global production networks.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Makiko Tsukui, Chen Lin, Kaiyan Ji & Xiaoliang Lang

[The true cost of trade among neighbors: the role of Japanese imports in waste generation in China](#)

China's rapid economic development has caused considerable environmental problems in waste generation and treatment. One important reason for this is China's manufacturing exports to other countries such as Japan, a major trading partner. However, the contribution of such importing countries has not yet been fully explored. This study quantitatively examined how final demand in trade between China and Japan affects both countries' economies and waste generation. The results show that imports of final consumption goods from China to Japan induced enormous waste generation in China, while the wastes induced in Japan were negligible. Even if final demand exports from China to Japan are significantly economically beneficial to China, the cost to China from addressing the induced waste generation seems too much to make these exports worthwhile. To encourage constructive discussions, improvement of reliability and transparency of waste statistics in China that allows comparison with other countries would be significant.

Markus Simbürger

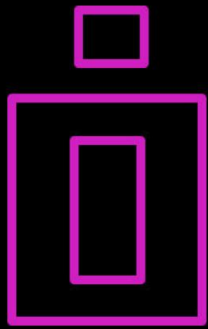
[Filter methods for MRIO tables: an evaluation](#)

Researchers who deal with network analysis based on multi-regional input-output (MRIO) tables cannot avoid the intensively discussed issue of filtering, which means identification of the most important and significant trade connections. The question of what is an appropriate filter method remains. This paper expands the existing discussion and brings new insight based on the evaluation of existing filter methods for MRIO tables. Six filter methods from the prevailing literature are identified as relevant and tested on the published MRIO tables: EORA26 and EXIOBASE. The results are verified by a case study. The evaluation shows that the Tolerable Limit approach and filter based on the Weaver-Thomas Index are the most restrictive. The Leontief filter and the filter based on holistic accuracy can be partially recommended. The filter on absolute trade values and average transactions can be recommended as 'good' methods.

Ning Chang & Chaohui Han

[Regional CO2 emissions and cross-boundary mitigation potential in China](#)

This paper presents a new framework for investigating regional CO2 emissions from the perspective of the domestic supply chain, with a combination of linkage analysis and structural decomposition analysis (SDA), which allows for a better understanding of spatial emission distributions and cross-boundary potential for CO2 mitigation. Based on the multi-regional input-output (MRIO) tables of 2007 and 2012, Chinese provinces (cities) are categorised into three groups according to linkage characteristics, among which, Group I is suggested to be given priority in formulating mitigation policies due to their stronger regional CO2 influence characteristics. Moreover, regions in Group I have been more affected by inter-regional trade than other groups with regard to their local CO2 emissions. Therefore, turning Group I into a low-carbon production pattern could help construct greener domestic supply chains. The results emphasise that regional analysis on CO2 emissions should go beyond the local factors, and that regional mitigation policies should consider the position and participation degree of different regions in domestic supply chains.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Julio Sánchez Chóliz, Rosa Duarte & Sofía Jiménez

[Structural components of income growth: an application to the evolution of the Spanish economy, 1980–2014](#)

This paper analyses the structural and technical changes in Spain since the 1980s, using annual input-output tables. Specifically, a differential structural decomposition analysis (SDA) is applied to shifts in value-added, revealing eight different components and allowing the estimation of the impacts of technical change on the process of economic transformation on a sector-by-sector basis. We conclude that growth in the Spanish economy in recent decades was a mix of technological modernization and general economic expansion, although with some heterogeneity among sectors over time. High-technology services played a key role in modernization in the late 1980s and 1990s. In fact, the growth of High-technology, Medium-high-technology, Energy and Construction sectors accelerated through the 2008 crisis. Labour compensation and returns from capital followed different trends both during expansions and recessions, intensifying income inequality in Spain.

Sabina Szymczak & Joanna Wolszczak-Derlacz
[Global value chains and labour markets – simultaneous analysis of wages and employment](#)

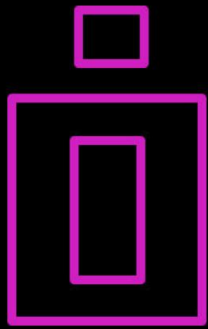
This study examines the overall effect of global value chains (GVCs) on wages and labour demand. It exploits the World Input-Output Database to measure GVC involvement via recently developed participation indices (using both backward and forward linkages) and the relative GVC position using three-stage least squares regression. We find that the relative GVC position is negatively correlated with wages and employment and that the GVC participation effect depends on whether backward or forward linkages are considered. Moreover, we find heterogeneity across both countries (middle- vs high-income) and sectors (manufacturing versus services). Notably, the effect of GVC involvement on the labour market differs from that produced by traditional domestic trade.

Muhammad Daaniyall Abd Rahman, Bart Los, Anne Owen & Manfred Lenzen
[Multi-level comparisons of input-output tables using cross-entropy indicators](#)

We introduce a cross-entropy (CE) indicator to quantify the extent to which two input-output tables or two tables with results based on input-output analysis differ from each other. Our work deploys a unique feature of the CE indicator: it can be decomposed, allowing for matrix comparisons at various levels within one coherent framework. To illustrate the power of this approach, we apply the technique to five multi-region input-output (MRIO) tables for 2011, derived from the Eora, EXIOBASE, GTAP, OECD and WIOD databases. We make pairwise comparisons between MRIOs and between global value chain (GVC) computations based on these MRIOs. We find that answers to questions related to broader aggregates are generally quite similar, but that answers to questions at the level of single industries can be rather different across MRIOs.

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INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Highlights in journals

Nooraddin Sharify

[A Model to Measure the Effects of Exchange Rate Variations on Prices.](#)

Investigación Económica.

The paper modifies the current input-output price models to analyze exchange rate variation effects on products price indices. In so doing, a Table Adjustment Price (tap) model was expanded to deal with different cases of the real-world economy. Among the contributions the new model makes to the literature are its ability to distinguish between the effects of imported intermediate input and imported final goods on price indices and the capability to consider imperfect exchange rate pass-through to prices of imported goods. The results of the implementation of the model for Iran's economy indicate that only in the case of an imperfect pass-through or a non-adjustment of one or more primary factors holders' endowments, the increment in the exchange rate will lead to smaller increments in the price indices of the products and other relevant indices.

Rodousakis Nikolaos and Soklis George

[The Impact of COVID-19 on the US Economy: The Multiplier Effects of Tourism.](#)

Economies.

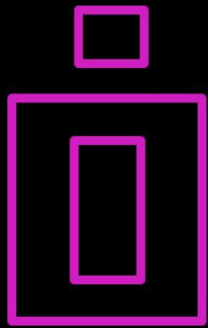
This article explores the multiplier effects on domestic product, employment, and the external sector of the US economy due to the decline of tourism activities during the pandemic. For this purpose, we use an input-output model and the latest available input-output data from the Organisation for Economic Co-operation and Development (OECD's) database. It was found that for every USD million decrease in tourism receipts, the net output decreases about USD 1.53 million, the level of employment decreases about 16.86 persons, imports decrease about USD 0.20 million, while the comparative analysis of these results with the economy's average multipliers indicates that tourism constitutes a key sector of the US economy. From the evaluation of the results, it is deduced that the decline of tourism activities recorded in the year 2020 accounts for about one-fourth of the observed recession in the US economy.

Duong Manh Hung and Bui Trinh

[Forestry Sector and Policies on Sustainable Development in Vietnam: Analyze from the Input - Output Model.](#)

International Journal of Social and Administrative Sciences.

Deforestation in Vietnam is among the most serious in the world, with many causes but the main reason is not seeing the importance of the forestry sector. Authorities seem to be "crazy loving" the GDP indicator, so it seems that everything is compared to GDP; If the ratio of a certain industry in GDP is low, it seems that the industry is not important enough! This study tries an attempt to estimate distribution of forestry to economy and environmental. This study uses an input - output system to highlight the importance of the forestry sector not only to the environment but also to the economy. The results from this analysis show that about 90% of the forest products are used for intermediate consumptions (for production) and only 10% for final uses, especially timber products. The imported value of the forest sector accounted for 43.76%, implying a need to change the plantation structure to increase the high value of timber from long rotation plantation forest to meet domestic and export demands. Researching also shows that in order to increase the value of timber exports, particular attention should be paid to the structure of the plantation forest towards converting to long rotation plantation forest. In term of environmet, the results show the role of afforestation in reducing emission. Moreover, the production of timber and wood processing sector also stimulates the planting and tending sector. Therefore, encouraging these sectors will spill over reducing emission.



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INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Manfred Lenzen, Arne Geschke, James West, Jacob Fry, Arunima Malik, Stefan Giljum, Llorenç Milà i Canals, Pablo Piñero, Stephan Lutter, Thomas Wiedmann, Mengyu Li, Maartje Sevenster, Janez Potočnik, Izabella Teixeira, Merlyn Van Voore, Keisuke Nansai & Heinz Schandl

[Implementing the material footprint to measure progress towards Sustainable Development Goals 8 and 12.](#)

Nature Sustainability.

Götz Kersting and Bertram Schefold

[Best techniques leave little room for substitution. A new critique of the production function.](#)

Structural Change and Economic Dynamics

The paper calls for a new turn in the critique of capital, both at the theoretical and the empirical level. Samuelson assumed a linear wage curve for each of a continuum of techniques such that their envelope was a monotonically falling wage curve for the economy, from which an aggregate production function fulfilling the marginal productivity conditions could be derived. But the capital intensities of the techniques chosen at each rate of profit are not necessarily lower at higher rates of profit, if the wage curves are not linear, a possibility exemplified by reswitching. This old critique of the capital controversy does not rule out Samuelson's construction as an approximation, since the paradoxes have been shown to be rare. Instead, a possibility can be shown to be likely that has so far not been noticed: the envelope of the wage curves will in the relevant range of the rate of profit be dominated by a small number of efficient techniques of approximately equal capital intensity, leaving little room for substitution. A new mathematical theorem demonstrates that the expected number of techniques that appear on the envelope is given by $(2/3) \ln s$, if independent uniform distributions for maximum wage rates and maximum rates of profit for individual techniques are assumed. Numerical experiments and empirical investigations based on input-output tables for different countries and periods confirm the analysis and extend it to normal distributions, which are more realistic. The results imply a new turn in the critique of capital. The old Cambridge critique was agnostic. It negated the neoclassical postulate that the intensity of capital falls, as the rate of profit rises, by showing that the opposite could happen, without being able to demonstrate that this happens so often that one cannot dismiss the phenomenon as exceptional.

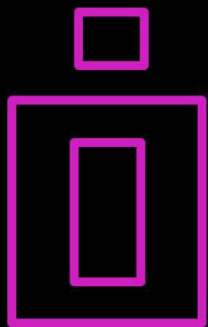
The new critique now shows that the range of possible substitutions is quite narrow, if only efficient techniques are being compared, so that technical change must be dominated by progress, not substitution, and the critique is not predominantly logical, as the old one, but buttressed by empirical investigations using input-output analysis. This new critique already has led to further papers and the beginning of a controversy.

Nooraddin Sharify

[Investigation the Effects of the Gasoline Price Increment Policy and Subsidy on Consumer Prices Indices and Welfare of Households' Groups.](#)

Quarterly Journal of Economic Research (QJER) (In Persian).

To prevent gasoline smuggling to abroad and its excessive consumption in the country, the price of gasoline increased and gasoline was quoted in 2019. This policy has affected the consumption expenditures of different income groups of households. To compensate the expenditures increment, the government pays subsidies to some income groups of households. This paper investigates the effects of this policy on the consumption expenditures of different income deciles in urban and rural areas and compares them with gasoline subsidies. To this end, a developed version of implicit subsidy elimination model is employed. The input-output table of Iran for the year 2016 is used as database of the research. The results of the research indicate that the subsidy of the government will cover the consumption expenditure increment due to its gasoline price policy for all target income groups. However, this policy fails to compensate the increment of the consumption expenditure in the case in which the labour force and capital owners adjust their endowments and the exchange rate is changed with respect to domestic price inflation.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Susana Santos

[An empirical and theoretical approach to a country's economic activity based on a Social Accounting Matrix. An application to Portugal.](#)

Bulletin of Applied Economics.

The economic flows measured by the national accounts, which are associated with transactions of goods, services, and assets, as well as transfers, all represent interactions between institutional units, to whom legal responsibility for their actions and the fulfilment of specific economic functions is recognized. These flows are defined by the underlying system – the System of National Accounts (SNA) as being transactions. When represented in the matrix form, depending on the classification and organization of the institutional units, at the origin and the destination of the corresponding flows, the “from-whom-to-whom” transactions can be measured and modelled, benefiting from the underlying network of linkages. By adopting the nomenclatures and rules of the current version of the above-mentioned system (SNA 2008), this study uses a top-down methodology to design a matrix representation of the above-mentioned transactions - the Social Accounting Matrix (SAM). Empirical and theoretical descriptions of the economic activity of a country (Portugal is used as the illustrative case), made possible by the use of the numerical and algebraic versions of a SAM, are adopted to approach the multiplier effects of policy measures and the corresponding economic adjustments.

Jiarui Zhong and Jiansuo Pei

[Beggar thy neighbor? On the competitiveness and welfare impacts of the EU's proposed carbon border adjustment mechanism.](#)

Energy Policy.

Curbing climate change is gaining increasing consensus globally. While many countries seek to set carbon prices, significant price dispersion and policy stringency continue to raise concerns about competitiveness. To address this issue, the EU has proposed a carbon border adjustment mechanism (CBAM), which aims to level the playing field by levying a carbon price on EU imports. In this paper, we estimate the competitiveness and welfare impacts of the EU CBAM, based on a refined multi-regional IO approach. We quantify changes in the value of exports to the EU market upon CBAM implementation for both EU members and non-EU economies. It is found that the EU CBAM will lead to a redistribution of competitiveness among countries and regions. Specifically, it is estimated that EU output would increase by 0.38 per cent while output in rest of the world decreases by 0.1 per cent in the short run, when CBAM is set at \$US100/tCO₂e. The burden is unevenly distributed among regions, with China, Russia and India bearing the most. Moreover, a deeper sub-national-level analysis on China shows that, given its pervasive domestic production network, income losses in landlocked provinces exceed their export losses, contrasting with the pattern for trade-exposed provinces.

Sébastien Miroudot and Ming Ye

[Decomposing value added in gross exports from a country and bilateral perspective.](#)

Economic Letters.

Decomposing gross exports into different value-added terms allows to remove the double-counting of intermediate inputs and provides insights on the structure of global value chains. We derive consistent formulas for the decomposition of gross exports from a country and bilateral perspective.

Navoda Nirmani Liyanapathirana, Amanda Grech, Mengyu Li, Arunima Malik, Manfred Lenzen and David Raubenheimer

[Nutrient-sensitive approach for sustainability assessment of different dietary patterns in Australia](#)

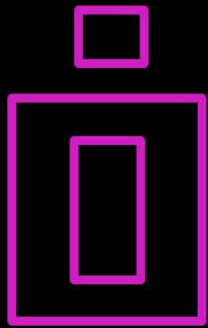
The American Journal of Clinical Nutrition.

Background

Understanding the relation between sustainability and nutrients is important in devising healthy and sustainable diets. However, there are no prevailing methodologies to assess sustainability at the nutrient level.

Objectives

The aim was to examine and demonstrate the potential of integrating input-output analysis with nutritional geometry to link environmental, economic, and health associations of dietary scenarios in Australia with macronutrients.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Yongming Huang and Jamal Khan

[Has the information and communication technology sector become the engine of China's economic growth?](#)

Review of Development Economics.

This study examines the key drivers of the information and communication technology (ICT) sector's growth and the dynamics of its sectoral relationships in the Chinese economy, about which little is known, by using four updated and harmonized input-output tables for the period 2002–2017. The decomposition analysis shows that the ICT sector's growth was mainly driven by the expansion of export and domestic demand in the 2002–2007 period and by domestic demand expansion in the 2007–2012 and 2012–2017 periods. Furthermore, causative matrix analysis demonstrates that the ICT sector was consistently externalized throughout the study period, regardless of whether it received limited feedback from non-ICT sectors' final demand in the 2002–2007 and 2012–2017 periods or substantial feedback in the 2007–2012 period. Finally, linkage analysis reveals that the ICT sector has had profound intersectoral linkages with both supply- and demand-side effects in the economy. We conclude that the ICT sector has been the engine of economic growth in China and that stimulating its growth is a key tool for economic development.

Jidong Kang, Tsan Sheng Ng, Bin Su and Alexandre Milovanoff

[Electrifying light-duty passenger transport for CO2 emissions reduction: A stochastic-robust input-output linear programming model](#)

Energy Economics.

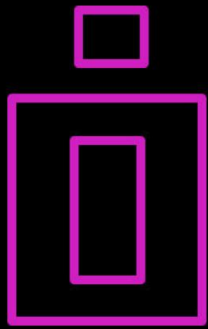
Electrification of light-duty passenger vehicles has been widely considered as an important strategy for decarbonizing the transport sector. This study proposes a novel input-output linear programming model with stochastic-robust optimization methodology to identify the optimal pathways to reduce direct and embodied emissions from light-duty passenger transport under technology cost and emission intensity uncertainties. The model introduces detailed transport technologies into a well-known economic input-output model so that the carbon dioxide (CO₂) emissions embodied in production inputs of vehicles in the entire economic system can be fully accounted for. We apply the model to a case study in China, which shows that tightening cumulative CO₂ emissions from light-duty passenger transport by 30% of the base case requires large deployment of electric vehicles, especially plug-in hybrids and battery electric vehicles. The emission reductions mainly come from vehicle operation-related emissions. Nevertheless, the total reduction in operation-related emissions is offset by the increase in capital-related CO₂ emissions by 13%–18%, depending on the variability in future emission intensity of electricity. Finally, we compare the data uncertainty handling performance of stochastic-robust model with a stochastic programming model and two deterministic optimization models under optimistic and pessimistic parameter settings. The comparison shows that the optimal technology portfolio generated from the proposed model is not only reliable in achieving the predefined emissions target, but is also able to reduce the total investment and operation costs in the light-duty passenger transport sector under data uncertainty.

Bin Su, B.W. Ang and Ya-Fang Sun

[Input-output analysis of embodied emissions: Impacts of imports data treatment on emission drivers](#)

Energy Economics.

Input-output (I-O) analysis has been widely used in embodied emission studies. For country-level analysis, the non-competitive imports assumption is generally preferred. However, national I-O tables with the non-competitive imports assumption are often not available. In empirical studies, the uniform imports share approach is usually adopted to give the estimated tables from the I-O tables with the competitive imports assumption. When data are available for two different years, structural decomposition analysis (SDA) can be applied to study the drivers of the embodied emission changes. We propose a SDA framework with two imports effects, i.e. input imports effect and demand imports effect, to evaluate the impacts of imports data treatment on the drivers. An empirical study using China's latest I-O datasets, for 2017 and 2018, show that the impacts are not significant at the national level but are significant at the sectoral level. For the latter, the impacts on sectoral embodied emission intensity range from –5% to 16%, while on sectoral embodied emissions range from –8% to 35%. Sectoral aggregate embodied intensity (AEI) indicators are found to be more robust to the imports data treatments than sectoral embodied emission intensity. In some cases a change in the sign of the input imports effect or demand imports effect is observed, which leads to opposite outcomes. Implications of the findings on embodied emission studies and the role of imports are discussed.



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Arunima Malik, Azusa Oita, Emily Shaw, Mengyu Li, Panitra Ninpanit, Vibhuti Nandel, Jun Lan and Manfred Lenzen

[Drivers of global nitrogen emissions](#)
Environmental Research Letters.

Nitrogen is crucial for sustaining life. However, excessive reactive nitrogen (Nr) in the form of ammonia, nitrates, nitrogen oxides or nitrous oxides affects the quality of water, air and soil, resulting in human health risks. This study aims to assess the drivers of Nr emissions by analysing six determinants: nitrogen efficiency (Nr emissions per unit of production), production recipe (inter-sectoral dependencies), final demand composition (consumption baskets of households), final demand destination (consumption vs. investment balance), affluence (final consumption per capita) and population. To this end, we construct a detailed multi-regional input-output database featuring data on international trade between 186 countries to undertake a global structural decomposition analysis of a change in global Nr emissions from 1997 to 2017. Our analysis shows that nitrogen efficiency has improved over the assessed time-period, however affluence, final demand destination and population growth have resulted in an overall increase in Nr emissions. We provide a global perspective of the drivers of nitrogen emissions at a detailed country level, and breakdown the change in emissions into contribution from domestic footprint and rest-of-world footprint. We highlight that food production coupled with growing international trade is increasing Nr emissions worldwide.

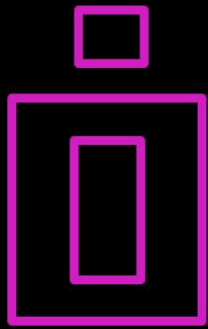
Rui Huang, Arunima Malik, Manfred Lenzen, Yutong Jin, Yafei Wang, Futu Faturay and Zhiyi Zhu

[Supply-chain impacts of Sichuan earthquake: a case study using disaster input-output analysis](#)
Natural Hazards.

With the development of interregional trade, a potential disaster that happens in one place could cause enormous economic losses in distant areas. Timely and comprehensive post-disaster assessments play a significant role in guiding disaster recovery, and for reconstruction and planning for future disaster risk reduction. In this study, we evaluate the post-disaster economic impacts due to Sichuan earthquake in 2008 and its regional and industrial spillover effects based on a Chinese multi-regional input-output table. The results show that the 2008 Sichuan earthquake caused around 1725 billion US dollars of value-added losses and 69.9 million people of employment losses. The Chemical industry in Guangdong and Zhejiang suffered severe value-added losses due to indirect effects through supply chains. Furthermore, public administration in Henan, Sichuan, and Guangdong suffered large employment losses. In general, we find that the economically less developed provinces are more susceptible to larger losses compared to the economically developed provinces. The results in this study can provide information for decision-makers to devise effective solutions on how to release relief funds and for dividing adaptation plans to avoid serious economic losses due to future disasters.

Manfred Lenzen, Mengyu Li and Shauna A. Murray
[Impacts of harmful algal blooms on marine aquaculture in a low-carbon future](#)
Harmful Algae.

The IPCC Special Report on Global Warming of 1.5 °C highlights the potential for dietary shifts to reduce greenhouse gas emissions from livestock. Reductions in the consumption of terrestrial animal protein require increases in the consumption of other food categories, to maintain food security, balanced dietary patterns, and protein intake. Aquaculture has long been suggested as one way to meet future food security needs, and marine and estuarine aquaculture in particular is associated with comparatively low greenhouse gas emissions. However, marine and freshwater aquaculture is affected by factors including harmful algal blooms (HABs), which have been increasingly documented around the world, correlated to increases in worldwide aquaculture. In this study, we applied a global multi-region input-output model to capture the direct effects as well as the indirect and induced effects HABs might pose to a global dietary transition from terrestrial livestock to increased seafood consumption from marine and estuarine aquaculture sources. We found that marine and estuarine aquaculture has a substantial potential to replace meat consumption from terrestrial livestock sources, as increases in CO₂ emissions from aquaculture were more than offset by reductions in emissions from mainly cattle grazing and associated land clearing. HABs were found to have a minor monetary impact, but the impact on protein supply was found to be potentially sizeable. For example, in a future setting where 40% of terrestrial protein sources were replaced by aquaculture, a HAB-caused global loss of 5% would set in motion numerous supply-chain cascades, affecting industries auxiliary to aquaculture, indirectly and ultimately reducing protein intake by 10–20%. Such reductions have the potential for pushing parts of Sub-Saharan populations into protein-energy malnutrition. Nevertheless, there remains a significant potential for a dietary transition to increased aquaculture seafood to contribute to reductions in GHG.



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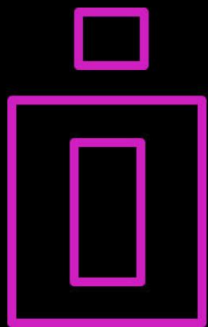
INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Albert E. Steenge

**[From Multipliers to the Distribution of Income:
Connecting Leontief and Sraffa](#)**

in: "A Reflection on Sraffa's Revolution in Economic Theory", Ajit Sinha, ed.

In this contribution we look at the relation between Leontief- and Sraffa-based multisector modelling, juxtaposing Leontief's static open model with the Sraffian models of Part 1 of 'Production of Commodities'. In this context we focus on models of the distribution of income, which are underexposed in Leontief modelling but are a central topic in Sraffian modelling. Starting with the Leontief model, we explore an extension based on so-called "extended input coefficients". These coefficients capture specific regularities in the workers' consumption behaviour and significantly increase the possibilities to study distribution processes in both the Leontief and the Sraffian multisector types. This wider scope can be attributed to the fact that such coefficients enable us to work with specific eigenvectors. These in turn allow us to study precise formulations between changes in the wage rate and the rate of profit on the one hand, and shifts in relative prices and quantities on the other. As we show, this provides a foundation for a new type of connection between the Leontief and Sraffian models. We conclude with a number of numerical exercises illustrating the role of certain specific numeraires.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Recent I-O Books and related

Input-Output Analysis: Foundations and Extensions 3rd Edition, 2022

AUTHORS

Ronald E. Miller, University of Pennsylvania

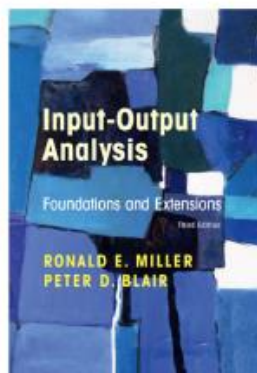
Peter D. Blair, George Mason University

ISBN: 9781108484763

New Supplemental Online Resources

This essential reference book for students and scholars in the input-output research and applications community has been fully revised and updated to reflect important developments in the field.

Associated with the text, Cambridge University Press has released a collection of online resources supplementing the text. These resources are contained in five online folders located on the textbook web site: <http://www.cambridge.org/millerandblair>.



Supplemental Chapter Appendices:

Appendix S2.1	The Relationship between Approaches I and II
Appendix S3.1	Basic Relationships in the Multiregional Input-Output Model
Appendix S4.1	Supplemental Discussion of Aggregation Bias
Appendix S5.1	Alternative Approaches to the Derivation of Transactions Matrices
Appendix S5.2	Elimination of Negatives in Commodity Technology Models
Appendix S5.3	Left and Right Inverses in Nonsquare Input-Output Systems
Appendix S7.2	Hypothetical Extractions with Partitioned Matrices
Appendix S8.1	Alternative Additive Decompositions of $\mathbf{x} = \mathbf{LBF}$
Appendix S8.2	Additional Early Additive Structural Decomposition Studies
Appendix S8.3	The Approximate Economy-wide Equivalence of Additive and Multiplicative SDA Effects
Appendix S10.2	Detailed Results for the Numerical Illustration in Section 10.4
Appendix S10.3	Brief History of Leontief Inverses with Errors in the Coefficients of A
Appendix S12.1	Earlier Formulation of Energy Input-Output Models

Exercise Problems and Solutions. This folder includes exercise problems illustrating many of the basic methodological concepts and applications highlighted throughout the text and organized by chapter in Appendix SP1. Summaries of solutions to these exercise problems are provided in Appendix SP2. Some problems reference illustrative data sets included in Appendices SD1 and SD2, described below. A computational workbook providing expanded discussion of the problems and solutions is included as Appendix SP3:

Appendix SP1 Exercise Problems

Appendix SP2 Exercise Problem Solutions

Appendix SP3 Computational Workbook

Reference Input-Output Data Tables. This folder includes machine readable versions (Microsoft Excel spreadsheets) of highly aggregated historical US Input-Output tables (Appendix SD1) and of other data tables referenced in the text and exercise problems (Appendix SD2).

Appendix SD1 US IO Data

Appendix SD2 Other Real-World Tables

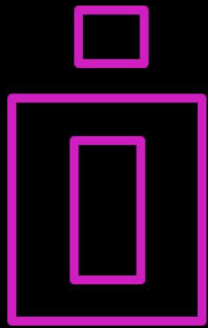
Exploring Input-Output Analysis with APL. This folder includes an expanded version of the computational workbook included as Appendix SP3 that provides additional computer software notes.

Errata. This folder will contain periodic updates of accumulated errata for the text, appendices, problems, data tables, and workbook.

About the Authors

Ronald E. Miller is Professor Emeritus of Regional Science at the University of Pennsylvania. A pioneer in the development of interregional input-output models, his research providing key insights about interregional feedback effects and many other features of regional economic models spans five decades.

Peter D. Blair is Distinguished Senior Fellow in the Schar School of Policy and Government, George Mason University. Published widely in many fields, his career includes management, research and teaching at the National Academy of Sciences, the Congressional Office of Technology Assessment, Technecon Analytic Research and the University of Pennsylvania.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

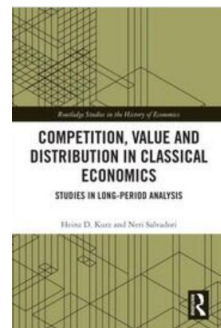
Recent I-O Books and related

By Heinz D. Kurz, Neri Salvadori

[Competition, Value and Distribution in Classical Economics. Studies in Long-Period Analysis.](#)

Drawing in particular on the work of Sraffa, Smith, Ricardo and Marx, the essays in this volume explore the characteristic features of the Classical economists' approach to economic problems, and the renewal of interest in that approach in modern times.

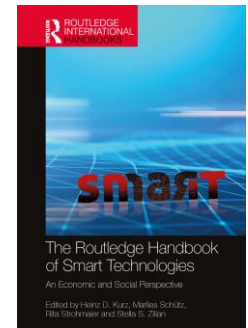
In recent years, new material has been made available on both Sraffa and Marx which have made new insights and interpretations possible. The release of Sraffa's hitherto unpublished papers and correspondence has led to reconsideration of doctrinal questions such as to what extent Sraffa built upon, or deviated from the analyses of Adam Smith, David Ricardo and other representatives of the classical British school and Karl Marx. A major theme is also to what extent we can today, equipped with Sraffa's insights and analytical tools, re-interpret and develop ideas of classical authors, which they could present only in primitive forms, on technological progress, exhaustible resources and other contemporary issues. On Marx, the publication of the MEGA2 edition of the works, papers and correspondence of Marx and Engels also gives rise to a reconsideration of this relationship, given Marx's disenchantment with some of his own work and return to ideas advocated by Ricardo, especially as regards the long-term tendency of the rate of profits. Finally, the classical notion of competition and monopoly deserve to be scrutinized carefully again and frequent misunderstandings in the literature refuted.



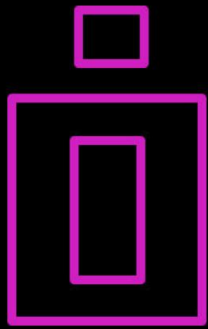
By Heinz D. Kurz, Marlies Schütz, Rita Strohmaier, Stella S. Zilian

[The Routledge Handbook of Smart Technologies. An Economic and Social Perspective](#)

This Handbook provides a thorough discussion of the most recent wave of technological (and organisational) innovations, frequently called "smart" and based on the digitisation of information. The acronym stands for "Self-Monitoring, Analysis and Reporting Technology". This new wave is one in a row of waves that have shaken up and transformed the economy, society and culture since the first Industrial Revolution and have left a huge impact on how we live, think, communicate and work: they have deeply affected the socioeconomic metabolism from within and humankind's footprint on our planet. The Handbook analyses the origins of the current wave, its roots in earlier ones and its path-dependent nature; its current forms and actual manifestations; its multifarious impact on economy and society; and it puts forward some guesstimates regarding the probable directions of its further development. In short, the Handbook studies the past, the present and the future of smart technologies and digitalisation.



This cutting-edge reference will appeal to a broad audience, including but not limited to, researchers from various disciplines with a focus on technological innovation and their impact on the socioeconomic system; students across different fields but especially from economics, social sciences and law studying questions related to radical technological change and its consequences, as well as professionals around the globe interested in the debate of smart technologies and socioeconomic transformation, from a multi- and interdisciplinary perspective.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Special Issues in Journals

Economic Systems Research Special Issue **Integrated Assessment Models and Input-Output Analysis**



Guest Editors: **Arunima Malik** (*The University of Sydney*) and **Roberto Schaeffer** (*Universidade Federal do Rio de Janeiro*)

Context

The IPCC uses Integrated Assessment Models (IAMs) as their core analytical capability for assessing future scenarios and mitigation strategies. Many IAMs incorporate Computable General Equilibrium (CGE) and Input-Output (IO) models. IAMs stand at the intersection of economics and industrial ecology. A very recent hot topic is the question of whether and to what extent degrowth has to play a role in achieving the 1.5 degrees target. The rationale here is that affluence is the main driver of greenhouse gas emissions (a finding supported by IO analysis), and hence should be considered as a mitigation lever. Of course, growth and therefore degrowth, are topics central to IO analysis. The Special Issue will therefore also have a special focus on degrowth.

In the political area, emerging technologies are seen as the saviours of the planet. The US Climate envoy, John Kerry, states: “[People] don’t have to give up a quality of life to achieve some of the things that we know we have to achieve...50% of the reductions we have to make to get to net zero are going to come from technologies that we don’t yet have”. The rationale for this statement is unclear. It has been previously shown that the feasibility risks are high in quick deployment of renewable energy technologies, whilst degrowth scenarios minimise key feasibility-related risks.

For this special issue, we welcome research from all aspects of IAMs and IO analysis, with some component of inter-industry content required for inclusion in **Economic Systems Research**.

[Link](#)

Queries and submission process

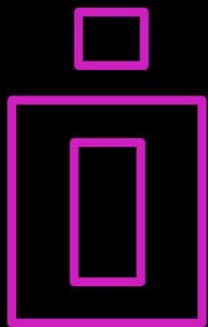
Please contact the guest editors:

Arunima Malik – arunima.malik@sydney.edu.au

Roberto Schaeffer - roberto@ppe.ufrj.br

Deadline for submissions

Submissions will be accepted until **31 March 2022**, however early submissions are encouraged. Early submissions will be added to the webpage of ESR, following peer-review. Hence, if you submit early, your article will not be held up waiting for other articles.



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INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Special Issues in Journals



Special Issue "Energy and Economic Systems: National Accounting Perspectives"

Guest Editors: Nikolaos Rodousakis (Centre of Planning and Economic Research), George Soklis (Panteion University) and Theodore Tsekeris (Centre of Planning and Economic Research).

The recent energy crisis and economic and environmental sustainability are among the biggest challenges in the contemporary world. As one of the primary tools for research and decision-making in the areas of economic development, energy policy and ecology, national accounting systems (NAS) have an important role in answering these challenges. The central position of national accounts in statistical systems, and along with their worldwide use and acceptance, reinforces their usefulness and importance as a source role as a universal language and body of factual information on the economy, energy and environment. Due to their ability to provide a comprehensive picture of the economic system, the models that are based on NAS (e.g., input-output and stock-flow consistent models) are widely used in environmental studies, linking economic and environmental variables on the demand and supply sides.

All these considerations motivate the proposal of this Special Issue, which aims to collect empirical studies and theoretical contributions exploring the linkages between the economy, energy and the environment.

Special topics of interest include but are not limited to:

- Climate change and NAS;
- Carbon emission estimations;
- Energy price shocks;
- Environmental input-output modelling;
- Environmental and energy factors in growth accounting;
- Extended supply and use tables;
- E3 (economy–energy–environment) modelling;
- Stock-flow ecological modelling;
- Energy and environmentally adjusted productivity;
- Network analysis

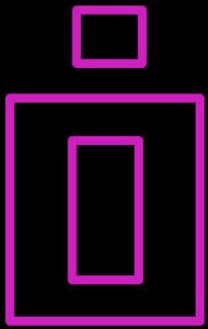
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[Special Issue Information](#)

Keywords: carbon emission; climate change; ecological macroeconomics; energy crisis; input-output analysis; national account systems; stock-flow consistent analysis; Growth accounting

Deadline for submissions

Deadline for manuscript submissions: **30 August 2022.**



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Job Positions



As the science and knowledge service of the Commission, the mission of DG Joint Research Centre is to support EU policies with independent evidence throughout the whole policy cycle.

The JRC is located in 5 Member States (Belgium, Germany, Italy, the Netherlands and Spain). Further information is available at:

<https://ec.europa.eu/jrc/>

The unit in Seville (Spain) has currently the following vacancies:

2022-SVQ-B2-FGIV-019970

**FG IV - Economic Analyst –
Corporate Tax Economist**

[Link](#)

2022-SVQ-B2-FGIV-019971

**FG IV - Economic Analyst - Microsimulation
modelling**

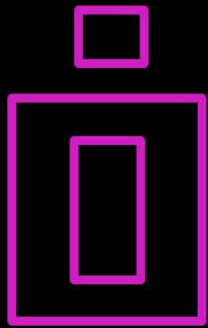
[Link](#)

2022-SVQ-B2-FGIV-020008

**FG IV - Economic Analyst - General equilibrium
modeller**

[Link](#)

[More info of other vacancies](#)



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Job Positions

University of Leeds -- Lloyds Banking Group Postdoctoral Research Fellowships

Lloyds Banking Group is the UK's largest retail and commercial bank, with over 13.7 million active online customers and 30m customers across our various businesses. Lloyds Banking Group is investing to support the UK's transition to a greener, more sustainable economy.



As part of this strategy, the bank is collaborating with **the Sustainability Research Institute** at University of Leeds to fund new, focused research on how financial transactions and other internal data resources can be used to generate insights and support new initiatives to improve client sustainability. Our goal is to help clients transition towards their Net Zero goals through innovative data-centric approaches to providing accurate feedback and guidance, and to produce internationally excellent new empirical research on sustainability measurement practices and methodologies. This research will leverage the bank's very large transaction-level data pools to address core theoretical questions in the measurement of carbon emissions, and find answers with direct applicability in industry. Could you help us make it happen? **Two full-time postdoctoral research fellow** roles are available and being funded directly by the bank. Researchers will be employed as contractors for LBG for an initial term of one year. These roles will also include post-doctoral research positions in the Sustainability Research Institute at University of Leeds. The posts will be based day-to-day at Lloyds Bank offices and within the department at Leeds. The posts will have a close working collaboration with the bank's in-house Behavioural Science team and Sustainability teams, and with members of the Research Group at Leeds, and other supporting academics at Universities including Edinburgh, Nottingham and Warwick Business School.

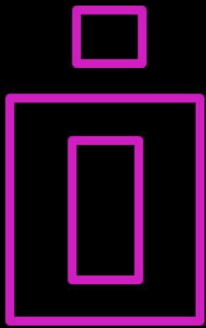
The research team is an interdisciplinary combination of sustainability, carbon accounting, behavioural and economic scientists led by Dr Anne Owen, Prof. John Barrett, Dr Matthew Brander and Dr David Leake. We will produce high impact insights to support LBG's sustainability strategy. Our findings are expected to be of broad interest. We will organise projects around the production of journal articles for the academic literature, with the research fellow leading the delivery of a portfolio of 2-3 papers. The team will deliver impact by producing internal research publications for Lloyds to capture key findings and drive stakeholder engagement.

As an applicant, you should have a PhD in a relevant subject which could include climate change or economics, or be about to submit your PhD. You should have a high level of numerical literacy and a willingness to learn new approaches such as Multi-Regional Input-Output Analysis. You will need expertise in using R and or Python to work with large data sets. Experience with data base query languages like SQL is an advantage, as is experience with econometrics. Experience in analysis of moderate to large data sets is an advantage. Experience writing up research for publication in scientific journals is essential. Experience presenting to academic and industry audiences is an advantage, as is experience of building productive relationships with the empathy to understand other people's perspectives and the ability to simplify, articulate and usefully explain complex ideas to non-specialists.

The roles are available to start from April 2022, with an initial fixed term contract of 1 year with the expectation to extend on this depending on progress. The salary range for these roles is £40k-£60k. You should be eligible to work in the UK, with any necessary visa in place.

If turning cutting edge data-led insights in sustainability into practical, real-world applications appeals to you and you've the background and skills we're seeking then get in touch--we'd be keen to hear from you. Please make informal enquiries to Dr Anna Owen (a.owen@leeds.ac.uk) and Dr David Leake (david.leake@lloydsbanking.com).

Please send you letter of application and CV to Dr David Leake (david.leake@lloydsbanking.com).



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

The Social Accounting Corner

Questions: 1) How did you learn about Input-Output for the first time? Can you remember your first thoughts? 2) Which was your first IIOA conference? Any memory that you want/can share? 3) Recommend the readers of the newsletter a paper that surprised or inspired you.

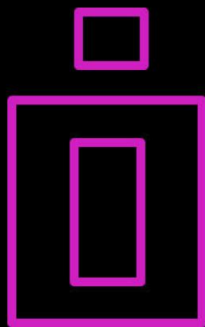
**Moana Silva Simas – Research Scientist,
SINTEF (Norway)**



1) First time I heard about IO was during my masters, back in 2010. I was working with wind energy and sustainability, and green jobs and employment associated to renewable energy was a hot topic. Then, during my thesis, I built an environmentally-extended IO model for Brazil, looking at jobs, GHG emissions, and ecological footprint. I thought it was a very useful tool to have an overview of how different technologies affected the entire economy, directly and indirectly, and I was very interested in learning more of these indirect environmental effects through value chains. I liked it so much that I have been working with IO ever since!

2) My first IIOA conference was in Lisbon, in 2014. It was a very nice experience. I met many people I still have contact and collaboration with to this day. During that conference, a researcher I had just met (and today is a colleague and a good friend!) convinced me to sit and talk to professors I admired, instead of sitting with other PhD students as I usually did. I think that was the first time I got confidence to talk to people I was used to citing!

3) There are many papers that have inspired me, so it is hard to choose only one. I am very interested in papers that link social and environmental impacts in global value chains that feels "close to home", that is, that I can relate to. I can recommend the paper "[Attribution of CO2 emissions from Brazilian deforestation to consumers between 1990 and 2010](#)" from Karstensen, Peters and Andrew published in Environmental Research Letters in 2013. And of course, Miller and Blair, which is always (including at this moment) on my table.



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Satoshi Inomata – Senior Overseas Research Fellow, Institute of Developing Economies – Japan External Trade Organization (Japan)



1) In my college, there was only a one-shot lecture (out of the whole three years!) on the IO method, for which I vaguely remember that the lecturer was talking on something about a Russian-named guy and 2×2 matrix inversion. I have an impression that the IO analysis was not extensively taught at that time in the UK, setting aside my lack of concentration during lectures.

So, I had known nothing about the IO analysis until I started my job at IDE-JETRO, which put me in the project of constructing the Asian International Input-Output Tables.

As one of my earlier job missions (in the 1990s), I visited a researcher of the European Bank for Reconstruction and Development (EBRD) in London. When I introduced myself, the person gave me a rather malevolent remark: “So, you are *still* doing the input-output analysis?!” ... I was young and quite upset. I wondered why she said to me in that way. Was it because IO analysis was associated with planned economies, which were considered to become extinct following the breakdown of the Soviet Union and Eastern bloc? (Again, it was in the early 1990s, and the EBRD was an apparatus to clean up socialist legacies.)

Now, I would refute her with confidence; “Look, the world has changed, and the IO is up on the stage again.”

2) Beijing, 2005. ...Well, unfortunately I was only a short visitor. I didn’t try my best to socialise myself, and was just hanging around like a stray sheep. However, I vividly remember that Prof. Cuihong Yang of the Chinese Academy of Sciences was the chair of my session. She welcomed me with great hospitality and kindness, and I was so obliged for that.

3) (1) “Structural Path Analysis and Multiplier Decomposition within a Social Accounting Matrix Framework,” Defourny, J and Thorbecke, E. (1984), *The Economic Journal*, 94 (373).

Until I came across this paper, my understanding of the IO analysis had been only macro-impact calculation of a change in final demands. The paper showed me a new way of looking at an IO matrix (or SAM) as a nexus of supply chain paths.

(2) “Using Average Propagation Lengths to Identify Production Chains in the Andalusian Economy,” Dietzenbacher, E., Romero, I. and Bosma, N. S. (2005), *Estudios de Economia Aplicada* 23 (2).

The traditional IO approach to analysing production networks is generally concerned with the interconnectedness or strength of linkages between industrial sectors. The “length” dimension of production linkages was first addressed by this study, which is, in this sense, revolutionary in the development of IO theories.

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