

Newsletter
Number 48, May 2021

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 sending your inputs.

This issue contains a presidential message regarding the virtual IIOA campaign, the latest ESR articles, highlights in Journals and recent I-O books, but also next events including the next IIOA Webinar by Thomas Howells and the Online Development Programme. You can also find the Tale of the 10th Anniversary of the reunion in Réunion, very important awards and promotions by the IIOA members and a job position. The Social Accounting Corner brings this time conversations with Krista Danielle Yu and Michael L. Lahr. 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

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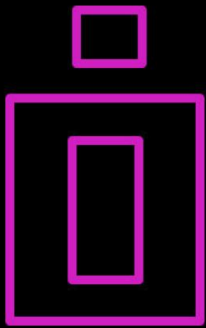
Personal E-mail: carrascalandre@uniovi.es

Would you like to contribute to the IIOA
newsletter?

Send us your news at newsletter@iioa.org

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INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Presidential Message - The Virtual IIOA Campaign was launched!!



Dear valued IIOA members

As I announced in the previous issue of the IIOA Newsletter, we are currently running the "Virtual IIOA Campaign". This is the first trial of a virtual campaign in the IIOA's history, as well as being exploratory for its future.

This campaign is a full-scale attempt by the IIOA Council to catch up with our changed research environment. The campaign is intended not only to make up for lost opportunities caused by the cancellation of the 2021 conference, but also to exploit new possibilities brought upon by new-found communication technologies increasingly available to us.

We kicked off Campaign on 17 February 2021 with a webinar by Prof. Maureen Rimmer from the Centre of Policy Studies at Victoria University in Melbourne, Australia. She presented on a CGE-based technique of historical simulation for data estimation, including that of input-output tables, with a particular reference to GTAP modelling.

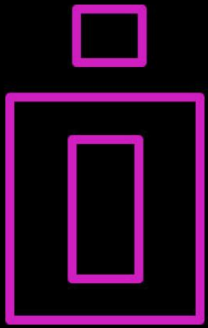
The next in line was Dr. Richard Wood from Industrial Ecology Programme, NTNU Trondheim, Norway, on 17 March 2021. His presentation delivered a concise introduction to the concept of a consumption-based approach to economic/environmental analyses, and why it matters. Capitalizing on EXIOBASE database, he articulated a need for demand side (consumption side) mitigation on GHG emission and equity problems.

The latest webinar was given on 6 May 2021 by Prof. Yauhide Okuyama from Kitakyushu University, Japan. He presented an excellent overview of the multitude of research works in disaster analyses, and indicated a future direction of the application of input-output techniques to this field of an increasing attention among academics and policy-planners alike.

These webinars were recorded and made available for viewing at the top page of the IIOA website.

Another important strand of the Campaign is the International School of Input-Output Analysis (ISIOA) Online. Since its first courses in 2010, the ISIOA has been a core component of IIOA conferences. With the current unfortunate circumstances of having to give up two conferences in sequence due to Covid-19, however, we decided to bring it online and make it asynchronous with any conference.

The first module of the current edition (10th) was delivered from 08 to 29 March 2021 by Prof. Heinz D. Kurz and Prof. Christian Lager from the University of Graz, Austria, with the title "Historical Roots and Theoretical Background of Input-Output Analysis". A full 74 members registered, of which 9 intend to seek official certification. You can now review the recordings of the four lectures through the ISIOA section in our website.



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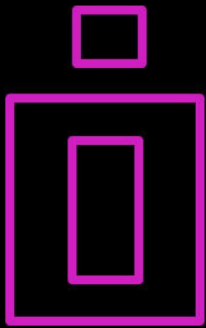
Presidential Message - The Virtual IIOA Campaign was launched!!

I express my sincere gratitude to all IIOA members for their continued interest in these programmes, as well as to the Council members/associated colleagues for their invaluable efforts and contribution in propelling these new ventures forward.

Last but not least ... while many of the programmes of the Campaign virtually emulate events of physical IIOA conferences, the Campaign itself is NOT intended to replace them...! That is, once current difficulties are overcome and with your help, the IIOA Council will identify a best mix of virtual programming and real face-to-face conferencing!

Well, I stop here, but please remain attentive to upcoming announcements from us ... many more are expected!!

Best wishes,
Satoshi INOMATA (President of the IIOA)



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Events

Next IIOA Webinar

Block your calendars: IIOA Webinar!

On Thursday **June 3**, **Thomas Howells** (U.S. Bureau of Economic Analysis) will give a talk with the title "**BEA's Supply-Use Framework: Current Research and New Extensions**".

In this webinar Tom will provide an overview of BEA's structure, the role of the supply-use framework as the foundation for many of BEA's products, and ongoing research building on BEA's SUTs/IOTs—including work on TiVA statistics, supply chain analysis, and satellite accounts covering the digital economy, marine economy, and commercial space economy.

The webinar will begin at **10pm Tokyo time**, which corresponds to **9pm Beijing time, 3pm Vienna time, 10am Sao Paulo time and 9am Washington DC time**. All IIOA members and other interested colleagues are most welcome to attend!

More information and the link to the meeting will be disseminated about a week before the webinar.

Best wishes,

Bart Los, Sanjiv Mahajan and Doug Meade

IIOA Online Development Programme 2021

To give young researchers a chance to receive feedback on their papers in a year in which the IIOA had to cancel its international conference again, an online version of the Development Programme will be offered. This announcement presents the details of this event (which is part of the IIOA's Virtual Campaign). All IIOA members is invited to attend!

July 5 – July 9

- MS Teams will be the platform used;
- Each session contains at most 3 presentations. Each speaker has 15 minutes for presentation, 10 minutes for discussion. The total number of sessions in the program depends on the number of accepted papers (max. of 10);
- Papers can only be presented by researchers who were born in **1980 or later** (co-authors are allowed to be older);
- Participation (speakers and attendees) is free of charge for all IIOA-members.

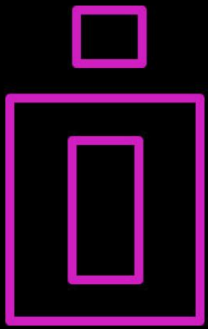
Important dates:

- Submission of full papers through COPASS (copass.iioa.org) **May 31st, 2021**
- Communication of selection to the authors by **June 10th, 2021**
- Full Programme will be announce by **June 18th, 2021**

We sincerely hope that young researchers will take this opportunity to present their work and to get feedback, despite the unfortunate circumstances they are currently experiencing. Please do not hesitate to contact us (b.los@rug.nl) if you would have questions or comments.

Best wishes and stay safe,

Rossella Bardazzi, Bart Los and Anne Owen (organizers)



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Events

SHAIO events

Sociedad Hispanoamericana de Análisis
Input-Output



Dear IIOA community,

Thank you for the great acceptance of the webinars held to date. Throughout 2021 we will continue to develop this series of webinars on a wide diversity of topics.

We can confirm the speakers for the following three webinars that will take place in May, June, and October 2021:

- **May 27** (5:00 pm, CET): [Luis Pedauga](#), University of León, Spain (language: Spanish, materials in English).
- **June 24** (5:00 pm, CET): [Julia Steinberger](#), University of Lausanne, Switzerland (language: English). Webinar developed in collaboration with the Energy Modeling Network for Sustainable Energy Transition ([RedMentes](#)).
- **October 28** (5:00 pm, CET): [Pablo Ruiz Nápoles](#), UNAM, Mexico (language: Spanish, materials in English).

The entire input-output community is invited to join our webinars. If you are not a SHAIO member, you only need to fill in a registration form that will appear about two weeks before each webinar on our web pages and social networks.

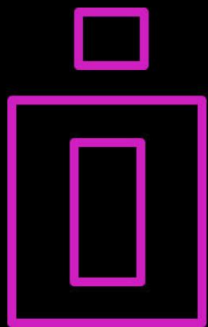
Don't forget to subscribe to our social networks [Facebook](#) and [Twitter](#) to be updated with our events and we remind you that you can enjoy the previous meetings and download the materials presented from our [Youtube channel](#) and our [web page](#).

From SHAIO, we wish you and your families all the best.

Stay healthy!!

The SHAIO Council.





INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Events

SHAIO events

Dear colleagues,

The [Faculty of Economics and Business of the University of León](#) and the [Department of Economics and Statistics](#) are pleased to invite you to participate in the [8th permanent Workshop](#) of the Hispanic-American Input-Output Society (SHAIO), which will be held in September of 2021 in León (Spain).

The health crisis caused by COVID-19 requires adopting preventive measures and following strict health protocols to prevent infection. For this reason, the organization committee of the 8th permanent Workshop of SHAIO has decided to adopt a double modality workshop (online and on-site).

Given the current protocol of measures Covid-19, the capacity in the spaces of the CRAI-TIC (place of the event) has been limited by the norms of the university to a total of twenty on-site participants.

w(I-O)⁸

SHAIO w(I-O)⁸
8th Input-Output Analysis
Workshop
León, 23-24 September 2021 (on-site and online)

Where:
Edificio CRAI-TIC
Campus de Vegazana s/n.
Universidad de León, 24071

Organizan:
Grupo de Investigación en Macro-finanzas y
Contabilidad Social (GIMACS)
Grupo de Investigación en Economía Aplicada (GIEA)

Departamento de
Economía y
Estadística

<http://wio8.shaio.es/>

These participants will be chosen from those who select to be indifferent between online and on-site presentation when they send the abstract. As far as sanitary conditions allow it. Of course, the online presentation will be available for those who show their preference for the online presentation.

We are sure of the hospitality that characterizes this millenary city will offer in the next meeting the most favorable conditions to share and discuss our latest works. This 8th meeting is another example of the consolidation of a constant and uninterrupted meeting in addressing all these issues of relevance in the economic analysis.

The keynote speaker confirmed is [Óscar Dejuán](#) (University of Castilla-La Mancha, Spain).

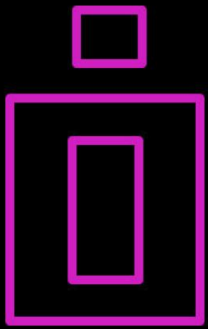
Key Dates:

- **Abstract submission** → June 15, 2021
- **Notification of acceptance** → June 30, 2021
- **Full paper submission** → July 13, 2021
- **Registration** → August 15, 2021
- **Workshop** → September 23-24, 2021

More information at: <http://wio8.shaio.es/en/>

We are looking forward to seeing you in León!





INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Events

FIGARO launch

Eurostat in close cooperation with the Joint Research Centre of the European Commission is organising a virtual event "**Full International and Global Accounts for Research in input-Output analysis (FIGARO)**" on **26 May from 15:00 to 16:30 CET**. The event aims to raise awareness of this new statistical product and to discuss its main uses. FIGARO are EU inter-country Supply, Use and Input-Output tables.

The event will be an opportunity to discover FIGARO statistics, a unique tool allowing economic modellers, policy-makers, and other interested parties to analyse the socio-economic and environmental effects of globalisation. How FIGARO data helps us understand the links between jobs, income and trade is only one of the questions we will look at.

The event will be opened by Ms **Mariana Kotzeva** (Director General of Eurostat) and Mr **Stephen Quest** (Director General of the Joint Research Centre). The keynote speakers are:

- Prof **Erik Dietzenbacher** (University of Groningen);
- Mr **Bernhard Michel** (Federal Planning Bureau, Belgium);
- Mr **Ignacio Garcia Bercero** (DG TRADE, European Commission).

You are invited to register your participation here. **Deadline for registration is 25 May 2021 at 12:00 CET**. Connection details for live-stream will follow in due time.

We hope to see you all at the FIGARO launching event!

Registrations:

<https://eu.eventscloud.com/website/4590/>

#EUmodelling

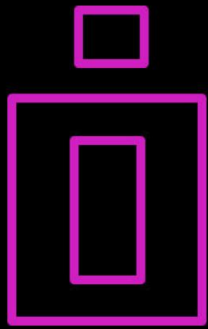
@EU_ScienceHub



Full International and Global
Accounts for Research in input-Output
analysis (FIGARO)

26 May 2021

On behalf of Lena Frej Ohlsson
Head of Unit C5 Integrated global accounts and Balance of Payments
Pille Defense
Unit C5 Integrated global accounts and Balance of Payments
Supply, use and input-output tables
European Commission
EUROSTAT



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Events

Call for papers for funding research - Research Network Sustainable Global Supply Chains

The Economics and Governance of Sustainability in Global Value Chains

This call for proposals aims to fill this gap by inviting applied and policy-relevant research that speaks to topic of sustainability in GVCs, mainly but not exclusively using quantitative analyses. We are in particular interested (1) in research that attempts to measure and to attribute sustainability outcomes (social and environmental) to GVC participation; (2) in research that attempts to identify (causal) drivers (including policies) of sustainable production in GVCs and conditions that determine how GVC participation impacts sustainability outcomes; and (3) in research that considers possible unintended consequences and trade-offs of such drivers and dimensions of sustainability.

Please find the detailed call with submission details [here](#) and [here](#).

Please contact globalsupplychains@giga-hamburg.de in case of questions.

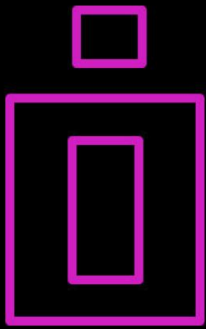
Conference "Sustainability in GVCs"

The Research Network on Sustainable Supply Chains will host a **research conference** in collaboration with UNIDO, aiming to bring together state of the art empirical research to further shed light on the subject of sustainability in global value chains. The research conference is an official part of UNIDO's annual Forum on Globalization and Industrialization (FGI 2021), organized as a back-to-back event on **December 6 and 7, 2021**.

Interested applicants wishing to present original research should send an extended abstract (600-1000 words) in PDF format stating "Conference abstract" in the subject line to: globalsupplychains@giga-hamburg.de by 31 May 2021. Before submission please read the detailed [call for papers](#).

CONFERENCE SUBMISSIONS AND DEADLINES:

- **31 May 2021** – Extended abstract submission (600-1000 words)
- **30 July 2021** – Paper submission deadline
- **15 August 2021** – Acceptance/rejection notification
- **15 November 2021** – Final papers due
- **6 December 2021** – The 2021 Forum on Globalization and Industrialization
- **7 December 2021** – Research conference



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Events



Dear colleagues,

The **Competence Centre on Modelling** of the European Commission is organising the **2021 EU Conference on modelling for policy support**. The event will take place fully online during the week of **22 – 26 November 2021**.

The Conference brings together **researchers and policymakers** from European and international institutions, Member States, universities, research institutes and consultancies. Its aim is to identify common challenges and solutions in the **use of models to support policymaking**. The 2021 programme will also offer interactive opportunities of exchange such as workshops and trainings.

Call for papers

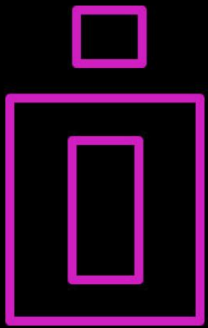
Authors need to submit an extended abstract of maximum 2 pages (1000 words) in English **by 30 June 2021**.

Contributions should cover model development and use for policy development, assessment and implementation in the EU and in the Member States. Submissions should refer to one of the following areas:

1. Transparency of models and their use
2. Ensuring model quality
3. Scenarios and data
4. Assessing and communicating uncertainty in model results
5. Multidisciplinary approaches, integrated assessment and model linkages
6. Complex systems and multicriteria analysis for policy modelling
7. Combination of qualitative and quantitative methods
8. Communication and visualisation of model results
9. Using model related evidence for policy: processes and experiences

Abstracts can refer to **all policy fields** characterised by the use of models in support to policymaking. They should clearly indicate the relevance and implications for model development and use in support to policy. The direct involvement of both scientists and policymakers in the presentation, as well as reference to concrete experiences of collaboration across disciplines, is an asset.

Contact: Please visit the [Conference webpage](#) or contact EU-CONF-MOD@ec.europa.eu



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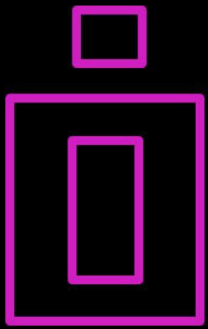
Tales from the I-O world: A reunion in Réunion, or: Impressions from the founding of an MRIO project

The Rationale

Réunion, a French Département in the Indian Ocean just east of Madagascar, is a place of many contrasts. Situated 9,500 km from Groningen/Leiden in the Netherlands, 9,200 km from Sydney in Australia, and 10,800 km from Chiba in Japan, it seemed to be a good place to bring together the representatives of Multi-Region Input-Output (MRIO) frameworks that had one year earlier – in 2010 – sat around a table at the IO Conference in Sydney, to discuss whether their respective initiatives could be unified. Initial doubts (Erik: "Is this a joke?") were dispelled, and at the end of March 2011, seven MRIO researchers met at L'Hermitage-les-Bains on Réunion's west coast: Arnold Tukker (EXIOBASE), Terrie Walmsley (GTAP), our President Satoshi Inomata (IDE-JETRO), Erik Dietzenbacher and Bart Los (WIOD), Tommy Wiedmann and Manfred Lenzen (Eora). Project Réunion was joined at subsequent meetings by Nori Yamano (OECD), Glen Peters and Robbie Andrew (GTAP), and Bo Meng (IDE-JETRO).

Tommy reminded us that this reunion in Réunion now celebrates its **10th anniversary**. The idea of unifying MRIO frameworks was then and is still now important for creating trust in MRIO results – trust that is needed to give MRIO-based research a chance of making it into policy-making circles, such as the Intergovernmental Panel on Climate Change.





INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Tales from the I-O world: A reunion in Réunion, or: Impressions from the founding of an MRIO project

The Meeting

Despite this clear rationale, the meeting did not start off on a good footing. The first day was marked with recognising differences, emphasising past investments in specific work flows, noting accounting hurdles, and highlighting organisational restrictions on the ability to share information. At some point, the meeting was adjourned, and people went snorkelling.

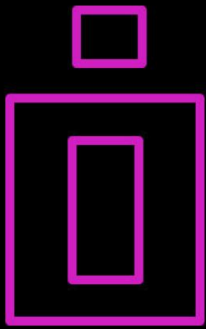
There's something that watching colourful fish in a lagoon does to you. Whether it's the stillness under water, or their blissful oblivion to your presence, or their abundance in shapes and numbers, it reminds one of the fact that there are things (quoting Arnold) "much more memorable than the IO maths and data we tried to align". I would add, much more significant too. In any case, (quoting Terrie), "the release of tension in the room as we got to know each other better and the issues each of us faced" was evident. I ascribe this to the fish in that lagoon.

The post-snorkelling mood in the room is best described as "Let's give this a go!". A notable notion was Erik's "Mother Of All MRIOs" – an MRIO database so big that any of the teams' research priorities and preferences could be accommodated by tailored aggregation. (I later found that Wittwer and Horridge 2010 had a somewhat similar plan with their TERM database; TERM as in "The Enormous Regional Model". Both Erik's epiphany and Wittwer and Horridge's enormous machine then inspired the IO Virtual Laboratories.)



Collaboration – before (left) and after (right) a snorkelling excursion. On the left, Erik can be seen taking a cigarette break, perhaps wondering whether he had come all this way for nothing, whilst Satoshi is scratching and shaking his head, and Terrie and Arnold checking on their return flights (?). Later, the initial tension in the room had evaporated thanks to a number of unnamed colourful fish. On the right, Erik can be seen lecturing the room on his concept of "The Mother Of All MRIOs", with Arnold being bemused, and Tommy amused.

After much deliberation, and to my great relief, we all decided that the rationale and purpose of this reunion on Réunion was not dead. We even decided to put money and time behind it: Satoshi and I mobilised the former, everyone made available the latter.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Tales from the I-O world: A reunion in Réunion, or: Impressions from the founding of an MRIO project

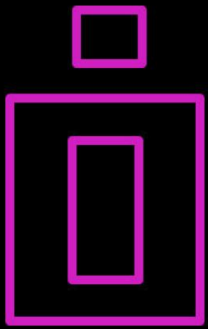


10 years ago - it's done! Project Réunion has agreement. Participants decide to give MRIO unification a go, and look for funds to make things happen. Back row left to right: Bart, Manfred, Arnold, Terrie, and Satoshi. Front row: Tommy and Erik.

The Aftermath

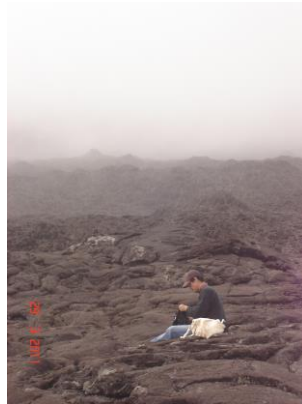
Buoyed by a common purpose, and by then familiar with each other, the team spent a few more days on the island. Satoshi discovered a treasure trove of indigenous island music which he took home for his dad. Terrie and I discovered our mutual passion for keeping country tallies. Tommy discovered that excessive snorkelling causes sunburn. Finally, Arnold discovered that steep slopes become slippery during rain: His solo hiking tour almost ended in disaster when rain started to fall, and he had to face a few-100-metre descent (which “felt like descending K2 at the time”) to the village where he wanted to stay. He just made it as night fell.

The highlight for many was our ascent of the Piton de la Fournaise, a 2600 metres high shield volcano dominating the island’s south-east. It had erupted three times just the year prior, with the December 2010 eruption not even four months gone. Enshrouded in mist and fumes, we once again realised that there are things (quoting Arnold) “much more memorable than the IO maths and data we tried to align”. Again, I would add, much more significant too. Luckily, a release of tension, like the one that Terrie noticed in our meeting room, did not occur in the volcano’s personality, whilst we were marvelling at its crater’s menacing demeanour.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

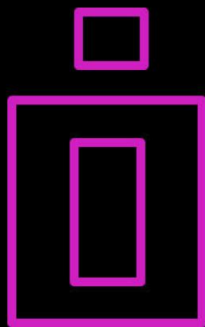
Tales from the I-O world: A reunion in Réunion, or: Impressions from the founding of an MRIO project



Project Réunion on top of the Piton de la Fournaise (2632m). The volcano had erupted three times just the year prior. Satoshi taking precautions, Terrie taking in the abyss, Tommy taking photos.

The Fall-Out

After Réunion, the collaboration went on to secure a research grant from the Australian Research Council (ARC), funding students to stay at CML Leiden with Arnold, and the University of Groningen with Bart and Erik. Two subsequent meetings were held: at the second meeting in Tokyo in January 2013 (thankfully organised by Satoshi), and the third and final meeting in Kurokawa Onsen in July 2013 (thankfully organised by Nori), a research strategy for the ARC grant was developed, including an MRIO Inter-Comparison project, and strategies for communication, science and policy outreach. The project was concluded at the IO Conference in Atlantic City in 2017.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Tales from the I-O world: A reunion in Réunion, or: Impressions from the founding of an MRIO project

Ultimately, MRIO unification did not happen, but with so many projects, many lessons were learned along the way, and people got to know each other, and each other's research work and outlook. If you would like to read up on the outcomes of Project Réunion, try

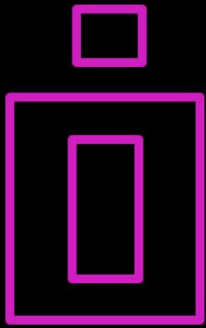
- the website <https://isa.org.usyd.edu.au/mrio/mrio.shtml> (outdated though);
- the excellent synthesis for ESR's MRIO Special Issue by Arnold and Erik (Tukker and Dietzenbacher 2013);
- the equally excellent introduction for ESR's MRIO Inter-Comparison Special Issue by Satoshi and Anne (Inomata and Owen 2014);
- the Project Réunion summary papers (Abd Rahman et al. 2017; Lenzen et al. 2017; Reyes et al. 2017) in ESR's Virtual Lab Special Issue (Geschke and Hadjikakou 2017), and the abstract of the final presentation at the Atlantic City Conference (<https://www.iioa.org/conferences/25th/papers/files/2791.pdf>).

To conclude, I quote Erik : "Perhaps it's time make a project for a reunion of Project Réunion!"

By Manfred Lenzen, University of Sydney

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INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Tales from the I-O world: Three reflections on Project Reunion

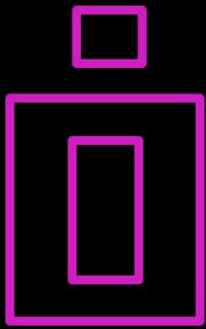
The first memory is about the island itself. It is: mangos, mangos, mangos! Mangos for breakfast, mangos for tea, mangos in bed, mangos in bath, mangos in the street, mangos on TV. It sounds like a rocksong. Perhaps Richard Baldwin was right when he called us rockstars.

It is true that I thought it was a joke. A serious meeting in a holiday resort, sandy white beaches and a bit of snorkeling, a deck chair with a Tequila Sunrise. Yes, it was a holiday resort, the beaches were sandy and white, I swam amidst the coral reefs and had my Tequila Sunrise. But it also was a very serious meeting. Manfred was happy to explain why this was the perfect location, also from an economic and environmental point of view. The algorithms for finding the optimal location for the distribution center in a network couldn't have done better. People coming from Europe, the US, Australia, and Japan, requiring good connections, minimizing travel time and distance. The solution was Ile de la Reunion, the French Island close to Madagascar.

The first part of the workshop was a bit tough. Partly because we didn't know each other that well, but also because we were perhaps a bit suspicious. No-one wanted to give his/her precious data away for free. 'What's in it for me' and 'competition' were buzzing in the air. It was a bit of a deadlock and as a way out we started to make a sketch of the ideal GMRIO table. This was coined the 'Mother of all GMRIO databases'.

It is as detailed as possible in terms of sectors and products, with a set of socio-economic and environmental extensions as extensive as possible, covering the globe and discerning as many as possible countries and regions, including long time series, and is cost-effective to build. This mother was huge! It became clear that such an ideal database does not exist and will probably never be constructed. This made us realize that there was no need to be afraid of each other or to compete with each other. This mother was so huge, there was enough for each of us. We realized that several GMIO databases could easily exist next to each other, each of them with its own advantages and disadvantages and each of them based on choices that the developers had to make. This realization loosened up all tensions. This mother had a set of siblings who spent a couple of very nice days on Reunion. [Song](#)

By Erik Dietzenbacher, University of Groningen



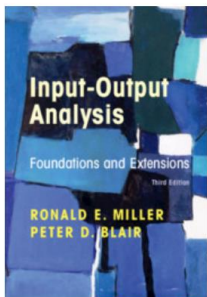
INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Other IIOA News

A new 3rd edition of Ron Miller and Peter D. Blair's text, **Input-Output Analysis: Foundations and Extensions**, is now scheduled for release by Cambridge University Press, this coming August. [Link](#)

The new edition has been fully revised and updated to reflect important developments in the field. Expanded coverage includes construction and application of multiregional and interregional models, including international models and their application to global economic issues such as climate change and international trade; structural decomposition and path analysis; linkages and key sector identification and hypothetical extraction analysis; the connection of national income and product accounts to input-output accounts; supply and use tables for commodity-by-industry accounting and models; social accounting matrices; non-survey estimation techniques; and energy and environmental applications.

Accompanying the text will be an expanded associated website as well, including additional technical appendices, a computational workbook with exercise problems and solutions aligned with the book's chapters, and a collection of input-output data used throughout the book.



Coming soon

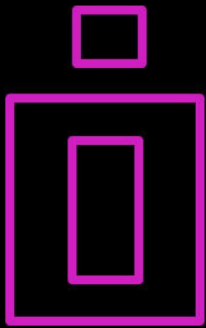
3rd edition

Ronald E. Miller, *University of Pennsylvania*, Peter D. Blair, *George Mason University*

Contents of 3rd Edition of **Input-Output Analysis: Foundations and Extensions**

Preface

- 1 Introduction and Overview
 - 2 Foundations of Input-Output Analysis
 - 3 Input-Output Models at the Regional Level
 - 4 Organization of Basic Data for Input-Output Models
 - 5 The Commodity-by-Industry Approach in Input-Output Models
 - 6 Multipliers in the Input-Output Model
 - 7 Supply-Side Models, Linkages, and Important Coefficients
 - 8 Decomposition Approaches
 - 9 Nonsurvey and Partial-Survey Methods: Fundamentals
 - 10 Nonsurvey and Partial-Survey Methods: Extensions
 - 11 Social Accounting Matrices
 - 12 Energy Input-Output Analysis
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 - 14 Mixed and Dynamic Models
 - 15 Additional Topics
- Postscript
- Appendices
- Appendix A. Matrix Algebra for Input-Output Models
- Appendix B. Guide to Online Input-Output Data Resources for This Text
- Appendix C. Historical Notes on the Development of Leontief's Input-Output Analysis
- Supplemental Online Appendices
- Additional Technical Appendices
- Input-Output Analysis Computational Workbook Exercises
- Input-Output Analysis Data Archive



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Other IIOA News

This is the first time the **Australian Department of Industry, Science, Energy and Resources** has used input-output tables to produce a consumption-based national greenhouse gas projection. The data show Australia to be a net emissions exporter. For further details see <https://www.industry.gov.au/sites/default/files/2020-12/australias-emissions-projections-2020.pdf>.

At the recent Leaders Summit on Climate, the Australian Prime Minister connected emissions with exports, by stating (<https://www.pm.gov.au/media/remarks-leaders-summit-climate>) that “already we have reduced our emissions by 19 per cent on 2019 - on 2005 levels I should say, more than most other similar economies - and by 36% when you exclude exports.”

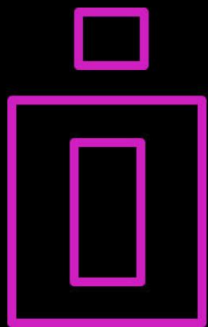
For a critique, see <https://www.theguardian.com/environment/2021/apr/23/australia-has-been-talking-up-its-climate-credentials-but-do-the-claims-stack-up>.

Manfred Lenzen, University of Sydney

ESR WITH THE HIGHEST SCORE IN POLISH JOURNAL RANKING

In January 2022 Polish *Ministry of Education and Science* (formerly *Ministry of Science and Higher Education*) will assess the quality of research across scientific disciplines in national universities. The assessment will be based on measuring the quality of publications that were released in the final form in the period 2017-2021. In order to conduct the assessment authorities in Poland have thoroughly worked out a new system of research evaluation - Polish Journal Ranking (henceforth referred to as the PJR). Noteworthy, **ESR was awarded the highest possible score in PJR**.

The PJR is one of the main elements of the ongoing reform of the system of higher education in Poland and sets the ground for the performance-based research funding system. Journals listed in PJR are divided into 6 categories depending on the level of ministerial points awarded, i.e. 20, 40, 70, 100, 140 and 200 points. Without going into details, each researcher being evaluated in January 2022 by Polish Ministry of Education and Science may report no more than four best publications (technically, the of sum of percentage shares of a given researcher in all the reported publications across all the scientific disciplines declared by a given author cannot exceed 400%), thus for the very first time in the history of evaluating research in Poland not the number but the quality of publications matter the most. The maximal number of ministerial points that an individual researcher may get in this scoring system is therefore 800. All individual results of the employed researchers are averaged across scientific disciplines and this gives the overall result of evaluating a given scientific discipline at a given university.

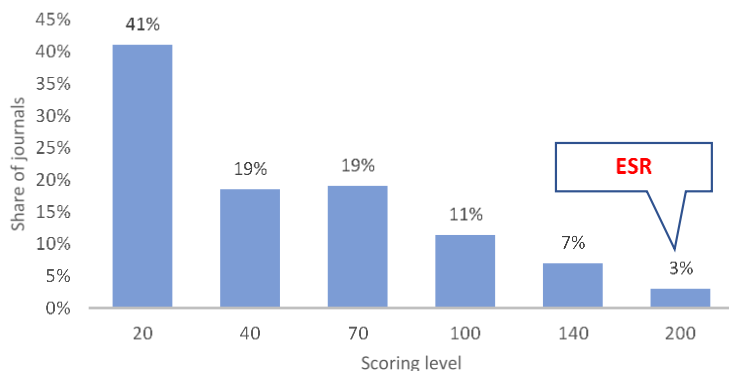


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The first (and at the same time most recent) release of the PJR was announced in 2019 and was preceded with a very long and lively debate on the optimal choice of criteria of ranking the scientific journals with respect to their quality. As already mentioned, the score of ESR in PJR is 200 points (i.e. the highest possible) which is similar to top economic and environmental journals, like Energy Economics (200 points), but higher than the score of Energy Policy (140 points), Ecological Economics (140), Regional studies (140), Water research (140), Structural Change and Economic Dynamics (100), Spatial Economic Analysis (100), Economic Development and Cultural Change (100) and Papers in Regional Science (70). PJR covers more than 1800 journals that were assigned to the discipline of economics. Distribution of PJR scores in this particular field is given below:

PJR scores of economic journals



As can be seen in the figure in the discipline of economics about 3% of the evaluated journals were given the highest note in PJR, while more than 40% of journals were awarded the lowest PJR score (20 points).

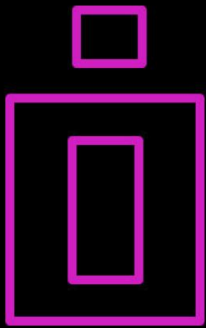
PJR scores were awarded according to the following algorithm:

Stage 1:

A starting point was to define the classification of the scientific disciplines. This stage was inspired by the classification of scientific disciplines of OECD. As a result 44 scientific disciplines were defined in PJR. The complete evaluation procedure covered more than 31000 journals (and 1500 conference materials), including mainly the titles indexed in SCOPUS or Web of Science (WoS), but also a portion of journals listed in ERIH+ and a number of Polish journals not indexed in SCOPUS nor WoS (these were added in course of government's policy of promoting national journals). Each evaluated journal was assigned to one or more scientific disciplines depending on the decision of ministerial teams of advisors.

Stage 2:

At this stage for all the disciplines that a given SCOPUS- and/or WoS-indexed journal was assigned to, the team of ministerial advisors calculated percentiles of distributions of six major bibliometric indicators of research evaluation: Source Normalized Impact per Paper (SNIP), CiteScore, Scimago Journal Rank (these were calculated for SCOPUS-indexed journals) and Journal Impact Factor, Article Influence, Category Normalized Citation Impact (WoS-indexed journals). In case of each bibliometric indicator used the journals were awarded initial levels of points in each discipline they were assigned to:



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- 200 points if the percentile value of the bibliometric indicator was at least 97;
- 140 points if the percentile value of the bibliometric indicator was at least 90, but less than 97;
- 100 points if the percentile value of the bibliometric indicator was at least 75, but less than 90;
- 70 points if the percentile value of the bibliometric indicator was at least 50, but less than 75;
- 40 points if the percentile value of the bibliometric indicator was at least 25, but less than 50;
- 20 points if the percentile value of the bibliometric indicator was less than 25.
- 20 points if the percentile value of the bibliometric indicator could not be calculated.

Stage 3:

In case of each discipline the respective advisory team selected just one main bibliometric indicator for Scopus-indexed journals (out of the three possibilities outlined in **Stage 2**) and just one bibliometric indicator for the WoS-indexed ones (also from the three possibilities listed in **Stage 2**). Next, the results obtained in **Stage 2** were restricted to the two chosen bibliometric indicators. If for a given journal in a given discipline the SCOPUS-based and the WoS-based scores were different the higher score was chosen as PJR score at this stage.

Example 1: In case of discipline X the advisory team decided to use Source Normalized Impact per Paper (SNIP) for Scopus-indexed journals and Journal Impact Factor (IF) in case of journals listed in WoS. At this stage journal B, indexed in both SCOPUS as well as WoS, was awarded:

- 140 points based on the percentile value of SNIP,
- 70 points based on the percentile value of IF.

Journal's B discipline-specific score in discipline X was therefore set at the level of 140 (the bigger number).

At this stage the overall PJR score of a given journal was set as the level of ministerial score that is closest to the average of scores obtained in all the disciplines the journal was assigned to. If the average score lied exactly between two levels of scoring the higher level of scoring was assigned (e.g. for the average score equal 120 the level of scoring equal to 140 would be assigned, as 120 lies exactly between the ministerial levels of scoring 100 and 140).

Example 2: Assume journal B was assigned to 3 scientific disciplines X, Y and Z at **Stage 1**. Further, assume that in these disciplines following scores were awarded based on **Stage 2** and **Stage 3** (the bibliometric indicator chosen by the discipline-specific advisory teams are given in parentheses):

- discipline X – 100 points (IF)
- discipline Y – 70 points (SNIP)
- discipline Z – 70 points (SNIP)

At **Stage 3** the overall PJR score of journal B in disciplines X, Y and Z is then equal to 70 points (the average of individual discipline-specific scores of journal's B in disciplines X, Y and Z is 80 and the closest level of ministerial scoring is 70).

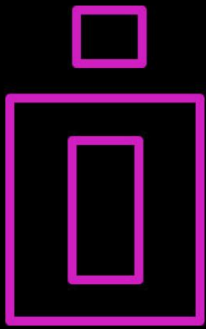
Stage 4:

Before setting the final overall PJR score all the discipline-specific scores obtained in **Stage 3** were once again thoroughly reviewed by discipline-specific panels of experts. In case of each discipline the analysis was aimed at examining:

- the values of the bibliometric indicators that were not used to calculate the discipline-specific score in **Stage 3**;
- the relative significance of a given journal in all the disciplines it was assigned to in **Stage 1**.

Experts could provide detailed justification for changing the PJR discipline-specific journal score calculated at **Stage 3** by no more than two scoring levels. In 2019 experts suggested changing the score obtained in **Stage 3** in case of almost 8000 journals with:

1. about 4500 suggestions of increasing the score
2. about 3500 suggestions of decreasing the score.



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The Ministry of Education and Science in Poland accepted about 85% of the suggestions of experts and modified the overall score at **Stage 3** accordingly. In the next step the final version of the PJR was released in 2019.

Although the second release of PJL has not been announced so far (and most likely will not be published before the 2022 evaluation of scientific disciplines in Poland because of lack of time required for a thorough evaluation) slight modifications of the journal rank were conducted in 2020 and 2021. These changes were mainly based on including some new Polish journals (e.g. those that were accepted for inclusion in SCOPUS after the release of PJR in 2019) or increasing the score of some Polish journals (mainly in the field of humanities). Despite obvious shortcomings and imperfections the PJR is doubtlessly one of the most important and influential regulations in Polish scientific community, especially if compared to previous algorithms of evaluating research in Poland that placed much more emphasis on arbitral scoring.

Łukasz Lach, AGH University of Science and Technology in Kraków

Databases

The **Industry and Competitiveness Group (GIC)** of the Federal University of Rio de Janeiro (IFRJ) publish through **Passoni and Freitas (2021)** an annual series of Input-Output Tables (IOTs) estimative at current prices from 2000 to 2018 for the Brazilian economy considering the System of National Accounts (SNA) 2010. This series promotes the compatibility of the data from SNA 2000 and 2010.

The methodological changes do not allow data comparison from the previous series officially released by the Brazilian Institute of Geographic and Statistics (IBGE). They use structural information from the previous IOT and Supply and Use Tables (SUT) published (IBGE). The authors show that the methodology they used, based on Grijó and Berni (2006), generates closer results to the official IOT published by IBGE when compared to estimates obtained from Guilhoto and Sesso Filho (2005; 2010) methodology.

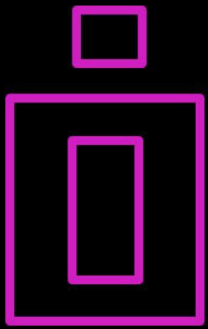
More details can be seen at:

https://www.ie.ufrj.br/images/IE/grupos/GIC/publica%C3%A7%C3%B5es/2020/TD_IE_025_2020_ALVES-PASSONI_FREITAS.pdf

and the series can be downloaded at:

https://www.ie.ufrj.br/images/IE/grupos/GIC/publica%C3%A7%C3%B5es/2020/MIP_42_2000a2018_correntes.zip and

https://www.ie.ufrj.br/images/IE/grupos/GIC/publica%C3%A7%C3%B5es/2020/MIP_67_2010a2018_correntes.zip



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Awards and promotions by the IIOA members

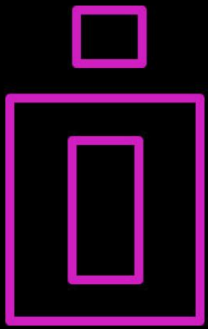
Royal Decoration for Erik Dietzenbacher

In the last week of April, former IIOA President and former editor of Economic Systems Research **Erik Dietzenbacher** was informed by the Mayor of Groningen that he had been appointed **Officer in the Order of Orange-Nassau**. Every year in the days preceding the birthday of the Dutch king, a limited number of such royal decorations are awarded to citizens with special merits. In the praise for Erik, not only his scientific achievements and his inspirational teaching were mentioned, but also (among many other things) his dedication to the activities of the International Input-Output Association.

A few days after the announcement, Erik was invited to Groningen's townhall to receive the associated "medal".

Congratulations Erik!





INTERNATIONAL INPUT-OUTPUT ASSOCIATION

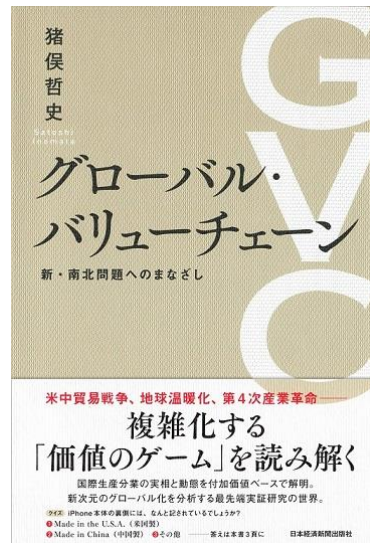
Awards and promotions by the IIOA members

Asia-Pacific Prize and Ohira Masayoshi Memorial Prize for Satoshi Inomata

Dr. Satoshi INOMATA, the IIOA President and a chief senior researcher of the Institute of Developing Economies (IDE-JETRO) has been double-awarded two most prestigious academic prizes in Japan for his book **Global Value Chains** (2019, Nihonkeizai-Shimbun Publishing) for the Japanese academic year of April 2020-March 2021.

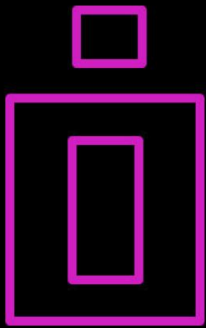
- The **Asia-Pacific Prize** (アジア太平洋賞) awarded by Mainichi Newspaper

- The **Ohira Masayoshi Memorial Prize** (大平正芳記念賞) awarded by Ohira Masayoshi Memorial Foundation



Congratulations Satoshi!





INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Awards and promotions by the IIOA members

Prêmio BNDES de Economia for Patieene Alves Passoni and Camila Unis Krepsky

Patieene Alves Passoni and **Camila Unis Krepsky**, have been awarded in the 38th edition of the **Prêmio BNDES de Economia** award, one of the most important awards for dissertations and thesis in Brazil.

Patieene Alves Passoni won first place in the PhD thesis category with the work entitled: "**Deindustrialization and regressive specialization in the Brazilian economy between 2000 and 2014: a critical assessment based on the input-output analysis**". And Camila Unis Krepsky, won second place in the Master dissertation category with the work entitled: "**Output Growth and Household Consumption in Brazil from 2000 to 2016: a structural decomposition analysis**".

Preliminary versions of both works were presented as papers respectively at the 26th and 27th editions of the IIOA conference in Juiz de Fora and Glasgow.

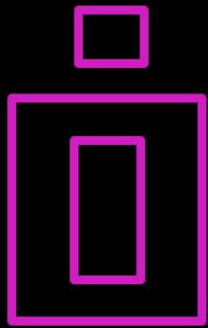
Congratulations Patieene and Camila!

Both works can be found at the Economics Institute of the Federal University of Rio de Janeiro website and the following links ([Patieene's thesis](#) and [Camila's dissertation](#)).

The nomination for the award can be found [here](#), at the Brazilian Development Bank (BNDES) website.



Patieene Alves Passoni and Camila Unis Krepsky at the 26th IIOA conference in Juiz de Fora (Patieene is on the left and Camila on the right).



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 1, 2021](#)



Allan, G. J., Connolly, K. and McIntyre, S. G.

[**Developing an electricity satellite account \(ELSA\): an application to Scotland, UK.**](#)

Within the system of national accounts the electricity sector is typically reported as a single entry representing generation, transmission, distribution and trade. The ways in which these components interact with the economy differ greatly, a feature lost within the standard accounting framework. In this paper we propose an Electricity Satellite Account (ELSA) approach to better understand the linkages between the electricity sector and economy, with a particular focus on generation technologies. In developing this framework, we draw parallels with Tourism Satellite Accounts (TSAs). To illustrate the practical steps in constructing ELSAs, we develop an ELSA for Scotland for 2012, and show how the ELSA framework gives an improved understanding of the economic contribution of the electricity sector, which is critical in improving the usefulness of such accounts for climate, energy, and economic policy.

Zhou, L. and Chen, Z.

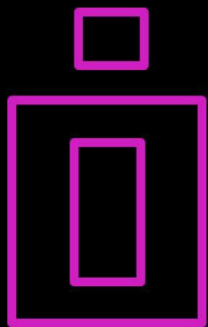
[**Are CGE models reliable for disaster impact analyses?.**](#)

This study investigates a fundamental issue of computable general equilibrium (CGE) modeling: are CGE models reliable for measuring the economic consequence analysis of disasters? We assess the outputs of CGE analyses after controlling for various modeling factors such as data, type of model, and modeling mechanisms via a meta-analysis of 253 CGE simulations in 57 empirical studies. Our study arrives at three major findings. First, we confirm that resilience significantly reduces business disruptions from disasters. Second, results using either real-world or hypothetical data tend to vary substantially by hazard type. Third, results are quite sensitive to model assumptions and modeling structure. Overall, we suggest that future impact assessments of disasters should be conducted more cautiously in terms of adopting appropriate data, models, and shock scenarios, in order to improve the validity of CGE modeling outcomes.

Duan, Y., Ji, T. and Mei, D.

[**Tariff costs embodied in product prices: a dynamic analysis from global value chain perspective.**](#)

The present study examines a measure, the embodied tariff, which is defined as the sum of all tariffs imposed on intermediate inputs at various stages of productions. It captures the total tariff costs in products in the context of the global value chain. We estimate the embodied tariff for 44 economies and 56 sectors, decompose it by tariff source, and also decompose its temporal changes using structural decomposition analysis. The embodied tariff is more than twice the size of the traditional direct input tariff, indicating a non-negligible value chain effect. This demonstrates an overall declining pattern over time, which reflects a dominating effect of decreasing customs tariffs over increasing international production fragmentation. Since 2011, however, the decline in international production fragmentation has also decreased embodied tariffs. A country's customs tariff is sizably translated into the embodied tariff of its own products, creating a competitive disadvantage for domestic producers.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Moya-Martínez, P., Bermejo, F. and del Pozo-Rubio, R.

[Hard times for long-term care systems? Spillover effects on the Spanish economy.](#)

Since the end of the last century, demographic aging has led to an increased demand for new social protection services. Universalizing these to meet the needs of the most vulnerable requires the design of policies that ensure the sustainability of the system. Consequently, the economic structure of a country and its productive fabric are affected. Assessing the impact of this growing demand is not an easy task, although extended input-output models can help. With this aim, we determine the spillover effects of the demand shocks arising from the increase in public spending allocated for the implementation of the Spanish long-term care system. The results reveal that such spending proves efficient in sustaining 116,000 jobs, most of which are in social work activities, entailing a large amount of direct but low-skilled employment. In addition, 5,000 million euros are generated in value added, including a fiscal return of 1,400 million euros.

Aroche Reyes, Fidel

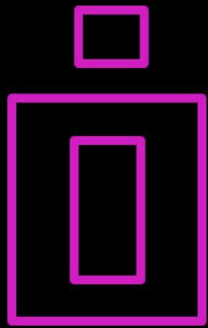
[On growth regimes, structural change and input coefficients.](#)

The input-output (IO) model assumes that the technical coefficient matrix changes as an economic system develops, following either of two tendencies; one, the entries of the matrix shrink, due to increased efficiency on the production lines; two, they expand, while productivity gains concentrate in the use of factors. Further, the economic structure grows more complex, as industries become more tightly (vertically) integrated and the development process evolves. Both phenomena have seldom been analysed together, despite the apparent connections they may have with the evolution of economic structures and the development opportunities countries may face. This paper intends to examine the implications of these tendencies for the evolution of economic systems in regards to the dynamics the growth process may adopt. Two indicators are presented here useful to characterise such dynamics, later tested on the Mexican IO data.

Miroudot, S. and Ye, M.

[Decomposing value added in gross exports.](#)

Several papers using intercountry input-output tables have developed frameworks to decompose value added in gross exports and to remove potential double-counting in intermediate inputs. But these papers rely on different definitions for the domestic value added, foreign value added and double-counting terms, depending in particular on the perspective from which gross exports are decomposed (world level, country level or bilateral level). At this stage, it is very difficult for any user of value-added trade statistics to know what is calculated and which type of decomposition should be used. In this paper, we provide a general framework that relies on extraction matrices to unambiguously and consistently define domestic and foreign value-added terms in the world, country and bilateral perspective. This framework allows us to classify existing decompositions based on the perspective taken and their definition of double-counting. We also indicate the most relevant decompositions for different types of trade analysis.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

[Economic Systems Research](#)

Journal of the [IOA](#)

[Latest articles](#) (up to 6th of May)



Carlos Llano, Julián Pérez, Fatima El Khatabi & Federico Steinberg

[Weaponized trade policy: the impact of US tariffs on the European automobile sector.](#)

Economic Systems Research.

With trade tensions running high, the Trump Administration is considering new tariffs on imported automobiles, and the main target would be the European Union, traditionally America's closest ally. In this paper we combine disaggregated models to estimate the impact of these tariffs worldwide, and especially on Spain. First, a trade-policy simulation model computes the potential effects worldwide. Then we plug these into the World Input-Output Database, obtaining the inter-sectoral effects of the tariffs on Europe and the rest of the world. Finally, we insert these results into the Spanish inter-regional Input-Output Tables, obtaining final effects for Spanish regions via their inter-sectoral relations with the European Union and the rest of the world. By our calculation, the new US auto tariffs could end up destroying 10,400 jobs in Spain alone and 567,000 jobs worldwide. Moreover, they might have unexpected consequences, affecting, Spanish regions and sectors that just indirectly depend on the automobile industry.

Mainar-Causapé, A. J., Philippidis, G. and Sanjuán-López, A. I.

[Constructing an open access economy-wide database for bioeconomy impact assessment in the European Union member states.](#)

Economic Systems Research.

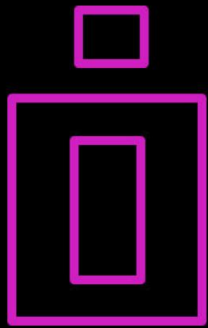
The bioeconomy encompasses the extraction, processing and transformation of renewable biological resources and waste streams, connected to activities as diverse as food, feed, energy and manufacturing. Under the auspices of the European Union's 'Green Deal' strategy, this broad collective of sectors is promoted as a cornerstone for achieving sustainable growth. Progress in developing ex-ante tools of economy-wide modelling analysis to assess its performance is, however, hindered by a paucity of consistent and comprehensive data. To overcome this shortcoming, the construction steps for a new set of open access social accounting matrices (dubbed 'BioSAMs') is described for a detailed and comprehensive selection of traditional and contemporary bio-based accounts for each of the EU member states. To illustrate its potential, a structural analysis based on three different and complementary methods (Rasmussen-Jones, hypothetical extraction method and eigenvector) is performed to classify bio-based sector wealth generating properties and to identify high performance ('key') sectors.

Tsujimura, M. and Tsujimura, K.

[Flow-of-funds structure of the U.S. economy 2001–2018.](#)

Economic Systems Research.

Great inventions and substantial productivity growth of the Roaring Twenties brought unprecedented prosperity to the United States. After Black Thursday in the fall of 1929 however, the U.S. economic landscape changed dramatically. To ensure that the bitter experience of the Great Depression does not recur, Wesley Mitchell and Morris Copeland, the architects of flow-of-funds analysis, urged a better understanding of the circulation of funds, the means of payment. The new century has so far brought us many technological innovations and new ways of doing business. The objective of the paper is to find out if and how well the funds have been flowing in the U.S. economy over the past two decades, using the flow-of-funds matrix (payer-payee matrix) proposed by Tsujimura and Tsujimura (2018). A flow of funds analysis of the U.S. quantitative easing. The industrial revolution of the new century does not seem to have enough momentum circulating funds, the lifeblood of the economy.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Parys, W.

[David Hawkins and the making of the Hawkins-Simon conditions.](#)

Economic Systems Research.

The Hawkins-Simon conditions, which are necessary and sufficient for the viability of input-output systems, are described in many encyclopedias, textbooks and papers, but always without historical details about the philosopher David Hawkins. The rich literature on the history of input-output economics has neglected Hawkins, probably because he spent only a few years among the economists. My paper fills this gap. By using the relevant archival material on Hawkins, Simon, and Leontief, I correct and expand some scarce remarks on Hawkins by Simon and Samuelson. I discuss Hawkins's three remarkable contributions to economics. First, Hawkins's dynamic input-output model in *Econometrica* in 1948 scooped Leontief. Second, I show how the correspondence between Hawkins and Simon created their famous joint note in *Econometrica* in 1949. Third, an overlooked chapter in Hawkins's 1964 book *The Language of Nature* discussed the commodity values of commodities, generalizing Marx's labour values and the Technocrats's energy values.

Juan F. Fung, Jennifer F. Helgeson, David H. Webb, Cheyney M. O'Fallon & Harvey Cutler

[Does resilience yield dividends? Co-benefits of investing in increased resilience in Cedar Rapids.](#)

Economic Systems Research.

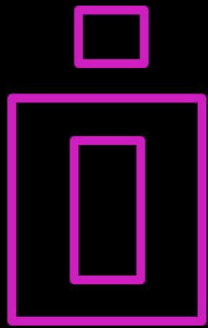
Cedar Rapids, IA, offers a unique case study in planning for increased resilience. In 2008, Cedar Rapids experienced severe flooding. Rather than simply rebuilding, the city of Cedar Rapids began to invest in a resilient flood control system and in the revitalization of its Downtown neighborhood. This paper develops a Computable General Equilibrium (CGE) model for the regional economy of Cedar Rapids to quantify 'resilience dividends': net co-benefits of investing in increased resilience. A resilience dividend includes benefits to the community even if another disaster does not occur. We build a CGE model of Cedar Rapids at two different time periods: one in 2007, before the flooding, and one in 2015, after the flooding and initial investment in resilience. We show that a positive economic shock to the economy results in larger co-benefits for key economic indicators in 2015 than in 2007. Our approach illustrates how co-benefits are distributed throughout the economy.

Ciaschini, C. and Chelli, F. M.

[Evaluating the impact of Violence Against Women in the macroeconomic Input-Output framework.](#)

Economic Systems Research.

Violence against women and girls (VAW&G) has progressively become an emergency issue in many European countries and a relevant topic of public discussion. In this paper, we attempt to insert this theme within a model for macroeconomic policy design and evaluation. Special attention is devoted to the assessment of distortions in the allocation of public expenditure generated by VAW&G, in terms of gains and losses in aggregate total output. We adopt a macroeconomic input-output approach by adding to the framework an industry that produces care services to victims of VAW&G. The resulting model is integrated with the public expenditure reallocations that emerge as a result of the progressive elimination of violence. It is, thus, a simulation tool for determining total output gains or losses that emerge from the reallocation of public expenditures as VAW&G fades.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Wang, Z., Zhang, Y., Niu, M. and Fan, Z.

[How important is domestic and foreign demand for China's income growth by business function?](#)

Economic Systems Research.

This paper explores the contribution of domestic and foreign demand to China's income growth by business function. To this end, we extend a single country input-output approach to a global multi-country setting, and further redefine the measure via forward linkages. We also propose chaining structural decomposition analysis to identify the role of domestic and foreign demand in functional income changes over 1999–2011. Using the World Input-Output Database combined with Labor Occupations Database, we distinguish functional activities in production, management, marketing and R&D. This enables us to find that domestic and foreign final demands, especially the former, jointly lead to China's income growth by business function. Dynamically, the generally upward trends in China's income hold in the aggregate as well as by industry and business function. We also find that China's income growth is quite heterogeneous across industries and business functions.

Maria Llop

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

Economic Systems Research.

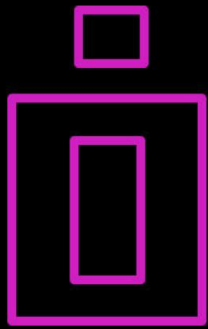
The literature of inter-regional social accounting matrices (SAM) focuses on quantity-oriented models that determine the transmission of income impacts. This paper develops a price version to identify the channels of price transmission at the inter-regional (or inter-country) level. The method proposed 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.

Carvalho, T. S., Santiago, F. S. and Perobelli, F. S.

[Demographic change in Brazil and its impacts on CO2 emissions.](#)

Economic Systems Research.

In recent years, the debate about demographic changes and its impacts on the economy has increased. The growth in the relative share of elderly people in the age pyramid may occur in the coming decades in many parts of the world, and their effects on the composition of consumption, notably on energy demand and emissions, are not yet known. This article estimates the changes in the pattern of consumption in Brazil due to the changes projected in the age pyramid in 2050 and the consequences of these changes on CO2 emissions. For this, projections will be made using an input-output model for the Brazilian economy for the year 2010 considering 67 productive sectors and six age groups. The results suggest that emissions grow less than proportionally to population growth and that the participation of sectors such as fuels and transport shows a small decrease in the consumption vector for 2050.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Jorge A. Garcia-Hernandez & Roy Brouwer

[A multiregional 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.

Wei-Hong Hong, Hui-Chih Chai, Y.-H. Henry Chen, John M. Reilly & Sergey Paltsev

[Will using newer input-output data for general equilibrium modeling provide a better estimate for the CO2 mitigation cost?.](#)

Economic Systems Research.

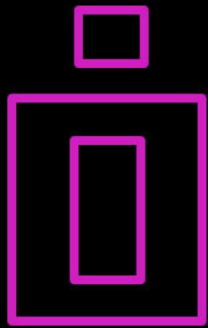
We provide a critical evaluation about how updating the input-output data of a computable generation equilibrium model can affect policy results, an assessment that is rarely done in existing literature. Specifically, we explore how datasets with different fossil energy cost shares alter results of policy simulations that aim at reducing CO2 emissions. We prove analytically that a sudden fossil fuel price surge, which provides little time for adjustment through input substitution, can lead to a higher CO2 mitigation cost. The finding is demonstrated empirically in a full-scale economy-wide model for a base year with lower fossil fuel prices, contrasted with results from a base year when fossil fuel prices spiked. We then propose an adjustment to resolve the issues of using input-output data that embed abrupt fossil fuel price hikes.

Umed Temursho

[On the Euro method.](#)

Economic Systems Research.

This paper critically examines the Euro method usage for the purposes of updating supply and use tables (SUTs) and/or input-output tables. Its known restricted applicability to only unnecessarily aggregated and symmetric SUTs (and not their underlying rectangular versions) is already an issue of concern. However, by studying analytically the nature of Euro's adjustments of the SUT elements and empirically assessing some of its underlying assumptions, including newly revealed ones, it is concluded that the Euro method is a largely ad hoc updating procedure. Its recently claimed superiority over the generalized RAS approach (GRAS, or SUT-RAS) in the absence of industry output is challenged. It is shown that applying the standard GRAS with exogenously given estimates of industry outputs under such restricted data-availability environment still outperforms the Euro method.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

José Francisco Cubells & Maria C. Latorre

[Brexit deal done! A detailed micro- and macroeconomic analysis of its fallout.](#)

Economic Systems Research.

We offer a rich set of macroeconomic and sectoral effects of Brexit in France, together with macroeconomic ones for the UK, the rest of the EU and the rest of the world. We explain the intuition for the impact on production and trade across the 21 sectors that underlie our macroeconomic estimations (national imports and exports, output, GDP, welfare, wages and rental rate of capital). Our comprehensive technique captures the direct and indirect effects of Brexit on trade. Four types of withdrawal are analysed, including the finally agreed between the EU and the UK on December 2020. This will avoid tariffs, but other medium size (non-tariff) barriers will emerge. The UK, France and the rest of the EU will be harmed by Brexit, although asymmetrically. While Brexit will substantially harm the UK economy, the negative impact on France and the rest of the EU will be limited and similar.

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.

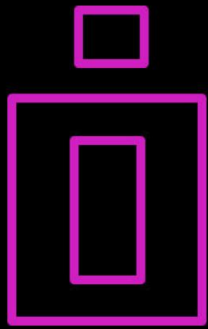
This paper analyses the structural changes in the Brazilian economy from 1990 to 2015 by applying structural decomposition analysis (SDA). The production structure of emerging economies is an important field of research because it enables the assessment of sectoral policies and technological progress 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.

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.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Ángela García-Alaminos, Mateo Ortiz,
Guadalupe Arce & Jorge Zafrilla
[Reassembling social defragmented
responsibilities: the indecent labour footprint
of US multinationals overseas.](#)
Economic Systems Research.

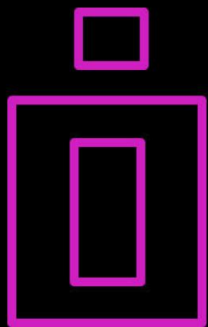
Multinational corporations (MNEs) have been at the forefront of the geographical disintegration of production chains in search of lower salaries, among other reasons, which led to a global race to the bottom in labour standards. Therefore, significant amounts of indecent work are currently embodied in 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.

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.

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 multiregional 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 interregional 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.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Óscar Dejuán, Ferran Portella-Carbó & Mateo Ortiz

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

Economic Systems Research.

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.](#)

Economic Systems Research.

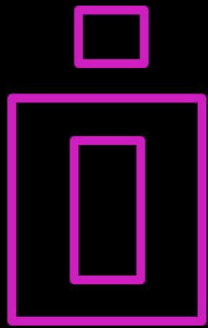
Two frameworks, hypothetical extraction and betweenness centrality analysis, can be used to identify environmentally important sectors in complex supply chains. This study derives an analytic expression for the relationship between hypothetical extraction and betweenness centrality analysis. Second, 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.](#)

Economic Systems Research.

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.](#)
Economic Systems Research.

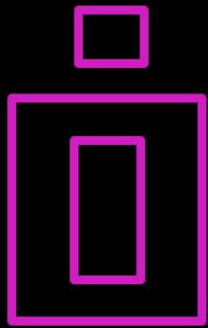
The homogeneity assumption, inherent to input-output (IO) analysis, implies that every euro spent within one product group is assigned the same environmental burden. We address this assumption applied to price conversion of household expenditures from purchasers' to basic prices when the carbon footprint 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.](#)
Economic Systems Research.

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.](#)
Economic Systems Research.

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

Łukasz Lach

[On the plausibility of using linear programming to trace important input–output coefficients in the framework of tolerable limits.](#)

Economic Systems Research.

Recent input–output (IO) literature offers original proposals on using linear programming (LP) to make ‘tolerable limits’ approach suitable for measuring the importance of IO coefficients to an economy. In this paper, I focus on one of such influential proposals presented in Tarancón et al. [(2008). A revision of the tolerable limits approach: searching for the important coefficients. *Economic Systems Research*, 20, 75–95]. In the theoretical part of this paper, I provide exact analytical solutions to the LP problems formulated in Tarancón et al. The main result proves that the classification of IO coefficients with respect to their importance in the sense of the LP-based indicators of Tarancón et al. does not depend on the benchmark welfare measure of interest. This fact, in turn, severely reduces practical applicability of the discussed LP-based approach to tracing important IO coefficients.

Juan Manuel Valderas-Jaramillo, José Manuel Rueda-Cantuche & Joerg Beutel

[The Euro and SUT-RAS methods: some further considerations.](#)

Economic Systems Research.

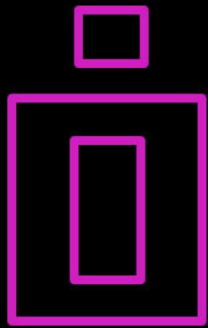
The main objective of this paper is to revisit the Euro method in a critical and constructive way. We have analysed some arguments against the Euro method published recently in the literature as well as some other relevant aspects of the SUT-Euro and SUT-RAS methods not covered before. Although not being the Euro method perfect, we believe that there is still space for the use of the Euro method in updating/regionalizing Supply and Use tables.

Tesshu Hanaka, Keiichiro Kanemoto & Shigemi Kagawa

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

Economic Systems Research.

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.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Claudia V. Montanía & Sandy Dall'erba

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

Economic Systems Research.

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 Hambjæ

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

Economic Systems Research.

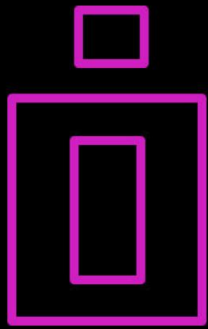
Exports matter for domestic employment in both export-producing firms and upstream suppliers. Their total effect can be captured through an input-output-based indicator of export-sustained employment. However, as industry classifications used in regular input-output tables are based on product similarity, 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.](#)

Economic Systems Research.

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

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.

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Jan Oosterhaven

Markets behind interacting Leontief price and quantity models: Addendum to Chapter 5 of [Rethinking Input-Output Analysis, A Spatial Perspective.](#)

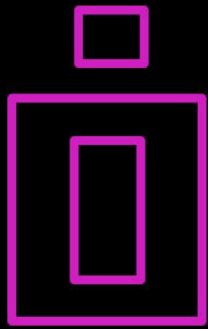
For better understanding its economics, this Addendum presents and discusses the supply and demand curves, i.e. the markets, that are hidden behind Fig. 5.2 from Rethinking IO Analysis. Thus, it shows how this combination actually comprises an extension of the basic – non-interacting – Leontief price and quantity models shown in Fig. 6.3a of Rethinking IO Analysis. Finally, it is discussed how this combination of these two dual IO models may be further disaggregated and applied in practice.

Nooraddin Sharify

[Economic resources' allocation: A goal programming model integrated with a social accounting matrix.](#)

Soft Computing.

Countries generally aim to attain several different or sometimes contrary goals. To this end, a Goal Programming (GP) model integrated with an Input-Output (I-O) one was implemented in a number of previous studies. This paper attempts to integrate a GP with a Social Accounting Matrix (SAM) framework to allocate economic resources of an economy among alternative sectors in order to achieve a number of goals. To do so, although the goals and limitations of regions are determined with respect to their situations, the supply and demand for products of economic sectors, as well as Gross Regional Products (GRP); employment for different educational groups of human forces; and income distribution inequality in addition to the personal income mean are formulated as the first to third goals of the research, respectively. The model has been examined by using the SAM Table for the Golestan Province of Iran. The result of implementing the model demonstrates that integrating SAM instead of I-O with GP will increase the capability of the integrated model.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Sinead M. Boylan, Anne-Marie Thow, Elijah K. Tyedmers, Arunima Malik, Janet Salem, Robyn Alders, David Raubenheimer and Manfred Lenzen
[Using Input-Output Analysis to Measure Healthy, Sustainable Food Systems.](#)
Frontiers in Sustainable Food Systems.

Our current food systems are hampering efforts to meet the Sustainable Development Goals. Reshaping our food systems could have enormous co-benefits for our populations and planet. However, decision makers and experts are questioning whether it is possible to meet environmental, social and economic goals simultaneously, or whether tradeoffs are necessary. There has been a call for the development of better measurements and indicators to help policymakers understand the benefits and considerations for healthy and sustainable food systems. There is an urgent need to address the gaps in understanding of what a sustainable food system means across varying populations and geographies and how we can better measure these systems. Practice calls for a framework in which different aspects of food and nutrition security can be measured under identical scope, where policy simulations which arrive at multi-indicator outcomes are comparable, and where quantified trade-offs between different sustainable development objectives are valid.

We introduce, and focus on one technique that does allow such multi-indicator scope-consistent analysis of food systems under a life-cycle perspective: input-output analysis. We describe input-output analysis, and its relevance and advantages for measuring the sustainability of food systems, nutrition and diets, including resilience and vulnerability. Using data from the global multi-regional input-output databases, we then describe potential measures that are able to extend the current state of art into a more comprehensive framework that has the potential to support policy related to global initiatives such as the Sustainable Development Goals.

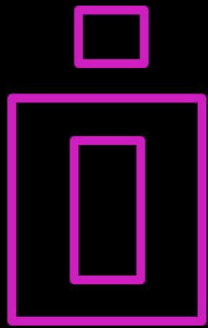
Quanrun Chen, Xikang Chen, Jiansuo Pei, Cuihong Yang & Kunfu Zhu
[Estimating domestic content in China's exports: Accounting for a dual-trade regime.](#)
Economic Modelling.

This paper identifies the heterogeneity issue as a key challenge that is central to but not fully addressed when measuring global value chains. To resolve this issue, we propose an extended input-output model that is consistent with the theoretical framework of heterogeneous firms. Empirically, we use China as a prominent example of a country that is engaged in both normal trade and the processing trade under a dual-trade regime, and we synthesize methods for constructing China's extended input-output dataset for the period 1997 to 2015.

Our results show that when alternative generic datasets are used, this is likely to result in overestimating the domestic content in China's exports by as much as 44%, compared to a model that uses an extended database that incorporates production heterogeneity, as does the one in this study. This paper's proposed methodology and rich dataset may be useful to a wider range of empirical applications.

Froemelt, A., Geschke, A. and Wiedmann, T.
[Quantifying carbon flows in Switzerland: top-down meets bottom-up modelling.](#)
Environmental Research Letters.

Modelling frameworks that aim to support policymakers in deriving effective measures to reduce environmental impacts should provide both: quantitative information on locally occurring consumption patterns and production systems as well as assessment of policy scenario outcomes. Regionalised models that can deliver on these aims are emerging, but are currently limited in resolution or have other restrictions. An advanced model can be achieved by exploiting the advantages and overcoming the limitations of top-down and bottom-up approaches. In this article, we describe a highly detailed, spatially-resolved modelling framework that quantifies local activities and simultaneously analyses system-wide environmental and economic effects of planned interventions.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

We combined an existing, highly detailed bottom-up model for Switzerland (focusing on individual households) with a macro-economic top-down approach by developing a new Swiss sub-national, multi-region input-output model. We conducted two case studies to demonstrate its abilities and to highlight its usefulness. First, production-based greenhouse gas emissions and consumption-based carbon footprints were computed for all Swiss cantons and regional differences, interdependencies as well as embodied carbon flows among regions were investigated. We find that rural cantons have higher production-based emissions per gross domestic product than more urban cantons because of different economic structures. In contrast, certain 'city-cantons' entail highest consumption carbon footprints per inhabitant due to high per-capita gross capital formation. Furthermore, this case study discusses the importance of providing regionalised information on effects of measures along the economic value chains. Second, a detailed scenario assuming a realistic lifestyle change for an actual household and a thorough physical retrofit of its home was set up. Regionalised environmental and economic consequences along the supply chains were evaluated. This case study exemplifies how the modelling framework can be used to inform policymakers about expected benefits and downsides of detailed scenarios and emphasises the importance of considering rebound effects.

Marcel P. Timmer, Bart Los, Robert Stehrer & Gaaitzen J. de Vries

[Supply Chain Fragmentation and the Global Trade Elasticity: A New Accounting Framework.](#)

IMF Economic Review.

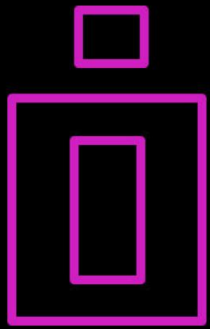
In this paper, we offer a new framework to measure cross-border supply chain fragmentation and its impact on the global trade elasticity. Firstly, we introduce the supply chain fragmentation ratio that sums the volume of imports by all countries that participate in a particular supply chain. We find that supply chain fragmentation slowed down after 2010 for most goods, but not for services. We demonstrate the importance of using trade and production data at constant prices in measuring fragmentation trends. Secondly, we quantify the impact of fragmentation on the elasticity of trade to world GDP, extending the framework of Bems et al. (Am Econ Rev Pap Proc 101(3):308–312, 2011). We account for trade effects from fragmentation within supply chains as well as asymmetric shocks to final demand. We find that the declining pace of fragmentation accounted for more than a third of the decline in the global trade elasticity after 2010.

Mariolis Theodore, Rodousakis Nikolaos and Soklis George

[Inter-sectoral analysis of the Greek economy and the COVID-19 multiplier effects.](#)

European Politics and Society.

Using a multi-sector model, with joint-products and heterogeneous labour, and data from the Supply and Use Tables, this paper analyses the inter-sectoral structure of the Greek economy and estimates the COVID-19 multiplier effects on this economy. It is found that the economy is heavily dependent on imports of industrial commodities, while significant multiplier effects are concentrated, primarily, in services and, secondarily, in the primary production. Furthermore, using these estimations and the available facts and figures about the COVID-19 impact on the elements of autonomous demand in 2020, we estimate a decrease in GDP in the range of 5.67–7.16 per cent, a decrease in the levels of employment in the range of 5.32–7.20 per cent, and a decrease in total imports in the range of 10.40–15.53 per cent, respectively. The evaluation of the results of our analysis indicates that, on the one hand, a short-term demand management recovery programme could be implemented, mainly, through the Public Sector and, secondarily, the Tourism Sector, while, on the other hand, a long-term growth-oriented policy should be directed towards industrial production and implement policies of import substitution.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

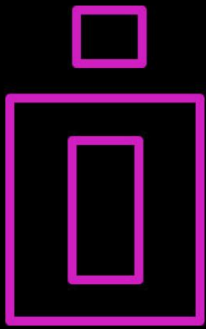
Christa D. Court, João-Pedro Ferreira, Geoffrey J.D. Hewings & Michael L. Lahr

[Accounting for global value chains: rising global inequality in the wake of COVID-19?](#)

International Review of Applied Economics

Finally, we show that economies with less-diverse sets of industries are more vulnerable to such global shocks. This study highlights the role of value chains in analyzing the spatial spread of the impacts and their contribution to amplifying world imbalances.

Production processes depend on fragmented and interdependent value chains; nowadays, a single product often includes components produced in dozens of countries. Many public health measures being implemented to prevent the spread of COVID-19 have dampened economic activity of 'non-essential' sectors. The decreased production affects other industries and countries that supply parts, machinery, and services via global value chains. Using the World Input-Output Database, we show how a hypothetical decline in the worldwide consumption of a set of non-essential sectors affects the global distribution of GDP and employment. While richer countries consume relatively more non-essential goods and services, we find, by considering the interdependencies among developed and developing economies, that low-income countries are likely to suffer steeper declines in their GDP and employment. Specifically, for each 1% decline in the demand for non-essential products, the GINI index across nations is expected to rise by 0.3%. That is, global inequality is likely to rise, contradicting some earlier findings.



INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Job Positions

RUTGERS

EMPLOYMENT OPPORTUNITIES

Executive Director of Bloustein School of Planning and Public Policy Informatics Program and Non-Tenure Track Associate Professor or Professor of Practice

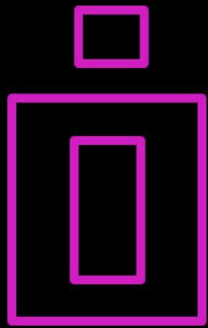
The **Bloustein School of Planning and Public Policy** in **Rutgers University**, New Brunswick, invites applications for the position of Executive Director of Urban and Public Policy Analytics and Health Informatics Program. This is a full-time non-tenured Associate Professor or Professor of Practice position in the School, for a period of three years, with the possibility of renewal, subject to availability of funding. Applicants with significant professional experience are encouraged to apply.

Our research centers are focused on transportation, workforce development, the built and natural environments, urban and civic informatics, survey research, and other areas. The school also has cross-cutting research clusters on Upstream Determinants of Health <https://bloustein.rutgers.edu/centers/health-at-bloustein/> and the Future of Cities, Society, Work and Health. <https://bloustein.rutgers.edu/centers/smart-civic-tech/>

We seek to appoint a senior practitioner who will administer our current programs in the Informatics area, including the Master of Public Informatics, a Graduate Certificate in Urban and Public Informatics, and a soon-to-be offered online Master of Public Informatics, and to recruit students into and grow those programs. We further expect that working with other faculty, and instructional technology developers, the successful candidate will establish new academic programs, including online programs, certificate programs that are targeted to mid career professionals, as well as programs in new areas of specialization. Based on our Strategic Plan, expected areas of growth include Health Analytics and Public Policy Analytics, and related areas.

The candidate will teach graduate-level courses on some of the following topics: data science, machine learning, GIScience, and other analytics; programming; optimization techniques; network analysis; domain-specific technology and tools-oriented courses; project management; technology strategy; and support student projects and independent learning. The ideal candidate will extend the school's already extensive government and industry engagement in the technology and analytics space, and will establish student internship and research programs in these areas.

More information in the [Link](#)



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.

**Krista Danielle Yu – Full Professor,
School of Economics, De La Salle University
(Philippines)**



1) I learned about the input-output model during a mathematical economics course as an application of matrix operations. I was fascinated with how useful it was. This somehow made an impression on me as when the time came to work on my thesis, I revisited my notes and worked on its applications towards disaster risk analysis.

2) The first IIOA conference I attended was in Alexandria, Virginia in 2011. I was both very nervous and excited. My excitement came from seeing that most of the authors of papers that I have been reading are actually there and I can actually interact with them. It was a wonderful opportunity to gather insights and constructive comments from renowned experts. It was during this time I met collaborators from across the globe.

3) One of the first interdisciplinary input-output articles that I have read was Bruce Hannon's *The Structure of Ecosystems* published in 1973. It was surprising to see how IO can be applied to biology. Another surprising IO reading is *The Future Impact of Automation on Workers* by Wassily Leontief and Faye Duchin, which was published in 1986. I came across this work while reading about the employment impact of artificial intelligence.

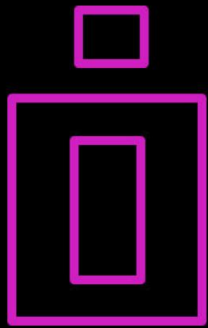
While these articles were published 30-40 years ago, I really find much inspiration on the wisdom they provide and how they can serve as foundations to solve current problems.

**Michael L. Lahr – Distinguished Research
Professor, Bloustein School of Planning and
Public Policy, Rutgers University (USA)**



1) My story here undoubtedly is a bit different than that of others. I learned about input-output (I-O) analysis via a required undergraduate course on regional analysis. This course roughly followed the outline of Walter Isard's book *An Introduction to Regional Science*, which had just been released. And, within it, input-output analysis was featured as Chapter 2. It was one among many tools and theories presented, and its use in the class was designed to underline the importance of industry concentration and diversity to multiplier effects and, hence, the development of regional economies.

Perhaps, interestingly given the heady nature of our department, we were not required to learn many names of researchers who were credited with these works. So, in this regard, Wassily Leontief and his inverse were equaled only by Johann Heinrich von Thünen's rings, Walter Christaller's conversion of them into market areas of central places, and August Lösch's completion of various tiers of such areas into honeycomb formation. While taught, the origins of location quotients and shift-share analysis were apparently credited to the public domain, although our teacher, an economic historian, did give a shout out to Douglas North. Note that Urban Analysis was another required course dealing with the internal structure and social interactions within cities. My "thrill" in encountering I-O for the first time was focused on my second use of a keypunch to cut holes into designated places in the cards in which we would establish the numbers for the changes in final demand for our I-O exercise.



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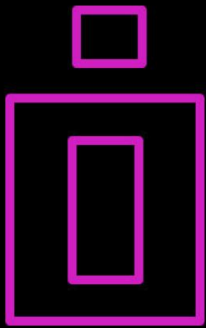
I have always been a poor, slow typist, a true detriment for anyone with a knack for computer programming/coding. Our first use of a keypunch in that class was to obtain results of a regression analysis of students in the class; we controlled for height and gender. By the way, we had to walk our data cards—wedged in behind a 10 cm stack of program cards—to a facility a few blocks off campus where they'd installed the card reader of the university's IBM computer.

To tell the full story, I never took a graduate-level I-O course. But I did take separate undergraduate courses from both Ron Miller and Pete Blair. Fortunately, I took Ron Miller's I-O course as I was also taking a course in the Mathematics Department in which we proved theorems in multivariate calculus. I quickly gathered it helps to understand matrix algebra for multivariate calculus, and the high school from which I graduated did not offer such a course. By the way, Ron's course was also required for the undergraduate major in regional science and all relevant calculations, including calculating determinants and inverses, were done by hand and as part of in-class tests. I took that course and two from Pete Blair as an undergrad, albeit one of Pete's an upper-level course in Energy Policy & Management. I'd already taken a course in programming in a matrix-based language (IBM's APL) to develop a program against which I played poker. But Pete's approach to teaching programming for I-O analysis was particularly fascinating. I still wonder if he made mistakes during his lectures on purpose, as he alluded at the time.

Ron never, ever made them. Ron's lectures on I-O fundamentals were as clear as the same sections of their book. We were the guinea pigs.

2) My first IIOA conference was that in New York City in 1998, and for me it was a personal disaster. I lived too close by. I say this because Rutgers University does not reimburse for costs of meals or overnight stays to New York City, Philadelphia, or Atlantic City. Worse, my office was between my home and the conference venue, which was Leontief's research workplace—New York University. So, I had to commute to NYU from my home and, as a result, typically missed the first session or two each day; I missed Wassily's welcome. I even missed a full conference day. Even more disappointingly, I literally missed the boat—the one that took conference attendees to the conference junket to the Statue of Liberty. I arrived 30 minutes late to the departure point after traveling two hours to get there.

While this first was a disappointment, understand that by this point I was a seasoned conference goer, organizing and attending sessions at Regional Science Association (RSA) Meetings since 1976. Via such venues, I'd met many of notable I-O colleagues, like Zoe Ambargis, Bill, Beyeres, Phil Borque, Joe Cartright III, , Geofftey J.D. Hewings, Jan Oosterhaven, Karen Polenske, Hank Robison, Adam Rose, Jeffrey I. Round and Michael Sonis by this juncture. I'd even heard Wassily Leontief speak in Pittsburgh in 1982. Besides my attendance at the New York City conference and heavy involvement in the RSA somehow enabled me to be invited to be program chair of the next IIOA conference in Macerata. Karen Polenske undoubtedly deserves a shout out from me on this.



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3) This is tough for me. I am not a strictly an I-O-nick; plus, I thought about the field unusually early in my “career”—long before I published. To be honest, I learned a great deal by reading the work of my dissertation committee members, three of whom I have not yet mentioned: Benjamin Stevens; Dick Conway, Jr.; and Janusz Szyrmer. And I had access to Ron Miller’s unusually full and well-organized file drawers of published papers, a number of which I copied and fetched from the library. Also, I dare not fail to credit Walter Isard who, in classes, related his Quaker traditions, environmental/ecological interests, and insight into regional modelling, including I-O. He certainly swayed my thoughts toward his. And if I didn’t mention Masahita Fujita, who I believe has published just a single I-O related paper—one of his few pieces with numbers in it, I’d surely be remiss. His tutelage, via three graduate courses in urban and regional economic development, undoubtedly framed much what I have done in I-O.

To reply more squarely, I suppose the early collected work of Rod Jensen and Guy West was what lit a fire in my I-O belly. The idea of figuring out how to best build a set of regional accounts using secondary data was intriguing to me, and their work appeared to provide a portal toward this end. Plus, Rod was an engaging Aussie, someone who anyone would love to work with as a postdoc or colleague; Guy, who was also personable yet a bit more serene, had a more-mathematical approach that I appreciated.

In this vein, I also should give a shout out to Erik Dietzenbacher and Eric Howe (University of Saskatchewan), both of whom produced mathematical I-O work that I really liked. In fact, if not for them, I likely would have abandoned I-O as a field of endeavour.

They were both about my age too, which counts for a lot when attending conferences. Otherwise, I only had Randy Jackson to hang with, although he’s proven to me on occasion that he can be more companion than one might wish for (recalling an interview at The Ohio State University some time ago).

If asked to identify one paper I would have liked to have written myself, I would have to say it is one by Masahiro Kuroda and Koji Numura entitled “Technological Change and Accumulated Capital: A Dynamic Decomposition of Japan’s Growth.” I had the pleasure of copy-editing this piece for the 2004 volume in honour of Wassily Leontief. Via both static and dynamic decomposition analysis, it examines an economy’s total productivity growth. To do so, the authors interpolated values of capital investment and, hence, accumulation. This enabled them to track, for example, how such accumulation of capital goods in machinery industries has enhanced productivity in industries that use that machinery, like Japan’s auto industry. The theory and the data work were by no means simple, but the implications of the work were policy-rich.

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