Newsletter
Number 50, November 2021

INTERNATIONAL
INPUT-OUTPUT ASSOCIATION

Welcome from the Editor

Dear **IIOA** member,

I am very pleased to release the 50th issue of the *International Input-Output Association Newsletter*. Many thanks to all of you that have contributed sending your inputs.

For this special milestone we dressed the newsletter in gold. We celebrate with an issue that contains the last presidential message from our president Satoshi Inomata, the latest ESR articles, highlights in Journals and recent I-O books, but also recent calls from the association, a report of the last Inforum conference and information about spaJS: A visual interactive online tool to conduct Structural Path Analysis. You can also find a call for a Special Issue, a job position and other news from the I-O world. But, as a special issue about the newsletter, José M. Rueda-Cantuche brings a summary of the history of the newsletter and The Social Accounting Corner includes conversations with all the previous newsletter editors. It is an issue full of interesting news that I hope you will enjoy!

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

Andre Carrascal Incera
IIOA Newsletter Editor
University of Oviedo, Spain
Newsletter E-mail: newsletter@iioa.org
Personal E-mail: carrascalandre@uniovi.es

Would you like to contribute to the IIOA newsletter?
Send us your news at newsletter@iioa.org

In this issue

Presidential Message

Dear valued IIOA members,

I hope you are all doing well. Unfortunately we continue to observe unbalanced global developments regarding Covid-19; in some parts of the world, we see significant improvement, while in others another wave is threatening anew. To all of you, I sincerely wish for an end to this hardship and a rapid recovery in years, if not months, to come.

Since the last issue of the Newsletter, we had a highly successful module of the International School of Input-Output Analysis. It was delivered by Dr. Douglas Meade, Executive Director of Inforum. The module was entitled "An introduction to building interindustry macroeconomic models using Interdyme" with the interesting subtitle "Cooking with Interdyme". Interdyme software was designed to help build models that use macro-variables in a dynamic interindustry setting. Dr. Meade presented a very practical "cookbook". Members can view recordings of his lectures through the ISIOA section in our website.

Also, as has already been announced by the IIOA Secretary, I am extremely pleased that the International Input-Output Conference will be held in Malaysia with a new date, 28 August - 02 September 2022. I am particularly thankful to the local organising committee for their tremendous efforts to date for still being able to motivate local stakeholders' and to offer us relevant infrastructure after we were forced to cancel our original plans. So, please block-off that part of your calendar NOW and start preparing for active participation!

Time flies.

This is my final Presidential Newsletter message following three years in office. Instead of confessing any personal sentimental retrospectives, I have one specific suggestion for the next IIOA Council.

As the movement of people has been significantly restricted, the role of social media and public relations has become ever more important. Thus, I ask the Council to consider creating the position of a social media officer for the Association. Twitter and LinkedIn have become important channels to inform a broader public about us, our findings, ideas, new data, vacancies. Also, it is my hope that the Association will strengthen its function of promoting job-hunting activities—particularly those for young researchers—that have been significantly compromised during the pandemic. All of these developments can be orchestrated by a Council-sanctioned social media officer for the IIOA.

The pandemic has brought unprecedented disorder to our lives. At the same time, it also has pushed us towards new and different ways of thinking. Having led the IIOA through a major epidemic, I am extremely interested in how the IIOA will subsequently evolve.

I take this opportunity to thank all who helped me in the Council to carry out my duties, Prof. Erik Dietzenbacher who supported me throughout by giving me advice as my predecessor, and, of course, everyone of you IIOA members for maintaining your interest and commitment in the Association during these unprecedented conditions.

I look forward to seeing you in person, sometime, somewhere, in near future.

Best wishes,

Satoshi INOMATA (The President of the IIOA)   2
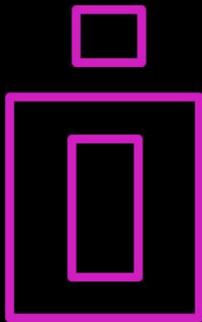
IIOA Newsletter 50TH issue!

In December 2005, Council members were surveyed about their visions of directions for our organization and fellow members, as well as about the future of interindustry economics more generally. One notable outcome of this inquiry was a need for a web-based newsletter. The prime rationale was the belief that such a venue might keep members abreast of Council actions and other IIOA activities, including perhaps members' research. At the Istanbul IIOA Conference in 2007, my first conference as a Council member, I proposed an outline of the possible content of such a newsletter. Council agreed. I was subsequently appointed the first Editor of the IIOA Newsletter by Jan Oosterhaven, the President of the IIOA. In September 2007, I solicited members and the Council for concrete ideas. In February 2008 the first issue of the Newsletter was delivered to members and posted on the IIOA website. In its most complete form, it included:

a) an editorial item,

b) a feature article relating "Tales from the Input-Output World",

c) abstracts of I-O articles from journals related to our field,

d) brief notes on key I-O frontiers and extensions,

e) fast-breaking I-O research news,

f) notices and links for relevant upcoming conferences,

g) new releases of input-output databases (including links where possible),

h) ongoing multinational research projects,

i) job openings,

j) teaching materials.

In principle, Editors have released issues a month in advance to the publication of *Economic Systems Research* issues in order to give an overview of its upcoming articles, namely: February, May, August and November. During 2008, the list of e-mail addresses used by the editor included IIOA members, national statistical offices and other research institutes (up to 235 for the first issue). Nowadays, the count of recipients
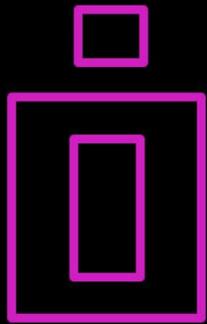
IIOA Newsletter 50TH issue!

Former and present newsletter editors

JOSÉ MANUEL RUEDA-CANTUCHE
February 2008 - November 2010 (issue 1 to 12)

IGNAZIO MONGELLI
February 2011 - August 2013 (issue 13 to 23)

ANTONIO F. AMORES
November 2013 - November 2015 (issue 24 to 32)

VINICIUS DE ALMEIDA VALE
August 2017 - August 2020 (issue 33 to 45)

ANDRÉ CARRASCAL INCERA
November 2020 - present (from issue 46)

Is notably longer. That is, the frequent mailing activity of the newsletter also facilitates continuous updating of the email addresses of Members for the IIOA Secretariat.

Now, 14 years later, I am extremely gratified that the IIOA releases the 50th issue of the Newsletter. Indeed, the Newsletter is, as it always has been since my tenure as Newsletter Editor, in very competent hands—now those of Professor André Carrascal of the University of Oviedo.

And last, and certainly not least, please help us all by keeping the Newsletter Editor informed of any news or other ideas fit to share with other IIOA members and colleagues!!

Dr. José M. RUEDA-CANTUCHE
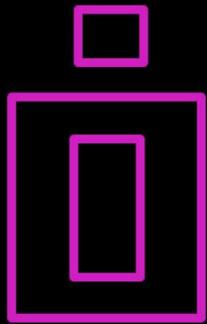
Call for nominations – IIOA Fellows

Dear IIOA Member,

Fellows of the IIOA are honoured via nomination and election for their scientific contributions to the field of input-output analysis, broadly defined. The elected Fellows are obligated to further promote development of the IIOA and to advocate suitable applications of input-output analysis. New Fellows must be nominated by IIOA Members and from among those nominated the body of existing Fellows select the new Fellows. **Nomination of new IIOA Fellows is now open**!

According to the guidelines described below, IIOA members may nominate any member of the Association. **Nominations must be sent to the current Secretary of the Fellows, Erik Dietzenbacher** (h.w.a.dietzenbacher@rug.nl) no later than **December 31, 2021**. Selection of up to two additional Fellows is determined by the voting of current Fellows.

Members of the IIOA, not themselves Fellows, are invited to nominate other members. A nominee must have been a member of the IIOA for at least six years. Each nomination should include: name, current address, current email, current institution, brief curriculum vitae, list of up to ten key publications, and a description of the candidate's contribution to input-output analysis of no more than 100-200 words. In addition, two letters from IIOA members, excluding the nominee and any Fellows, must be submitted to support any given nomination. Nominations from previous years are not carried over; that is, re-nominations are required.

After all nominations have been completed and submitted, the procedure is as follows. All Fellows are eligible to vote on the nominees. Up to two new Fellows of the IIOA may be elected. Any newly elected Fellows is installed during a plenary event at next year's conference.

I look forward to receiving your nominations.
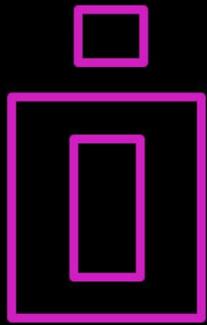
Erik Dietzenbacher, University of Groningen

2021 IIOA Council Elections

Dear valued IIOA Member,

as an IIOA member, your are kindly asked to vote for **3 new IIOA council members**.

Please click this link to view the candidates and cast your vote: https://members.iioa.org/vote/8cdae145cb6f5037369958923f8e17e9.html

You can also log into our members area: https://members.iioa.org and click on EVOS.

Voting is permitted until **13 December 2021**, 24:00 hours Central European Time.

Yours truly,

Oliver Fritz (IIOA Secretary)

Call for application: Head of the International School of Input-Output Analysis

Don't miss this opportunity to get to know the most renown experts in the field, increase your network and build up other colleagues' training records while you're also having fun with it!! The IIOA is looking for someone like you!!!

The IIOA is seeking a new **Head of the International School of Input-Output Analysis (ISIOA)**. The Head is responsible for the management, coordination and assessment of the training modules provided at the annual IIOA Conference. Due to the COVID-19 pandemic, this role has extended to the provision of online training.

A summary of tasks is given below, for more information see the ISIOA website (https://www.iioa.org/isioa/

Any member of the IIOA can apply for this post and the Council of the IIOA will select the best candidate based on meeting the following **list of requirements**:

• Organisational skills (demonstrated by arranging workshops, conferences, webinars, seminars, etc.).
• Communication skills and networking with a diverse group of individuals in the IIOA and other scientific organisations.
• Academic record of publications.
• Overview of new developments in Input-Output analysis and related fields.
• Development of plans on a rolling three-year basis.
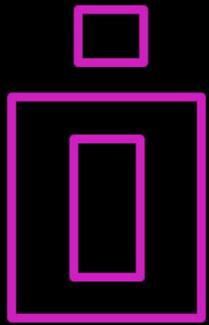
INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Call for application: Head of the International School of Input-Output Analysis

The mandate of the Head of the ISIOA is for **three years** with a possibility of being re-elected for another three years maximum. The Head of the ISIOA will propose a new Directorate, which will need approval by the Council of the IIOA.

Application:

- **Submission materials**:

(1) CV
(2) A motivation letter (less than 500 words)
(3) Your vision for the ISIOA for the next three years (less than 2,000 words)

- **To be sent to**

oliver.fritz@wifo.ac.at
JoseM.RCantuche@ec.europa.eu

- **Deadline**
31st December 2021

A summary of **tasks**

The Head of the ISIOA is responsible for:

• Selecting the topic themes and speakers for the training modules at each annual IIOA conference.

• Managing the invitation process.

• Processing the submissions (to be approved by the ISIOA Directorate).

• Interacting with lecturers to ensure the quality and adequacy of the proposals.

• Deciding on the list of students to be admitted (using pre-agreed criteria).

• Approving the certificates that students receive.

• Preparing the analysis of the students' evaluation and presenting the results to the IIOA Council and the General Assembly at the annual IIOA Conference.

The Head of the ISIOA is currently assisted by two members of the ISIOA directorate, the Management and Admissions Coordinator and the Certificate Coordinator.
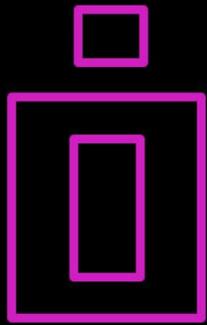
Events

2022 IIOA conference in Malaysia

Call for organised sessions:

Dear valued IIOA members,

At past International Input-Output Conferences, pre-planned sessions organised by attendees have been most successful in terms of the number of attendance and participant interaction. For this reason, we strongly encourage proposals for sets of thematic sessions. In proposing such sessions or sets of sessions, please send the following information to kagawa@econ.kyushu-u.ac.jp:

 * Title of the organised session,
 * Abstract describing the theme/objective of the session,
 * Name and institutional affiliation of the organiser,
 * Name and institutional affiliation of co-organiser(s), if any,
 * Names and institutional affiliations of the session chair,
 * Names and institutional affiliations of presenters, with the titles of their presentations.

Deadline: 28 February 2022

Once the session proposal is accepted by the Chair of the Scientific Programme Committee, the individual article submission procedure should follow for each of the presentations planned for the proposed sessions.

 We look forward to receiving interesting proposals!
 Best regards,

Shigemi KAGAWA
The Chair of the Scientific Programme Committee

Other workshops

Call for Paper
14. Input-Output-Workshop

The aim of the workshop is to bring together scientists and practitioners in the field of input-output research and to provide a platform for sharing experiences and research methods in the area of input-output analysis. Please hand in your abstract (max ½ page in pdf format) **until January 31th, 2021** to moennig@gws-os.com. Participants without presentation are welcome. You can register for the workshop after the program has been announced.

Organising Team: Anke Mönnig (GWS), Prof. Dr. Jutta Günther (University of Bremen), Prof. Dr. Tobias Kronenberg (Bochum University of Applied Sciences)

March 9th – 11th, 2022

- If possible, it will be an onsite event in Osnabrück. Online – if necessary

- Per lecture 40 minutes of which max 20 minutes presentation

- Each session has a session chair

- Number of participants is limited

- Conference language is German and English.

Important dates:

▪ Submission of abstract **January 31st, 2022**

▪ Confirmation of participation and Workshop programme **beginning of February and mid February, 2022**

For questions please contact Anke Mönnig: Email: moennig@gws-os.com
Phone: +49 (0)541 40933-210
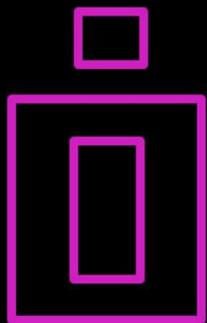
INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Events

2021 International Conference on Economic Situation Analysis and Forecasting Science (ICESAFS 2021)

December 11, 2021

To intensely discuss the latest theoretical methods and applications in economic analysis, forecasting science, and other related fields, the **Laboratory of Economic Analysis and Forecasting Science**, Academy of Mathematics and System Sciences, **Chinese Academy of Sciences** will host the **2021 International Conference on Economic Situation Analysis and Forecasting Science**. The conference will invite well-known scholars in the fields to make keynote speeches. The conference sets four Best Presentation Awards (1 for the first prize, 3 for the second prize). We sincerely invite scholars to participate in the conference and submit abstracts. We will carry out this conference online. Hopefully, the conference can strengthen cooperation among experts and scholars worldwide and promote the convergence and development of disciplines.

1. Main topics

(1) Analysis and prediction of China's and world's economy
(2) Theory and method in economic forecasting
(3) Coordinated development of population, resources, environment, and economy
(4) Related topics in management science

2. Submission requirements

The conference solicits abstracts or papers on relevant topics. The number of words in each abstract is required no more than 500. Authors can send their submissions to the e-mail address: icesafs2021@163.com.

3. Timelines

(1) Submission deadline of abstracts: **December 4, 2021**
(2) General assembly reports and sessions: **December 11, 2021(Saturday)**

4. Conference fee: There is no registration fee for this conference.

5. Address of venue

South Building, Academy of Mathematics and System Sciences, Chinese Academy of Sciences, No. 55 Zhongguancun East Road, Beijing, 100190
Zoom Meeting No.: 871 4350 7451   Code: 567186

6. Conference committee

General Chairs:

Geoffrey J. D. Hewings, Regional Economics Applications Laboratory, University of Illinois at Urbana-Champaign, IL, USA

Shouyang Wang, Academy of Mathematics and Systems Science, Chinese Academy of Sciences, China

Xikang Chen, Academy of Mathematics and Systems Science, Chinese Academy of Sciences, China

Yongmiao Hong, Academy of Mathematics and Systems Science, Chinese Academy of Sciences, China

Executive Chairs:

Cuihong Yang, Academy of Mathematics and Systems Science, Chinese Academy of Sciences, China

Jue Wang, Academy of Mathematics and Systems Science, Chinese Academy of Sciences, China

Xiaoguang Yang, Academy of Mathematics and Systems Science, Chinese Academy of Sciences, China

Xiuli Liu, Academy of Mathematics and Systems Science, Chinese Academy of Sciences, China

Chair of the Best Presentation Award Committee:

Geoffrey J. D. Hewings, Regional Economics Applications Laboratory, University of Illinois at Urbana-Champaign, IL, USA

7. Contacts

Zijie Cheng, Email: icesafs2021@163.com
Xin Xiang, Email: xiangxin950205@163.com
YuXing Dou, Email: 15229933168@163.com

The flash of the conference invitation please check the website,
https://a.eqxiu.com/s/sfJTCKEr
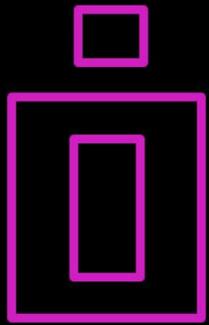
Events

Recent webinars

Sociedad Hispanoamericana de Análisis Input-Output

The 2021 Edition of the SHAIO Webinars is coming to an end. We had the great pleasure of closing the 2021 webinars series with **Professor Cuihong Yang** from the Academy of Mathematics and Systems Sciences, Chinese Academy of Sciences (CAS), China.

• December 2 (1:00 pm, CET): "Firm Size Matters in Value-added Generation and CO2 Emissions: The Case of China", Cuihong Yang (language: English).

The entire input-output community is invited to join our webinars.

Do not forget to subscribe to our social networks **Facebook** and **Twitter** to be updated with our events, and we remind you that **you can enjoy previous meetings and webinars like this one** and download the materials presented from our **Youtube channel** and our **web page**.

Stay healthy, and we wish you an excellent end of the year!!

The SHAIO Council.
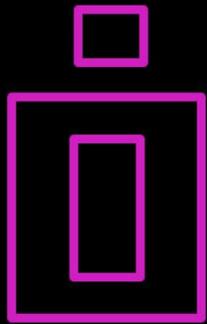
Other IIOA News

spaJS: A visual interactive online tool to conduct Structural Path Analysis

Thor Tepper-García,[1,2*] Joy Murray,[2] Arunima Malik,[2,3] Arne Geschke,[2] and the OAASIS team

1) Sydney Institute for Astronomy (SIfA), School of Physics A28, The University of Sydney, NSW 2006, Australia

2) Centre for Integrated Sustainability Analysis (ISA), School of Physics A28, The University of Sydney, NSW 2006, Australia

3) Discipline of Accounting, Sydney Business School, The University of Sydney, NSW 2006, Australia

* Corresponding author email: tepper@physics.usyd.edu.au

As part of the *Open Analysis to Address Slavery in Supply Chains* (OAASIS) project we have developed an online tool to conduct Structural Path Analysis (SPA), called **spaJS**. The tool has been written from scratch entirely in JavaScript; it runs in the local browser, and is fully dynamic, i.e. data-driven and interactive. One of the main features of spaJS is that the result from each run can be both saved to disk and *visualised* directly in the browser session (see Figure 1). An additional feature (available soon) is the geographic visualisation of the links between the countries within the economic system represented by the input data. For more details on its usage we refer the reader to spaJS's User Guide, linked to the tool's interface.
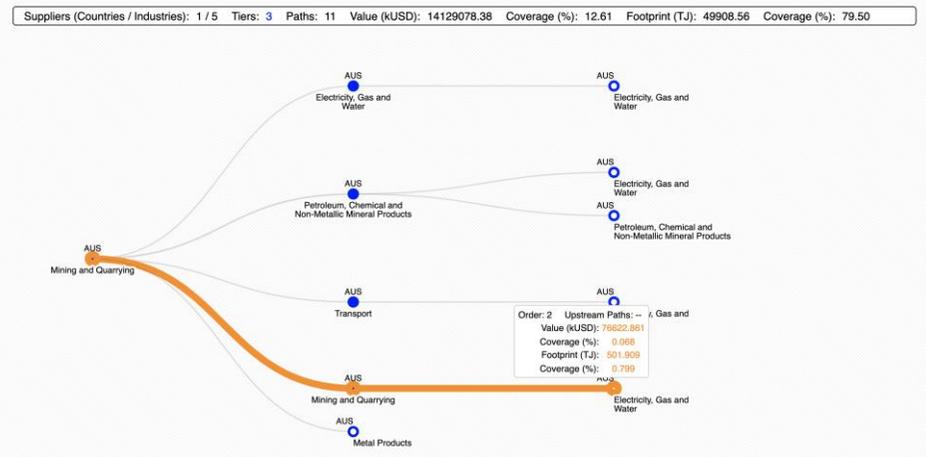

Figure 1. Example of a supply chain visualisation with spaJS.

spaJS is made freely available to the community exclusively for non-commercial purposes and can be found at:
http://www.physics.usyd.edu.au/spajs/

spaJS is currently in its open beta version. We welcome feedback from the community including suggestions for improvement, additions, bug reports, etc.
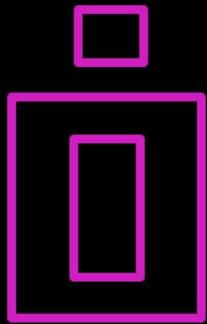
Other IIOA News

Inforum Virtual World Conference 2021

The Inforum community has met from **October 11 through October 13, 2021** online for their **first Virtual World Conference**. As it was not possible to hold a face-to-face event due to the current worldwide pandemic situation, it was decided to hold a virtual conference to ensure the scientific exchange of the Inforum community even in these times. The online conference was organized and hosted by the Inforum Country Groups of Italy, Germany and the USA.

Inforum was founded by Clopper Almon, Professor Emeritus from the University of Maryland, USA in the 1970s. Since 1992, the international community of economists and scientific researchers from five continents have met every year for a World Conference to share and discuss new research approaches and results in the field of I/O-based macroeconomic and industry modelling.

Apart from general economic I/O modelling questions, many topics of this year's presentations and discussions dealt with the **Green Transformation** and questions concerning the impact of the **COVID-19 pandemic**. In many cases, the research work relates to the climate debate as one of the dominating worldwide societal and political discussions at present. Besides, new and progress in existing **regional and general I/O modelling** approaches were presented as well as studies focusing on **labour market** research.

Thanks to the proven mix of experienced economic researchers, who have been part of the Inforum group for a long time, and young PhD students and scientists, the first Inforum Virtual World Conference also became a very productive and interesting experience for all participants.

The Inforum community would like to thank this year's organizing committee for hosting the virtual event, which not only allowed for the exchange of research results and findings, but also provided an opportunity to maintain relationships between all member organizations during times when face-to-face meetings are unfortunately not possible.

A web page for the Inforum conference is hosted by the partner organization GWS at the following link: https://www.gws-os.com/de/index.php/die-gws/inforum-konferenz-2016/inforum-2021.html

The group is looking forward to the **28th Inforum World Conference**, which is planned for 2022 as a face-to-face event. The venue and date will not be determined until spring 2022 due to the planning uncertainty caused by the pandemic situation.

Not only members, but all scientists involved in I/O based economic research are welcome to join the Inforum conference.

If interested & for further information, please contact: Inforum; www.inforumecon.com, email to: info@inforumecon.com

Rossella Bardazzi
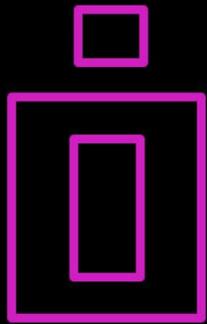
Other IIOA News

Input-Output Analysis: Foundations and Extensions
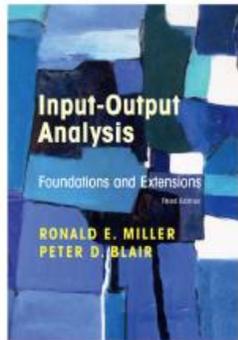
Input-Output Analysis
Foundations and Extensions
3rd Edition, 2021

AUTHORS
Ronald E. Miller, University of Pennsylvania

Peter D. Blair, George Mason University

ISBN: 9781108484763

This essential reference for students and scholars in the input-output research and applications community has been fully revised and updated to reflect important developments in the field. 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. Input-Output Analysis is an ideal introduction to the subject for advanced undergraduate and graduate students in many scholarly fields, including economics, regional science, regional economics, city, regional and urban planning, environmental planning, public policy analysis and public management.

### Reviews

'It is not an exaggeration to call this book the Bible of input-output practitioners. Past editions of this book have served as the undergraduate and post-graduate textbook, introducing scholars from outside the Economics discipline to extended topics such as social accounting, resource depletion, pollution, and environmental impacts. The book has recently enjoyed increased popularity and attention at higher levels of academic and decision-making impact. Therefore, this latest edition book is a timely update of a truly seminal foundation.'

Manfred Lenzen - The University of Sydney

'This book comes just at a time when multi-country input-output analysis has become the key instrument to understand the economic, social and environmental consequences of international trade flows between sectors, global value chains or supply chains disruptions, caused for example by COVID-19. The authors draw on the traditional literature and expand it again very smartly to incorporate the latest advances in input-output analysis, thus offering the reader a reference unique for students, professionals, researchers and policy makers around the world.'

José M. Rueda-Cantuche - European Commission Joint Research Centre

'Since the publication of the second edition of this book, the world changed rapidly when production activities became organized in global value chains and we started to realize that our consumption at home also had environmental consequences on the other side of the globe. To handle the new circumstances, today's analyses require global input-output tables and models. This new, third edition includes a discussion of such tables and models, and their application to relevant issues such as climate change and international trade. In other words, the input-output textbook is up-to-date again.'

Erik Dietzenbacher - University of Groningen

'The expanding community of scholars and practitioners who have used the prior two editions will welcome the addition of a third version that addresses the increasing use of input-output systems in environmental and trade modeling, with attention to life-cycle analysis and value chains. This edition retains the book's stature as an amazingly valuabledigestion of an ever-expanding literature that is presented in a logical and clear fashion.'

Geoffrey J.D. Hewings - University of Illinois

'It is highly difficult if not impossible for input-output researchers to write a new textbook on the field, because they already have at hand Input-Output Analysis: Foundations and Extensions. This book is so comprehensive in coverage and continuously evolving for updates, allowing very little room for other scholars to supplement. The book also embraces readers of differing levels and areas of interest, from university undergraduates to professionals, from trade economists to environmental analysts, which again makes it hard to imagine a substitute of any kind. The book is really a must-read literature.'

Satoshi Inomata - The President of the International Input-Output Association & Chief Senior Researcher of Institute of Developing Economies, JETRO
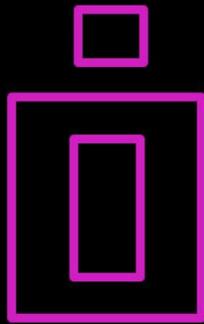
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• Errata

http://www.cambridge.org/millerandblair

About the Authors

Ronald E. Miller, University of Pennsylvania

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

Peter D. Blair, George Mason University

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

November 2021

Databases

Romanian IO Tables: Updated Series 1989-2018 in Twenty-Sectoral Structure

The INS extended input-output tables were organized into twenty-sectoral structure, which allows a deeper investigation of the Romanian economy in its evolution from the centrally planned system to market mechanisms. Integral statistical series 1989-2018 are compacted into three annexes: i) the sectoral shares of output and of gross value added (Appendix 1); ii) the technical coefficients at current prices (Appendix 2); and iii) the Leontief coefficients at current prices (Appendix 3). Methodological problems discussed in the previous fourteen-sectoral structure (Romanian Statistical Review 3/2019) remain valid and are not repeated. As an illustration of the analytical insights offered by these statistical series, the present paper examines from a dynamical perspective the temporal intensity of sectoral changes, their interdependences, the main relocations of the output multipliers, structural impulses for changing the ratio of gross value added to output.

Link to the text
Link to the appendices

Emilian Dobrescu
Viorel Gaftea
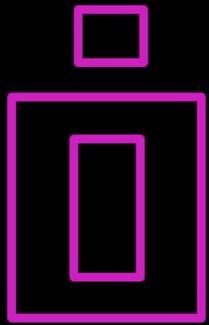
In memoriam

PAUL DE BOER

This note reports that Professor Paul de Boer of the Erasmus School of Economics passed away in mid-September this year. Paul was somewhat of a mathematical virtuoso among interindustry economists. This helped him to be a meticulous journal editor (Statistica Neerlandica) and valuable manuscript reviewer. His first publication in 1976 was an input-output piece in *Weltwirtschaftliches Archiv* and related production functions to Leontief systems. He also dabbled somewhat in development economics. But the largest body of his work tied index number theory to structural decomposition analysis.

His last paper was accepted for publication just a month before Paul died. In that paper, he weaves together several threads of his scientific life: it touches on a topic, consumer preferences, he first explored in the 1980s while its policy application uses empirical data he gathered during development work he performed in the early 2000s. The piece contains both econometrics and economic theory; and it also is a respectful contribution to the history of economic thought since, as always with his work, it contains extensive acknowledgments and contextual notes. In this vein, there is elegance in the way Paul brought closure to his scientific legacy.

The senior of us first met Paul along with a gaggle of other Dutchmen in 2000 at the 13th International Input-Output Conference in Macerata, Italy. That was back when we all carried business cards to share of our life's work. Paul's

card displayed a picture of bug-eyed, wild-haired, mad professor that immediately evoked a belly laugh (from Lahr) and that, in turn, startled everyone at the table. With an elfin smile, Paul responded with something like, "Is something wrong?" As he was the senior member of our table gathering, apologies were rapidly submitted: he, just as quickly, cast them aside. Apparently, Paul got the reaction he sought from that card; the picture surely must have been carefully selected. This connection more or less displays Paul personality—one full of humour and good faith.

The junior member of us first met Paul late in the summer of 2017. By then Paul had retired from Rotterdam's Erasmus School of Economics. He had stepped away from research for several years for personal reasons. All three of us convened in Groningen in 2017 because he wanted to get back into the game.
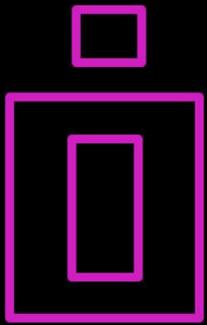
In memoriam

With the passion of a PhD student, he brimmed with ideas, had scoured the literature meticulously, and shared reams of pages scribbled with very dense derivations. This explains why in 2018, after some years of absence from IIOA meetings, Paul re-appeared in Juiz de Fora, Brazil, proudly displaying what he called his "Kalashni-crutch". (He thought his crutch looked like an automatic rifle and often wished to use it as such. See his picture above.)

What we will most remember about Paul is his inner peace: he accepted life's challenges graciously and with humility, and always had a positive word to say. Indeed, he was keen on writing friendly notes. In these notes he shared his humour, his concern for a favourite team (especially longish jottings about ADO Den Haag), and the latest family news, which was typically about his son Franz, a priest in France. Football and family were his main passions, input-output analysis played second fiddle. To Paul, rooting for the "wrong team" was almost as bad a poorly written paper.

Paul de Boer's *joie de vivre* was contagious. At his memorial service, family, friends and neighbours alike openly declared sincere affection for his part in their lives. Paul also was at home was the IIOA, and many of us also are grateful for having met him. We certainly both are.

--Michael L. Lahr & João F.D. Rodrigues
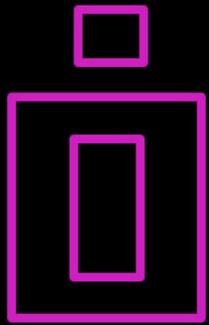
In memoriam

JOSEFINA CALLICÓ LÓPEZ

Josefina Callicó López was a profesor in the Departamento de Disciplinas sobre el Derecho de la División de Estudios Jurídicos en el Centro Universitario de Ciencias Sociales y Humanidades en la Universidad de Guadalajara (México). As a teacher, she was highly appreciated and loved by both her classmates and her students, who saw Josefina as a reference in their learning.

I believe that Josefina could be framed, due to her natural ability, within the broad group of "applied economists" and with a special inclination towards the dissemination of knowledge. She made progress in her research by promoting the debate of ideas, starting with the organization of forums, workshops and meetings; I have had the honour and pleasure of participating in some.

Her research was always very close to social economics and especially focused on Mexico. For example, she studied youth violence in Jalisco, trying to contribute ideas and solutions to this important problem. Another of her lines of research was input-output (IO) analysis. Together with other Mexican academics (Noé Fuentes, Fidel Aroche, Lilian Albornoz, Joana Chapa and Rafael Bouchain) she helped to found the AMMIP, Asociación Mexicana de Análisis Insumo Producto. This association promoted IO methods in Mexico, bringing together all those analysts and more to advance the subject.

Undoubtedly, Josefina was a reference in the IO field and a promoter of its knowledge and use. No doubt what stood out most about Josefina was her open, congenial personality. But her energy, her tenacity, her generosity, her clear perception of the problems of the real society and her desire to help in putting them to an end also played prime roles in her contributions to our society.

Descanse en paz.

--Carmen Ramos Carvajal
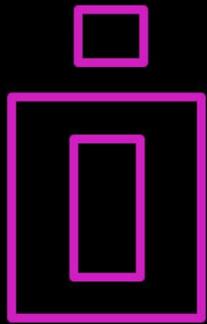
Published papers and books in Input-Output Analysis and related methods

Latest ESR articles

Economic Systems Research

Journal of the IIOA

Volume 33, Issue 3, 2021

Łukasz Lach

On the plausibility of using linear programming to trace important input–output coefficients in the framework of tolerable limits.

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.

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

Weaponized trade policy: the impact of US tariffs on the European automobile sector.

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.

Tsujimura, M. and Tsujimura, K.

Flow-of-funds structure of the U.S. economy 2001–2018.

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.
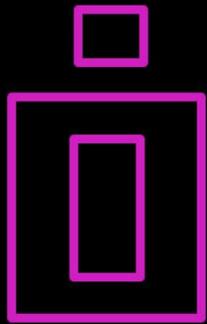
Parys, W.

David Hawkins and the making of the Hawkins-Simon conditions.

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.

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.

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

How important is domestic and foreign demand for China's income growth by business function?.

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.
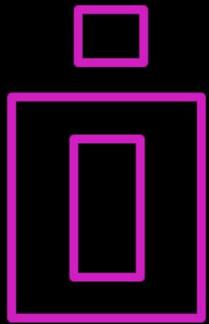
Economic Systems Research

Journal of the IIOA

Latest articles (up to 24th of Nov)

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.

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.

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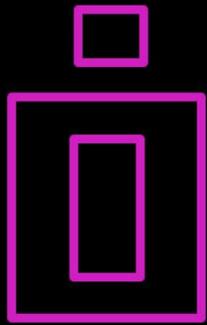
Ángela García-Alaminos, Mateo Ortiz, Guadalupe Arce & Jorge Zafrilla
Reassembling social defragmented responsibilities: the indecent labour footprint of US multinationals overseas.
Economic Systems Research.

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.

Bartlomiej 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.
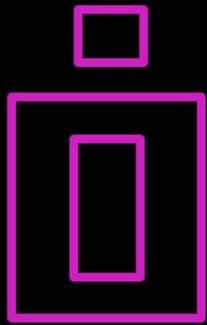
Óscar Dejuán, Ferran Portella-Carbó & Mateo Ortiz
Economic and environmental impacts of decarbonisation through a hybrid MRIO multiplier-accelerator model.
Economic Systems Research.

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, CO_2 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 CO_2-reduction polices 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.
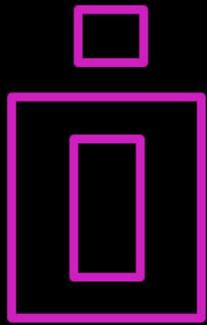
Radomír Mach, Milan Ščasný & Jan Weinzettel
The role of allocation of retail trade margins across household segments on their carbon footprint calculation.
Economic Systems Research.

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.
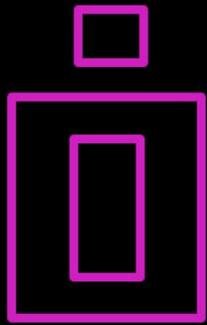
INTERNATIONAL
INPUT-OUTPUT ASSOCIATION

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 Hambÿe
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.
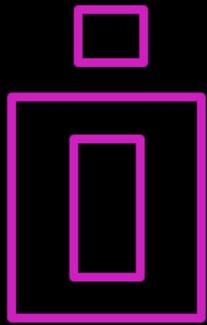
Andrea Bonfiglio, Silvia Coderoni, Roberto Esposti & Edoardo Baldoni

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.

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.

Timon Bohn, Steven Brakman & Erik Dietzenbacher

Who's afraid of Virginia Wu? US employment footprints and self-sufficiency.

Economic Systems Research.

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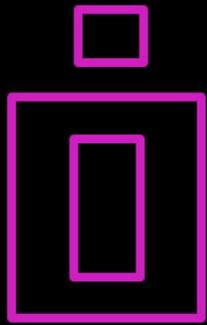
Christian Lutz, Maximilian Banning, Lara Ahmann & Markus Flaute

Energy efficiency and rebound effects in German industry – evidence from macroeconometric modeling.
Economic Systems Research.

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

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

Entropy-based Chinese city-level MRIO table framework.
*Economic Systems Research.*

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

Rossella Bardazzi & Leonardo Ghezzi

Large-scale multinational shocks and international trade: a non-zero-sum game.
Economic Systems Research.

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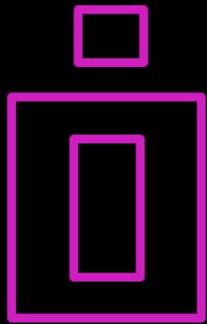
José L. Zofío, Julio González, Angel Prieto & Juan Vicente

Modelling the spatial and sectoral benefits of productivity enhancing innovations using a transport oriented multiregional IO framework: the 'megatruck' in Spain.
Economic Systems Research.

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

Anton Pichler & J. Doyne Farmer

Simultaneous supply and demand constraints in input–output networks: the case of Covid-19 in Germany, Italy, and Spain.
*Economic Systems Research.*

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

Timothé Beaufils & Leonie Wenz

A scenario-based method for projecting multi-regional input–output tables.
Economic Systems Research.

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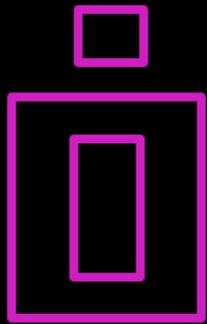
Jan Weinzettel

[Aggregation error of the material footprint: the case of the EU](#).
Economic Systems Research.

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

Yoshihiro Hashiguchi, Norihiko Yamano & Colin Webb

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

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

Arndt Feuerbacher, Scott McDonald & Karen Thierfelder

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

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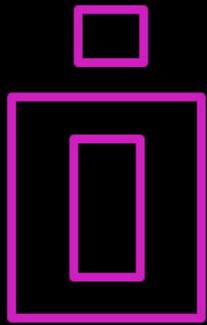
INTERNATIONAL INPUT-OUTPUT ASSOCIATION

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

Consumer preferences in CGE models when data are scarce: comparing the linear expenditure and the indirect addilog systems.
Economic Systems Research.

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

Syeda Tasnia Hasan, Michael Oliver Wood & Simron Singh

Revealing embedded carbon emissions within the Comprehensive and Progressive Agreement for Trans-Pacific Partnership.
*Economic Systems Research.*

The Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), representing approximately USD 13.5 trillion of the global GDP, is one of the largest free-trade agreements in the world. This trade agreement considers many important issues yet fails to address climate change or carbon dioxide (CO_2) emissions. CO_2 emissions in trade are critical as all CPTPP parties have made significant carbon emissions reduction commitments of between 8-36% through the COP21- Paris Agreement. Herein lies a paradox. This study assesses the amount of embedded CO_2 emissions in the CPTPP through an input-output analysis of consumption-based emissions in ten carbon-intensive sectors, under three scenarios. The results reveal that as trade between partners increases, so will CO_2 emissions across those sectors. These findings are essential for policymakers who are striving to grow Partnerships (Sustainable Development Goal 17) while seeking to address Climate Action (Sustainable Development Goal 13), which appear to be conflicting goals.

Arianto A. Patunru & Prema-chandra Athukorala

Measuring trade in value added: how valid is the proportionality assumption?.
Economic Systems Research.

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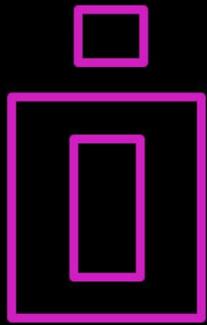
Makiko Tsukui, Chen Lin, Kaiyan Ji & Xiaoliang Lang

The true cost of trade among neighbors: the role of Japanese imports in waste generation in China.
Economic Systems Research.

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

Markus Simbürger

Filter methods for MRIO tables: an evaluation.
*Economic Systems Research.*

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

Ning Chang & Chaohui Han

Regional CO2 emissions and cross-boundary mitigation potential in China.
Economic Systems Research.

This paper presents a new framework for investigating regional CO_2 emissions from the perspective of the domestic supply chain, with a combination of linkage analysis and structural decomposition analysis (SDA), which allows for a better understanding of spatial emission distributions and cross-boundary potential for CO_2 mitigation. Based on the multi-regional input–output (MRIO) tables of 2007 and 2012, Chinese provinces (cities) are categorised into three groups according to linkage characteristics, among which, Group I is suggested to be given priority in formulating mitigation policies due to their stronger regional CO_2 influence characteristics. Moreover, regions in Group I have been more affected by inter-regional trade than other groups with regard to their local CO_2 emissions. Therefore, turning Group I into a low-carbon production pattern could help construct greener domestic supply chains. The results emphasise that regional analysis on CO_2 emissions should go beyond the local factors, and that regional mitigation polices should consider the position and participation degree of different regions in domestic supply chains.
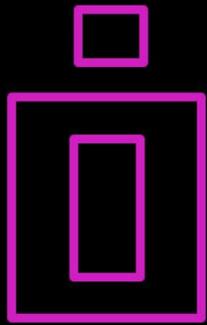
Julio Sánchez Chóliz, Rosa Duarte & Sofía Jiménez
Structural components of income growth: an application to the evolution of the Spanish economy, 1980–2014.
Economic Systems Research.

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

Sabina Szymczak & Joanna Wolszczak-Derlacz
Global value chains and labour markets – simultaneous analysis of wages and employment.
*Economic Systems Research.*

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

Muhammad Daaniyall Abd Rahman, Bart Los, Anne Owen & Manfred Lenzen
Multi-level comparisons of input–output tables using cross-entropy indicators.
Economic Systems Research.

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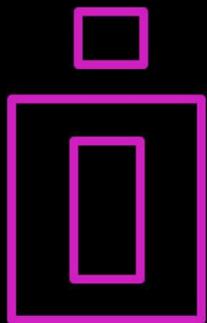
Cristian Mardones & Claudio Brevis

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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Joaquim J.M. Guilhoto

Input-Output Models Applied to Environmental Analysis.
Oxford Research Encyclopedia of Environmental Science.

Input-Output (I-O) models and analysis were originally conceived by the Nobel Prize winner Wassily Leontief in the 1930s as a tool that can be used by economists and economic policy makers to help in their decision process. The I-O models provide a "picture" of how the economy works, that is, what are the necessities to produce goods and services, how this production generates income, profits and taxes, and how this income is spent. In a simplified way the I-O models can be seen as the model implementation of the economy circular-flow diagrams usually shown in economics introductory courses. Associated with the theory behind I-O models and analysis, I-O tables contain the empirical information necessary to implement these models and theory.

Link to the summary

Zhang, Haiyan, Yue Xu, & Michael L. Lahr

The greenhouse gas footprints of China's food production and consumption (1987–2017).
Journal of Environmental Management

As China urbanized and its economy grew rapidly, its food production and consumption patterns changed dramatically over the past three decades. With this in mind, we evaluate how the nation's greenhouse gas (GHG) emissions related to food production and consumption altered from 1987 to 2017. We further explore key factors that affect GHG emission changes from agricultural production and household diet perspectives. We find that the GHG emissions from China's food production rose 51 percent, while that from food consumption rose 64 percent. The rise in GHG footprint of China's food production was largely caused by the increasing material- and energy-intensive food production system. Agricultural modernization was a main cause of the rise in GHGs, as China was late to the game in improving agricultural productivity. But a more meat-intensive diet accompanied by a general rise in households' use of processed food also helped to drive these transformations. China's growing appetite for meat not only intensified GHG mitigation pressures domestically, but also abroad, as Chinese households began to demand greater variety that was satisfied via imports. Indeed, GHG emissions embodied in imported meats rose over eleven-fold from 2007 to 2017. Through this study, we highlight the importance of future policy-making focused on a more sustainable food system in China to benefit the world's environment, health, and climate.
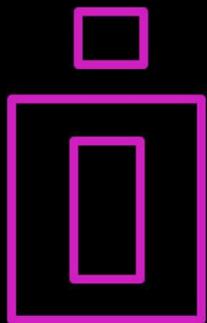
Pan He, Kuishuang Feng, Giovanni Baiocchi, Laixiang Sun & Klaus Hubacek

Shifts towards healthy diets in the US can reduce environmental impacts but would be unaffordable for poorer minorities.

Nature Food.

Environmental implications of food choice are the focus of increasingly extensive research, but less is known about the impacts of dietary patterns of different socio-economic groups of a country, and the trade-offs between nutritional quality and environmental impacts of diet within those groups. We evaluate the impacts of US household dietary patterns on greenhouse gas emissions, blue water footprint, land use and energy consumption across supply chains using an environmentally extended input–output analysis. We compare the nutritional quality of these dietary patterns using healthy eating index scores across individuals' income and other socio-economic characteristics. Individuals with higher income or education levels are more likely to adopt healthier diets but are also responsible for larger environmental impacts of diet primarily due to a higher consumption of dairy and livestock products, seafood and items with lower energy density but higher nutrient density. Our optimization shows that a healthy diet with lower environmental impacts is achievable within current food budgets for almost 95% of people, and results in average decreases of 2% in food-related greenhouse gas emissions, 24% in land use and 4% in energy consumption, but a 28% increase in blue water consumption.

However, such dietary patterns are unaffordable for 38% of Black and Hispanic individuals in the lowest income and education groups. Policies that affect income and food prices making nutritious food more affordable would be needed to achieve better nutrition and improved environmental outcomes simultaneously, particularly for more vulnerable socio-economic groups.

Sheng Zhong & Bin Su

Investigating ASEAN's Participation in Global Value Chains: Production Fragmentation and Regional Integration.

Asian Development Review.

This paper focuses on the Association of Southeast Asian Nations (ASEAN) —a major final assembler in production—where studies and evidence on the role of the region in global value chains are limited. We seek to provide new evidence regarding the extent and patterns of international fragmentation in ASEAN. To do so, we derive the foreign value-added shares of final products for all global value chains of ASEAN. Using the Asian Development Bank's multiregional input–output tables for 2000–2017, we document a series of stylized facts. The results show declining foreign value-added shares in ASEAN. Regional economic integration within ASEAN has increased, while value-added contributions vary widely across its members. We find evidence of increasing value-added contributions from emerging economies to ASEAN, whereas the contributions from advanced economies have declined.

Rui Xie, Meng Niu, Bin Su & Jiali Ge

Are global value chains merely global? The case of Chinese Provinces in global value chains.

Applied Economics.

We extend the measure of the global value chain (GVC) decomposition framework to the sub-national regional level based on a new Trans-national Inter-regional Input-Output (TIIO) table , which covers 30 Chinese provinces for 2007 and 2012. We answer the question whether fragmentation of GVCs is mainly national, regional or merely global by deriving the geographical distribution by province and the trends related to the production chain of a particular final good. Depending on whether the intermediate inputs cross borders for production or not, we further divide these production activities into GVC or non-GVC activities and identify the changing mechanism from the perspective of simple and complex GVC activities. We find that coastal provinces show a higher decline in nationalization compared to inland provinces. The degree of regionalization weakening of each province is generally the same, which is more evident in coastal provinces. Additionally, coastal provinces show a more significant decline of globalization compared to inland provinces. Regarding border crossing production-sharing activities, complex GVC embeddedness is the main mode of Chinese provinces. They, however, show signs of gradual weakening over time. This is more pronounced in the dynamic evolution of regionalization and globalization in coastal provinces.
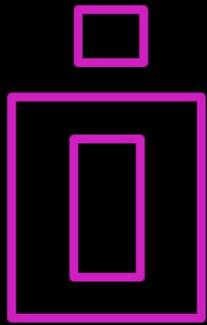
André FT Avelino, Alberto Franco-Solís & André Carrascal-Incera

Revisiting the Temporal Leontief Inverse: New Insights on the Analysis of Regional Technological Economic Change.
Structural Change and Economic Dynamics.

The current availability of longer series of input-output tables, as well as the release of global input-output databases, has fostered a growing literature analyzing changes in the economic structure and their drivers. In this paper, we take advantage of these time-series by proposing a methodology designed to trace the contribution of different drivers of the change in interindustrial relationships over time. Based on the Temporal Leontief Inverse (TLI), the Extended TLI (ETLI) decomposes the economy-wide effects of changes in direct interindustrial links between years, isolating the impact of different determinants of economic (environmental, energy, etc.) spillovers according to the interests of the researcher. For example, one can explore how the multipliers of a particular industry were affected by changes in technology of other sectors and in the own sector; by changes in trade patterns in specific countries; by indirect changes in intraregional production chains in foreign nations; etc. The ETLI is illustrated by uncovering certain hidden effects not captured in a previous application of the original TLI to the Chicago region between 1980-1997.

Jiansuo Pei, Gaaitzen de Vries & Meng Zhang

International trade and Covid-19: City-level evidence from China's lockdown policy.
*Journal of Regional Science.*

This paper examines the impact of Covid-19 lockdowns on exports by Chinese cities. We use city-level export data at a monthly frequency from January 2018 through April 2020. Differences-in-differences estimates suggest cities in lockdown experienced a ceteris paribus 34 percentage points reduction in the year-on-year growth rate of exports. The lockdown impacted the intensive and extensive margin, with higher exit and lower new entry into foreign markets. The drop in exports was smaller in (i) coastal cities; (ii) cities with better-developed ICT infrastructure; and (iii) cities with a larger share of potential teleworkers. Time-sensitive and differentiated goods experienced a more pronounced decline in export growth. Global supply chain characteristics matter, with more upstream products and industries that had accumulated larger inventories experiencing a smaller decline in export growth. Also, products that relied more on imported (domestic) intermediates experienced a sharper (flatter) slowdown in export growth. The rapid recovery in cities' exports after lockdowns were lifted suggests the policy was cost-effective in terms of its effects on trade.

Trinh Bui & Ngoc Quang Pham

Mathematical Discussion on the Relationship Between SUTs and SIOTs.
Research in World Economy.

Since the 1993 System of National Accounts (SNA) and especially the 2008 SNA, traditional input-output table (IOT) of Leontief has been modified quite a lot with many variations. The supply and use tables (SUTs) seem to be substituted for the IOT, although there has not been a complete guiding to SUTs to IOT conversion. Originally in 1968 SNA, SUTs was called make and use matrices as an intermediate step to compile IOT. However, 1993 and 2008 SNA seem to replace IOT with SUTs, of which regulations make it difficult to convert from SUTs to IOT such as regulation on the size of supply and use tables and regulation on the prices of the intermediate input matrix. Some countries use computable general equilibrium (CGE) model, while others use both the CGE model and input-output analysis, so they need to convert SUTs into symmetric input-output tables (SIOTs). The construction of SIOTs is a controversial issue as regards the choice of model to construct both product-by-product and industry-by-industry SIOTs. This paper discusses the SUTs given in 1968, 1993, 2008 SNA, and the method for converting SUTs to SIOTs. Although there have been several articles on how to convert SUTs into SIOTs, this article is an effort to provide an easier, more understandable way to convert SUTs to SIOTs based on the arrangement of supply and use matrices.
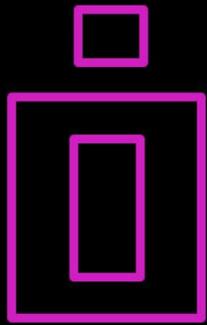
Manuel Alejandro Cardenete, María del Carmen Delgado & Paula Villegas

Impact assessment of Covid-19 on the tourism sector in Andalusia: an economic approach.
Current Issues in Tourism.

The goal of this study is to analyse with an economic approach the impact assessment of COVID-19 on Andalusian tourism through the input-output methodology using the social accounting matrix (SAM). Tourism is one of the key sectors of the Andalusian economy, representing 13% of regional GDP and 14% of employment. We observe how the GDP reacts to possible changes in tourism, specifically to two possible situations: a pessimistic situation with a fall of 68% and an optimistic situation with a fall of 65%. To do so, we use the most recent SAM built for 2016, with an approximation for 2020, and a linear applied general equilibrium approach. This will allow us to have a first approximation of the real effect of the drop in the tourism sector in Andalusia.

Qifeng Zhang, Thomas Wiedmann, Kai Fang, Junnian Song, Jianjian He & Xianpeng Chen

Bridging planetary boundaries and spatial heterogeneity in a hybrid approach: A focus on Chinese provinces and industries.
Science of the Total Environment.

Communicating the finiteness of the Earth system at sub-global scales is necessary to guide human activities within a safe operating space.

Despite the numerous efforts committed to downscaling planetary boundaries (PBs) at multiple scales, neither top-down nor bottom-up approaches adequately account for the spatial heterogeneity and integrity of local and global natural systems. To overcome these shortcomings, we developed a hybrid approach that combines bottom-up aggregation and top-down adjustment for downscaling five crucial PBs (i.e., climate change, nitrogen and phosphorus cycles, freshwater use, and land use change) to Chinese provinces and industries. In addition to the widely applied equity principle, we further incorporated the eco-efficiency principle into the downscaling of PBs under the proposition that safeguarding finite PBs should be reconciled with the pursuit of maximizing human welfare. Environmental sustainability at multiple scales was subsequently assessed with the complementary use of environmental footprints and downscaled PBs. The results demonstrate that 1) China suffers from severe unsustainability because of the transgression of PBs for phosphorus and nitrogen cycles, carbon emissions, and cropland use; 2) provinces in West and North China perform worse than other provinces in terms of the eco-efficiency in manufacturing industries, including Electronic equipment, Textiles, and Wood processing and furnishing, rendering these industries that are more unsustainable; and 3) industries with varying eco-efficiencies account differently for the provincial PBs. Construction dominates the provincial shares of carbon PBs, whereas Agriculture and Food processing and tobacco contribute most to the other four PBs. Our findings suggest that improving eco-efficiency in most manufacturing industries is the key to saving resources, reducing emissions, and safeguarding local boundaries.

Hannah-Jayne Shilling, Thomas Wiedmann & Arunima Malik

Modern slavery footprints in global supply chains.
Journal of Industrial Ecology.

Slavery is more prevalent today than at any point in human history. Society's heightened scrutiny and new government policy is forcing businesses and nations to act in lieu of reputational, financial, and legal repercussions. However, slavery hides within complex supply chains, making it difficult to identify instances of human exploitation. This study takes a consumption perspective by investigating the potential of footprinting in exposing modern slavery impacts embodied in upstream supply chains. A multi-regional input–output analysis extended with a slavery satellite account enables footprints of direct and indirect incidents of modern slavery to be quantified. The footprints reveal a displacement of slavery from developed to developing nations through the global supply chains of production. Accountability for enslavement significantly increases for countries and regions like North America, Western Europe, Australia, and Japan due to a high dependence on imports with embodied human exploitation. The results expose hotspot sectors, including construction, trade, and agriculture. These footprints go beyond current estimates of slavery in supply chains, revealing hidden impacts and the true risk, which may enable more effective action into improving global social sustainability and support companies to responsibly manage their supply chains.
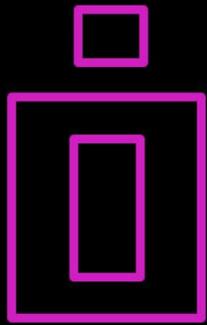
Nikolaos Rodousakis & George Soklis

The COVID-19 multiplier effects of tourism on the German and Spanish economies.

Evolutionary and Institutional Economics Review.

Based on a multisectoral model of single production and using data from the input–output tables, this paper estimates the COVID-19 tourism multiplier effects on output, employment and trade balance of the German and Spanish economies. It is found that the decrease of international travel receipts recorded in the year 2020 correspond to a decrease in GDP of about 0.58% in the German economy and a decrease in GDP of about 4.54% in the Spanish economy. The evaluation of the results reveals that the higher observed recession in the Spanish economy than in the German economy can be attributed to the relatively stronger dependency of the former on the highly vulnerable in the pandemic tourism industry.

Andrew B. Trigg

Reconstructing Marx's Theory of Credit and Payment Crises under Simple Circulation.

Review of Political Economy.

There is general agreement amongst scholars of Marx that his monetary theory is incomplete, especially in his most detailed writings on credit in the third volume of Capital. Moreover, in these unfinished notes Marx takes sides with the banking school approach, notable for its opacity compared to the clear axioms of its currency school counterpart. A reconstruction is proposed based on Marx's step-by-step method, commencing with a critique of Say's Law under simple commodity circulation, these foundations formalised here using the model of pure labour developed by Pasinetti (1993). Piecing together the fragments, and filling in some of the gaps in Marx's writings on money, the analysis builds from commodity money and private debt contracts, to the modelling of pure credit and pure banking systems. Adapting the Pasinetti model of a real economy, its endogenous money requirements provide an alternative to the exogenous money approach of the currency school: a streamlined analytical core to the banking school approach, as interpreted by Marx. In addition, the structure of payment crises — as an extension of Marx's possibility theory of crises — is examined with money as a means of payment required to settle debts between producers and the banking system.

Pedro S. Machado & Andrew B. Trigg

On absolute and comparative advantage in international trade: A Pasinetti pure labour approach.

Structural Change and Economic Dynamics.

This paper builds upon Pasinetti's pure labour model, formalizing some of the insights that he has provided into the structure of international trade. A systematic approach is followed, starting with restrictive assumptions that are relaxed in subsequent stages of analysis. The starting point is a model in which two countries, one advanced and the other underdeveloped, have equal costs of production. This implies that there are no incentives for trade. At a second stage, we introduce and formalize the conditions required for these countries to exhibit absolute cost advantages, based on wage disparities. Finally, the paper establishes the conditions required for comparative advantage, based on relative differences in technology. Building on an interpretation of Ricardo's writings on trade, it is shown that absolute advantage is critical for the two countries to realise potential cost reductions afforded by comparative advantage. This abstract insight, based on the Pasinetti pure labour system, suggests that absolute advantage has a more fundamental role in international trade than given by previous studies, which focus more on either the international mobility of money capital or the international fragmentation of production.
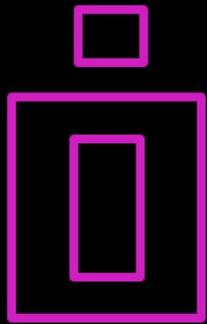
Rui Huang, Arunima Malik, Manfred Lenzen, Yutong Jin, Yafei Wang, Futu Faturay & Zhiyi Zhu

Supply-chain impacts of Sichuan earthquake: a case study using disaster input–output analysis.
*Natural Hazards.*

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

Arunima Malik, Guillaume Lafortune, Sarah Carter, Mengyu Li, Manfred Lenzen & Christian Kroll

International spillover effects in the EU's textile supply chains: A global SDG assessment.
Journal of Environmental Management.

Successful implementation of the Sustainable Development Goals (SDGs) requires world countries to account for actions that inadvertently generate negative impacts on other countries. These actions/effects are called 'spillovers', and can hinder a country's SDG progress. In this work, we analyse negative social spillover effects, focussing specifically on the occupational health and safety aspects of workers in textile supply chains. We select two indicators: fatal accidents and non-fatal accidents that take place in global supply chains for satisfying consumption of textile products (such as clothing, leather products) by European Union (EU) countries. Specifically, we scan global supply chains originating in countries outside of EU for meeting the demands of its citizens. To this end, we employ a well-established technique of multi-regional input-output analysis, featuring information on 15,000 sectors for 189 countries, to scan international supply chain routes that are linked to consumption of textile products by EU countries. Our findings suggest that Italy, Germany, France, Spain, Poland, Belgium and Portugal are collectively responsible for about 80% of both fatal- and non-fatal accidents that are attributed to the EU's consumption-based footprint. These findings not only call for a need for coherent SDG policies that consider spillover effects, but also the need for these effects to be included in EU's strategic instruments and policy-related tools.

Pilar Campoy, Alejandro Cardenete, M. del Carmen Delgado & Ferran Sancho

Food Losses and Waste: A Needed Assessment for Future Policies.
International Journal of Environmental Research and Public Health.

About one third of food produced for human consumption is lost or wasted. For this reason, food losses and waste has become a key priority within worldwide policy circles. This is a major global issue that not only threatens the viability of a sustainable food system but also generates negative externalities in environmental terms. The avoidance of this forbidding wastage would have a positive economic impact on national economies in terms of resource savings. In this paper we look beyond this somewhat traditional resource savings angle and we shift the focus to explore the distributional consequences of food losses and waste reduction using a resource constrained modeling perspective. The impact due to the behavioral shift of each household is therefore explained by two factors. One is the amount of resources saved when the behavioral shift takes place, whereas the other one has to do with the position of households in the food supply chain. By considering the whole supply chain, instead of the common approach based only in reducing waste by consumers, we enrich the empirical knowledge of this issue and improve the quantification of its economic impact.
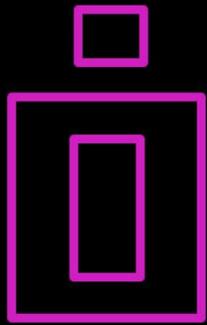
We examine data for three EU countries that present different economic structures (Germany, Spain and Poland) so as to have a broader and more robust viewpoint of the potential results. We find that distributional effects are different for consumers and producers and also across countries. Our results could be useful for policymakers since they indicate that policies should not be driven merely by the size waste but rather on its position within the food supply chain

Martin Lábaj & Erika Majzlíková
Drivers of deindustrialisation in internationally fragmented production structures.
Cambridge Journal of Economics.

This paper provides detailed evidence on the extent of outsourcing and offshoring of manufacturing employment and value added using a regional subsystem input–output framework. The paper argues that direct employment and the value-added shares of manufacturing in the totals underestimate manufacturing's importance. Jobs in manufacturing subsystems accounted for more than 25% of total worldwide employment, in contrast to just 15% recorded in direct statistics. In major developed countries, the level of intersectoral outsourcing reached its upper limit at the beginning of the new millennium. At the same time, the offshoring of activities interlinked with manufacturing has become the dominant driver of deindustrialisation in these countries.

While direct manufacturing employment and intersectoral outsourcing declined between 2000 and 2014, offshoring experienced a significant increase of 6.5 percentage points, from 29% to 35.5% of the total employment generated under the G7 manufacturing subsystem. Furthermore, 84% of the value added that existed to meet the final demand for manufactured products in G7 countries remained in G7 countries, while most of the jobs needed to meet G7 final demand have been offshored to developing countries. The paper concludes that the importance of manufacturing subsystems for the world economy did not decline over 2000–14, but there was a significant shift of manufacturing activities and related services from G7 countries to China and other rapidly growing economies.

Recent I-O Books

A Reflection on Sraffa's Revolution in Economic Theory.

This book presents a substantial collection of essays from a wide range of well respected scholars addressing several aspects of Piero Sraffa's economics in light of continuing controversies over the interpretation that should be placed on his work. It moves beyond extant scholarship with an added emphasis on the philosophical dimension of Sraffa's seminal work, *Production of Commodities by Means of Commodities.* Contributors probe new ways of thinking about the political economy of Sraffa and in doing so, alongside the comments to each contribution by other scholars, provide a cutting edge debate and discussion on non-mainstream economic theory.

This book will be of interest to academics and advanced graduate students in economics, with additional interest from scholars in philosophy and the methodology of science.

Editor: Ajit Sinha, Professor at Thapar School of Liberal Arts and Sciences, Patiala, India.
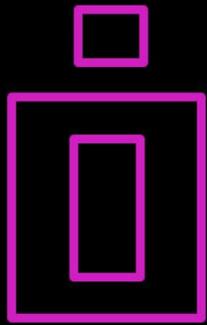
Special Issues in Journals

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

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

Context

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

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

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

Link

Queries and submission process

Please contact the guest editors:
Arunima Malik – arunima.malik@sydney.edu.au
Roberto Schaeffer - roberto@ppe.ufrj.br

Deadline for submissions

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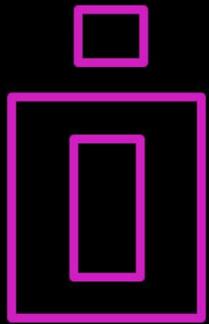
INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Job Positions

UNIVERSITY of BRADFORD

The **University of Bradford** is looking to recruit **a Post-Doctoral Researcher** to carry out environment-economy modelling. The position is available for **24 months** and is part of the UKRI funded project **"Marine Spatial Planning Addressing Climate Effects (MSPACE)?**. The successful candidate will join an interdisciplinary team from Plymouth Marine Laboratory, the Centre of Fisheries and Aquaculture Science Heriott-Watt University, Marine Scotland-Science, The Marine Climate change Impacts Partnership, The University of Bradford and the University of Essex.

The successful applicant will work with an academic team to model the economic, environmental and social impacts of changing marine resource distributions and adaptation plans. This will involve working closely with natural science colleagues and key partners to construct regional input-output tables and satellite accounts that are closely linked to marine resources. The successful candidate will be expected to share the findings verbally and in writing, with both academic and non-academic communities.

Application Deadline: 16th December 2021

More information in the **Link**

Please contact **Simon Mair** to discuss the post informally (s.mair1@bradford.ac.uk):

Dr Simon Mair (He/Him/His)
Lecturer in Circular Economy and Data Analytics
Faculty of Management, Law & Social Sciences
University of Bradford
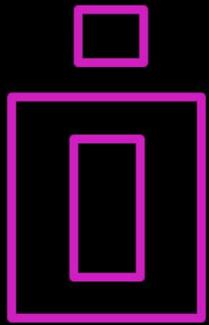
The Social Accounting Corner

Questions: 1) Among the issues of the IIOA newsletter that you edited, which one was your favourite and why? 2)How did you learn about Input-Output for the first time? Can you remember your first thoughts? 3) Which was your first IIOA conference? Any memory that you want/can share? 4) Recommend the readers of the newsletter a paper that surprised or inspired you.

José M. Rueda-Cantuche – Scientific Officer, European Commission, Joint Research Centre, Seville, (Spain)

1) There is no doubt that my favourite issue was the one dedicated to the 10th anniversary of the decease of our dear W. Leontief, in February 2009. There, I had the invaluable help of some of his colleagues, such as Thijs ten Raa, Faye Duchin, Debesh Chakraborty, Clopper Almon, Anne Carter and his daughter Svetlana, all of which prepared a few words in his tribute. At the same time, I made a compilation of images and photographs that I inserted throughout the text.

2) The first time I heard about input-output analysis was in 1996, right after coming back from the Navy. My Professor of Econometrics, who at that time was directing the Regional Statistical Office, informed me about a selection process being run by the University of Cordoba, which was seeking for young researchers to compile the first Input-Output Tables of Andalusia under the new System of National Accounts 1993. During that period, I had a good time learning first-hand how the information was collected, combined and finally compiled into Supply, Use and Input-Output tables.

At the same time, I was also studying my PhD courses where I first came across the first edition of the famous textbook written by R. Miller and P.D. Blair.

3) My first IIOA conference was in 2002, in Montreal (Canada) and although many of those who were there did not like the St. Lawrence River boat cruise because of its long duration and lack of countryside views (due to high levees), I loved it because it gave me time to chat and get to know authors and names in person that I had been reading for more than two years for my doctoral thesis. It was exceptional and I enjoyed it a lot.

4) The article that served as my first inspiration to enter the world of input-output analysis was that of P. Kop Jansen and T. Ten Raa (1990) on the construction of product-by-product IO tables. It served as a catalyst for me to visualize a new way of explaining how to go from Supply and Use tables into Input-Output tables. Likewise, I cannot help mentioning the splendid article written by Erik Dietzenbacher "In vindication of the Ghosh model: A reinterpretation as a price model" where I learned everything that can be known about the Leontief and Ghosh models of prices and quantities, as well as how to interpret them correctly.

P. K. Jansen and T. ten Raa (1990) "The Choice of Model in the Construction of Input-Output Coefficients Matrices", *International Economic Review*, 31(1).

E. Dietzenbacher (1997), "In vindication of the Ghosh model: A reinterpretation as a price model", *Journal of Regional Science* 37(4).
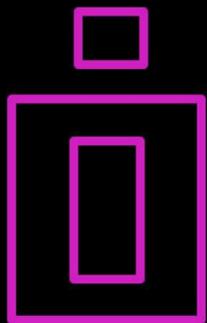
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### Ignazio Mongelli – Scientific Staff Member, European Commission, Joint Research Centre, Seville, (Spain)

1) I can't remember one in particular, but the report after the annual IIOA conference was always interesting to prepare.

2) Was during my PhD, my supervisor gave me a couple of papers to read and Leontief's book *Input-Output Economics*. It was an edition that had the IO table of the US economy folded inside the book.

3) Can't remember the first, but Istanbul 2007 it is the one I enjoyed the most, probably also the first I attended.

4) For sure: Structure of the World Economy: Outline of a Simple Input-Output Formulation, Wassily Leontief in *The American Economic Review*, Vol. 64, No. 6 (Dec., 1974).

Antonio F. Amores – Economic Analyst, European Commission, Joint Research Centre, Seville, (Spain)

1) It is very difficult to select only one. Instead, I would recommend new sections that were established in that period: conferences Wall of Fame, Fellows corner, etc.

2) It was in a class on structure of the economy during the second year of my bachelor. I loved from the very beginning. I thought: "this is supercool!"

3) Istanbul 2007: I recall a very nice and warm welcoming session organized by Geoff Hewings for young scholars and the boat trip.

4) ten Raa, Thijs (2007) The Extraction of Technical Coefficients from Input and Output Data, *Economic Systems Research*, 19:4, 453-459. I liked how it revisited a basic concept from a new angle but with great simplicity.
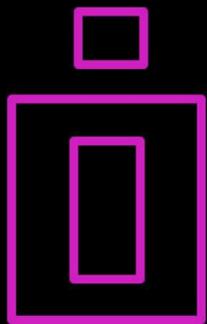
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Vinícius de Almeida Vale – Professor Adjunto, Departamento de Economia, Universidade Federal do Paraná - UFPR, Curitiba, (Brazil)

1) I liked to edit all issues. However, my favorites were number 37 (August 2018) and number 41 (Aug-Sep 2019). The number 37 was special because it was the first issue after the IIOA Conference in Juiz de Fora (Brazil). It was nice to have a piece about the conference and see how much fun we had in Juiz de Fora. The number 41 was special because we celebrated the 30 years of REAL. As a past visiting scholar, I was grateful to organize this piece.

2) My first step with input-output was during my undergraduate. Prof. Rafael Morais taught the basics of input-output analysis. However, I started to learn more sophisticated input-output techniques later in a project with Prof. Fernando Perobelli. He showed me the book written by Miller and Blair – *Input-Output Analysis: Foundations and Extensions* – and asked me to read chapters 1-6. That time, it scared me a lot since my English was not good enough and I saw many matrices and equations. However, Prof. Perobelli has helped me to understand it. The project was very nice and since that time I am using input-output techniques in papers, projects, and classes.

3) My first IIOA conference was in Lisbon (2014). It was very nice. I could see many researchers that I had cited in my paper. It was very exciting to see all of them and see how they get involved with all the conference activities. By the way, it was possible to be in Lisbon because of the Travel Grant that I received that year. It was very important to my career and to get more involved with input-output techniques and IIOA activities.

4) The papers "Calculating Energy-Related CO2 Emissions Embodied in International Trade Using a Global Input-Output Model" by Kirsten S. Wiebe, Martin Bruckner, Stefan Giljum, and Christian Lutz and "A Miyazawa Analysis of Interactions between Polluting and Non-Polluting Sectors" by Oliver M. Fritz, Michael Sonis, and Geoffrey J.D. Hewings inspired my master's thesis. I used the ideas to study emissions embodied in international trade with the WIOD database. The paper that I presented in Lisbon was the first effort with these ideas. Later, I have published a new version in ESR with Fernando Perobelli and Ariaster Chimeli – "International trade, pollution, and economic structure: evidence on CO2 emissions for the North and the South".