Newsletter
Number 46, November 2020

INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Welcome from the Editor

Dear **IIOA** member,

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

This issue contains information about the SHAIO 7th Workshop Webinars, a call for voting in the 2020 IIOA Council elections, the latest ESR articles, Highlights in Journals, next events including the Online Input-Output Workshop organized by the GWS. You can also find three calls for articles for different special issues and some job positions. As a new section, the Social Accounting Corner brings a couple of short conversations with Raquel Langarita and Albert Steenge, and the November Crossword.

This is my first issue as IIOA Newsletter Editor, after the great job done by Vinicius Vale over the last 3 years. I hope you enjoy it! Any feedback, comments or suggestions are greatly appreciated. I also welcome contributions to future issues.

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

In this issue

SHAIO: 7th Permanent Workshop – Webinar series

Unfortunately, the COVID-19 forced us to leap to online to avoid stopping activities this year. The expected 2020 Workshop became in a multi-webinar programme focused on COVID-19 related analyses with the input-output as the backing tool.

Up to date, three webinars have been held:

- On June 25, Klaus Hubacek, from the University of Groningen (The Netherlands) presented his outstanding recent paper in Nature Human Behaviour entitled "Global supply-chain effects of COVID-19 control measures".

- On October 1, we had the opportunity to enjoy an inter-institutional round table titled "The Input-Output in the inter-institutional response to COVID-19" with José Durán (ECLAC), José Manuel Rueda-Cantuche (European Commission), and Enrique Moral (Bank of Spain).

- On October 29, André Carrascal, from City-REDI at University of Birmingham (UK) presented his series of exercises about the effects of the pandemic entitled "Once upon a time in a Pandemic: Economic exposure of the UK regions to COVID-19".

A total of around 140 people from all around the world attended the webinars. Thanks to all of the participants, both the speakers and the attendees, for accompanying us.

Our last 2020 webinar will be the presentation by Fernando Bermejo and Eladio Febrero from the University of Castilla-La Mancha (Spain) titled Estimating the impact of COVID-19 on the Spanish Economy with Input-Output tables on the 2nd of December. All the information about this last webinar and the links to sign up will be provided on the website of the 7th Workshop and in our social media profiles (Facebook and Twitter)

The SHAIO Council hopes to see you soon in person again.
We also wish all the best for all the IO community.

Sociedad Hispanoamericana de Análisis Input-Output
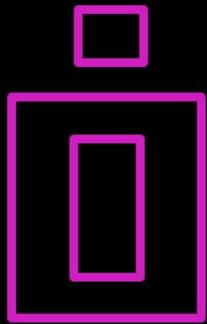
INTERNATIONAL INPUT-OUTPUT ASSOCIATION

2020 IIOA Council elections

Dear valued member of the IIOA:

On the 17th of November at midnight, Central European Time, EVOS, our electronic voting system, will be activated and the council elections will begin. EVOS will remain open until midnight of December 7, 2020 (CET).

The following candidates will run for three open seats:

Ariel Wirkierman
Carlos López-Morales
Christa Court
Heinz Kurz
Patricio Aroca
Rosella Bardazzi
Vinicius Vale

On the ballot you will find all the information these colleagues have provided to us (and included in their membership profiles): Their affiliation, professional experience and their vision for the future of the IIOA.

We can assure you that these elections will be fair and transparent: All ballots will be counted and a certified accountant will observe that all rules are being obeyed. The results will be know as soon as the elections are over. We are also quite certain that the outgoing council members and the candidates not being elected will accept the elections results and abstain from going to court. A smooth transition from the old to the new council is guaranteed as well.

Please make use of your right to vote!

Have a good day, stay healthy and keep your good spirit in difficult times like these.

Oliver Fritz
(Executive Secretary of the IIOA)
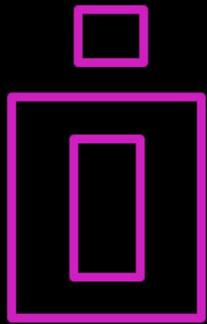
Published papers and books in IOA and related methods

Latest ESR articles

Economic Systems Research

Journal of the IIOA

Volume 32, Issue 4, 2020

Albert E. Steenge & Rachel C. Reyes,
Return of the capital coefficients matrix,
Economic Systems Research, 32:4, 439-450.

A core ingredient of post-disaster input–output recovery models is the reconstruction of lost production capacity. Therefore, one would expect a set of models endowed with capital coefficients matrices to be available for analysis. However, this is not the case, possibly due to earlier negative experiences with such models. Nevertheless, in this paper, we aim to show that there is a class of problems that can be addressed successfully with a dynamic input–output model with a fully functioning capital coefficients matrix. We put forward that if reconstruction is tightly planned, investment and therewith gross output essentially become pre-determined. This also means that traditional final demand becomes an endogenous residual,

with the model being transformed into a distribution and allocation model. We begin with a reordering of variables and equations as proposed in Leontief's dynamic inverse, and then move on directly to the newly proposed model. Suggestions for further work are given.

Carl-Johan H. Södersten & Manfred Lenzen
A supply-use approach to capital endogenization in input–output analysis,
Economic Systems Research, 32:4, 451-475.

Input–output analysis currently treats capital investment as exogenous to the inter-industry system despite capital goods being used further in production processes. Previous studies have applied the Leontief calculus to include impacts of capital in footprint calculations. Here, we adopt a supply-use approach to incorporating capital into footprint calculations, by constructing capital supply-use tables (KSUTs) that enable differentiating capital goods. As the new KSUT formalism is compliant with the Supply-Use formalism in the UN's System of National Accounts, we can keep full transparency throughout the process of calculating impact multipliers. We demonstrate the usefulness of the KSUT framework in a case study of the Australian economy, with environmental extensions from the EXIOBASE3 database.

If consumption-based emissions were considered for the UN's Framework Convention on Climate Change, the KSUT framework would provide a consistent and transparent foundation for working out countries' responsibility for carbon emissions from both current use and capital investment.

Nino Mushkudiani, Jeroen Pannekoek & Li-Chun Zhang
Uncertainty measures for economic accounts,
Economic Systems Research, 32:4, 476-501.

The problem of adjusting large systems of estimated economic or social accounts such that they fulfill known functional relationships can be quite complex. For such complex systems, evaluating the accuracy of the estimates after the adjustment is difficult since these estimates are defined by unadjusted initial estimates, the accounting equations and the adjustment method. In this paper, we consider such accounting systems as a single entity and develop scalar uncertainty measures that are based on the first two moments of the joint distribution of final adjusted estimates. Scalar measures can help to effectively communicate to the users the relevant uncertainty of disseminated macro-economic accounts and can assist the producer in choosing and improving adjustment method and input estimators.
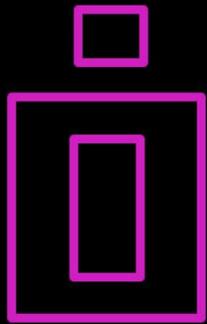
The proposed approach is illustrated both analytically and by simulation. Applications to supply and use tables and to time series data are presented.

Francesca Severini, Rosita Pretaroli, Claudio Socci, Jacopo Zotti & Giancarlo Infantino
The suggested structure of final demand shock for sectoral labour digital skills.
Economic Systems Research, 32:4, 502-520.

International data seem to confirm that countries with a relative abundancy of highly-skilled labour with digital competences grow faster than others. For this reason, digital competences and skills in general are progressively assuming a central role in labour market policies. In this article, we show the potential of the disaggregated multisectoral analysis with the macro multipliers approach as a tool of economic policy. Such analyses allow identifying a set of endogenous policies in which specific objectives do not clash with growth objectives. The identification and the quantification of the macro multipliers is based on an extended multi-industry, multi-factor and multi-sector model, which accounts for the representation of the income circular flow as in the social accounting matrix (SAM). The SAM constructed for this exercise allows for a proper disaggregation of the labour factor by formal educational attainment, digital competences and gender for the case of Italy.

Julio Gustavo Fournier Gabela
On the accuracy of gravity-RAS approaches used for inter-regional trade estimation: evidence using the 2005 inter-regional input–output table of Japan.
Economic Systems Research, 32:4, 521-539.

In contrast to international trade, it is still difficult to find regional trade statistics within a nation. Given that the gravity model continues to be very popular, we test two gravity-RAS approaches used for interregional trade estimation: a standard one and an extended version, which additionally estimates intra-regional flows. We assess the accuracy with the help of two measures and for different sectoral aggregation levels. For that, we use the survey-based 2005 interregional input–output table of Japan as a benchmark. Results show high overall accuracy levels for the standard approach, better than when using international data, albeit with heterogeneous errors for sectors and regions. We further find that the results of a multiregional input-output model are highly sensitive to the trade estimation approach and that errors slightly increase for increasing sectoral disaggregation levels. Results from an experiment based on a random number generator show how RAS influences results.

Hao Xiao, Bo Meng, Jiabai Ye & Shantong Li
Are global value chains truly global?
Economic Systems Research, 32:4, 540-564.

Are global value chains (GVCs) truly global or are they more of a regional phenomenon? We provide a new perspective on this issue using network analysis based on the measure of trade in value added. We first show that GVC activities can be consistently identified and grouped into three types of networks, i.e. traditional, simple, and complex trade networks, according to the number of times that factor contents cross national borders in global production sharing. Further investigation on the changes in topology and structure of various networks reveals that, GVCs are more likely organized regionally and dominated by large countries, like the US, China, and Germany. However, at the sector level, what GVCs look like largely depends on the perspective (supply or demand) and the type of networks adopted. This can help better understand the possible structural change of GVCs brought by the US–China trade war and the COVID-19 pandemic.
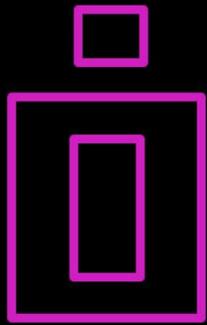
Eduardo A. Haddad, Fatima Ezzahra Mengoub & Vinicius A. Vale

Water content in trade: a regional analysis for Morocco.

Economic Systems Research, 32:4, 565-584.

This paper aims at evaluating the virtual water content in trade in an intra-country perspective and discussing potential tradeoffs between the use of natural resources and value added creation. We develop a trade-based index that reveals the relative water use intensities associated with specific interregional and international trade flows. The index is calculated considering the measures of water and value added embedded in trade flows associated with each regional origin-destination pair using an interregional input-output matrix for Morocco together with information on sectorial water use. We add to the literature on virtual water by encompassing the subnational perspective in a country that shows a clear 'climate divide'. Furthermore, we contribute to the literature by proposing an index that may be applied to different economies to evaluate multidimensional trade-offs associated with the pressure of specific economic flows to the use of natural resources relative to its economic relevance.

Economic Systems Research

Journal of the IIOA

Latest articles (up to 29-Oct.)

Tsujimura, M. and Tsujimura, K.

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

Economic Systems Research.

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

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

Constructing an open access economy-wide database for bioeconomy impact assessment in the European Union member states.

Economic Systems Research.

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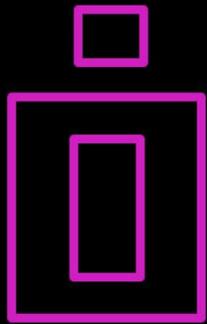
Parys, W.

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

Economic Systems Research.

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

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

Does resilience yield dividends? Co-benefits of investing in increased resilience in Cedar Rapids.

Economic Systems Research.

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

Ciaschini, C. and Chelli, F. M.

Evaluating the impact of Violence Against Women in the macroeconomic Input–Output framework.

Economic Systems Research.

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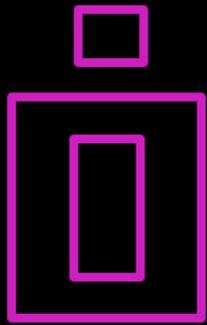
Wang, Z., Zhang, Y., Niu, M. and Fan, Z.

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

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

Maria Llop

Defining prices in an inter-regional SAM system.
Economic Systems Research.

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

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

Demographic change in Brazil and its impacts on CO_2 emissions.
Economic Systems Research.

In recent years, the debate about demographic changes and its impacts on the economy has increased. The growth in the relative share of elderly people in the age pyramid may occur in the coming decades in many parts of the world, and their effects on the composition of consumption, notably on energy demand and emissions, are not yet known. This article estimates the changes in the pattern of consumption in Brazil due to the changes projected in the age pyramid in 2050 and the consequences of these changes on CO_2 emissions. For this, projections will be made using an input–output model for the Brazilian economy for the year 2010 considering 67 productive sectors and six age groups. The results suggest that emissions grow less than proportionally to population growth and that the participation of sectors such as fuels and transport shows a small decrease in the consumption vector for 2050.
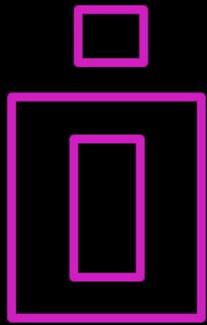
Jorge A. Garcia-Hernandez & Roy Brouwer

A multiregional input–output optimization model to assess impacts of water supply disruptions under climate change on the Great Lakes economy.
Economic Systems Research.

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

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

Will using newer input–output data for general equilibrium modeling provide a better estimate for the CO_2 mitigation cost?.
Economic Systems Research.

We provide a critical evaluation about how updating the input–output data of a computable generation equilibrium model can affect policy results, an assessment that is rarely done in existing literature. Specifically, we explore how datasets with different fossil energy cost shares alter results of policy simulations that aim at reducing CO_2 emissions. We prove analytically that a sudden fossil fuel price surge, which provides little time for adjustment through input substitution, can lead to a higher CO_2 mitigation cost. The finding is demonstrated empirically in a full-scale economy-wide model for a base year with lower fossil fuel prices, contrasted with results from a base year when fossil fuel prices spiked. We then propose an adjustment to resolve the issues of using input–output data that embed abrupt fossil fuel price hikes.

Umed Temursho

On the Euro method.
Economic Systems Research.

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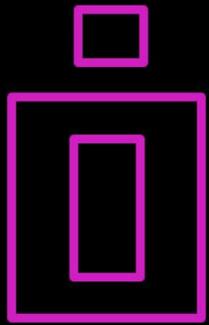
Zhou, L. and Chen, Z.

Are CGE models reliable for disaster impact analyses?.
Economic Systems Research.

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

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

Tariff costs embodied in product prices: a dynamic analysis from global value chain perspective.
Economic Systems Research.

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

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.
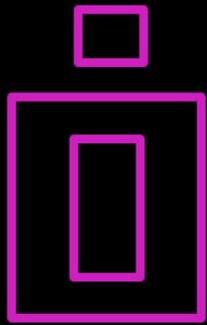
Moya-Martínez, P., Bermejo, F. and del Pozo-Rubio, R.
Hard times for long-term care systems? Spillover effects on the Spanish economy.
Economic Systems Research.

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

Carlos Llano, Julián Pérez, Fatima El Khatabi & Federico Steinberg
Weaponized trade policy: the impact of US tariffs on the European automobile sector.
Economic Systems Research.

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

Allan, G. J., Connolly, K. and McIntyre, S. G.
Developing an electricity satellite account (ELSA): an application to Scotland, UK.
Economic Systems Research.

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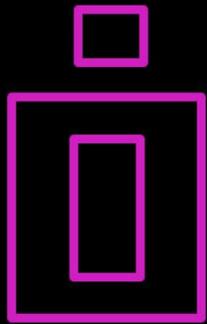
Reyes, F. A.

On growth regimes, structural change and input coefficients.

Economic Systems Research.

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

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.

Miroudot, S. and Ye, M.

Decomposing value added in gross exports.

Economic Systems Research.

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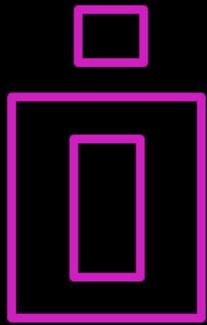
Ángela García-Alaminos, Mateo Ortiz, Guadalupe Arce & Jorge Zafrilla
Reassembling social defragmented responsibilities: the indecent labour footprint of US multinationals overseas.
Economic Systems Research.

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.
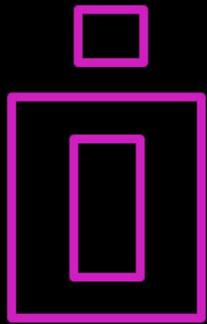
Cristian Mardones & Claudio Brevis

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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Highlights in journals

Mariolis Theodore, Rodousakis Nikolaos & Soklis George

The COVID-19 multiplier effects of tourism on the Greek economy.
Tourism Economics.

Using a multisectoral model and data from the Supply and Use Tables, this article estimates the COVID-19 multiplier effects of tourism on gross domestic product (GDP), total employment, and trade balance of the Greek economy. The results indicate that a—not-unexpected—decrease of international travel receipts in the range of 3.5 to 10.5 billion euros would lead to a decrease in GDP of about 2.0% to 6.0%, a decrease in the levels of employment of about 2.1% to 6.4% and an increase in the trade balance deficit of about 2.4 to 7.1 billion euros, respectively.

García-Alaminos, Á., Monsalve, F., Zafrilla, J. & Cadarso, M.A.

Unmasking social distant damage of developed regions' lifestyle: A decoupling analysis of the indecent labour footprint.
PLOS ONE.

A fair path to achieve a sustainable world would imply reducing the eventual negative effects linked to the production process while increasing economic output, which is referred to in the literature as impact decoupling. This article aims to assess whether global consumption chains are currently on the decoupling path or not, from a social point of view. Specifically, we address the working conditions which developed societies' lifestyle sparked at a distance in global factory countries, focusing on the most harmful consequences of an indecent work. Additionally, we determine the kind of decoupling observed through the new concept of social footprints' elasticities with respect to final demand for each region. We employ a Multi-Regional Input-Output model and an own elaboration database of social impacts concerning undignified working conditions. Results indicate that most countries achieved the goal of decoupling occupational injuries -both fatal and non-fatal- from production, while results for forced labour show a slower and sometimes uncertain process of decoupling. European Union and United States' footprints have been reduced overtime for the three impacts. However, more than half of these footprints are still generated by imports, mainly from developing regions.
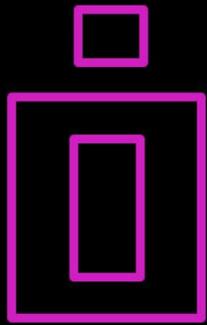
Mark Thissen, Frank van Oort, Philip McCann, Raquel Ortega-Argilés & Trond Husby
The Implications of Brexit for UK and EU Regional Competitiveness.
Economic Geography.

Any form of Brexit will impact heterogeneously in terms of sectors and regions on the competitive position of firms in both the UK and Europe. The ongoing uncertainty about the conditions under which the UK will be leaving the EU creates difficulties in structurally estimating these impacts. Using uniquely detailed interregional trade data on goods and services for the EU, we apply a novel methodology that disentangles region-sector sensitivities (elasticities) of firms' competitive positions to (non)tariff barriers from the implications of different post-Brexit UK–EU trade scenarios. This enables us to derive the economic geography of competitive opportunities and vulnerabilities of Brexit of firms, along with the degree of uncertainty that surrounds these effects, independently from scenarios. Our analysis demonstrates that the adverse international competitive vulnerabilities of UK regions are much larger than those of the rest of the EU due to the dependency of the UK on the EU via global value chains. The impact on the competitive positions of firms means that within the UK, Brexit is likely to increase interregional inequalities. In contrast, interregional inequalities across Europe may actually fall, depending on the nature of the post-Brexit UK–EU trading arrangements.

Moreover, the key political focus on the nature of the post-Brexit arrangements appears to be misplaced in that most UK regions are rather insensitive to the specific nature of the deal. As such, the economic geography implications of Brexit appear to be largely unrelated to UK domestic political narratives.

Wang, Z., Su, B., Xie, R., & Long, H.
China's aggregate embodied CO_2 emission intensity from 2007 to 2012: A multi-region multiplicative structural decomposition analysis.
Energy Economics, 2020, 85, 104568

The striking disparities among China's provinces suggest the need for regionalized carbon emission intensity mitigation measures. This study extends the aggregate embodied energy/emission intensity measures proposed by Su and Ang (2017) to a national multi-region setting, defines the aggregate embodied CO_2 emission intensity (AECI) indicators at the aggregate, provincial, and final demand category levels from the demand perspective, and adopts multiplicative structural decomposition analysis (SDA) to identify the driving factors of the historical changes over the 2007–2012 period in China. On the basis of China's latest multiregion input-output tables, we find that (a) the AECIs show heterogeneities across the provinces and final demand categories, with the AECIs of inland provinces higher than those of coastal provinces

and the AECIs of investment and export higher than those of consumption; (b) the generally downward trends of the AECIs hold at different levels, and the improvements in carbon emission performances are more pronounced in inland provinces, presenting a convergence toward the levels of developed coastal provinces; (c) according to the multiplicative SDA results, the input structure effect and the emission intensity effect generally contribute to the decline of AECIs. By providing a deeper understanding of carbon emission performance and its driving factors at the subnational level, our study finally proposes some policy recommendations.

Zhou, X., Zhou, D.Q., Wang, Q.W., & Su, B.
Who shapes China's carbon intensity and how? A demand-side decomposition analysis.
Energy Economics, 2020, 85, 104600

As national efforts to decouple carbon emissions from economic growth intensify, policymakers need more specific, sub-national information about the sources and reduction potentials of carbon intensity. This study presents a demand-side decomposition of China's carbon intensity to its regions, final demand types, and economic sectors, based on a predefined "aggregate embodied intensity (AEI)" indicator, i.e. the ratio of embodied emissions to embodied value added. We find that China's carbon intensity has been largely shaped by developed provinces, capital investment demand, and the construction sector. **15**
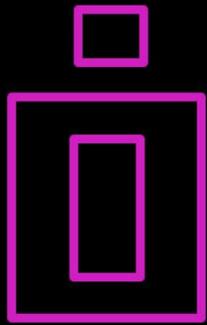
However, less-developed provinces, consumption demand, and the services sector have played increasingly important roles. Wealthy provinces generally experienced much lower AEIs and higher AEI reductions compared to poor provinces from 2007 to 2012, mainly owing to provincial differences in final demand structure and sectoral structure. Coastal region's emission reduction efforts at both production and demand sides were the main contributor to China's decrease in carbon intensity during the period, while interior region's structural degradation in demand partially offset the decrease. Our results suggest that allocating national carbon intensity targets based on AEI, and adjusting the final demand structure of central-western provinces, would greatly benefit for China to achieve its ambitious carbon intensity target by 2030.

Zhu, B.Z., Su, B., Li, Y.Z., & Ng, T.S.
Embodied energy and intensity in China's (normal and processing) exports and their driving forces, 2005-2015.
Energy Economics, 2020, 91, 104911

International trade has important impacts on a country's energy consumption. This paper first uses the time-series (2005–2015) extended input-output database to study China's embodied energy and intensity in both normal and processing exports.

Structural decomposition analysis (SDA) is then applied to analyze the driving forces behind the embodiment changes. The empirical results show that China's energy embodied in both normal and processing exports first increased in 2005–2008, dropped in 2009 due to the global financial crisis, and then rose again after 2009, and finally dropped in 2014–2015. The embodied energy in trade as a percentage of total energy consumption in China was relatively stable before and after the global financial crisis, at around 28% over the 2005–2008 period, and 22% over the 2009–2015 period. The contribution of the aggregate embodied intensity (AEI) of exports to China's aggregate energy intensity dropped from 30% in 2005 to 21% in 2015. Among China's trading partners, the United States, Japan and Korea together accounted for around half of China's embodied energy and AEI in exports in 2005, but their shares dropped to only one third in 2015. Energy efficiency improvement played the key role in reducing the embodied energy and intensity in China's exports. Similar analysis can be applied to other regions and indicators.

Kang, J.D., Ng, T.S., Su, B., & Yuan, R.
Optimizing the Chinese electricity mix for CO$_2$ emission reduction: An input-output linear programming model with endogenous capital.
Environmental Science & Technology 2020, 54, 697-706

This study develops an input–output linear programming (IO-LP) model to identify a cost-effective strategy to reduce the economy-wide carbon dioxide (CO$_2$) emissions in China from 2020 to 2050 through a shift in the electricity generation mix. In particular, the fixed capital formation of electricity technologies (FCFE) is endogenized so that the capital-related CO$_2$ emissions of various generation technologies can be captured in the model. The modeling results show that low-carbon electricity, e.g., hydro, nuclear, wind, and solar, is associated with lower operation-related CO$_2$ emissions but higher capital-related CO$_2$ emissions compared to coal-fired electricity. A scenario analysis further reveals that a shift in the electricity generation mix could reduce the accumulated economy-wide CO$_2$ emissions in China by 20% compared to the business-as-usual (BAU) level and could help peak China's CO$_2$ emissions by 2030. The emission reduction is mainly due to a drop in operation-related CO$_2$ emissions of electricity, contributing to a decrease in accumulated economy-wide emissions by 21.4%. The infrastructure expansion of electricity, on the other hand, causes a rise in the accumulated emissions by 1.4%.
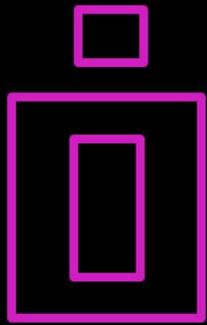
The proposed model serves as an effective tool to identify the optimal technology choice in the electricity system with the consideration of both direct and indirect CO_2 emissions in the economy.

Kang, J.D., Ng, T.S., & Su, B.
Optimizing electricity mix for CO_2 emissions reduction: A robust input-output linear programming model.
European Journal of Operation Research 2020, 287, 280-292

Input-Output Linear Programming (IO-LP) model has been recently used to identify a cost-effective strategy for reduction in economy-wide CO_2 emissions through a shift in the electricity generation mix. As an extension, this study further develops a robust IO-LP model to address the data uncertainties of technology cost and final demand. Compared to the deterministic IO-LP model which seeks to minimize the levelized cost of electricity (LCOE), the robust IO-LP model aims to maximize the tolerance of data uncertainty under a dynamic uncertainty setting. The modelling results in case study of China show that coal-fired and hydro generation technologies should be greatly developed from 2020 to 2050 in the Business-As-Usual (BAU) scenario with no emissions target set. In order to mitigate accumulated economy-wide CO_2 emissions by 30% compared to the BAU emissions level, various types of clean generation technologies, i.e., gas-fired, hydro, nuclear, solar, wind, and biomass, should be introduced into the electricity mix.

Along with the decrease in emissions target, the tolerance of data uncertainty will drop to a certain degree. Finally, we compared results of the robust IO-LP model with results of the stochastic and deterministic IO-LP models. The comparative analysis shows that the robust IO-LP model tends to select the generation technologies with smaller uncertainty in LCOE, and is able to improve the robustness of capacity planning solutions compared to the alternative models under data uncertainty.
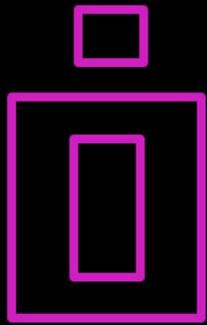
INTERNATIONAL INPUT-OUTPUT ASSOCIATION

Events

Next workshops

7TH PERMANENT WORKSHOP (WEBINARS EDITION)

Due to the global sanitary situation, the 7th permanent workshop of the SHAIO will be held, throughout 2020, in webinar format.

During the next few months, and within the framework of the workshop, a series of COVID-19-related online presentations will take place with the input-output analysis as the methodological protagonist.

The entire input-output community is invited to join these events. Just keep an eye on the website and our social media (Facebook - Twitter), where we will publish the dates and registration forms (totally free).

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

The SHAIO Council.

Sociedad Hispanoamericana de Análisis Input-Output

Call to Join

13. *Online* Input-Output-Workshop

This year's workshop takes place online.

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. It will be possible to register for single sessions only. For technical reasons, the number of participants is limited.

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

March 22nd – 24th, 2021

Online Participation:

- Daily afternoon

- 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, 2021**

- Confirmation of participation and Workshop programme **February 19th, 2021**

For questions please contact Anke Mönnig:
Email: moennig@gws-os.com
Phone: +49 (0)541 40933-210
https://www.gws-os.com/de/index.php/die-gws/io-workshop.html
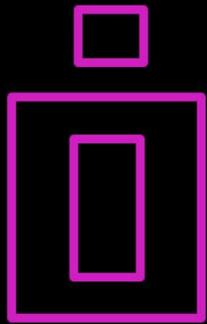
Special Issues in Journals

Special Issue "Achieving a Just Transition in the Pursuit of Global Sustainability"

The objective of the Special Issue is—by analyzing the social, economic, and environmental outcomes and tradeoffs of policy choices in an integrated way—to break the sustainability deadlock, which is caused by the belief that economic growth and environmental sustainability are conflicting goals. By identifying potential winners and losers, policies need to be designed to maximize positive social, economic, and environmental outcomes while protecting and offering solutions to countries, industries, companies, workers, and communities which may be negatively impacted by the restructuring. We are especially inviting contributions from the field of input-output analysis.

Dr. Kirsten Svenja Wiebe
Mr. Marek Harsdorff
Guest Editors

sustainability

Deadline for manuscript submissions:
31 March 2021.

Link to the webpage

SPECIAL ISSUE: CALL FOR PAPERS

COVID-19 and its economic effects:
Supply chain disruptions and behavioural changes

In this Special Issue of the Revista Galega de Economía, we would like to invite contributions dedicated to an analysis of the socioeconomic effects of the COVID-19.
Insights on a broad spectrum of themes are welcomed, including, but not restricted to:

o   The spatial distribution of the economic impacts
o   Analysis of specific sectors affected (Health services, Tourism activities, etc.)
o   Consumer behaviour
o   Labour market effects
o   Recovery paths and post-lockdown scenarios
o   Trade and supply chain disruptions

Guest Editors:

Dr. André Carrascal Incera
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evazquez@uniovi.es

Dr. Mònica Serrano
University of Barcelona (Spain)
monica.serrano@ub.edu

Revista Galega de **ECONOMÍA**

Deadline for manuscript submissions
15 December 2020.

Link to the webpage

Transformations collection

The journal Global Sustainability invites contributions to a new collection of articles on the topic of Transformations. This Collection is guest-edited by IIOA member Tommy Wiedmann and aims to bring together theoretical and practical knowledge from systematic research in transformations towards sustainability. Contributions from the IIOA community are welcome.

Thomas Wiedmann
(Guest editor, Editorial Board member)

Heide Hackmann
(Guest editor)

Global Sustainability

Deadline for submissions to the collection is **31st March 2021**.

Link to the webpage
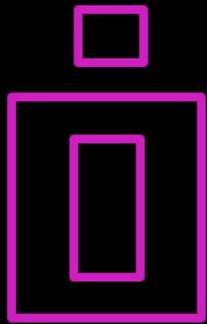
Job Positions

OECD
BETTER POLICIES FOR BETTER LIVES

The OECD Statistics and Data Directorate is looking for senior managers to fill two positions: the **Head of the National Accounts Division** and the **Head of the Trade and Productivity Statistics Division**. The person to lead the National Accounts Division will have a thorough knowledge of the System of National Accounts and related domains attested by significant experience, research and international standing in the field. The person to lead the Trade and Productivity Statistics Division will have expertise in macro-economic and/or structural economic statistics with an excellent grasp of the economic and policy drivers underpinning the Division's statistics. If you have relevant academic background and practical experience, demonstrate innovative strategic thinking, and have strong communication skills and a track record of managing multicultural teams, we are interested in hearing from you!

All qualified applicants of OECD member countries are encouraged to apply online before **6 December**. Review the full description at the links below, and feel free to share this opportunity with your network!

Link

GWS SPECIALISTS IN EMPIRICAL ECONOMIC RESEARCH

THE INSTITUTE OF ECONOMIC STRUCTURES RESEARCH

Researcher in the field of "Energy and Climate"

Participation in research projects on the topics of value chains of energy technology goods, bioeconomy and/or socio-economic effects of climate change. Collection of information on current market and policy developments. Participation in model development and model analyses. Preparation of the project results in reports, lectures and publications.

Researcher in the field of "economics and social affairs"

Creation, preparation and evaluation of large data sets. Qualitative and quantitative analyses (especially of the labour market and industry development). Classification of results in a macroeconomic context. Preparation of results in the form of reports, lectures and publications.

Ingrid Suilmann
Heinrichstraße 30, 49080 Osnabrück
stellenausschreibung@gws-os.com

Please send your detailed application by email by **November 23, 2020**

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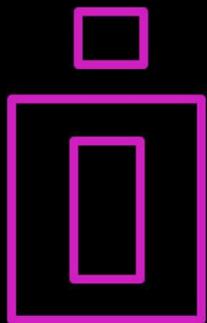
The Social Accounting Corner

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

Raquel Langarita Tejero – Assistant Professor, University of Zaragoza (Spain)

1) I learnt about Input-Output for the first time in my Bachelor's degree, in a subject called Applied Economics Techniques. We saw an input-output table for the first time and I was fascinated because of the realism and the logic of the methodology shown and the many things we can study with them. Specifically, we saw an input-output table for Spain and I thought I would like to learn more about that. After that, my first research work was in my master's thesis, obtaining an update of the input-output table for the Aragon region.

2) The first IIOA conference I attended was the one held in Lisbon in 2014, presenting a paper on the effects of the International Expo Zaragoza 2008. I remember I was really nervous because this was my first international conference; however, after having met this wonderful input-output family, I understand I do not have to be so (although sometimes I still fell nervous in conferences...).

3) It is difficult to choose one input-output paper to recommend. I really enjoy all the input-output papers. However, the ones I would like to comment now are those focused on methodological issues. I would like to cite *Lenzen M, Rueda-Cantuche JM. A note on the use of supply-use tables in impact analyses. SORT-Statistics Oper Res Trans 2012;36:139–52* on the multipliers directly obtained from supply and use tables. I really enjoyed reading it.

Albert E. Steenge – Honorary Professor, University of Groningen (The Netherlands)

1) My very first encounter with Input-Output (IO) analysis was in the form of a number of articles in Scientific American in the 1950s and '60s by Wassily Leontief. At the time, it was a 'bridge too far' for me, but I found the issues that were dealt with fascinating: the structure of an economy, the role of technology, disarmament, poverty, etc. I became acquainted with IO from the well-known textbook by *R.G.D. Allen, Mathematical Economics, MacMillan, New York, 1966*. The chapter on IO opened with a transactions table and an input coefficients matrix for the UK for 1935 and the US for 1947, with interesting differences. To figure out which types of economic theorizing would be required to interpret the changes became a life-long fascination.

2) From my early IIOA conferences the one in Innsbruck, 1979, is the one I remember most vividly. I recall Wassily Leontief as an opponent at one of the sessions where the question of the relevance of IO analysis for social sciences in general suddenly arose, and also the question of how abstract commodities could be. Wassily made a deep impression on me as a person who was full of ideas and new suggestions. Another person who made a lasting impression was Andrew Brody, with whom I had the opportunity to discuss various topics in the context of his 1970 book "Proportions, Prices and Planning".

3) I would like to mention the following *J. von Neumann, A Model of General Economic Equilibrium, Review of Economic Studies, vol. 13, 1935-1946.* This is a really amazing paper. Incredibly, it already contains many of the concepts that were to be polished in later years by many future authors. If I can add who in the IO field made an impression on me, Francis Seton definitely comes to mind. Francis was born in Vienna in 1920, and he survived the war years in England and Canada. Francis was always a bit vague about the end of the war and the early post-war period. (A whiff of James Bond, perhaps??). Francis' life-long interest concerned efficiency and justice. His creativity was also reflected in his way of doing IO, like his creation of eigenprices. 'New life' may be here, with the cross-connections between economic activities in a context of climate change.
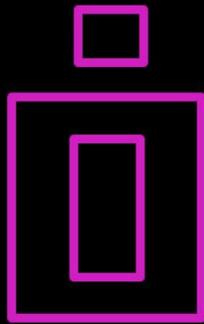
The Social Accounting Corner

November 2020 Crossword

ACROSS

1. Second surname of the first Newsletter Editor of the IIOA (Feb 2008).
3. Last name of the Treasurer of the IIOA.
7. Last name of the Chair of Local Organising Committee in Glasgow.
8. Name of the third author of the most cited article in the ESR.
9. A Multiregional Environmentally Extended I-O table that includes 15 land use types, 48 types of raw materials and 172 types of water uses.
10. Place of the "14th International Conference on Input-Output Techniques".

DOWN

2. _ Extraction Method developed by Paelinck, J., J. de Caevel and J. Degueldre (1965).
4. Name of the prize awarded to the best paper presented at an IIOA Conference by author(s) under 40 years of age.
5. Name of the fifth president of the IIOA.
6. Pan Pacific Association of Input-Output Studies.