Newsletter

International Input-Output Association (IIOA)

Number 23; August, 2013

Editorial

IIOA and ESR: 25th anniversary

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Dear IIOA member,

The International Input-Output Association (IIOA) was founded in 1988 and in that same year the first issue of Economic Systems Research (ESR) was published. This implies that both the association and the journal are celebrating their 25th anniversary in 2013. To this end, the current editors of ESR (Manfred Lenzen and Bart Los) and myself have invited a group of scholars (young and old, with a spread over the sub-fields) to submit their views on the future of input-output analysis. These views will appear as separate sections of a paper that will be published in the last issue of ESR's volume 25. What follows, is part of my own section (entitled "About wine and bottles"). Focusing on the short-term future developments of IO, I expect a lot of old wine in new bottles. I see two broad areas: exploiting sources of information and sensitivity analyses.

An important aspect of our research in the past has been the linking of IO tables to all sorts of other information. With the improvement of the quality and, in particular, the availability of data (also for developing countries), I expect to see an enormous growth in this area. In this respect, I want to distinguish three lines of development.

First, the construction of global multiregional IO (MRIO) tables. The last couple of years, various groups of researchers have constructed such tables. Although the idea is far from new, it has only recently become possible to construct such tables. I expect that the work on global MRIO tables will intensify. More detail in terms of products and industries, more detail in terms of countries, and the splitting of one (or some) of the countries in the global MRIO table into regions. A further step, is to take states, provinces, counties, or neighborhoods (instead of countries) as the "regions" in global MRIO tables.

Second, the typical Isard-type interregional IO table lists the same set of industries in different regions within a country. Similar national tables have been derived with a distinction between different types of production (instead of regions). For example, Chinese tables have been used that distinguish for any industry (e.g. Telecommunication equipment, computer and other electronic equipment) whether its production is for domestic use only, whether it is for processing exports, or whether it is other production. In a similar vein, tables have been constructed for Japan reflecting for each industry the production of the small-sized and the large-sized firms in that industry.

Third, IO tables have always been appended by satellite accounts using the same industry classification. Examples are employment data for many occupations, R&D expenditures, all sorts of emissions, the use of energy, water, and land. Recently, IO tables have been linked to other types of data such as biodiversity and another study analyzed how many deaths in the US were due to Chinese consumption and vice versa. I expect that IO tables will be linked in the future to a wide variety of data sources, such as engineering data, GIS-data, data from micro surveys at firm level, or household surveys. It should be stressed that the three lines of development as sketched above will be intertwined. For example, data on water use show that consumption of beef requires approximately three times as much water as the same amount of pork does. To take this difference into full account calls for detail, i.e. an IO table that distinguishes between the production of beef and of pork. In the same vein, some resources (for example scarce metals) are only extracted in a few locations. To enable a thorough analysis, all such locations (i.e. countries) should be included separately in a global MRIO table, which holds even if the country is (economically) very small. In addition, one might want to use a global physical MRIO table.

The increased availability of data sources implies that the linking of data will increase and that for some cases more than one dataset is available. Much of the future work in IO will involve estimation (which—depending on the type of application—is also termed projection, interpolation, or imputation). This means that the information contained in the IO tables and satellite accounts that we are working with is uncertain. The question arises therefore how

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confident we can be in the results. This requires sensitivity analyses.

Some data construction work requires assumptions and it is thus relevant to know how sensitive the outcomes of the calculations are to the assumptions. That is, do different assumptions change the outcomes very much, or not? The same applies for projections, where it is important to investigate how the outcomes differ for alternative scenarios (i.e. assumptions for the exogenous variables). In the same vein, it is interesting to know to what extent the results differ across data sources (for example, global MRIO tables or CO2 emissions). I expect that we will see many of such sensitivity analyses (or comparisons across alternative assumptions, scenarios and datasets) in the future.

These analyses point at a very fundamental question. In the WIOD-project, we devoted one of the work packages to examining this fundamental question, namely whether the construction of the WIOD tables was worth all the money funded by the EU. (It should be stressed that it was formulated somewhat—but not much—different.) Of course, when we raised the question we already knew the answer. That is, for some questions one needs a global MRIO table, for some questions not. I expect that one of the future tasks is to come up with a catalogue or categorization of what data are required for what problems? Put in another way, what outcomes can be obtained reliably through shortcuts?

Postdoctoral Position in Applied Economics

The Quantitative Urban and Regional Economics (QURE) research group invites applications for a Postdoctoral Position in Applied Economics starting in February 2014. The QURE is at the Department of Economics of Universitat Rovira i Virgili.

The deadline for applications is October-31 2013.

Further info at: https://sites.google.com/site/qureeconomics/job-openings

Tales from the IO world

Industrial Ecology Virtual Laboratory

a nectar-funded project

Dear readers,

The Integrated Sustainability Analysis (ISA) team in the School of Physics is the lead organization in a team of eight universities, Intersect, and CSIRO responsible for running the recently funded Industrial Ecology Laboratory (IELab). The $1.1 million funding for the virtual laboratory was awarded by the Australian Government's NeCTAR scheme.

Recent research at the School of Physics has produced methods for advanced computation and automation that enable the rapid and cost-effective deployment of harmonised, large-scale, detailed Multi-Region Input-Output (MRIO) analysis systems. Such systems are sought after in Economics and Environmental Science, and Industrial Ecology for their ability to comprehensively trace environmental impact analyses across complex interregional supply chains. The Industrial Ecology Lab will deliver Australian sub-national MRIO infrastructure that utilises the best quality data available.

The MRIO analysis technique has emerged as the major tool underpinning consumption-based accounting of environmental impacts. The ISA team is amongst the world leaders in this field, and has recently published a paper in Nature that describes the linkages between biodiversity loss and international trade.

The term 'consumption-based accounting' arose when China's chief climate negotiator, in 2009, argued that carbon emissions stemming from the production of Chinese exports should be the responsibility of the importing countries. Attributing the emissions from one region to those regions that import (consume) its goods and services then became known as consumption-based accounting.

The highest profile application of this consumption-based accounting is for environmental footprinting. As an example, the technique of carbon footprinting is increasingly recognised as providing valuable information on the driving forces of greenhouse gas emissions. However, generating accurate consumption-based accounts is a major challenge as it requires the evaluation of trillions of production processes, supply chains and trade links between economic entities all over the world. Input-output (IO) tables summarise all financial transactions between all industry sectors in an economy. By linking IO tables to environmental statistics it becomes possible to trace environmental impacts through complex inter-industry supply-chain networks. This ability has made

IO techniques among the most rapidly growing applications in the interdisciplinary field of industrial ecology, linking disciplines such as economics, engineering and environmental sciences. Today, Multi-Region Input-Output (MRIO) tables are routinely used to establish the carbon and environmental footprints of nations. In a world where consumption and production are increasingly spatially separated, the capacity for

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MRIO to provide high quality consumption-based accounting gives it a high degree of policy relevance.

IO tables also make it possible to use advanced techniques for environmental Life-Cycle Assessment (LCA), whereby detailed process-specific data are combined with overarching IO data. This enables the evaluation of multiple environmental impacts at a high level of detail and completeness, improving the quality and reliability of information provided for applications such as eco-labelling of products, corporate reporting, supply-chain analysis, policy formation, and infrastructure selection.

A further integration and harmonisation of methods for sustainability accounting, analysis and assessments would be ground-breaking, and is long overdue. The current trend of regionalisation in LCA is mirrored by a trend in global, multi-national-scale analysis in IO research. Linking and integrating these developments will deliver an extremely powerful and useful method.

National IO tables are issued regularly by statistical offices in more than 100 countries. However in countries such as Australia, that are so geographically and climatically diverse, economic structure and production activities vary significantly between sub-national regions. This regional variability is not captured in national IO tables. In order to make this critical regional detail available for environmental footprint and LCA applications, sub-national multiregion (MRIO) variants of IO tables are required. Only a handful of research groups in the world have taken on the task of compiling sub-national MRIO databases. The conventional approach for this is prohibitively arduous, labour and cost-intensive, because regional economic data and environmental data are notoriously scarce and mis-aligned. Hosting the Industrial Ecology Lab on a NeCTAR Research Cloud will enable the MRIO tables to be regularly updated into the future, and will make the infrastructure available to a much broader section of Australia's research and policy development community. Inclusion of a comprehensive set of environmental extensions will allow users to carry out environmental footprinting, life-cycle and other sustainability assessments at performance levels that are far greater than anything achieved to date.

For further information see http://www.isa.org.usyd.edu.au/ielab/ielab.shtml.

Alexandra Green, Manfred Lenzen and Tommy Wiedmann

Published papers in Input-Output Analysis and related methods.

In the next ESR issue

Economic Systems Research –

Journal of the IIOA

Volume 25, Issue 2 (June 2013)

http://www.tandf.co.uk/journals/titles/09535314.asp

IDENTIFYING ENVIRONMENTALLY IMPORTANT SUPPLY CHAIN CLUSTERS IN THE AUTOMOBILE INDUSTRY. KAGAWA S., SUH S., KONDO Y. and NANSAI K..

In this paper, we develop a new approach that combines the spectral clustering method and input–output analysis to detect environmentally important supply chain clusters. The newly developed method was applied to automobile manufacturing in Japan, and major clusters with high energy intensities in the automobile supply chain were identified. This paper proposes that the car manufacturers will be able to regularly publish their life-cycle assessment reports with a focus on the indirect energy consumptions within the critical supply chains and request key auto-part manufacturers in the cluster to reduce the indirect consumptions through the relevant supply chain engagement.

IMPACT OF URBAN AND RURAL HOUSEHOLD CONSUMPTION ON CARBON EMISSIONS IN CHINA. ZHANG Y.

In this paper, we utilize input–output analysis and decomposition techniques to examine the direct and indirect urban and rural per-capita carbon emissions generated by household consumption in China from 1987 to 2007. The results show that indirect emissions are considerably larger than direct emissions due to households in urban and rural areas. Indirect urban emissions increase significantly because of growing expenditures, but indirect rural emissions do not register the same increase. Direct urban emissions decrease significantly because of changes in the energy mix, but direct rural emissions show only a slight decrease. The increase in the disparity of indirect urban–rural emissions and the decrease in the disparity in direct urban–rural emissions are evident. These findings imply that both energy-saving behavior in the production sector and residential lifestyle transition – particularly in the urban areas – are significant in mitigating carbon emissions in China.

DISAGGREGATING THE ELECTRICITY SECTOR OF CHINA'S INPUT–OUTPUT TABLE FOR IMPROVED ENVIRONMENTAL LIFE-CYCLE ASSESSMENT. LINDNER S., LEGAULT J. and GUAN D.

Missing process detail of sectors in Input–Output (I–O) tables has been pointed out as a limitation of I–O analysis in environmental-economic life cycle assessment. Aggregation of resource-intensive sectors decreases the accuracy of the results. Often, economic sectors are compiled in a more aggregated form than environmental satellite accounts, and as [Lenzen, M. (2011) Aggregation Versus Disaggregation in Input–Output Analysis of the Environment. Economic Systems Research, 23, 73–89] asserts, it is superior for environmental analysis to disaggregate the I–O table, even if only partial information exists for the disaggregation. In this paper we present a methodology to disaggregate the electricity sector of the Chinese national I–O table by using regional information and cost data for operation and maintenance of power plants. The electricity sector is disaggregated into a transmission and distribution sector as well as eight sub-sectors representing different types of technology in power plants (subcritical coal, hydro, etc.). The electricity consumption mix of each industry is determined by using regional industry presence and regional electricity power mixes. The disaggregated I–O table offers refined results for calculating emissions embodied in international exports from China, a valuable contribution for

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estimating national greenhouse gases emissions inventories under the consumption-based approach for countries that rely heavily on imports of goods from China.

A POST-KEYNESIAN AGE MODEL TO FORECAST ENERGY DEMAND IN SPAIN. DEJUÁN O., LÓPEZ L.A., TOBARRA M.A. and ZAFRILLA J.

This paper develops an extended input–output model for the estimation of energy demand and related issues. It is built on the last Spanish Symmetric Input–Output Table (IOT, 2005). It has been tested for the period 2005–2008 and used for forecasting energy demand for the years 2009–2012 under different economic scenarios. The model shares some traits of the computable and applied general equilibrium models where quantity and price systems are interwoven. The differences lie in the theories explaining output and prices. Our quantity system is based on Keynes' principle of effective demand (broad energy multipliers are derived). The price system is based on the classical (Sraffian) theory of prices of production, akin to post-Keynesian full-cost prices. The general price system can be manipulated to account for the specificities of energy prices. Historical trends of energy coefficients are computed by extrapolation of past IOTs and calibration.

EXPANDING EXTRACTIONS. DIETZENBACHER E. and LAHR M.L.

In this paper, we generalize hypothetical extraction techniques. We suggest that the effect of certain economic phenomena can be measured by removing them from an input–output (I–O) table and by rebalancing the set of I–O accounts. The difference between the two sets of accounts yields the phenomenon's effect (or importance).We suggest that the approach can be used to measure the effect of changes in intermediate output, which are otherwise not easily rationalized within a Leontief framework. Of course, it can also be used to estimate the possible effects of the shutdown of a particular establishment or other identifiable segment of an economy. We demonstrate some properties and potential of the approach using the annual 2006 US I–O accounts.

A NOTE ON THE GRAS METHOD. TEMURSHOEV U., MILLER R.E. and BOUWMEESTER M.C.

The GRAS method as presented by Junius and Oosterhaven [Junius, T. and J. Oosterhaven (2003) The Solution of Updating or Regionalizing a Matrix with Both Positive and Negative Elements. Economic Systems Research, 15, 87–96] assumes that every row and every column of a matrix to be balanced has at least one positive element. This might not necessarily be true in practice, in particular, when dealing with large-scale input–ouput tables, supply and use tables, social accounting matrices, or, for that matter, any other matrix. In this short note we relax this assumption and make available our MATLAB program for anyone interested in matrix GRASing. The same issue arises in the presentations of the KRAS method [Lenzen, M., B. Gallego and R. Wood (2009) Matrix Balancing Under Conflicting Information. Economic Systems Research, 21, 23–44] and the SUT–RAS method [Temurshoev, U. and M.P. Timmer (2011) Joint Estimation of Supply and Use Tables. Papers in Regional Science, 90, 863–882], which should be accordingly accounted for in their empirical applications.

Highlights in journals

SU B. AND ANG B.W. (2013). INPUT-OUTPUT ANALYSIS OF CO2 EMISSIONS EMBODIED IN TRADE: COMPETITIVE VERSUS NON-COMPETITIVE IMPORTS. **ENERGY POLICY 56, 83-87**

Energy-related CO2 emissions embodied in international trade have been widely studied by researchers using the environmental input–output framework. In the literature two different approaches to deal with emissions embodied in a country's imports can be found. One of the approaches is based on the assumption of competitive imports while the other is based on the assumption of non-competitive imports. We show that the implications of the results obtained using different imports assumptions are not the same. The approach using the competitive imports assumption gives estimates larger than those obtained using the non-competitive import assumption. The differences between the two embodiment estimates come from the transition of embodied emissions in China's imports for intermediate consumption to those in China's exports. This explains why relatively high estimates of CO2 emissions embodied in China's exports are reported in several recent studies appearing in Energy Policy.

SHARIFY N. (2013). INPUT–OUTPUT MODELLING OF THE EFFECT OF IMPLICIT SUBSIDIES ON GENERAL PRICES. **ECONOMIC MODELLING, 33, PP. 913-917.**

Implicit subsidies are implemented for different reasons in many countries. These subsidies generally emerge through selling public resources such as gas, oil, and water at a lower price to one or more sectors. They are not considered in government payments and national accounts. Hence, it is expected that any change in the size of these subsidies influences the price of the relative sectors through the intermediate expenditures. This paper aims at developing the Table Adjusting Price (TAP) and Standard Leontief Price (SLP) models to measure the effect of an exogenous change in the size of implicit subsidy on the price indices of all sectors. The proposed models allowed the researcher to analyse a change in the level of implicit subsidy in different cases. In addition, an empirical example illustrates the result of the implementation of these models.

LÓPEZ L.A., ARCE G., ZAFRILLA J.E. (2013). PARCELLING VIRTUAL CARBON IN THE POLLUTION HAVEN HYPOTHESIS. **ENERGY ECONOMICS 39, 177–186.**

The methodology proposed in this paper allows us to parcel the pollution haven hypothesis (PHH) into a bi-regional input–output framework to analyse whether the specialisation of countries in different stages of production and/or in final goods trading generates an increase or a decrease in global emissions as a consequence of international trade. We apply the model to the Spain–China trade relationship as it existed in 2005, finding a PHH of 29,667 KtCO2. If this trade had not existed (so each country had met its demand for intermediate and final goods), global emissions would have been reduced by these 29,667 KtCO2. Of this PHH, 43.5% corresponds to imports of final goods; 32.4% is related to imports of intermediate goods for the last stage of production; the remainder, 24.1%, is caused by global value chains (GVC) between the countries. Only 3229 KtCO2 of PHH emissions are linked to domestic emissions from the sector in which the imports are produced; the rest is explained by domestic linkages or successive rounds of domestic production, which supports the existence of an indirect PHH. Together with a trade growth in the last years, the fall of trade barriers would have implied a transformation of global production chains that have boosted global emissions.

OOSTERHAVEN J. AND BOUWMEESTER M.C., (2013). THE AVERAGE PROPAGATION LENGTH: CONFLICTING MACRO, INTRA-INDUSTRY AND INTERINDUSTRY CONCLUSIONS. **INTERNATIONAL REGIONAL SCIENCE REVIEW 36, 481-491**

The average propagation length (APL) has been proposed as a measure of the fragmentation and sophistication of an economy. For a one-sector economy, we show that the APL is strictly proportional to the macro multiplier of that economy. The same holds for strong intra-industry linkages. Hence, for comparing economies and comparing single industries, the concept of the APL is of no value. For pure interindustry linkages, however, we find that the length of the supply chain between two different industries is negatively related to the strength of the multiplier between those two industries, be it weakly. Hence, the APL should only be used to compare pure interindustry linkages.

MULLIGAN, G., JACKSON R. AND KRUGH A. (2013) . ECONOMIC BASE MULTIPLIERS: A COMPARISON OF ACDS AND IMPLAN. **REGIONAL SCIENCE POLICY & PRACTICE, 5, 289-303.**

Many local and regional practitioners still use the single multiplier version of economic (export) base analysis in project assessments. However, dependable estimates of this multiplier require that the division of total activity into its export (basic) and local (non-basic) components be reasonably accurate across all industries. This paper compares the economic base multiplier that is generated by a shortcut approach, one calibrated by the Arizona Community Data Set (ACDS), with that generated by the popular IMPLAN input-output model. The comparison is made across 577 micropolitan (all non-metropolitan) US counties in the year 2000. Although the two approaches are not at all similar they generate comparable economic base multipliers. Moreover, various regional attributes, like human capital and specialization, affect the two multiplier estimates in much the same way.

WEST, G. R. AND JACKSON R. W. (2014). SIMULATING IMPACTS ON REGIONAL ECONOMIES: A MODELING ALTERNATIVE. ECONOMETRIC METHODS FOR ANALYZING ECONOMIC DEVELOPMENT. **IGI GLOBAL: 132-152.**

Practitioners and academics apply a range of regional economic models for impacts assessment. These models extend from a simple economic base through to input-output and econometric models and computable general equilibrium models. All such models have strengths and weaknesses. Dimensions of which impact assessment models are often compared include level of industry detail, data availability, and complexity of behaviour modelled. This chapter presents a model for Simulating Impacts on Regional Economies (SIRE) that occupies an intermediate position between Input-Output (IO), arguably the most widely used model for regional impacts assessments, and Computable General Equilibrium (CGE) models. With greater behavioural detail than the typical regional IO model, the SIRE model incorporates many of the features of CGE models without enforcing the strictly linear behavioural relationships of IO. Like most CGE models, the simulation framework presented here borrows a subset of parameters from an existing econometric model for the same region. The SIRE model falls short, however, of the complexity of capturing the full range of behaviours of CGE models.

Upcoming conferences

43rd Australian Conference of Economists

1-4 July 2014 Hobart, Tasmania

The University of Tasmania, the Economic Society of Australia and the organising committee invite you to join the first joint meeting of the Australian Conference of Economists and the Econometric Society Australasian Meeting.

IMPORTANT DATES:

Call for papers opens: 1 Nov 2013
Final date submission of papers: 14 March 2014
Notification of acceptance : 30 April 2014
Registration opens: 1 March 2014
Early bird registration closes: 23 May 2014

Newsletter Editor:
Ignazio Mongelli