Newsletter
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In this issue

Tales from the I-O world

OECD ICIO database

The first release of OECD-WTO Trade in Value Added (TiVA) indicators in early 2013 provided new analytical tools for researchers and policy makers worldwide to better understand the nature of economic globalisation and, in particular, the increasing international fragmentation of production.

But the release of the database was not just an exercise designed to raise awareness of the need for new indicators, it was also intended to mainstream the development of TiVA type indicators, and the underlying data, within national and international statistics compilation systems. The institutional commitment of the OECD and WTO to produce regular updates of TiVA indicators has been one clear example of this mainstreaming, but even more so has been the interest of national statistical institutes and other international and regional organisations, to work with the OECD.

But whilst the indicators themselves have generated most interest, perhaps the unsung hero at the heart of the system has been the Inter-Country Input-Output (ICIO) database used to generate them: a database, building on over two decades of OECD experience, that will be made publicly available for the first time, along with the next TiVA indicator release, towards the end of this month.

What's included in the OECD ICIO database

The new ICIO database covers 61 countries including OECD, EU and G20 members as well as most of ASEAN, and Colombia, Costa Rica and Tunisia. Further countries will continue to be added as data becomes available. The database provides industry by industry tables broken down by 34 ISIC Rev.3 activities and covers 1995, 2000, 2005, 2008, 2009, 2010 and 2011.
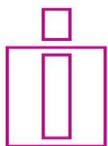
How are the ICIOs created?

Many national Statistics offices around the world produce official SUIOT. Following adjustments to harmonise national data, these tables form the primary source of information to create the OECD ICIO, or, rather, the underlying OECD Inter-Country Supply-Use table used to construct the ICIO. The block-diagonals, i.e. the domestic parts, of the ICIO are estimated by applying the fixed product sales assumption to national supply-use tables converted to basic prices, in conjunction with national I-O data where available. Similarly the off-diagonal elements, of the ICIO are created from the import use tables at purchasers prices combined with bilateral trade by end use data. By design the tables are constrained to official National Accounts statistics of value-added and production by activity, COICOP (and household final consumption) aggregates and all other final demand and trade components, where available, and to estimates where data were not available. National Accounts based estimates of trade in goods differ from the corresponding Customs based statistics used for Merchandise Trade data, which are in turn not always consistent globally. These differences drive the balancing process needed to arrive at the final ICIO, described in more detail in Ahmad, Yamano, Wang, (2013). To put this exercise into some perspective the total size of the OECD ICIO for a single year reflects around 5.5 million cells.

Special features of the OECD ICIO and TiVA

One of the primary drivers for the development of the TiVA indicators has been to better understand global production and the impact it has on trade and
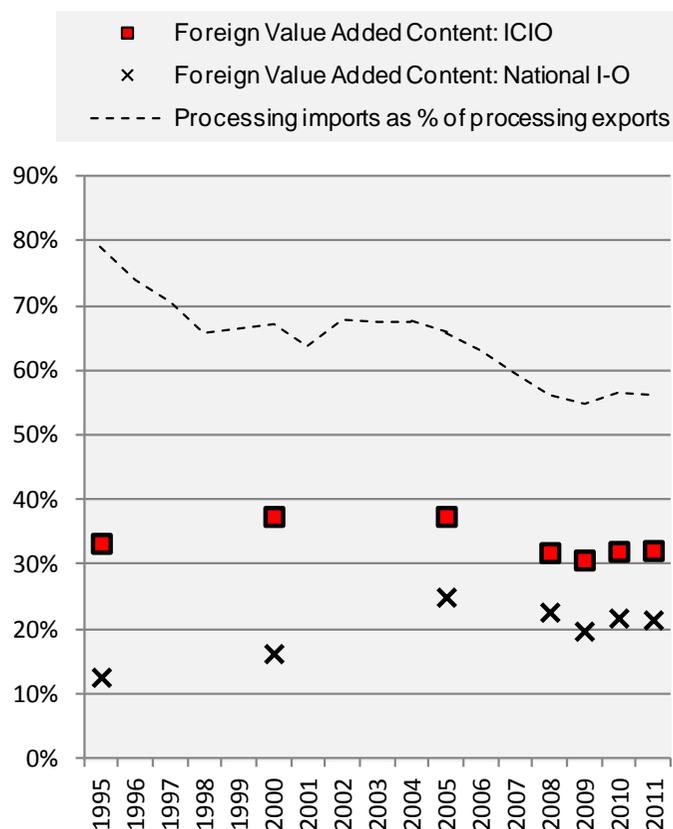
investment policies as well as the factors driving Global Value Chains (GVCs), including for example skills, innovation, taxes etc. In this respect it quickly became apparent that the conventional ways in which IO and SU tables are typically created generate potentially biased results. In many countries the heterogeneity of firms allocated to a particular industry grouping varies significantly, with exporting (and also foreign owned) firms typically being better integrated into GVCs than their non-exporting counterparts. To address this issue the OECD has embarked on a number of related activities that all push in the same direction, namely to motivate the development of data at the national level that aggregates firms (within an industrial sector) on the basis of their integration or otherwise within GVCs – or put more simply, a broader effort to improve the homogeneity of firms (and, so, the classification of firms) within national IO tables. The OECD ICIO currently reflects these improvements for two countries where the heterogeneity of exporting and non-exporting firms is significant: Mexico and China.

Does heterogeneity matter … yes.

For China, separate tables are produced that differentiate firms in the following ways: processing firms, non-processing exporters and domestic-only firms. And for Mexico, a distinction is made between "Global Manufacturers" and other. The impact of such an approach can be significant and reveals the importance of extending the accounting practice to other countries with similar heterogeneities. For example, based on a National I-O perspective the foreign value added content of

Figure 1. China Trade: 1995 to 2011

Legend:
- ■ Foreign Value Added Content: ICIO
- ✕ Foreign Value Added Content: National I-O
- - - - - Processing imports as % of processing exports

Source: OECD ICIO 2015 and China Customs

China's gross exports was about 13% in 1995 doubling to about 25% in 2005.

Using split tables the shares are notably higher and the increase from 1995 is less marked – increasing from 33% to 37% (see Figure 1). The higher shares

are due to more appropriate weight being given to the importing activities of exporters. Using tables that separate exporters has a bigger impact in earlier years. This can be attributed to a combination of two factors: rapidly falling processing imports as a share of processing exports (80% in 1995 to 56% by 2008) while processing exports as a share of GDP rose (from 10% to 15%). In other words, accounting for heterogeneity matters.

Cross-Border Trade and Non-residents

Another important innovation in the ICIO, using Balance of Payments statistics and Tourism Satellite accounts, is the separation of expenditures by non-residents from national accounts estimates of trade; improving analyses for trade policies whilst at the same time providing the basis for better understanding value chains in the tourism, sector.

What indicators will be included in the next TiVA release?

The TiVA database can be accessed from the dedicated page at, http://oe.cd/tiva. The forthcoming update includes, as before, a range of indicators showing value-added trade relationships both on the basis of bilateral trade flows as well as on a final demand perspective. Figure 2 below shows (country codes), for the "ICT and electronics" industry, the share of domestic value added meeting foreign final demand, together with domestic value added in gross exports. The former showing how much of an industry's total value added is actually destined to meet foreign final demand. And

the latter showing how much domestic value-added (including all upstream contributions) is embodied in the exports of a given industry.

What's next on the TiVA programme?

Developing the ICIO and TiVA indicators is now a permanent activity in the OECD, reflecting the importance of responding to the globalisation agenda and interconnectedness more generally. Through collaborations with national statistical agencies and regional partners the OECD will continue to expand the coverage of countries, and also to adapt the tables in line with new standards (such as the 2008 SNA) and new international classifications (ISIC Rev. 4). Improving timeliness of the indicators, through nowcasting techniques, also forms an important component on the agenda.

Improving quality, in particular through better

accounting for heterogeneity, forms a central pillar of the OECD's work and a number of efforts are currently being made to develop best practice on data linking (e.g. linking trade and business statistics). In addition the OECD is working with national statistics institutes to develop "extended" SUTs that build in distinctions between domestic and foreign-owned firms in addition to splits between exporters and non-exporters. Measuring domestic value added embodied in gross exports or foreign final demand is only a beginning. Determining how much 'domestic' value added remains in an economy, beyond labour costs, is of key concern to policy makers and responds directly to frequently asked questions including: How is trade in income related to investment? What profits are repatriated by multinational enterprises and through which chains?

In general, many initiatives are emerging around the world to improve statistical infrastructures and help
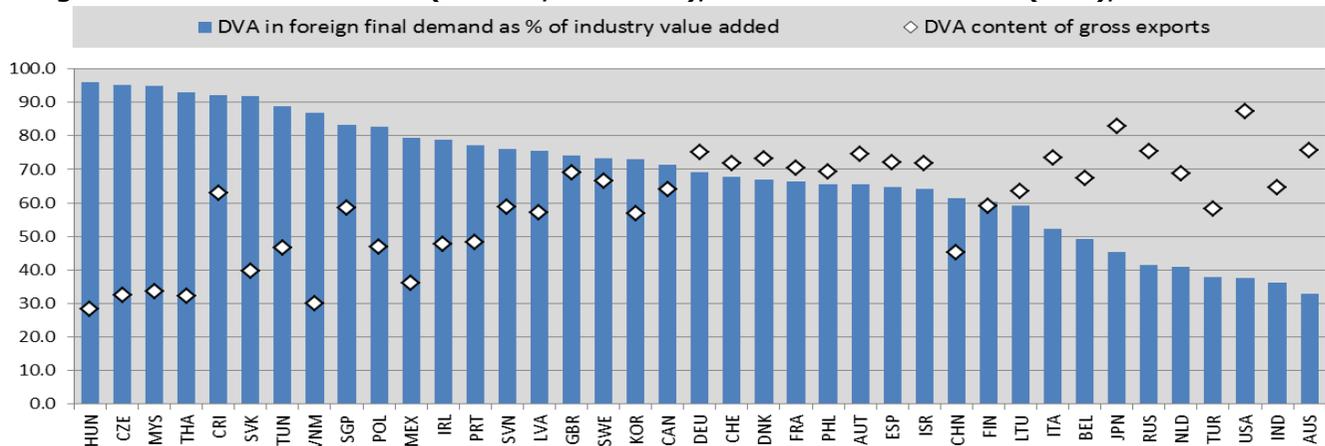
with capacity building as part of a global response to better measuring globalisation. The initial 2013 release of OECD-WTO TiVA database provided a catalyst and although there is still much to do , the momentum is accelerating.

An Input-Output Table for Germany in 1936

This contribution summarizes a long-term research project to construct an IOT for Germany in 1936. Our research can be seen as follow-up to the activities of the German Statistical Office (Statistisches Reichsamt) completing their "matrix of economic interdependencies" (Volkswirtschaftliche Verflechtungstabelle) for Germany. Independently of Leontief's works in the United States the Office had started this project as early as in the thirties of the last century. Surprisingly, this fact is not taken note of. Originally, the preliminary industrial census of 1933 was chosen as base year for this purpose. In 1936, however, the Statistical Office conducted a comprehensive industrial census providing detailed information on input and output data for all branches of the German

Figure 2. ICT and electronics (ISIC 30,32 and 33), Domestic Value Added (DVA), 2011

Source: OECD ICIO 2015

industry. In connection with rearmament, however, the Statistical Office gave up the I-O endeavour and instead, the census data were used for constructing detailed material balance sheets, which served as a statistical basis for preparing the war. Using the hitherto secret archival records and additional statistical information, we finally fulfilled the original plan of the German Statistical Office of constructing the projected IOT.

The symmetric table for 1936, covering 40 economic sectors, 5 final demand categories and 5 primary inputs, is completely based on original statistical data and does not rely on separate supply and use tables. The IOT is integrated into national accounts and accordingly offers a new benchmark for German historical national accounts, i.e. production, expenditure and income of Germany in 1936. Our IOT thus provides a detailed and consistent account of the German economy in 1936, the second-largest economy of the world at that time. Arriving at 69 billion Reichsmark (RM), we computed the national income of 1936 somewhat higher than the 66 billion RM estimated and published by the Statistical Office. Their calculation was based on tax returns. The lower figure of the German Statistical Office, even modified downwards, became the post-war benchmark. In contrast to the Office, we based our bottom-up approach on the industrial census of 1936, on complementary statistics of the Statistical Office, e.g. those compiled for the unfinished IOT for 1933, and on various estimated production accounts backed by published and archival sources. Our production approach to calculate value added

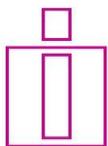and national income revealed the otherwise hidden profits.

In two articles the compilation of the IOT are put forward (see sources in Annex): the article in the "European Review of Economic History" presents national accounts data as new benchmark for 1936. It compares our data with alternative 1936-figures from the German Statistical Office which had been kept secret and with national accounts estimates of other German researchers. As a first analytical use of the historical table we calculated the impact of military spending on production and employment in 1936. We found that in 1936 the military budget amounted to 11 percent of German gross domestic product requiring in total more than 7 percent of the labour force in Germany. The largest direct and indirect effects on production and employment were computed for the branches "iron and steel/non-ferrous metals", "structural steel/machinery/vehicles" and "construction". Rearmament thus surely helped the German economy in driving towards full employment.

The article in the "Economic History Yearbook" offers a documentation of results, sources and research strategy of the IOT for Germany in 1936 which is summarized in the other article as online appendix. The documentation is organized in the following way: first, we present the results of our endeavour. Second, we discuss major data sources of the IOT, we touch upon conceptual and empirical statistical problems and finally we enter into the estimation procedure. This part concentrates on the industrial census of 1936. Furthermore, government expenditure is particularized in order to reveal the enormous amount spent on rearmament. In addition, we discuss the compilation of non-industrial branches, i.e. agriculture, wholesale and retail trade, transport and communication, banking and insurance, dwelling, other services and domestic

services. Private consumption, government consumption, gross fixed capital formation, changes in inventories and exports are dealt with as categories of final demand. Among the components of primary inputs compensation of employees, indirect taxes minus subsidies, depreciation and mixed income/operating surplus were distinguished. Third, we converted purchasers' prices to producers' prices. And, fourth, the rows and columns of the preliminary IOT which were not consistent with each other required a final balancing.

The rows and columns of an IOT reduce a lot of information consisting of numerous detailed figures, vectors, and matrices which have to be gathered and compiled. We were the first to construct additional submatrices for 1936: a cross classification of private consumption expenditures by products and purposes, an investment matrix for Germany which shows gross fixed capital formation by investing industries, i.e., an cross classification of fixed assets by industry and by product, and a matrix of indirect taxes encompassing 40 production sectors with excise duties (broken down into various types), customs duties, other transaction taxes, the turnover tax as well as federal states' and municipal taxes.

The already mentioned first analytical use of the IOT by measuring direct and indirect effects of military spending on production and employment in 1936 was broadened in the meantime. We used the extended version of the conventional Leontief model by integrating the Keynesian multiplier in order to compute the impact of work creation and rearmament

in Germany between 1933 and 1938 (see source in Annex). Empirically, we applied our recently presented IOT of Germany for the benchmark year of 1936. The results show the effects of both work creation programs and rearmament on job creation. These measures of the government were sufficient for achieving full employment in Germany as early as 1936/37. It remains an open question if this government policy constituted a necessary condition for this purpose as well.

References:

Fremdling, R. and Staeglin, R. (2014) Output, national income and expenditure: an IOT of Germany in 1936, in: European Review of Economic History 18:371-397

Fremdling, R. and Staeglin, R. (2014a) An IOT for Germany in 1936: A Documentation of Results, Sources and Research Strategy, in: Jahrbuch für Wirtschaftsgeschichte – Economic History Yearbook, pp.187-298.

Fremdling, R. and Staeglin, R. (2015) Work creation and rearmament in Germany 1933-1938 – A revisionist assessment of NS-economic policy based on I-O analysis, in: Groningen Growth Development Centre, GGDC Research Memorandum Nr. 152

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Published papers in IOA and related methods

Last ESR articles

Economic Systems Research

Journal of the IIOA

Latest articles (up to 30th April 2015)

GLOBAL IMPACTS OF THE AUTOMOTIVE SUPPLY CHAIN DISRUPTION FOLLOWING THE JAPANESE EARTHQUAKE OF 2011. ARTO, I., ANDREONI, V. and RUEDA CANTUCHE, J.M.
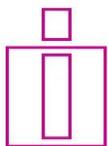
This paper provides an I-O method to estimate worldwide economic impacts generated by supply chain disruptions. The method is used to analyse global economic effects due to the disruptions in the automotive industry that followed the Japanese earthquake and the consequent tsunami and nuclear crisis of March 2011. By combining a mixed MRIO model, WIOD and data at the factory level, the study quantifies the economic impacts of the disruptions broken down by country and industry. The results show that the global economic effect (in terms of value added) of this disruption amounted to US$139 billion. The most affected (groups of) countries were Japan (39%), the USA (25%), China (8%) and the European Union (7%). The most strongly affected industries were transport equipment (37%), other business activities (10%), basic and fabricated metals (8%), wholesale trade (7%) and financial intermediation (4%).

AN INCOME TAX INCREASE TO FUND HIGHER EDUCATION: A CGE ANALYSIS FOR CHILE. MARDONES, C.

An increase in income taxes to fund education was one of the demands made by the social movements that emerged in Chile in 2011. Currently, the Chilean Congress is enacting a tax reform to raise money for higher education. This study aims to show the dynamic effects on the general equilibrium of the Chilean economy under two alternative approaches: a subsidy to lower the price of higher education (public and private), and greater spending on public higher education to reduce household payments for education. The social accounting matrix (SAM) used to calibrate the computable general equilibrium (CGE) model has 38 economic sectors, including the production structure of private education and public education. The study mainly concludes that a subsidy policy has significant advantages over increasing higher public education spending, regarding its effects on variables such as GDP, investment, and household incomes, while both policies have a similar effect on poverty and income distribution.

UNDERSTANDING ENVIRONMENTAL RESPONSIBILITY OF CITIES AND EMISSIONS EMBODIED IN TRADE. CHOI, T.

The attribution of greenhouse gas (GHG) emissions embedded in interregionally traded products to either production or consumption regions is a key issue to the understanding of the global

environmental responsibility of metropolitan areas. In this paper we identify GHG emissions for which metropolitan areas assume responsibility by allocating emissions embodied in import and export products to regions of either consumption or production in the cases of three US metropolitan areas. The case studies show that embodied emissions in both export and import products accounted for 63?73% of total GHG emissions directly and indirectly pertaining to these metropolitan economies. These findings suggest that an accounting method that incorporates emissions embodied in product trade has relevance to the development of local policies that govern actions ranging from redirecting metropolitan development patterns toward low carbon emissions to promoting sustainable consumption behavior, particularly those involving the collaboration of cities.

ADJUSTMENT OF INPUT–OUTPUT TABLES FROM TWO INITIAL MATRICES. FERNANDEZ-VAZQUEZ, E., HEWINGS, G.J.D. and RAMOS CARVAJAL, C.

The compilation of the information required to construct survey-based I-O tables consumes resources and time to statistical agencies. Consequently, a number of non-survey techniques have been developed in the last decades to estimate I?O tables. These techniques usually depart from observable information on the row and column margins, and then the cells of the matrix are adjusted using as a priori information a matrix from a past period (updating) or an I-O table from the same time period (regionalization). This paper proposes the use of a composite cross-entropy approach that allows for introducing both types of a priori information. The suggested methodology is suitable to be applied only to matrices with semi-positive interior cells and margins. Numerical simulations and an empirical application are carried out, where an I-O table for the Euro Area is estimated with this method and the result is compared with the traditional projection techniques.

Highlights in journals

DASGUPTA S. and ROY, J. (2015) UNDERSTANDING TECHNOLOGICAL PROGRESS AND INPUT PRICE AS DRIVERS OF ENERGY DEMAND IN MANUFACTURING INDUSTRIES IN INDIA, *ENERGY POLICY* 83:1–13.

This paper presents a comprehensive analysis of energy demand behaviour of seven energy intensive manufacturing industries and the aggregate manufacturing sector in India during 1973–74 to 2011–12. The policy Perform, Achieve and Trade (PAT) has mandated energy efficiency targets for these manufacturing industries in India. We focus on two major drivers of energy demand: technological progress and energy price. Productivity growth accounting and estimation of parametric cost function using Annual Survey of Industry data bring out important implications regarding the role of these two drivers. Results suggest that these industries experienced technological progress over the study period (1973–74 to 2011–12) with significant energy-saving bias during 1998–99 to 2011–12. Increase in energy price has led to reduction in energy demand and augmented technological progress in most of the industries. Energy and material inputs are mostly substitutes. During 1998–99 to 2011–12, productivity growth of energy input was induced by both technological progress and increase in energy price. Estimates of inter-factor substitution suggest that price induced reduction in energy demand can be a capital-intensive process in case of some industries. Rebound effect has never taken back full gains of energy efficiency policies in the context of these industries.

REYNOLDS, C.J., PIANTADOSI, J. and BOLAND, J. (2014) A WASTE SUPPLY-USE ANALYSIS OF AUSTRALIAN WASTE FLOWS. *JOURNAL OF ECONOMIC STRUCTURES* 3.1: 1-16.

In this paper we apply the Lenzen and Reynolds (2014) Waste Supply Use Table extension of Nakamura and Kondo's (2002a) Waste Input–Output (WIO) framework to the 2008 Australian economy. This is the first application of any WIO-style method to Australia as a nation. We find that the Services sector has the largest direct and indirect waste generation for an intermediate sector. This is followed by the Forestry sector, for direct waste generation, and the Transport sector for direct and indirect waste generation effects.

In terms of waste treatment methods, landfill generates the smallest direct and indirect waste tonnages, but it also provides the least amount of economic activity per tonne treated, producing $US2.53 in total of economic production per tonne treated.

REYNOLDS, C.J.,PIANTADOSIA, J., BUCKLEY, J.D., WEINSTEIND, P. and BOLANDA, J. (2015) EVALUATION OF THE ENVIRONMENTAL IMPACT OF WEEKLY FOOD CONSUMPTION IN DIFFERENT SOCIO-ECONOMIC HOUSEHOLDS IN AUSTRALIA USING ENVIRONMENTALLY EXTENDED INPUT–OUTPUT ANALYSIS. *ECOLOGICAL ECONOMICS* 111:58-64.

This paper uses input–output analysis to model the environmental impacts of the weekly food consumption of Australia's households sorted by income quintile in 2003. We found that weekly food consumption of the relatively better off

households caused greater environmental burden than that of the less well-off household.

Meat and bakery products/flour/cereals were the categories that contributed the largest share of environmental impacts in an average household's food consumption footprint: 58% water, 26% energy, 29% CO2, and 31% wasted materials. Per dollar spent, fruit and vegetables generated 0.0874 m3 of water, 0.0055 GJ of energy, 0.37 kg of CO2, and 0.0114 kg of wasted materials. This was lower than the per dollar impacts of bakery products (0.8482, 0.0067, 0.63, 0.0204), meat (0.3471, 0.0070, 0.65, 0.0203), dairy (0.0995, 0.0114, 0.98, 0.0192), and edible fats (0.2373, 0.0080, 0.70, 0.0165). Eating out and fast food consumption also had a low per dollar impact (0.1317, 0.0046, 0.38, 0.0141).

We surmise that substituting fruit and vegetables at the expense of animal products, processed foods, and fats would decrease environmental impacts. Change at low income levels should be focused upon meat, bakery and dairy consumption, while higher incomes should be focused upon the consequences of eating food outside the home.

REYNOLDS, C.J. GESCHKE, A., PIANTADOSI, J. and BOLAND, J. (2015) ESTIMATING INDUSTRIAL SOLID WASTE AND MUNICIPAL SOLID WASTE DATA AT HIGH RESOLUTION USING ECONOMIC ACCOUNTS: AN INPUT–OUTPUT APPROACH WITH AUSTRALIAN CASE STUDY. *JOURNAL OF MATERIAL CYCLES AND WASTE MANAGEMENT* 1-10.

In publicly available waste reports only the totals of waste produced for municipal, or industry waste typically feature. The types of waste generated and the generating industry sector are usually omitted. We propose the direct inputs waste estimation methodology to create a detailed estimate of municipal solid waste and industrial solid waste for an economy (including sectoral and waste type disaggregation) using a top-down estimation methodology that links the aforementioned limited publicly available waste data with an input–output table's direct inputs (A) matrix. We then provide an application of the direct inputs waste estimation methodology upon the 2008 waste generation of Australia resulting in a 344 industry sector and 14 waste type data set. The resulting estimation gives unique insights into Australian waste generation; including the large C&I tonnages of waste estimated to be produced from the Service sectors such as the Education, Hospitality, and Health sectors as well as the large amount of food waste produced throughout the economy.

TIMMER, M.P., DIETZENBACHER, E., LOS, B., STEHRER, R. AND DE VRIES G.J. (2015) AN ILLUSTRATED USER GUIDE TO THE WORLD INPUT-OUTPUT DATABASE: THE CASE OF GLOBAL AUTOMOTIVE PRODUCTION. *REVIEW OF INTERNATIONAL ECONOMICS*

This article provides guidance to prudent use of the World Input–Output Database (WIOD) in analyses of international trade. The WIOD contains annual time-series of world input–output tables and factor requirements covering the period from 1995 to 2011. Underlying concepts, construction methods and data sources are introduced, pointing out particular strengths and weaknesses. We illustrate its usefulness by analysing the geographical and factorial distribution of value added in global automotive production and show increasing fragmentation, both within and across regions. Possible improvements and extensions to the data are discussed.

MALIK, A., M. LENZEN AND A. GESCHKE (2015) TRIPLE BOTTOM LINE STUDY OF A LIGNOCELLULOSIC BIOFUEL INDUSTRY. *GLOBAL CHANGE BIOLOGY - BIOENERGY*

Growing concerns about energy security and climate change have prompted interest in Australia and worldwide to look for alternatives of fossil fuels. Among the renewable fuel sources, biofuels are one such alternative that have received unprecedented attention in the past decade. Cellulosic biofuels, derived from agricultural and wood biomass, could potentially increase Australia's oil self-sufficiency. In this study, we carry out a hybrid life-cycle assessment (LCA) of a future cellulose-refining industry located in the Green Triangle region of South Australia. We assess both the upstream and downstream refining stages, and consider as well the life-cycle effects occurring in conventional industries displaced by the proposed biofuel supply chains. We improve on conventional LCA method by utilising multi-region input–output (IO) analysis that allows a comprehensive appraisal of the industry's supply chains. Using IO-based hybrid LCA, we evaluate the social, economic and environmental impacts of lignocellulosic biofuel production. In particular, we evaluate the employment, economic stimulus, energy consumption and greenhouse gas impacts of the biofuel supply chain and also quantify the loss in economic activity and employment in the paper, pulp and paperboard industry resulting from the diversion of forestry biomass to biofuel production. Our results reveal that the loss in economic activity and employment will only account for 10% of the new jobs and additional stimulus generated in the economy. Lignocellulosic biofuel production will create significant new jobs and enhance productivity and economic growth by initiating the growth of new industries in the

economy. The energy return on investment for cellulosic biofuel production lies between 2.7 and 5.2, depending on the type of forestry feedstock and the travel distance between the feedstock industry and the cellulose refinery. Furthermore, the biofuel industry will be a net carbon sequester.

RODRÍGUEZ-ALLOZA, A.M., A. MALIK, M. LENZEN and J. GALLEGO (2015) HYBRID INPUT–OUTPUT LIFE CYCLE ASSESSMENT OF WARM MIX ASPHALT MIXTURES. *JOURNAL OF CLEANER PRODUCTION* 90:171-182.

One of the most important challenges facing our society is the efficient and economic use of energy, and with it the corresponding need to reduce greenhouse gas (GHG) emissions. Due to growing concerns over global warming and climate change in recent years, warm mix asphalt (WMA) has become an important new research topic in the field of pavement materials, as it offers a potential solution for the reduction of energy consumption and GHG emissions during the production and placement of asphalt mixtures.

While many studies have been conducted to demonstrate that the mechanical properties of such mixtures are not significantly affected, many questions and concerns regarding the environmental benefits they offer have yet to be addressed. In this study, a comprehensive hybrid life cycle assessment of WMA production was carried out to accurately evaluate and quantify the potential benefits of WMA technology by assessing the environmental impacts of its production associated with energy consumption and GHG emissions.

The results of this study show that, for the WMA mixtures considered here, when the upstream supply chain related to the production of the materials composing such mixtures is taken into account, WMA technology is able to significantly save energy and reduce GHG emissions when compared to the control mixtures. However, it must be noted that in some cases, the manufacturing temperature at the asphalt plant must be reduced before the benefits of reduced emissions and fuel usage can be obtained. The results of a detailed production layer decomposition indicate that the fuel, mining and construction sectors are the main contributors to the environmental impacts of manufacturing the WMA mixtures studied.

ALSAMAWI, A., J. MURRAY, M. LENZEN, K. KANEMOTO AND D. MORAN (2014) THE INEQUALITY FOOTPRINTS OF NATIONS: A NOVEL APPROACH TO QUANTITATIVE ACCOUNTING OF INCOME INEQUALITY. *PLOS ONE* 9, E110881.

In this study we use economic I-O analysis to calculate the inequality footprint of nations. An inequality footprint shows the link that each country's domestic economic activity has to income distribution elsewhere in the world. To this end we use employment and household income accounts for 187 countries and an historical time series dating back to 1990. Our results show that in 2010, most developed countries had an inequality footprint that was higher than their within-country inequality, meaning that in order to support domestic lifestyles, these countries source imports from more unequal economies. Amongst exceptions are the US and UK, which placed them on a par with many developing countries. Russia has a high within-country inequality nevertheless it has the lowest inequality footprint in the world, which is because of its trade connections with the Commonwealth of Independent States and Europe. Our findings show that the commodities that are inequality-intensive, such as electronic components, chemicals, fertilizers, minerals, and agricultural products often originate in developing countries characterized by high levels of inequality. Consumption of these commodities may implicate within-country inequality in both developing and

MALIK, A., M. LENZEN, P.J. RALPH and B. TAMBURIC (2014) HYBRID LIFE CYCLE ASSESSMENT OF ALGAL BIOFUEL PRODUCTION. *BIORESOURCE TECHNOLOGY* 184:436–443.

The objective of this work is to establish whether algal bio-crude production is environmentally, economically and socially sustainable. To this end, an economic multi-regional input–output model of Australia was complemented with engineering process data on algal bio-crude production. This model was used to undertake hybrid life-cycle assessment for measuring the direct, as well as indirect impacts of producing bio-crude. Overall, the supply chain of bio-crude is more sustainable than that of conventional crude oil. The results indicate that producing 1 million tonnes of bio-crude will generate almost 13,000 new jobs and 4 billion dollars' worth of economic stimulus. Furthermore, bio-crude production will offer carbon sequestration opportunities as the production process is net carbon-negative.

In memoriam

Norihisa Sakurai (1958-2015)

Senior Research Economist at the Socio-economic Research Center of the Central Research Institute of Electric Power Industry (Japan). He served for the IIOA as a Council member (2004-2012) and as Vice-President (2004-2009). He made a significant academic contribution in the field of I-O economics and energy economics. While he was a Senior Economist of the OECD, he founded a project for the development of the OECD I-O Database, which laid a foundation of multi-country I-O based databases of various organisations.

"Nori was a good friend. We spent some time together in Beijing and again in Tokyo where I asked to see a Baseball All Star game in the old stadium. Although he bought the tickets, he thanked me for the opportunity later since he'd never before seen his son, who he brought along, so animated. I gather Nori's schedule did not permit much personal time with his son who was then about 11 or 12 years old.

I always viewed Nori as an "old school" Japanese business man. He was polite but politically astute. That is, he was surely well connected, socially speaking. He liked nights out with his colleagues. (I once saw him in Japan walking one evening with about 12 young Japanese scholars following him.) He clearly adored his beautiful wife and son and paid them due allegiance. And he, at least seemingly, worked hard, long hours.

I would guess his leadership in PAPAIOS has been absent for some years now as it has in the IIOA. Still, he is one of our members who have left an indelible mark on many in these associations and the RSAI. I wish his memory well, and all the best of thoughts to his family and friends."

Michael L. Lahr
Vice-President IIOA
Research Prof.
E.J. Bloustein School of Planning
and Public Policy
Rutgers, The State University of NJ

Mária Augusztinovics (1930-2014)

"Many have thought of the input-output model only as a tool for establishing the connection between gross and net output, for working out the total (gross) production necessary to turn out a given bill of final products. However, theoretical and practical analyses have shown that the possibilities inherent in the model are greater and much more varied; that the mathematical-economic structure of the model and its information content yield answers to several other economic problems. This is true not only for the mire developed and sophisticated variants of the model –say, for the dynamic ones– but for the original form itself in a more general way, and to systematize –at least partially– the possibilities inherent in it."

Mária Augusztinovics , 1970

Mária Augusztinovics, a prominent economist of Hungary died at the end of November last year. She graduated at the Karl Marx University of Economics in 1952. During her lifetime her research work clustered around three main topics: theory of money, application of input-output models in planning the national economy, and economic analysis as well as finance of human life course. She defended her thesis for candidature (equivalent of PhD) in 1956 which was titled as "Model of the socialist economy's money circulation". In the wake of her work input-output technique became accepted tools for coordinating macroeconomic planning in the National Planning Office, and under her guidance several long-term I-O based models for economic analysis were developed and used. Creating the "Model of Money Flows Representing Product and Income Flows" is noteworthy from the point of view of methodology as well. She defended her thesis for "Doctor of Science" (roughly equivalent to Habilitation) in 1980 which was titled as "A description model of the human economy". This was an experiment to connect an input-output based model of the economy and a model of the human life course. She continued her research from 1984 at the Institute of Economics of the Hungarian Academy of Sciences, where her work concentrated on the economic analysis and finance of human life

course. In connection with this research she became one of the internationally best known pension system experts.

Excerpt from an interview by Krisztina Megyeri with Mária Augusztinovics at her 70th birthday in 2000.

You are saying that your Ph.D course was fantastic for you because one could freely think about things no one really understood. What did you think about then starting your career?

One of the incomprehensible things was what happens to the budget surplus in a socialist economy. Back then, budget always had a surplus, not a deficit and according to the textbooks, this was an important feature of socialist economy. And if it happens to be a deficit, who would cover it? What was even less comprehensible is where money comes from, where it disappears and what really controls the amount of money in circulation of the economy.

Money in circulation meant the actual cash that the population had at its hands. Mainly due to fears from a shortage of goods, it was a high priority to keep this amount as low as possible. The income of every shop had to be deposited at the post offices every evening. There were times when they collected all the money at the post offices every afternoon and brought it to the main post offices, because there it was not considered to be cash anymore. This formally made the closing stock lower which reassured politicians. Of course it was clearly a joke. No one thought collecting pieces of paper in the evening, just to distribute them again in the morning to be more than a formality. Money was not born in the main post office. But where was money born then? I understand that it seems quite strange now that this used to be a mystery in

Hungary in the 1950s. But back then, everyone lived under the spell of money backed by gold. That included capitalist economies, too. Of course we have learned about so-called money substitutes, like paper money and banknotes. Paper money was considered to be ugly because by releasing it the state gains something for nothing. Banknotes were considered to be handsome, a draft given by a bank that is founded on real money. Don't forget that Bretton Woods was built on the dollar being bound to gold. The central bank does not lend from deposit. The other way round, it lends and credits the loan, that is, it turns loan to deposit. The conceptual recognition was that deposit is money as well. No wonder your textbooks now list all kinds of moneys. (Although monetary theory will still have to fight with the new issue of bits circling around the net as money.) So the solution to my mystery was a new understanding of the existence and structure of credit money. This has put the problem of budget surplus and deficit in the right perspective as well. This is now a triviality but it was not back then. Many of my friends and colleagues called me stupid when I insisted that money is created by lending and stops existing when the loan is paid back. This was the main topic of my dissertation.

Is that the time of the famous 13 bottles of champagne story as well?

Indeed. In January 1959, when making the preliminary calculations for the production price settlement, 13 billion forint went missing, at least in the books. This was an enormous amount of money back then. The explanation was that the companies and their corresponding ministries were overestimating the price indices of their material costs while underestimating the price indices of their own projected sales. They did this to create a sweet little revenue reserve for themselves. We all knew that this is the deal but orthodox tools were not useful to catch the culprits. So

Ottó Gadó, the head of the financial division at the Hungarian Planning Office offered a bottle of champagne for each billion found. After a long unsuccessful search, using input-output tables then called chessboard balance, we managed to find all the missing money. We drank the 13 bottles of champagne on a big party then. The case has proved that input-output is an excellent tool for plan coordination, because it reveals inconsistencies among separated parts of the plan. This brought a wide recognition of applying input-output at the Planning Office and that was my job for years then.

How much was input-output, or more generally, economical planning an inherently socialist technique?

This is a subjective question. If by planning you mean a central dispatcher division, that is, that a central state office tells how much brown, half-length shoelaces should be produced in village N, then of course, such things never existed in capitalist states. Although, in my opinion, this also has not much to do with socialism, this was rather a specific, primitive technique of monetary control, raised under specific historical circumstances.

If we start from the opposite extreme, that a perfect market will take care of everything and the state should refrain from meddling in such matters, then of course all kinds of planning and input-output should be banned as something not just socialist but downright evil Bolshevik tricks. … No wonder that the input-output model got attacked in the US the heaviest and that is where it got the least amount of official state support.

However, if we try to look at it intelligently, then planning basically means assessing, as much as possible, the following. First, what can be expected in the future, independently of us (external

conditions). Second, what are our most important, second most important etc. objectives (preferences). Third, under the given conditions, to what extent these objectives can be reached and what other aims we have to give up to reach them (quantitative options, unfortunately you cannot avoid calculations here). Fourth, what are our tools to reach our goals (actual? options). Finally, we have to choose among these options (decision). The more complicated the problem and the institution preparing the decision are, the more important it is to coordinate and synchronize these steps. For this, you need something like an input-output technique.

I do not claim that the Planning Office did its coordinating job perfectly. The discrepancies and contradictions swept under the rug always caused a lot of problems. Here is a classical, longer term story to complete the one about the 13 bottles of champagne. Jenő Rácz, a former minister of finance coming from the Smallholders Party, then senior

researcher at the Planning Office, and excellent economist, who we just called uncle Jenő, in the early sixties made a famous calculation out of private diligence. He computed that the projected food-, clothing-, fridge-, etc quantities based on future consumption normatives simply will not fit at the projected overall square meters of apartments to be built. Now we know that this was not a joke.

Unfortunately, even today it is not widely understood that the essence of macroeconomic planning is not dirigisme or giving orders but coordination. Those who destroyed the Planning Office in 1990 did not know what they were doing. There is a hole in its place now. There is no coordinating mechanism left apart from the budget. But budget is more like a battlefield for distributing the money. It has nothing to do with synchronizing the underlying substantial state activities. Shockingly, it tends to make the news when two ministers are having lunch.

So all these have nothing to do with socialism?

What does have to do with socialism or capitalism, that is, the ways of ownership, is the role the state takes in controlling or at least regulating economy and also in addressing the problems in society. Of course, in our global economy it also became the big, open question what it has the power to do at all. But whatever role it takes, it is better to be planned properly, otherwise it will turn to a contradictory precipitance and will certainly not reach its goals.

It is not a coincidence that in its prime, input-output was very popular from Norway to India and from Paris to Moscow. Planning Offices, or where they did not exist, ministries of finance computed and applied this method on the state level. The input-output conferences were great places for exchanging knowledge. And the American colleagues were envy, because they saw that where there is planning, there economists can get close to the real macroeconomic decisions, even if at the end of the day, the final plan does not come from an optimal solution.

Her intellect, rationality, fairness, acumen and precise way of thinking will be missed by all who had the privilege to know her.

Megyeri Krisztina
Assistant Prof.
Dept. Mathematics
Corvinus University of Budapest

Australia Awards recipients receive input-output training

Twelve Australia Awards Fellowship recipients from Indonesia, Tonga, the Cook Islands, Vanuatu, the Federated States of Micronesia, Kiribati, Nauru and Niue visited the ISA group at the University of Sydney within the scope of ISA's Sustainable Islands program, funded by the Australian Government's Department of Foreign Affairs and Trade (DFAT), and delivered in collaboration with EcoNorfolk Foundation. The Australia Awards Fellows are leaders able to make a valuable contribution to their country on their return home; they receive four weeks of intensive professional training on a broad range of issues, spanning environmental impact assessment, marine resources management, and sustainable business operation. Input-output analysis constitutes one unit of study within the program. The photo shows some of the Fellows playing the Input-Output Game (see Chapters 16 and 17 of Murray and Wood (2010) The Sustainability Practitioner's Guide to Input-Output Analysis. Champaign, USA, Common Ground). In addition, Fellows take part in seminars and tutorials on applications of input-output analysis for small islands, and on input-output-assisted hybrid life-cycle and triple-bottom-line assessment.

The rationale for the professional training is that regarding sustainability, most island communities face two major challenges: energy supply and waste disposal. First, most islands do not have indigenous energy resources, but instead have to ship in fuels

over often considerable distances, at a considerable financial burden. Especially the oil embargos forced many island governments to re-think their energy supply strategies, and to consider introducing renewable energy sources, and efficiency and conservation policies. Second, most islands do not have enough space for operating landfills, so that waste is often burnt under hazardous conditions, with resulting toxic emissions to air. The training assists island communities in addressing these sustainability challenges by gaining knowledge and practical know-how about

a) environmental impact assessment and environmental accounting (including input-output-based carbon footprinting and sustainable living site visits),

b) management of fisheries resources, marine reserves, and monitoring for ciguatera and other harmful algae (including hands-on microscopy skills),

c) managing and saving energy and fuel, and managing waste disposal (including site visits showing working, sustainable, and island-friendly solutions), and

d) governance, planning and administration, grant writing, and strategies for understanding legal and regulatory issues for small islands, including legislative frameworks that guide investigation and implementation of potential sustainable business projects.

Emphasis is placed on peer-to-peer learning, especially with Norfolk Island community leaders who implemented alternative energy and waste strategies without any outside assistance. Thus, Fellows can obtain first-hand knowledge about solutions that are suited to island environments and skill pools. The training program will provide

diverse yet sound knowledge needed for communicating and implementing strategies that address energy, waste, pollution and fisheries issues.

This knowledge will position Fellows to provide policy advice to their communities and governments.

Conferences

6th Spanish Conference on Input-Output Analysis, September 7th-9th 2015, Barcelona (ES)

The 6th Spanish Conference on Input-Output Analysis (8th and 9th Sept) and the 1st edition of the Spanish School of I-O Analysis (7th Sept) will be held in Barcelona. The Hispanic-American Input-Output Society (SHAIO), the University of Barcelona (UB), the Autonomous University of Barcelona (UAB), and the Statistical Institute of Catalunya (IDESCAT) are working together to organize this conference that will take place at the Faculty of Economics and Business (UB).

The modules (in Spanish) of the school will be:

1. Modelos MRIO y LCA para el cálculo de huellas antropogénicas
2. Un caso práctico en la elaboración del Marco I-O: la experiencia de Cataluña
3. Análisis cuantitativo del comercio internacional e interregional: modelos gravitatorios, econometría espacial y IOT

We encourage the participation of young (<40) researchers with the 4th Emilio Fontela Research Prize for the best conference paper.

Key dates:

Abstract submission (extended): **May 24, 2015**
Notification of acceptance: **May 31, 2015**
School application **July 20, 2015**
Early registration ends: **July 20, 2015**
Submission of full papers: **July 20, 2015**
Reduced Registration ends: **July 24, 2015**

5th Annual Edition of the International School of Input-Output Analysis, June 22nd 2015, Mexico.

The 5th edition of the International School of Input-Output Analysis (ISIOA) is being held during the 23rd International Input-Output Conference in Mexico city. This year there are five modules of teaching sessions due to their high demand. The modules will deal with core topics of interest in input-output analysis, mostly taking into account the feedback of past editions.

Each module is led by one or various lecturers and consists of four teaching sessions:

1. World Input-Output Database
2. New revised version of the UN Handbook on Supply, Use and Input-Output Tables
3. Input-Output Visualisation (in Spanish)
4. The How and Why of Subnational Multiregional Input-Output Accounting
5. The OECD Trade in Value added Database (TiVA)

DEADLINE FOR APPLICATION: **May 15, 2015**

More info at the conference website

IELab Conference June 11th-12th 2015, Manly, Sydney (Australia)

The 1st Conference of the Industrial Ecology Virtual Laboratory (IELab) will be held on June 11th-12th 2015 at Harbord Diggers, Manly, Sydney. The I-O community is cordially invited to participate in this milestone event of the IELab project. The registration (already open) includes conference materials and the conference dinner in the historic former St. Patrick's Seminary (now site of the International College of Management, Sydney).

The IELab provides the most comprehensive, environmentally extended I-O database available for use in Australia. The goal of the conference is to share information about the exciting IELab research platform, demonstrate projects using IELab, discuss new collaboration and projects ideas, provide hands-on training and guidance in using the IELab analytical toolbox, and network with researchers, practitioners, analysts and experts of Industrial Ecology.

International Student Conference of Economics (ISCE), October 10th-11th, 2015. Babolsar (Iran)

The 1st International Student Conference of Economics (ISCE) will be held in October 2015

at the University of Mazandaran in Babolsar (Iran). After successfully holding 5 annual national student conferences in economics since 2008, the Department of Economics of the University of Mazandaran has now decided to hold conferences on economics on an international scale. The language of the conference will be both Persian and English held in two parallel sessions. The conference will, moreover, be a non-profit scientific forum.

Topics:
•Economic Growth and Development,
•International Economics,
•Labour Economics,
•Environmental & Resource Economics,
•Financial Economics,
•Public Sector Economics,
•Monetary Economics,
•Ecotourism,
•Islamic Economics.

Benefits:
•All papers and abstracts will be published in refereed conference proceedings (online).
•Outstanding papers will be considered for Iranian Economic Review & International Journal Business and Development Studies.
•Participation certificates will be provided.
•The three best papers will be awarded a prize at the terminating conference ceremony.

Deadline abstracts submission: **May 20, 2015**

4th National Input–Output Conference, February 2016, Tehran (Iran).

The Conference Council has decided that the 4th National Conference will be held on Feb. 2016, in the Faculty of Economics and Institute for Economic Sciences (ATU) at Tehran (Iran) with the financial support of Statistical Centre of Iran and Islamic Parliament Research Centre, Alzahra University and Mazandaran University are actively participating in the conference.

Topics:
1. Theoretical Basis of SUT and Methods of Estimation of SIOTs.
2. Evaluation of Compilation of IOTs in Iran.
3. Evaluation of Methods of Updating IOTs.
4. Physical and Monetary IOTs.
5. Evolution of Factor Contents in International Trade Theory.
6. Theoretical Development of I-O Models in Short-run and Long-run Analysis.
7. Application of I-O, SAM and CGE in: Resilience, Energy, Subsidies, Heath, Services, Environments, and … .
8. Methods of Estimation of RIOTs and their Applications.

We would like to invite foreign researches to attend. Although the conference is in Persian, it will be possible to allocate time in some sessions to present paper(s) in English.

23rd INFORUM World Conference, August 23rd-29th 2015 Bangkok (THAILAND)

The INFORUM group of international partners will hold its 23rd World Conference this year in Bangkok. This conference will be hosted by the Faculty of Economics, at Chulalongkorn University, from August 23 to August 29, 2015. The venue is the Chulalongkorn University historical building. This is the oldest and most prestigious university in Thailand, located in the heart of Bangkok.
Each year since 1993, Inforum has held an annual world conference. The aim of these conferences is to advance the work of empirical input-output modeling, analysis, and data development techniques through the presentation and publication of papers representing the work of INFORUM activities worldwide. Although the agenda overlaps somewhat with that of the International Input-Output Conference, it more specifically is dedicated to empirical work, especially in the areas of model building and data development. More information on the INFORUM conferences

Organizing Committee Contact Information:
Somprawin Manprasert
Danupon Ariyasajjakorn

Key deadlines:
Preliminary registration **April 30, 2015**
Registration confirmation **June 15, 2015**
Final paper submission **Aug 10, 2015**