Newsletter
International Input-Output Association (IIOA)
Number 7; August, 2009

# Editorial

## Three new IIOA Fellows installed in Sao Paulo

Dear IIOA member,

The Fellowship Award of the IIOA honours noteworthy members of the IIOA for their scientific contributions to the field of input-output analysis, broadly defined. Regular members of the IIOA nominate the candidates for the Fellowship Award, and the sitting Fellows elect a maximum of three new Fellows from the nominees. Besides a certificate and a bronze medal, Fellows receive a free membership of the IIOA for life. During our 2009 international conference in Sao Paulo, three new Fellows were installed. It is my honour to reiterate my General Assembly summary of their achievements in the Newsletter, alphabetically.

**Clopper Almon.** Clopper is Emeritus Professor of Economics, of the University of Maryland, United States of America. He received his Ph.D. from Harvard University in 1962. Afterwards, he taught at Harvard until 1966 when he joined the faculty at Maryland. He has played a major role in integrating econometric macro models and inter-industry models for forecasting purposes. He is the founding father of the INFORUM modelling community, which now spans countries all over the world. He has used INFORUM to spread knowledge about integrated modelling across the globe and has contributed to numerous efficiency improvements in this type of modelling. His work has not been limited to model building in a narrow definition, but also dealt with solutions to practical problems related to scarcity of suitable data. Anyone who believes that I-O models are overly simplistic and cannot be used for detailed policy analysis should have a good look at INFORUM's models. They have the sophistication of the most detailed CGE models (including how prices affect quantities and vice versa) and have been used for series of policy applications.

**Ronald E. Miller.** Ron is Emeritus Professor of Regional Science, University of Pennsylvania, United States of America. He received his Ph.D. from Princeton University in 1961, and joined the faculty of the Regional Science Department at the University of Pennsylvania rising to the rank of Professor. Ron has been a major influence on the standardization and spread of I-O analysis through his 1985-textbook with Peter Blair. The book made I-O accessible to a diverse readership, and still is an important reference today. From personal experience I know that the second edition, which appears this year, will be a meticulously checked integral update. Before "Miller & Blair" was published, Ron already contributed to the input-output literature, inter alia on the taxonomy and analysis of interregional spillovers and feedbacks and on aggregation errors in spatial I-O analysis. He continued doing so thereafter, not only by publishing more articles, but also by editing books (such as Frontiers to Input-Output of Input-Output Analysis, 1989, co-edited with Adam Rose and Karen Polenske). Finally, Ronald Miller served as editor and managing of the *Journal of Regional Science* for a long time, thus also making possible the appearance of many clearly articulated I-O-related articles.

**Graham Pyatt.** Graham is Honorary Professor of the University of Warwick, United Kingdom. Graham has worked with various international organizations, such as the ILO, the World Bank and UNDP. He also has advised many countries across the world on their economic and social development policies. He has extended I-O analysis with social accounting and provided a series of applications showing the usefulness of this major extension for the analysis of income distribution and poverty problems. His work on CGE models for developing countries is also influential, as is his SAM multiplier decomposition and his clarification of the commodity-industry framework and its relation to I-O and CGE in an important double ESR-article. His recent work includes a critical review on behalf of donors of the first 25 World Bank Poverty Assessments for countries in sub-Saharan Africa and a volume of essays "Identifying the Poor" (edited jointly with Michael Ward). He has published in the very best journals and has garnered a reputation as a scholar who can move with ease across the spectrum from theory to application.

**Jan Oosterhaven,**
**President of IIOA**

## *In this issue*



New documents have been published in the **Working Papers Series in Input-Output Economics** of the IIOA at: WPIOX (see p. 10)

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# Innovation Systems Analyses and Input-Output Economics

The idea that technological innovation evolves within 'systems' rather than being purely a property of individual businesses emerged slowly over the 1960s, 70s and 80s. In the late 1980s Chris Freeman, Bengt-Åke Lundvall and others crystallised the idea as national innovation systems. Since then the concept has been expanded to focus on regions, sectors, technologies and more recently cities. Simply put, the focus is on the way local factors (universities, firms, deep labour markets etc) aid the development of innovations.

I believe the late Chris DeBresson was most responsible for developing a bridge between the frameworks of innovation systems and input-output economics. Chris collected information from businesses regarding the industries that used innovations and from this developed innovation-based input-output tables (not simply transactions tables). The pinnacle of this line of work is the 1996 edited volume and the unpublished (unfortunately) report for the OECD (1998). In the earlier volume he pointed out that innovation I-O tables bore a strong similarity to economic transactions I-O tables for obvious and rational reasons.

Noting the challenges of collecting the data that Chris developed, other authors have worked on approaches which rely more directly on available I-O data.

Often this second approach has sought to embed industry research and development expenditures into I-O tables to generate a flows approach to technological knowledge. Typically called 'embodied technology' it has been analysed by Drejer (2000) and During and Schnabl (2008), among many others. Montresor (2009) continues to explore and advance this analytical technique within a comparative national context.

My own work is the most indirect in relation to innovation systems. It reverses the usual premise of using innovation related data within an I-O context. I wanted to use standard I-O tables (based on the findings of DeBresson) to understand the structure of innovation systems in a multi-country context. The book *Innovation System Frontiers: Cluster Networks and Global Value* extends the literature by examining the extent to which innovation systems might be 'national' or internationalised.

By using the OECD input-output and trade data and developing a series of multicountry input-output models it is possible to map the evolution of cross-country sectoral input structures across time. I hope the book begins to tell us something of the really big picture of innovation in various industries. For me this couldn't have happened without the mathematical ability of Professor Russel Cooper (now at Macquarie University, who developed a piece of software that uses his block partitioning 'net' multipliers approach (see Cooper, 2000). This software can crunch a transaction matrix of virtually any size (the latest spreadsheet contains approximately a million cells).

The book *Innovation System Frontiers* presents findings that are perhaps contrary to some expectations in that four higher R&D-intensive industries (aerospace, auto, office equipment and communications equipment are among the most import dependant activities (as a share of output). By taking the analysis further and exploring the spatial structure of international flows in these industries, some interesting features emerge. The spatial patterns for auto and electronics industries have strong similarities between 1970 and 2000 even though the analysis is able to include many new economies in the latter periods. However, the pattern for aerospace pattern, as far as it can be analysed, reveals a de-specialisation of trade partners, indicative at least of the emergence of the European production system.

In taking the spatial analysis further, I am exploring the idea that the more an industry is able to modularise its products, the more it de-specialises its international trading partners. This needs further work and, I hope, in the future there will be continued expansion of the availability of both national and regional I-O data that will enable further exploration of these issues.

**References**

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**Simon Fraser University, Vancouver**

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Thijs
ten Raa

Utz-Peter
Reich

# Sir Richard Stone Memorial Prize

The Sir Richard Stone prize awards author (or authors) of the best article published in Economic Systems Research. The prize is $1000, donated by Francis and Taylor the publishers of the journal. The first time covered the period 2006-2007 and now 2007-2008. The jury consists of Faye Duchin, Graham Pyatt, Ron Miller, editor Erik Dietzenbacher and myself as chair. This round we have nominated two papers for the Stone Prize, namely:

**Pirkko Aulin-Ahmavaara** and **Perttu Pakarinen**: *Integrated Industry and Economy-wide TFP-Measures with Different Prices in Different Uses* (September 2007)

and

**Utz-Peter Reich**: *Inequality in Exchange: The Use of a World Trade Flow Table for Analyzing the International Economy* (December 2007)

The paper by Aulin-Ahmavaara and Pakarinen is a highly innovative theoretical paper resolving a conflict between schools of thought by showing that their productivity measures can be interrelated.

This is done by endogenizing various (factor) inputs (taking into account their production structure). The paper is clearly written despite the technicalities.

The paper by Reich demonstrates that rich countries are able to buy cheap and sell dear relative to developing countries. The assessment involves converting trade data into a common currency using real exchange rates instead of nominal ones.

Utz puts the theories of unequal exchange of the 1950s back on the table. This is a highly provocative and timely piece, especially for those of us who think that the US trade deficit and the Chinese surplus (which is not to exonerate others) have been at the root of the global depression. It sets an agenda that ought to be central to international finance.

Unfortunately none of the nominees were present at the conference in Sao Paulo. Communication between the IIOA Executive Council and the authors was the apparent prime reason for their nonpresence. Regardless, the winner of this year's Stone prize was Utz-Peter Reich, and we congratulate him.

At the conference my report to the IIOA General Assembly, which is essentially embodied in the above, was followed by a nice portrait of Utz Reich by his friend Joerg Beutel, who also read his acceptance speech. The acceptance speech reveals an interesting connection between Stone and Reich and follows below. Joerg's portrait was witty. He asked a tall Dutch to stand up and said Utz looked like liked him some 35 years ago, when Utz and Joerg first met. These words from the stand-in winner drew a big round of laughter.

Here follows Utz Reich acceptance speech :

"Being awarded the Sir Richard Stone Prize of this association for my paper on inequality in international exchange is great recognition of my past work, and a binding obligation for the future. I am delighted, and thank you very much. Let me add to this happy event a little anecdote about Sir Richard Stone that explains my gratitude and may be told in public, now, with your permission.

It was in the seventies of the last century when I was young. We youngsters had just become acquainted with, intrigued by, and crazy about the System of National Accounts, the SNA1968, which had been conceived by Richard Stone, largely, as you know.

We admired the beauty of a scheme that in all its comprehensiveness elucidated the structure of a entire national economy by means of a few straightforward principles of accounting. This was truly worth a Nobel Prize, or so at least we felt. So, at the next membership meeting of the International Organisation for Research in Income and Wealth (IARIW), I stood up asking for a supporting vote from its assembly. There was opposition as you may expect, because other candidates had some stakes in there, too, perhaps. At any rate, the membership of the IARIW decided to abstain from a formal procedure, and, instead, the president of Statistics Sweden offered to talk informally to the Nobel committee.

Two years later, Sir Richard Stone had his Nobel Prize in economics. At the next IARIW conference; I was introduced to him. He greeted me warmly and thanked me several times. While to this day I do not think he had been thanking me for my scientific contributions, I nevertheless still feel deeply rewarded.

Accepting this prize today brings this story full circle in an unexpected way. With your distinction, Mr. President, you have renewed and doubled the original reward, which I choose to take as presented by Sir Richard Stone through your hands for a scientific achievement.

Thank you very much, indeed."

**Thijs ten Raa,**
**Chair of the Selection Committee**

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Geoffrey J. D. Hewings

Joost Santos

# Leontief Memorial Prize

This 1000 US$ prize is awarded to the best paper presented at an International I-O Conference by authors) all under 40 years of age. The prize winning paper is published in *Economic Systems Research*, the Journal of the IIOA.

From the submissions received by the selection committee (Nori Sakurai, Manfred Lenzen, Bart Los and myself), the paper "Probabilistic modelling of workforce-based disruptions and input-output analysis of interdependent ripple effects: applications to a pandemic scenario" by Mark Orsi and **Joost Santos** (University of Virginia) was chosen as the 2009 winner.

The second place was awarded to **José M. Rueda-Cantuche** (European Commission's Joint Research Centre, Spain) for "Testing the assumptions made in the construction of input-output tables" and the third place to **Eduardo Haddad** (University of São Paulo, Brazil) for "Regional integration in Colombia: on Cournot's problem and the new economic geography".

**Geoffrey J. D. Hewings,**
**Chair of the Selection Committee**

# Conferences

Wuppertal Institut für Klima, Umwelt, Energie GmbH

**10-12 September 2009**

## 2nd International Wuppertal Colloquium on: *Sustainable Growth, Resource Productivity and Sustainable Industrial Policy - Recent Findings, new Approaches for Strategies and Policies*

The international colloquium shall bring together top experts on sustainable growth and sustainable resource management. It aims to analyse the contribution of increasing resource productivity to sustainability. Having a focus on economics, the international colloquium shall also cover the technological, the environmental and the international dimensions. The international colloquium shall take place in 2009 and 2010; a first colloquium has taken place in 2008. The three colloquia accompany a large research project on "Material Efficiency & Conservation of Resources", which is coordinated by the Wuppertal Institute with some 30 partners on behalf of the German Federal Ministry for the Environment. While the first international colloquium intended to assemble the state of the art, this year's colloquium shall discuss issues such as: (1) System innovations and visions, (2) Leapfrogging strategies, (3) Rebound effects, (4) International market development.

More information is available at: Wuppertal Institute

I.A.R.I.W.

## Thirty-first General Conference—St. Gallen, Switzerland, August 22–28, 2010

## CALL FOR PAPERS

The International Association for Research in Income and Wealth has as its major interests: (1) the furthering of research on national and economic and social accounting, including the development of concepts and definitions for the measurement and analysis of income and wealth; (2) the development and further integration of systems of economic and social statistics; and (3) related problems of statistical methodology.

In particular, the Association is concerned with the international aspects of these questions, such as: (1) international comparisons of income and wealth; (2) the use of economic and social accounting for budgeting and policy analysis in different countries; and (3) the experiences of different countries in the development of economic and social accounting systems.

It pursues these objectives by providing for communication and interchange on these topics and by bringing together academic and government scholars in the field of economic and social statistics from many countries. This is accomplished by holding biennial general conferences, by arranging regional and specialized conferences, by the circulation of scholarly papers, and by the publication of a quarterly journal, the Review of Income and Wealth.

Abstracts should be submitted before **August 31, 2009** according to the instructions given in the call, which can be accessible through: http://www.iariw.org/call2010.php.

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Transformation, innovation and adaptation for sustainability: integrating natural and social sciences

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## 14-16 September 2009 Davos (Switzerland) – Nagoya (Japan)

The **R'09 Twin World Congress** promotes innovative technologies and frameworks for resource management to improve material and energy efficiencies in the production, use, and recycling of materials.

The R'09 Twin World Congress is the 9th event in the bi-annual R' World Congress series started in 1993. It aims to improve material and energy efficiencies in industry, including energy supply, cement and building materials, metallurgical, chemical, glass, pulp and paper, machinery, the automobile and electronic industries as well as activities of collection, sorting, further treatment and final disposal of post-consumer material. The factor information and therefore the use of Information and Communication Technologies (ICTs) are of increasing importance in resource management and will find special consideration at R'09.

The R'09 Twin World Congress is an example and an experiment in resource management: to be held simultaneously in two parts of the world – Davos in Switzerland and Nagoya in Japan – while all plenary lectures and discussions will be shared using teleconferencing technology, this congress will avoid many intercontinental flights, which are known to account for most of the resource demand of international congresses.

More information at: Twin World Congress

World Resources Forum 2009

# Highlights in journals

**P. J. Thomassin & K. Mukhopadhyay,** "Impact of East-Asian Free Trade on Regional Greenhouse Gas Emissions", *Journal of International Global Economic Studies*, 1(2) 2008, pp. 57-83, December.

The environmental impact of a regional trade agreement towards liberalization is an empirical question. The paper estimates the economic and environmental impacts of alternative trade policies of liberalization between six East Asian countries using Global Trade Analysis Project (GTAP) framework. The finding reveals that Japan will be in a win-win situation followed by Republic of Korea after tariff reductions. Among the other countries, the impact on China is found to be neutral, while for Vietnam, though industrial output inducing is not environmental friendly. Further, the paper discusses the relevance of the findings for trade and environment debate. The paper concludes with alternative environmental policy implications.

**D. Guan, G. P. Peters, C. L. Weber & K. Hubacek**, "Journey to world top emitter: an analysis of the driving forces of China's recent $CO_2$ emissions surge", *Geophysical Research Letters*, 36, L04709, 2009, pp. 1-5.

China's economy has been growing at an accelerated rate from 2002 to 2005 and with it China's carbon emissions. It is easier to understand the growth in China's carbon emissions by considering which consumption activities - households and government, capital investments, and international trade - drive Chinese production and hence emissions. This paper adopts structural decomposition analysis, a macro-economic approach using data from national statistical offices, to investigate the drivers of China's recent $CO_2$ emissions surge. The speed of efficiency gains in production sectors cannot cope with the growth in emissions due to growth in final consumption and associated production processes. More specifically, Chinese export production is responsible for one-half of the emission increase. Capital formation contributes to one third of the emission increase. A fast growing component is carbon emissions related to consumption of services by urban households and governmental institutions, which are responsible for most of the remaining emissions.

**A. Tukker, E. Poliakov, R. Heijungs, T. Hawkins, F. Neuwahl, J.M. Rueda-Cantuche, S. Giljum, S. Moll, J. Oosterhaven & M. Bouwmeester**, "Towards a global multi-regional environmentally extended input–output database". *Ecological Economics*, 68 (7) 2009, pp.1928-1937.

This paper summarizes the EU-funded Project: EXIOPOL, with special attention to the construction of its environmentally extended (EE) Supply-Use Table (SUT) database. The ambitious project has three principal objectives. (1) To synthesize and further develop estimates of the external costs of key environmental impacts for Europe. (2) To develop an integrated inter-country EE SUT for the EU-27 plus the 16 largest countries in the rest of the world, with over a 100 industries and commodities, including as many of these estimates as possible, to allow for the estimation of environmental impacts of different industries, households and other final consumption activities, and of the resource consumption in commodity use. (3) To apply the results of the work on external costs and the integrated inter-country EE SUT for illustrative policy questions.

**D. Stelder & J. Oosterhaven**, "Non-survey international input-output construction methods; a generalized RAS algorithm GRAS4', in: H. Kuwamori, Y. Uchida & S. Inomata (eds) *Compilation and Use of the 2005 International Input-Output Tables*, pp. 165-174 (Chiba: Institute of Developing Economies).

This paper presents a generalization of four non-survey methods to construct a full-information international input-output table from national IO tables and international import and export statistics. A review of the relevant literature and theoretical backgrounds has been presented in an earlier paper by Oosterhaven & Stelder (2007) on the subject which also contains an evaluation of the results for the Asian-Pacific Input-Output Table of 2000. As a follow-up of that work this paper presents a new software package GRAS4 that can use the four methods on comparable databases with a variable number of countries, sectors and trade statistics goods.

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**Gulay Gunluk-Senesen,** "Assesing the role of arms production in the economy: the case of Turkey", in: A. Prinz, A. E. Steenge & N. Isegrei (eds) *New technologies, networks and governance structures*, LIT Verlag, Germany 2009, pp. 31-52.

This paper attempts to assess the two decades of the arms modernization program of Turkey and addresses the question: "What is the role of arms production in the Turkish economy?" The focus being on the domestic production structure, the research serves to test the import substitution and spin off hypotheses. The methodology is input-output modelling which enables us studying this specific sector within the input transactions network of production sectors. Following the Introduction section, in section two, we first present core facts on the arms business in the world, then discuss briefly the pros and cons of the arms industry in the economics domain with respect to developing countries. In section three, we present basic tools of input-output modelling and discuss extensions with reference to the arms industry. The position of special purpose machinery, arms industry and aircraft industry in Turkey are assessed in section 4, based on input structures, final demand compositions and backward domestic and import linkages. The final section summarizes the findings, challenges and issues for future research.

**R. Wood & M. Lenzen**, "Aggregate measures of complex economic structure and evolution", *Journal of Industrial Ecology*, vol. 13 issue 2, 2009, pp.264-283.

It is perhaps in the nature of complex systems that they call for aggregate measures that enable analysts to grasp their structure and evolution without being overwhelmed by their very complexity. Complex inter-industry theory and models are a typical case, where the underlying database—an input–output table—routinely contains thousands of data points for a single year. Within input–output analysis, quantitative measures have been developed that describe and characterize inter-industry interactions and that have been used to compare economies, both in a static taxonomy and through their evolution over time. First, we review and critically discuss a number of concepts that have been proposed and applied to inter-industry systems, such as interconnectedness, interrelatedness, linkages, and economic landscapes. Second, we apply these concepts to a case study of the Australian economy between 1975 and 1999 in terms of environmental headline indicators. Our results enable the reader to judge the usefulness and ability of the measures in capturing the key structural elements and evolutionary processes governing the interaction between the economy and the environment. For the Australian case study, the measures showed a diversifying economy occurring together with a specialization of environmental flows.

**T. Kronenberg**, "The Impact of Demographic Change on Energy Use and Greenhouse Gas Emissions in Germany", *Ecological Economics*, 68(10), 2009, pp. 2637-2645.

This paper estimates the impact of demographic change on energy use and greenhouse gas emissions in Germany. Since old people display different consumption patterns than young people, an increase in the proportion of old people affects overall consumption patterns. Micro data from a household survey are used to identify age-specific consumption patterns and to project the impact of demographic change on the structure of total consumption expenditure up to the year 2030. The resulting final demand vectors are entered into an environmental input-output model, which allows the calculation of sectoral production, energy use and greenhouse gas emissions. The model results suggest that until 2030, demographic change raises the share of methane in total greenhouse gas emissions and does not contribute to reducing energy use and greenhouse gas emissions in Germany.

**P. de Boer**, "Generalized Fisher index or Siegel–Shapley decomposition?", *Energy Economics*, 2009, 31 pp. 810-814.

It is generally believed that index decomposition analysis (IDA) and input–output structural decomposition analysis (SDA) [Rose and Casler, 1996; and Dietzenbacher and Los, 1998] are different approaches in energy studies; see for instance Ang et al. (2004). In this paper it is shown that the generalized Fisher approach, introduced in IDA by Ang et al. (2004) for the decomposition of an aggregate change in a variable in r=2, 3 or 4 factors is equivalent to SDA. They base their formulae on the very complicated generic formula that Shapley (1953) derived for his value of *n*-person games, and mention that Siegel (1945) gave their formulae using a different route. In this paper tables are given from which the formulae of the generalized Fisher approach can easily be derived for the cases of r=2, 3 or 4 factors. It is shown that these tables can easily be extended to cover the cases of r=5 and r=6 factors.

**P. P. Ghosh, A. Dhar & D. Chakraborty**, "Government Finances and Economic Growth: A Policy Perspective on the Developing Economy of Sri Lanka", *Asia-Pacific Development Journal*, 15(2) , 2008, pp 61-96.

In this paper, we analyse the fiscal policy orientation of the developing economy of Sri Lanka in the context of the growth performance of the economy during the period 1975-2000, using an integrated input-output and macro econometric model. The paper draws upon the Government's policy approach towards faster economic growth. The empirical findings show that the Government's budget deficits are not primarily the result of an excess of consumption over revenue. Rather, other current expenses, such as Government transfers and interest payments, have been the main cause of the country's mounting public debt. The proportion of Government investment in total Government outlays has declined over time. This could be a major obstacle to economic growth. At the same time, the Government's recurring budget deficits have led to an escalating national debt, and the monetization of deficits has created inflationary pressures. In order to arrest these trends and encourage economic growth, reducing the current deficits in the Government budgets is imperative. Domestic private investment, foreign direct investment and Government investment have to be combined as complementary forces to ensure rapid economic growth in the country

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# In the next ESR issue

**Economic Systems Research**

**Journal of the International Input-Output Association**

***Volume 21*** ***Number 3*** ***September 2009***

Manfred Lenzen and Bart Los. Editors

**Asuke Yamakawa & Glen P. Peters.** *Environmental Input-Output Analysis: Using Time-Series to Measure Uncertainty*

Environmental Input-Output Analysis (EIOA) is a tool for environmental analysis of broad classes of sectoral activities, taking into account indirect effects in other sectors in the supply chain. The core of EIOA is an input-output table (IOT) and a national accounting matrix including environmental accounts (NAMEA) for a fixed base-year. We evaluate the uncertainty in EIOA using a time series of current-price IOT and NAMEA which may represent realistic changes in production or measurement error. We assume the changes are errors and apply a regression analysis to remove the trends from the underlying data and estimate the uncertainty in the raw IOT. Using Monte-Carlo analysis, we then investigate how well the variations in the current-price IOTs and NAMEAs over time may represent uncertainties.

**José M. Rueda-Cantuche & Thijs ten Raa.** *The choice of model in the construction of industry coefficients matrices*

Kop Jansen and ten Raa's (1990) characterization of product-by-product input-output product tables was adopted by the United Nations (1993). Recent OECD and several EU funded projects, however, used industry by industry tables, which raises comparable issues concerning their construction. We show how their two main construction models are instances of the transfer principle, with alternative assumptions on the variation of input-output coefficients across product markets. We augment the theory by formulating desirable properties for industry tables and investigate the so-called fixed product and fixed industry sales structure models, which are used by statistical institutes. The fixed industry sales structure model is shown to be superior from an axiomatic point of view.

**Euijune Kim & Geoffrey J. D. Hewings.** *An Application of an Integrated Transport Network - Multiregional CGE Model to the Calibration of Synergy Effects of Highway Investments*

A transportation network-multiregional CGE model is applied to estimate the synergy effects of a set of highway projects on value added by region and industrial sector, for construction and operation periods. Among nine east-west highways in Korea, the East-West 9 highway increases GDP by 0.3% over the 30-year time period horizon with 0.016% of this GDP growth due to the synergy effect. This synergy effect is defined as a difference between the summation of the net GDP increase from the development of each highway sub-link without spatial linkages, and the change in GDP resulting from the concurrent development of all links with spatial linkages. We find that the East-West 9 highway also has the largest synergy effect (0.164 billion US$ per year) on the manufacturing sector of Kwangju Metropolitan Area, resulting in a gain in its GRP per capita of 15.88 US$ per year. Since more synergy effects are generated in less developed regions such as Kwangju rather than in developed regions, highway development can contribute to the reduction of regional disparities.

**Fernando S. Perobelli, Eduardo A. Haddad, Jaime B. Morón & Geoffrey J. D. Hewings.** *Structural interdependence among Colombian departments*

This paper analyzes the structural interdependence among Colombian departments. The results show that Bogotá has a large influence in the other regional economies through the power of its purchases. Additionally, a centre-periphery pattern emerges in the spatial concentration of the effects of the hypothetical extraction of any territory. From a policy point of view, the main findings reaffirm the role played by Bogotá in the recent polarization process observed in the regional economies in Colombia. Any policy action oriented to reduce these regional disparities should take into account that, given the structural interdependence among Colombian departments, new investment in the lagged regions would flow through Bogotá and the major regional economies.

**Giovanni Cerulli & Bianca Potì.** *Measuring Inter-sectoral Knowledge Spillovers: An Application of Sensitivity Analysis to Italy*

R&D spillovers are unanimously considered as one of the main driving forces of technical change, innovation and economic growth. This paper aims at measuring inter-industrial spillovers, which provides useful information for policy-makers. We apply an "uncertainty-sensitivity analysis" to the Italian input-output table of intermediate goods split into 31 economic sectors for the year 2000. The value added of using this methodology is the opportunity of distinguishing (separately) between spillover effects induced by productive linkages (the Leontief forward multipliers) and those activated by R&D investments, also capturing the uncertain and non-linear nature of the relations between spillovers and factors affecting them.

**The ESR Editorial Office has changed location. Editorial Correspondence should be addressed to the Editorial Office Manager, Centre for Integrated Sustainability Analysis, A28 - School of Physics, The University of Sydney NSW 2006, Australia. Tel: +61 (0)2 9036 9365. Fax: +61 (0)2 9351 7726. Email: esr@physics.usyd.edu.au**

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# Input-Output software

## SimSip "SAM"

**(for Simple, Automated and Marketable)**

**A Tool for the Analysis of Input-Output Tables and Social Accounting Matrices**

### The Simulation Tool That You Always Wanted But Did Not Know Existed

Complicated! Have you ever written code to conduct structural path analysis? Done properly, it entails identifying and quantifying the importance of all paths connecting an account that is shocked to one or several destination accounts. A brute force approach would consider close to $k$ times $n$ paths, where n is the total number of endogenous accounts, and $k$ is the maximum path length. The number of endogenous accounts can easily exceed 100, and most of the published applications use $k$=3. That yields one million paths to analyze each time, and this would grow exponentially with a longer path length! There is however a better way to do it using sparse matrices and recursive routines.

Slow and tedious! Have you ever been tired of writing lengthy code for relatively simple computations, such as having to repeat several times a similar code for estimating the components of a multiplier decomposition when considering different simulations? Have you ever wished that a tool would enable you to save time instead of jumping back and forth between different software packages to format the input, process the data, and then again format the output?

Difficult to sell! Have you ever tried to attract bright, but not mathematically or computationally inclined fellow researchers or students to the field of I-O and SAM analysis? Because applied SAM analysis is intensive in coding, and because advanced techniques are often not available in existing software, it should be no surprise that the field may not attract the same following than some other fields in economics do. The technicality of SAM analysis today represents a high entry cost for many students, and the students who pursue the field often spend too much time crunching numbers or writing code to the detriment of time spent thinking about the economic intuition of their analysis and results.

Yet SAM analysis does not need to be complicated, slow and tedious, and difficult to sell. There is a growing number of software tools that are now available for I-O and SAM analysis, including PyIO by REAL (the Regional Economics Applications Laboratory) at the University of Illinois at Urbana-Champaign, and IRIOS by Stelder and Oosterhaven at the University of Groningen. The main feature of the newly available SimSIP SAM tool is that it integrates many of the functions of other tools while also including other modules. In addition no programming skills are involved in its use, and the tool is especially user-friendly.

SimSIP SAM is an Excel based application to analyze SAMs and I-O tables (SimSIP stands for Simulations for Social Indicators and Poverty). The tool uses MATLAB as computation engine but this use is invisible to the final user, and no license or knowledge of MATLAB is required. The application is user-friendly and only requires basic knowledge of Excel. It performs a large number of decompositions and analyses including two algorithms for SAM balancing (RAS and cross-entropy), SAM aggregation, multiplier decompositions, several types of economic linkages, income redistribution analysis, structural path analysis, several methods to analyze structural change (fields of influence, direction of change, importance of technical coefficients), supply constraints, price models, price controls, and poverty and income distribution analysis by linking the tool to household survey data.

The tool, developed by the Development Dialogue on Values and Ethics Unit in the Human Development Network at The World Bank, is available for free and it is ideally suited to conduct research or teach IO-SAM techniques. It was presented at the Intermediate Input-Output Meeting at Seville in 2008, and last month at the International Input-Output Conference in Sao Paulo, with each time 90 minutes sessions that were well attended. World Bank staffs, government officials and university researchers have been trained in using the tool in several countries, and more training sessions are scheduled this year or can be organized depending on demand. The latest release of the tool is version 1.1, which now features a fully automatic installation, as requested by previous users. The installer is available at www.simsip.org (approx 170 MB).

Several empirical applications using the tool have been recently prepared at The World Bank, with an initial focus on Africa where SAMs are often the main tools readily available to analyze general equilibrium effects. One application examines the impact of oil and food price shocks on rural and urban households in Ghana and finds that the impact of an increase in oil prices on households' cost of living could be larger than that of an increase of cereal prices due to higher multiplier effects for oil. Two applications study the links between trade and gender using SAMs for Kenya and Senegal. In Kenya, as result of an oil price shock, male-headed households would be more affected than female-headed households. In Senegal, higher incomes from tourism could increase not only the labour income of female workers, but also their share of total labor income. Two more studies analyze the links between growth and labour income by gender in Guinea and Tanzania. In the case of Guinea, and expansion of sectors oriented primarily towards domestic consumption could have a larger positive impact on the labour income share of women than an expansion of export-oriented sectors. For Tanzania, structural path analysis is used to characterize the concentration, strength, and speed of various transmission channels between growth and labour income by gender. Other applications have dealt with export cash crops, for example for cotton in Mali, and have yielded results that were used to inform World Bank loans and grants in developing countries.

Our ultimate goal is to write a textbook on IO-SAM techniques that fully integrates the use of the tool. But the simulation tool itself is already available and a detailed (although technical) user's manual is included in the installer together with a tutorial. Even though the tool has been used and tested using data for many countries, we welcome suggestions on how to extend it and improve it. If you have comments or if you would like to use the tool in the classroom and need installation CDs or other materials, please contact **Juan Carlos Parra** (jparraosorio@worldbank.org).

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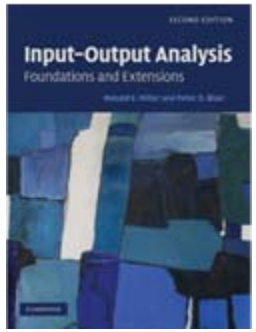
# Highlights in books

**INPUT-OUTPUT ANALYSIS. FOUNDATIONS AND EXTENSIONS.** Ronald E. Miller and Peter D. Blair, Cambridge University Press, Cambridge, UK, 2009. 2nd revision.




Cambridge University Press is delighted to announce the publication in August of Input-Output Analysis: Foundations and Extensions, the long-awaited new edition of Ronald Miller and Peter Blair's classic textbook.

The new edition is an essential reference for students and scholars in the input-output research and applications community.

The book has been fully revised and updated to reflect important developments in the field since its original publication. New topics covered include SAMs (and extended input-output models) and their connection to input-output data, structural decomposition analysis (SDA), multiplier decompositions, identifying important coefficients, and international input-output models. A major new feature of this edition is that it is also supported by an accompanying website with solutions to all problems, wide-ranging real-world data sets, and appendices with further information for more advanced readers.

*Input-Output Analysis: Foundations and Extensions* is an ideal introduction to the subject for advanced undergraduate and graduate students in a wide variety of fields, including economics, regional science, regional economics, city, regional and urban planning, environmental planning, public policy analysis, and public management.

Advance praise for the new edition!

Erik Dietzenbacher (University of Groningen)

"Generations of scholars and practitioners in input-output grew up with Miller and Blair (MB). The last generation had to learn the trade using a worn out copy from the library or a thumbed xerox copy of a xerox copy of MB. With the new version, MB2, input-output seems well equipped for future generations. […] MB has been THE input-output textbook for the past decades. I anticipate that MB2 will be THE textbook in input-output for many decades to come."

Geoffrey Hewings (University of Illinois at Urbana-Champaign)

"The new edition of Miller and Blair's superb volume on input-output analysis covers much of the same ground as the first edition but in even greater depth. The chapters on energy and environmental input-output analysis have been significantly expanded reflecting the heightened interest in environmental/ energy-economy interactions. However, new chapters on social accounting matrices build a bridge to analysis of structural decomposition, and lead to links with general equilibrium models. Additional chapters on supply side models, expanded coverage of non-survey methods and mixed and dynamic models provide, in one volume, an impressive intellectual smorgasbord of theory and applications that will serve both the academic community and practitioners."

Andrew Isserman (University of Illinois at Urbana-Champaign)

"Miller and Blair have done a great service by updating and expanding their important book. The long-anticipated second edition is remarkably comprehensive. No other source is so thorough, clear, and authoritative. Input-Output Analysis is both text book and indispensable reference work. Beginners will start with the fundamentals of the model, including theory, algebra, and data issues. Experts will realize how much more there is to learn and be directed, via ample references, to journal articles and advanced books. If they study this book, skilled practitioners and consultants who do economic impact studies will avoid logical errors and nonsensical results."

Karen Polenske (Massachussets Institute of Technology)

"This long-awaited Second Edition of Miller and Blair's Input-Output Analysis: Foundations and Extensions is destined to become a bestseller. They methodically and excellently review in fourteen chapters the basic input-output accounts, and they expand the accounting framework to new energy, environmental, and ecological issues. Readers should grab a copy to learn the basics, but, most importantly, to update their knowledge with the latest accounting concepts, and to learn in each chapter how to apply the accounting basics to sample problems of analysis."

For more information on the book and to see the extra resource material available on-line visit the Cambridge University Press website at: www.cambridge.org/millerandblair

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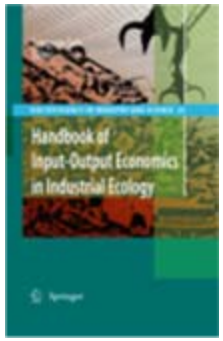
**HANDBOOK OF INPUT-OUTPUT ECONOMICS IN INDUSTRIAL ECOLOGY.** Sangwon Suh (ed.) Springer, 2009. Series: Eco-Efficiency in Industry and Science , Vol. 23.Link to the editorial site: Handbook of IO Economics and Industrial Ecology




"Handbook of Input-Output Economics in Industrial Ecology" covers an array of topics including the history of industrial ecology and input-output economics, material flow analysis, LCA, sustainable consumption, policy applications, energy and climate change, waste management, national accounts and statistics, and new developments in modelling and theory.

Particularly, this handbook is designed to offer a comprehensive coverage on three major issues:

(1) theory and method of key analytical tools and models;
(2) fundamental accounting principles and compilation of basic data; and
(3) practical applications of the tools and models at various scales.

First, various analytical tools and modelling techniques that are of particular importance to industrial ecology applications are comprehensively treated in this handbook, which includes hybrid models for LCA, Material Flow Analysis (MFA) and energy analysis; physical and hybrid-unit I-O models; Waste I-O model; multiregional I-O models; dynamic I-O model; thermodynamic analysis; linear programming and optimization techniques; graph theory and network analysis; use of scenarios; and Structural Decomposition Analysis (SDA).

Second, basic accounting frameworks and compilation of required data for these analytical tools and models are shown, which covers e.g., the supply-use framework, resources accounts, time-use survey, Social Accounting Matrices (SAMs), compilation of environmental IO databases of Japan (3EID) and the U.S. (CEDA).

Third, use of these data, tools and models for micro-, meso-, as well as macro-scale applications are presented throughout the chapters. Readers will also notice the difference in mode of writing in some chapters: for instance, some are written more as a practical and instructive guide (e.g., the step-by-step approaches for net energy analysis of Chapter 24) and some are done more as a theoretical contribution (e.g., the multistage process-based make-use system of Chapter 35).

**FROM THE SYSTEM OF NATIONAL ACCOUNTS (SNA) TO A SOCIAL ACCOUNTING MATRIX (SAM) - BASED MODEL. AN APPLICATION TO PORTUGAL** Susana Santos, Edições Almedina, Coimbra (Portugal), 2009. Link to the editorial site: From the SNA to a SAM-based model

From the SNA to a SAM-based Model, through an application to Portugal, systematizes a methodology for using the European System of National and Regional Accounts in the European Community of 1995 to construct numerical and algebraic versions of a Social Accounting Matrix that are in complete harmony with this. From both versions, scenarios are defined and analysed, arising from experiments that have been carried out into the (macro-)impacts of government policies regarding income distribution. Close attention is paid to the corresponding response of the different macroeconomic aggregates, balances and indicators. "It is to be hoped that this interesting monograph, representing painstaking and diligent research, will represent another useful stepping stone in the development of practical policy models based on the SAM approach" – from the Foreword by Jeffrey Round.

## New Publications of the WPIOX Series in 2009

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**WPIOX09-004 Ling Yang and Michael L. Lahr**
Sources of Chinese Labor Productivity Growth: A Structural Decomposition Analysis, 1987-2005: Abstract | PDF

**WPIOX09-003 Michael Sonis and Geoffrey J.D. Hewings**
Coefficient Change and Innovation Spread in Input-Output Models: Abstract | PDF

**WPIOX09-002 Theodore Mariolis and George Soklis**
Additive Labour Values and Prices of Production: Evidence from the Supply and Use Tables of the German and Greek Economy: Abstract | PDF

**WPIOX09-001 Rosa Duarte Pac, Mónica Flores García and Julio Sánchez Chóliz**
Comparison and Components of Backward Linkages in a Social Accounting Matrix: Abstract | PDF

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