Newsletter

International Input-Output Association (IIOA)

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Tales from the I-O world

Construction of supply and use table for Tajikistan

During the last decade increasing attention has been paid to the further development and improvement of the national accounts in Tajikistan. In particular, interest from statistical, academic and development communities focused on the development of the use and supply tables. Subsequently attention to social accounting matrices followed. Availability of quantitative statistical evidence of the appropriate quality, structure and depth inevitably was required for the effective formation of new macroeconomic policies. Local experts supported by international consultants provided macroeconomic policymaking support on a number of programs for the Tajik government. All were waiting impatiently for reliable data. The local academic community clearly articulated similar requests, e.g., during scientific meetings, such as the 2012 Dushanbe Economics Meeting, that have been sponsored by state development partners.

There was at least one prior effort to construct social accounts for the Tajik economy. In 2005 Zavkidjon Zavkiev estimated a social accounting matrix for the year 2001. That table includes 27 commodity and activity accounts, 2 production factors, 3 institutional accounts, 12 tax accounts, a non-tax payments and subsidies account, a capital account and the rest of the world aggregate. Zavkiev estimated the social

accounting matrix using non-survey methods.

Some years later, after further calls by economists and researchers, the international community in Tajikistan has provided Statistical Agency of the Republic of Tajikistan with requested technical advice. Several programs were set up for further training on how to expand the supply and use tables to obtain a full-fledged social accounting matrix. The goal was to use it as a basis for economic and social policy analysis and planning. In parallel, a program was developed to generate pilot input-output tables for 2008 and 2010. Plans were also made to elaborate more-detailed internal guidelines for the construction of the social accounting matrices of the Tajik economy. The guidelines went far beyond a description of how to construct social accounting matrices. They addressed the overall data framework needed for their construction. In addition the precise structure, level of detail and sector/commodity classifications were proposed. They took into the account the structure of the Tajik economy while enabling comparability of the data with the key world-wide collections of SUT's.

An iterative approach was employed for the compilation of the pilot supply and use tables. Of course, the availability and quality of the data needed for the GDP calculations first had to analysed from both output and expenditure aspects. In this vein, existing data sources were assessed in their original level of aggregation. They subsequently were adjusted to correspond to the industries and products classifications ISIC/CPA. On the basis of data availability, sector/product-specific detail of the accounts was proposed at the two-digit level. Thus, the pilot version SUT's were constructed with 34 sectors according to ISIC/NACE classifications.

The supply matrix is available in industry (ISIC/NACE)

and product (CPC/CPA) classifications and valued in basic prices. It includes data on the production of manufacture industries, agriculture, construction, transport, trade and financial units. All data were obtained from available statistical reports. Additional sources such as state budget data reports were used to calculate the output of general government operations as well as of nonprofit organisations. Recently the industry classification OKED, which is based on the ISIC rev.1, was introduced, and data were made available two-digit level. Note that much sector-specific data on secondary

production might not be included. Thus any attempt to construct the SUTs from these data necessarily relies on rather strong assumptions, e.g., each sector produces only one product, since no statistical evidence on the output structure is yet available. Output of the banking sector, usually measured as FISIM, is calculated by the Statistical Agency as the difference between interest payments received and paid. The source data are made available through reports submitted by commercial banks. The agency was advised to expand the current stage of data collection to include additional information, particularly that on secondary products, the structure of subsidies to enterprises and improvements to the calculations of FISIM according to SNA2008.

Data on the intermediate consumption are generally readily available through various statistical reports produced by respective departments of the Statistical Agency. Final adjustments ensuring consistency across accounts are typically handled by the national accounts department. Data are available in the industry classification OKED, which is considered consistent with international classification ISIC rev.1. The level of detail on the intermediate output of products differs, however, since establishments do not report an official product classification. Household consumption is reported using the so-called national concept. This considers private consumption of Tajik households that live abroad. Data on household consumption account for subsistence production as well as in-kind transfers. Data are available with detail on up to 300 products obtained from the household budget survey (COICOP).

Government expenditures are derived from the sector's total output. Data on gross fixed capital formation are typically scarce in Tajikistan. Indeed, only data on the stock of fixed assets in purchased prices are available. Of course, adjustments of the underlying surveys are proposed.

Data on imports and exports of goods and services are usually measured in cif and fob prices respectively. They are provided by the national bank after having done several adjustments to the foreign trade statistics and balance-of-payments data. They provide detailed coverage on up to 34 products. Since data on household consumption follow the national concept, imports also contain consumption data on households living abroad. In a similar vein, exports contain the consumption of foreign households residing in Tajikistan.

Tajik national accounts recognise government revenues from the value added tax, the excise tax, taxes on imports, the turnover tax, the turnover tax on trade, taxes on production of manufactured products and other taxes on products. In terms of subsidies, all subsidies paid by the government to enterprises are treated as subsidies on products. Nevertheless the available data do not include tax revenues or subsidies paid at this level of industry detail. In a similar vein, no information is available on retail and wholesale

trade margins as trade statistics do not include any data on purchases of goods for resale. In terms of value added, data on compensation of employees and other taxes on production are regularly collected and available for key economic sectors. For the purpose of the pilot SUT's accounts, both other subsidies on production and the consumption of fixed capital were not considered.

To conclude we highlight that the work on the pilot SUT's of the Tajik economy is evolving in a positive direction. However, the continued strong support of the international community is needed by specialists in the Statistical Agency as well as by the Tajik academic community to complete this enormous task.

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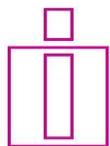
Published papers and books in IOA and related methods

In the next ESR issue

Economic Systems Research

Journal of the IIOA

Volume 26, Issue 1 (March 2014)
http://www.tandf.co.uk/journals/titles/09535314.asp

DISASTER IMPACT AND INPUT–OUTPUT ANALYSIS. YASUHIDE OKUYAMA and JOOST R. SANTOS

Macroeconomics models, such as the input–output model, the social accounting matrix, and the computable general equilibrium model, have been used for impact analysis of catastrophic disasters for some time. While the use of such models to disaster situation, which may quite differ from the ordinary economic setting, has been critiqued (for recent example, see Albala-Bertrand, 2013), there are still valuable reasons for the use of such models. In particular, such models can be used in order to quickly provide a ballpark estimate of the system-wide impact for recovery plan and finance and/or to evaluate disaster countermeasures in the pre-event period. This paper presents how these methodologies have evolved to incorporate with disaster-specific feature and discusses how far they still need to go from the current stage. This paper also serves as a preface to this special issue, which encompasses several papers devoted to the use of macroeconomic data and models to assess economic losses from disasters.
Keywords: Disaster impacts; Input–output analysis

ESTIMATION OF PRODUCTION CAPACITY LOSS RATE AFTER THE GREAT EAST JAPAN EARTHQUAKE AND TSUNAMI IN 2011. YOSHIO KAJITANI and HIROKAZU TATANO

This research aims to investigate a method for estimating the production capacity loss rate (PCLR) of industrial sectors damaged by a disaster, such as an earthquake, tsunami, or nuclear radiation, particularly the 2011 Great East Japan Earthquake. PCLR is fundamental information required to gain an understanding of economic losses caused by a disaster. In particular, this paper proposes a method of PCLR estimation that considers the two main causes of capacity losses as observed from past earthquake disasters, namely damage to production facilities and disruption of lifeline systems. To achieve the quantitative estimation of PCLR, functional fragility curves considering the relationship between production capacity and earthquake ground motion and lifeline resilience factors for capturing the impact of lifeline disruptions have been adopted, while actual recovery curves are considered mainly for damaged facilities. Through the application of this method to the case study of the 2011 Great East Japan Earthquake, the PCLR in various industrial sectors is estimated; the estimated PCLR in the manufacturing sectors are then compared to the corresponding index of industrial production. The results demonstrate that the estimated values are close to the actual production indices in the overall manufacturing sector and many of the individual sectors.

Keywords: Great East Japan Earthquake; Production capacity; Economic impact; Industries

MODELLING CRITICAL INFRASTRUCTURE FAILURE WITH A RESILIENCE INOPERABILITY INPUT–OUTPUT MODEL. OLAF JONKEREN and GEORGIOS GIANNOPOULOS

Over the past few years much effort has been made in modelling economic losses resulting from critical infrastructure failure. It has appeared that including resilience measures in the modelling approach, which may mute the losses considerably, is a challenging task. At the same time it is necessary because it prevents the modeller from generating overestimates. This study presents two directions to improve the modelling of (economic) resilience for which the state-of-the art with respect to dynamic inoperability input–output modelling is taken as a starting point. Firstly, the new model allows for a different recovery path than the traditionally assumed 'concave up decreasing curve' that describes for a disrupted infrastructure or economic sector in the aftermath of a disaster. In this paper, we explain how the recovery path may depend on the type of disaster. Secondly, the model refines the aspect of 'inventory' as a resilience measure. Inventory is interpreted in a broad sense here: it can be any resilience measures which enable an infrastructure or economic sector to continue its supply despite being disrupted. The model is applied to both a simple two-sector illustrative example and a severe winter storm scenario in Europe using economic data from the World Input–Output Database to show its practical usefulness.

Keywords: Inoperability input–output model; Economic resilience; Critical infrastructure; Recovery; Inventory

TIME-VARYING DISASTER RECOVERY MODEL FOR INTERDEPENDENT ECONOMIC SYSTEMS USING HYBRID INPUT–OUTPUT AND EVENT TREE ANALYSIS. JOOST R. SANTOS, KRISTA DANIELLE S.YU, SHEREE ANN T. PAGSUYOIN and RAYMOND R. TAN

Disasters damage physical infrastructure systems, disrupt the movement of people and commodities, and cause significant economic losses. This paper develops an I–O model extension using an event tree analysis to assess the propagation of disaster effects across interdependent economic sectors using the inoperability and economic loss metrics. Inoperability, a dimensionless index that ranges between 0 and 1, indicates the extent to which a sector's production deviates below its normal state. On the other hand, economic loss is the monetary worth of the drop in output incurred in each sector of the economy due to the disaster. The new dynamic I–O extension is capable of adjusting the inoperability parameters within the disaster timeline to reflect events that can either degrade or enhance the predicted paths of sector recovery. It was implemented to the Nashville region – a metropolitan area in the USA known for its vibrant music and the tourism industry. The Nashville region is frequently hit by natural disasters such as tornadoes and floods, which makes it a suitable case study site for the model application. Results of the study help to identify critical economic sectors and ultimately provide insights for formulating preparedness decisions to expedite disaster recovery.

Keywords: Inoperability; Input–output modeling; Event trees; Disasters

A VULNERABILITY INDEX FOR POST-DISASTER KEY SECTOR PRIORITIZATION. KRISTA DANIELLE S.YU, RAYMOND R. TAN, KATHLEEN B. AVISO, MICHAEL ANGELO B. PROMENTILLA and JOOST R. SANTOS

Input–output-based techniques have proven to be effective in modeling how disasters lead to economic disruptions, while taking into account the structural connectivity of economic systems. In particular, through the inoperability input–output model (IIM), the degree of failure in an economic system can be quantified on a scale from 0 (normal state) to 1 (complete failure). This paper develops a vulnerability index that builds upon the foundations of the Leontief input–output model and the IIM, which is capable of identifying and prioritizing the key sectors in the aftermath of disasters. The key sector prioritization framework proposed in this paper is expected to contribute to the domain of disaster preparedness planning, such as enhancing the efficiency of resource allocation across various sectors. The proposed vulnerability index is formulated in terms of three underlying components: (1) economic impact, (2) propagation length, and (3) sector size. The vulnerability index captures the impact of investments to various sectors in times of disaster in order to yield the maximum benefits to the entire economy. This paper considers a baseline scenario that assumes that the decision-maker has an equal preference for all index components. Using Monte Carlo simulation and sensitivity analysis, we investigated the extent to which the key sector rankings could fluctuate with respect to variations in the decision-maker preferences. Key sectors tend to be sensitive to the weight assignments across the three vulnerability index components; nevertheless, some sectors are less sensitive to such weight variations and may persist on their level of priority, independent of the scenario. Using the Philippine input–output data, we found that the private services sector is consistently a high-priority sector, the trade sector is a mid-priority sector while the real estate and ownership of dwellings sector tend to be a low-priority sector.

DISASTER AND ECONOMIC STRUCTURAL CHANGE: CASE STUDY ON THE 1995 KOBE EARTHQUAKE. YASUHIDE OKUYAMA

In 1995, the Kobe Earthquake occurred in the second largest economic region of Japan, and its economic damages were accounted around 10 trillion yen. A catastrophic event of this magnitude would have surely created some long-run effects to the regional economy as well as to the surrounding regions. Additionally, the recovery and reconstruction activities would have affected the economic structure of the region and interdependence between regions in a potentially different way from the original growth trend before the event. While these long-run economic effects may have become sizable, few studies have been conducted to empirically measure or evaluate such effects, due to the significant noises in economic data muddled with macroeconomic influences from the outside. This paper presents an empirical investigation of long-run economic effects of the Kobe Earthquake, using structural decomposition methods. The results indicate significant changes in economic structure of the Kobe economy, and the changes are quite different across sectors and among factors. An additional investigation using shift-share analysis yielded the regional-specific changes; the corresponding decomposed factors of structural analysis with shift-share results appear complicated, and changes in regional final demand were found to be most influential to the changes in output for many sectors.

Keywords: Disaster; Structural decomposition analysis; Regional input–output table; Long-run impact

Highlights in journals

BOUWMEESTER M.C. and J. OOSTERHAVEN (2013) SPECIFICATION AND AGGREGATION ERRORS IN ENVIRONMENTALLY EXTENDED INPUT–OUTPUT MODELS, ENVIRONMENTAL AND RESOURCE ECONOMICS, 56(3):307-335.

This article considers the specification and aggregation errors that arise from estimating embodied CO2 emissions and embodied water use with environmentally extended national input–output (IO) models, instead of with an environmentally extended international IO model. Model specification errors result from the use of domestic environmental and domestic technology coefficients to estimate emissions or resources that are embodied in international trade. For CO2 footprints, unacceptably large overestimations arise from using domestic emission coefficients, which are only partly canceled out by using domestic technology coefficients. For water use footprints both specification errors are smaller, but hardly cancel out. Sectoral aggregation errors occur when combining the 129 EXIOPOL industries to 59 EU industries and 10 broad sectors. The latter aggregation creates the largest errors. Spatial aggregation errors arise from combining 43 individual EXIOPOL countries in four broad regions and "the rest of the world". Substantial, unacceptable errors occur again, now especially in relation to water use.

LÓPEZ, L.A., ARCE G. and ZAFRILLA J. (2014) FINANCIAL CRISIS, VIRTUAL CARBON IN GLOBAL VALUE CHAINS, AND THE IMPORTANCE OF LINKAGE EFFECTS. THE SPAIN-CHINA CASE. ENVIRONMENTAL SCIENCE AND TECHNOLOGY 48:36-44

Trade has a disproportionate environmental impact, while the international fragmentation of production promotes different patterns of intermediate inputs and final goods. Therefore, we split up the balance of domestic embodied emissions in trade (BDEET) to assess it. We find that Spain has a significant emissions deficit with China between 2005 and 2011. The Global Financial Crisis of 2008 reduced Spanish imports of pollution-intensive inputs from China and slightly improved the BDEET. China primarily exports indirect virtual carbon, representing 86% of the total, especially from Production of electricity, gas, and water sector. These linkages effects in China indicate that post-Kyoto agreements must focus not only on traded goods but also on the environmental efficiency of all domestic production chains. The methodology proposed allows us to identify the agents responsible for this trade in both Spain and China, namely the sectors importing intermediate inputs (Construction and Transport equipment) and industries and consumers importing final goods (Textiles, Other manufactures, Computers, and Machinery). The relevant sectors uncertainties found when we compare the results for BDEET and emissions embodied in bilateral trade (BEET) lead us to recommend the former methodology to evaluate the implications of environmental and energy policy for different industries and agents.

ARTO I. ROCA J. AND SERRANO M. (2014) MEASURING EMISSIONS AVOIDED BY INTERNATIONAL TRADE: ACCOUNTING FOR PRICE DIFFERENCES", ECOLOGICAL ECONOMICS, VOL. 97:93–100

Net Emissions Avoided by trade (NEA) are the difference between the pollution that would have been produced in a country if it had not exported any products and all the imports required to satisfy its domestic demand had been produced internally, and its actual emissions. The Domestic Technology Assumption (DTA) applied to an Input–Output model is the appropriate method to estimate the NEA. The usual implementation of the DTA involves that the country analyzed should produce a quantity of products equivalent to the monetary value of the imports required to satisfy its final demand (i.e. 'monetary DTA'). However, due to price differences, the same physical quantity of goods in different countries could have a different monetary value and the estimation of the NEA would be biased. We show that a 'physical DTA', focused on the pollution to produce domestically the imports measured in physical units, would be a better approach. We have applied both methodologies to analyze greenhouse gas emissions in Spain 1995–2007. Both methodologies show that Spain is avoiding emissions through trade. However, the NEA increases up to three times when applying the 'physical DTA', showing that results from the 'monetary DTA' are biased by price differences.

LENZEN M, MORAN D, BHADURI A, KANEMOTO K, BEKCHANOV M, GESCHKE A AND FORAN B (2013) INTERNATIONAL TRADE OF SCARCE WATER, ECOLOGICAL ECONOMICS 94:78-85

Recent analyses of the evolution and structure of trade in virtual water (VW) revealed that the number of trade connections and volume of VW trade have more than doubled over the past two decades, and that developed countries increasingly import water embodied in goods from the RoW to alleviate pressure on domestic resources. At the same time, as demand continues to increase and climate change threatens to alter hydrological cycles, water scarcity is a growing problem. Does research into VW trade need to consider water scarcity and differentiate flows out of water-scarce regions from flows out of water-abundant regions? Previous studies sum and compare VW originating in countries experiencing vastly different degrees of scarcity. We therefore incorporate scarcity into an assessment of global VW flows. We use I-O to include indirect VW flows.

We find that the structure of global VW networks changes significantly after adjusting for scarcity.
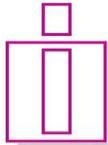
BARRETT J, PETERS G, WIEDMANN T, ROELICH K, LENZEN M, SCOTT K, LEQUERE C (2013) CONSUMPTION-BASED GHG EMISSION ACCOUNTING IN CLIMATE POLICY: A UK CASE STUDY, CLIMATE POLICY 13(4):451-470

Global GHG emissions continue to rise, with nearly a quarter of it due to trade that is not currently captured within global climate policy. In the context of current trade patterns and limited global cooperation on climate change, the feasibility of consumption-based emissions accounting to contribute to a more comprehensive (national) policy framework in the UK is investigated. Consumption-based emissions results for the UK from a range of models are presented, their technical robustness is assessed, and their potential application in national climate policy is examined using examples of policies designed to reduce carbon leakage and to address high levels of consumption. It is shown that there is a need to include consumption-based emissions as a complementary indicator to the current approach of measuring territorial emissions. Methods are shown to be robust enough to measure progress on climate change and develop and inform mitigation policy. Finally, some suggestions are made for future policy-oriented research in the area of consumption-based accounting that will facilitate its application to policy.

MORAN D, LENZEN M, KANEMOTO K, GESCHKE A (2013) DOES ECOLOGICALLY UNEQUAL EXCHANGE OCCUR? ECOLOGICAL ECONOMICS 89:77-186

The hypothesis of ecologically unequal exchange posits that low and middle income developing nations maintain an ecological deficit with wealthy developed nations, exporting natural resources and high impact commodities thereby allowing wealthy economies to avoid operating ecologically impactful industries at home. In this survey we assess the footprint of consumption of 187 countries using eight indicators of environmental pressure in order to determine whether or not this phenomenon occurs. We use input–output analysis with a new high resolution global Multi-Region Input–Output table to calculate each trading pair's balance of trade in biophysical terms of: GHG emissions, embodied water, and scarcity-weighted water content, air pollution, threatened species, Human Appropriated Net Primary Productivity, total material flow, and ecological footprint. We test three hypotheses that should be true if ecologically unequal exchange occurs. One: The inter-regional balance of trade in biophysical terms is disproportional to the balance of trade in financial terms. We find this is true, though not strongly so. Two: Exports from developing nations are more ecologically intensive than those from developed nations. We find this is true. Three: High income nations disproportionately exert ecological impacts in lower income nations. We find this is false: high income nations are mostly exporters, not importers, of biophysical resources

LENZEN M, SCHAEFFER R, KARSTENSEN J AND PETERS G (2013) DRIVERS OF BRAZIL'S CO2 EMISSIONS, CLIMATIC CHANGE 121(4):815-824

Brazil's economic development has been underpinned by a diverse and – in a global comparison – unusual set of energy carriers, notably hydroelectricity and ethanol from sugar cane. Its energy mix makes Brazil one of the least energy-related carbon-intensive economies worldwide. Given that the country is fast becoming one of the world's economic powerhouses, decision-makers need to understand the drivers underlying past and current carbon dioxide emissions trends. We therefore investigate a) which key long-term drivers have led to Brazil's unique emissions profile, and b) the implications of these drivers for Brazil's national policies. We show that Brazil's emissions are growing mainly due to increasing individual standards of living, exports and population size, and that this growth is so far unchallenged by technological and structural improvements toward lower emissions intensities and more efficient production structures. As these trends are likely to continue amidst growing international pressure on key economies to reduce their carbon emissions, a decoupling of drivers from emissions is needed to simultaneously meet development and environmental goals.

WIEDENHOFER D, LENZEN M AND STEINHOFER J K (2013) ENERGY REQUIREMENTS OF CONSUMPTION: URBAN FORM, CLIMATIC AND SOCIO-ECONOMIC FACTORS, REBOUNDS AND THEIR POLICY IMPLICATIONS, ENERGY POLICY 63:696-707

Household consumption requires energy to be used at all stages of the economic process, thereby directly and indirectly leading to environmental impacts across the entire production chain. The levels, structure and determinants of energy requirements of household consumption therefore constitute an important avenue of research. Incorporating the full upstream requirements into the analysis helps to avoid simplistic conclusions which would actually only imply shifts between consumption categories without taking the economy wide effects into account. This paper presents the investigation of the direct and indirect primary energy requirements of Australian households, contrasting urban, suburban and rural consumption patterns as well as inter- and intra-regional levels of inequality in energy requirements. Furthermore the spatial and socio-economic drivers of energy consumption for different categories of energy requirements are identified and quantified. Conclusions regarding the relationships between energy requirements, household characteristics, urban form and urbanization processes are drawn and the respective policy implications are explored.

Highlights in Books

INPUT-OUTPUT ANALYSIS AND CONTEMPORARY ECONOMICS. EZRA DAVAR. LAMBERT ACADEMIC PUBLISHING 2013

This book shows that one of the main reasons why input-output analysis is not usable for solving meaningful economic problems is the dissonance between theoretical and empirical accounts of input-output analysis and real life economic activities. And this, despite the fact that many countries have been compiling empirical input-output tables. The author expounds the flaws of existing input-output models, and demonstrates the inadequate results yielded by their practical applications. He covers various topics of input-output analysis with the overall goal of bringing theoretical and empirical accounts of input-output analysis closer to the needs of real life and economic reality. The author puts forward new versions of input-output models reflecting the needs of today economics and how this can be addressed by: (1) the reformulating their theoretical basis by introducing separate categories: money, land, saving; and (2) Extending empirical input-output and considering it in detail. The suggested models should be useful for both theoreticians and those who empirically implement input-output analysis.

ECONOMÍA ECOLÓGICA Y POLÍTICA AMBIENTAL, FONDO DE CULTURA ECONÓMICA. JOAN MARTINEZ ALIER Y JORDI ROCA JUSMET. 3RD EDITION. **MEXICO,** 2013.

The first edition of this book appeared in 2000 and the second edition in 2001; after that, it was reprinted several times. The book has had a great diffusion both in Spain and Latin America. It analyses several theoretical perspectives on the relationship between nature and economic systems, different experiences of environmental policies and several cases of environmental conflicts. It has been used as the reference textbook in ecological economics and environmental and resource economics courses both for economics and environmental sciences students. This 2013 edition (640 pages) updates the previous editions and incorporates new sections.
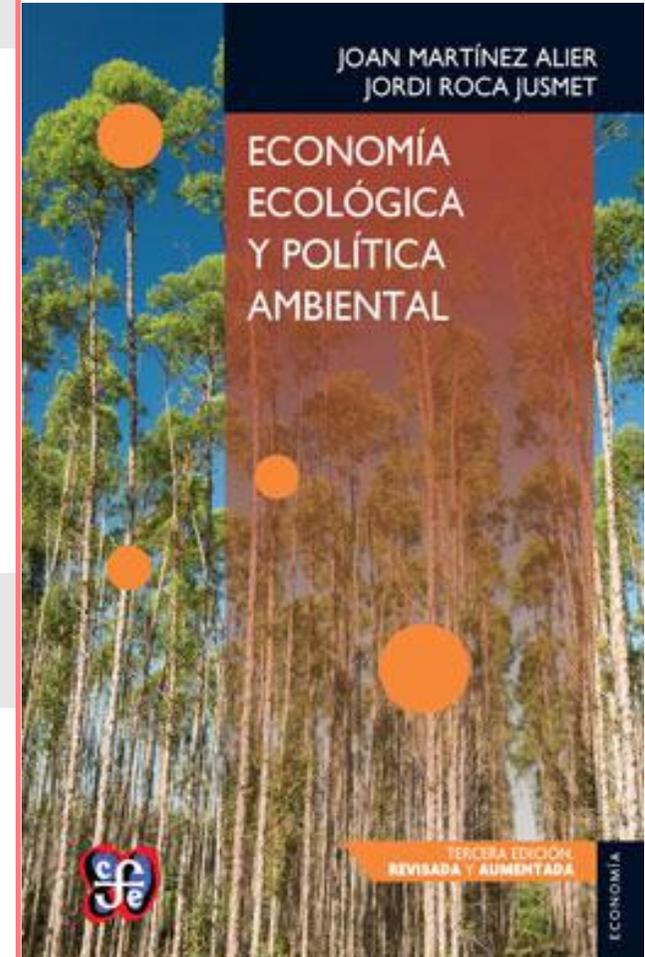
In memoriam

Lawrence Robert Klein (1920-2013)

Some of the greatest figures of science and culture have so many significant features that make their classification difficult with the usual archetypes. That is the case of Lawrence Robert Klein. He was a theoretical and practical economist, leader of modern econometrics and a pioneer of input-output analysis. At the same time, he was passionate for mathematics; economic cycles; the connections between economy, policy and society; the complex field of international relationships ... and a true visionary of the future.

A brief overview of his career as professor, researcher and a man committed to society, is essential to understanding his complex personality.

The young Klein of the 1940s, during World War II and after the years of economic crisis following the Great Crash of 1929, joined the Communist Party for a few years, completed his studies in mathematics (Los Angeles City College) and economics (University of California at Berkeley) before working towards completing his doctoral thesis on Keynesian economics at MIT (1947), under the direction of Paul A. Samuelson.

Although he wrote several papers on theoretical economics, his post-doctoral years opened new horizons when he joined the Cowles Commission—a team of econometricians at the University of Chicago directed by Jacob Marschak. Before joining the National Bureau of Economic Research in Cambridge (MA, US) in 1948, Professor Klein came into contact with some of the most important precursors of macro-econometrics of the time, both in the US and Europe (Jan Tinbergen, Ragnar Frisch and Richard Stone).

Although his approach was initially Keynesian, Klein was open-minded to other theoretical

Lawrence R. Klein (right) with Antonio Pulido (left) on a visit of the first to the L.R. Klein Institute in Madrid (Spain)

developments. In particular, early in the 1950s Prof. Klein argued the need to complement Keynesian models of determination of final demand and income with input-output-based interindustry models "for a complete synthesis of supply and demand in the economy as a whole." His association with input-output analysis was a constant throughout the wide range of methodologies he used for analysis and forecasting.

After 1958, he taught at the University of Pennsylvania Wharton School. His worldwide international profile was not only due to his intellectual leadership, but also by means of his involvement and personal support of multiple initiatives in many countries.

In 1960 Klein founded Wharton Econometric Forecasting Associates Inc. (WEFA), which was initially funded by his university. WEFA expanded to include various models to enable sector or macroeconomic forecasts. WEFA grew to have several hundred researchers in U.S. and multiple connections in other countries. Nowadays, WEFA is now part of the "Country and Industry Forecasting" group of Global Insight, Inc.

His vocation for a global view of the economy led him to found and lead the so-called Link Project in 1968. Link was a network of teams across a large number of countries that was sponsored by the United Nations.

When Prof. Klein received the Nobel Prize for Economic Sciences in 1980, he highly remarked upon the diversity of economies in the Link network, that included "modeling the centrally planned economics of the world (especially the USSR) and introducing modern econometrics into the People's Republic of China".

In a single page it is not possible to cover the immense breadth of work Prof. Klein undertook in economic theory, econometric methods, forecasting models and other multiple issues such as index numbers, sample surveys, National Accounts, measuring cycles and economic policy. But it would be unfair to evaluate a figure of Lawrence Klein dimension only for his broad and deep research work and worldwide leadership. While Professor Emeritus at the University of Pennsylvania, we can also find a few examples of his diverse involvement in institutions such

as Economists against the Arms Race, Human Rights Committee of the National Academy of Sciences and the American Philosophical Society. His work has been widely recognized through numerous awards and distinctions. But most important, he has left an indelible stamp on a half century of students and thousands of collaborators who have always been fortunate to have his support, advice and mentorship.

Permit me now to borrow from my speech on the occasion of his appointment as Doctor Honoris Causa by the Autonomous University of Madrid (1981), the excellence of Professor Klein resides "in his many scientific contributions, his effective and deep dedication to the University and his valuable messages as a man, as a teacher and as a researcher."

Prof. Antonio Pulido
Dir. L.R. Klein Institute
Autonomous University
of Madrid

Upcoming conferences

17th Annual Conference on Global Economic Analysis "New Challenges in Food Policy, Trade and Economic Vulnerability" June 18-20, 2014. Dakar (Senegal)

Organized by GTAP Center and AGRODEP, facilitated by IFPRI, the goal of the conference is to promote the exchange of ideas among economists conducting quantitative analysis of global economic issues. Particular emphasis will be placed on applied general equilibrium methods, data, and applications. Related theoretical and applied work is welcome.

The overall theme of the conference is "New Challenges in Food Policy, Trade and Economic Vulnerability" with sub-themes on: International Trade and Food Security; International Trade and Finance; Foreign Direct Investment in Land and Land Markets; The Impact of Demographic Transition and Population Aging on World Economy; Trade, Environment, Natural Resources, and Sustainable Development; The Impact of the Internet and New Technological Innovations on Global Trade; The Interaction between Global Trade, Poverty, Income Distribution, Inequality, and Development: The integration of Africa into the World Trade System; The Potential for Africa to "Feed the World".

Abstracts and organized session proposals are currently being accepted on the GTAP website through January 15. A number of scholarships will be available for presenters currently residing in Africa. Scholarship recipients will be chosen based on and following the review of their submitted abstract. Please note that for the convenience of our abstract reviewers, we kindly ask that abstracts be submitted in English; however, if not possible, submissions will be accepted in French. Registrations will be accepted from early January through April 30.

The joint Socio-Economic Metabolism and Asia-Pacific Conference "Industrial Ecology in the Asia-Pacific Century: Interdisciplinary science for building sustainable industrial systems and human settlements" 17 - 19 November, 2014. Melbourne (Australia)

Please submit abstracts for either oral or poster presentation by 15 February 2014. All abstracts will be assessed by the scientific committee for the joint conference. Session topics are:

- Methodological and analytical advances in socio-economic metabolism research
- Material flows, waste and recycling management; Modelling of stock and flow relationships, scenario analysis
- Low carbon urban development and planning; Critical materials (energy carriers, water, metals, agricultural nutrients and biomass)

- Industrial ecology of mining and minerals; Linking socio-economic metabolism and climate change
- Trade and global material flows
- Environmental impacts and resource use embodied in trade
- Sustainable resource management
- Socio-economic metabolism and environmental policy
- Socio-economic metabolism and economic theory
- Environmentally Extended Input-Output analysis
- Life cycle analysis and integrated sustainability analysis
- Carbon, material and water footprints of consumption
- Green economy and decoupling
- Industrial symbiosis
- Eco-industrial development
- Sustainable design of products and services
- Sustainable consumption and production.

Upcoming courses

22ⁿᵈ Annual Short Course in Global Trade Analysis "Introduction to Applied General Equilibrium Analysis in a Multi-Region Framework" August 2-8, 2014. West Lafayette, Indiana, US

Organized and hosted by the GTAP Center at Purdue University, the objectives of this course are to introduce participants to a standardized framework for conducting global trade analysis in an applied general equilibrium setting, provide hands-on training with software that has been tailored to global trade analysis and give participants the opportunity to interact with economists working on global trade and resource use issues while becoming part of an international network. The course will consist of two parts:

Part I: Web-based Modules (May 19–July 20, 2014) By working through this material in advance participants will become familiar with the theory behind GTAP, the standard GTAP notation as well as the course software.

Part II: On-site intensive training (August 2-8, 2014) mix of daily lectures, lab assignments, and informal discussions to introduce participants to the basic features of the model and data base. These activities culminate in a major application based on a GTAP model extension undertaken by small groups and presented on the final day of the course. Each group is assigned two instructors who are intimately familiar with their project to act as resource persons. Participants leave with the capability of designing, conducting, and analysing simulations.

Applications for this course are currently being accepted on the GTAP website through February 16. Applications will be reviewed as they are submitted. Demand for this course is very high; therefore, we strongly encourage early application. Note that application not guarantee acceptance.

4ᵗʰ Annual Edition of the International School of Input-Output Analysis; July 14, 2014. Lisbon (Portugal)

Organized by the IIOA and hosted the UECE and the ISEG (University of Lisboa), the modules of this edition will be:

1. Applied General Equilibrium: Introduction. M. Alejandro Cardenete (Loyola University, Spain)
2. Environmental LCA. Sangwon Suh (University of California-Santa Barbara, US)
3. Material Flow Analysis. Stephan Lutter (SERI, Austria)
4. Disasters analysis (Yasuhide Okuyama, University of Kitakyushu, Japan)
5. Managing Uncertainty in Input-Output Analysis (Joao Rodrigues, Technical University of Lisbon)

For more info on applications: check conference website by the end of February.