Literature Report

张晨峰, 华东理工大学商学院

Abstract

THE LABOUR FOOTPRINT: A FRAMEWORK TO ASSESS LABOUR IN A COMPLEX ECONOMY

- Economic Systems Research---2015---Jorge Gómez-Paredes,Eiji Yamasue,Hideyuki Okumura,Keiichi N. Ishihara

As addressing labour becomes crucial in the move towards sustainability, there is the need for assessment tools suitable for current complex economic systems. This article presents an input--output based framework (‘labour footprint’) for evaluating labour issues behind the production of different economic commodities, including entire supply chains. In line with the guidelines of the International Labour Organization, six labour issues are considered: collective bargaining, forced labour, child labour, gender inequality, hazardous work, and social security. This conceptual article sets to (a) define this footprint's labour dimensions, (b) cite relevant data sources, (c) describe its calculation, (d) illustrate its application through a case study, and (e) discuss this framework's relevance from ‘conscious consumption’, ‘supply chain responsibility’, and regulators' standpoints. Since it advances the evaluation of fundamental labour issues and the scope of multi-criteria analyses, this footprint may be a valuable tool for sustainability assessments.

A METHOD TO CREATE CARBON FOOTPRINT ESTIMATES CONSISTENT WITH NATIONAL ACCOUNTS

- Economic Systems Research---2015---Bram Edens,Rutger Hoekstra,Daan Zult,Oscar Lemmers,Harry Wilting,Ronghao Wu

Although multiregional input--output (MRIO) databases use data from national statistical offices, the reconciliation of various data sources results in significantly altered country data. This makes it problematic to use MRIO-based footprints for national policy-making. This paper develops a potential solution using the Netherlands as case study. The method ensures that the footprint is derived from an MRIO dataset (in our case the World Input--Output Database (WIOD)) that is made consistent with Dutch National accounts data. Furthermore, usage of microdata allows us to separate re-exports at the company level. The adjustment results in a foreign footprint in 2009 that is 22% lower than the original WIOD estimates and a significantly altered country allocation. We demonstrate that already in the data preparation phase due to the treatment of re-exports and margins, large differences arise with Dutch national statistics, which may help explain the variation in footprint estimates across MRIO databases.

CARBON EMISSION ACCOUNTING IN MRIO MODELS: THE TERRITORY VS. THE RESIDENCE PRINCIPLE

- Economic Systems Research---2015---Arkaitz Usubiaga,José Acosta-Fernández

Consumption-based CO 2 emissions, which are commonly calculated by means of environmentally extended input--output analysis, are gaining wider recognition as a way to complement territorial emission inventories. Although their use has increased significantly in the last years, insufficient attention has been paid to the methodological soundness of the underlying environmental extension. This should follow the internationally agreed accounting rules of the System of Environmental-Economic Accounting, which addresses the activities undertaken by the residents of a country , independent from where these take place. Nonetheless, some footprint calculations use extensions that account for all the activities within the territory , which leads to methodological inconsistencies. Thus, this article introduces the most relevant conceptual differences between these accounting frameworks and shows the magnitude of the gap between them building on the data generated for the EXIOBASE model. It concludes that the differences are high for many countries and their magnitude is increasing over time.

REFLECTIONS ON THE INOPERABILITY INPUT--OUTPUT MODEL

- Economic Systems Research---2015---Erik Dietzenbacher,Ronald E. Miller

We argue that the inoperability input--output model is a straightforward -- albeit potentially very relevant -- application of the standard input--output model. In addition, we propose two less standard input--output approaches as alternatives to take into consideration when analyzing the effects of disasters or disruptions.

CONSTRUCTION OF MULTI-REGIONAL INPUT--OUTPUT TABLES USING THE CHARM METHOD

- Economic Systems Research---2015---Johannes Többen,Tobias Kronenberg

Subnational multi-regional input--output tables (IOT) are important tools for studying interregional socio-economic and/or environmental interrelations that help to address a wide range of current societal, ecological and economic challenges. However, the lack of subnational input--output data is a major obstacle which leads to a wide use of non-survey methods. Like other non-survey methods, the cross-hauling adjusted regionalization method (CHARM) was originally developed for the construction of single-regional IOT. In this paper, we extend CHARM to the case of bi- and multi-regional IOT. We find that the original CHARM formula has two limitations that are also of great importance for the single-regional case: First, cross-hauling in interregional trade is implicitly set to zero and, second, accounting balances may be violated owing to structural differences between the regional and national economies. We present a modified formula addressing these issues and examine its performance in terms of a case study.

EMPIRICAL ESTIMATION OF NON-LINEAR INPUT--OUTPUT MODELS: AN ENTROPY ECONOMETRICS APPROACH

- Economic Systems Research---2015---Esteban Fernandez-Vazquez,Esteban Fernández Vázquez

Despite theoretical advances, non-linear input--output models have been empirically applied only to a limited extent. This is mainly due to the fact that the number of parameters to be estimated is much higher than the number of available data points. Taking advantage of the recent proliferation of input--output databases and by applying an estimation strategy that relies on entropy econometrics, this paper suggests a way to estimate the parameters that characterize non-linear relationships between inputs and output. This non-linear modelling allows for considering time-specific

input coefficients, instead of fixed ones. Several types of multipliers can be derived from this non-linear model, and the proposed generalized maximum entropy (GME) estimator allows estimating them from time series or cross-sectional datasets of input--output tables. The proposed GME technique is illustrated by means of an empirical application that estimates the parameters that characterize a non-linear input--output model for the Spanish economy over the period 1995--2011.

ON THE ACCURACY OF CGE FORECASTS IN EXPANSION AND RECESSION: SPAIN 1990--1997

- Economic Systems Research---2015---Clemente Polo,Raimundo Viejo

A recursive dynamic disaggregated computable general equilibrium model of the Spanish economy is used to compare the model predictions of endogenous variables with their observed values over the period 1991--1997. It includes 12 producers, 12 households, government and 2 external sectors. There are four types of labour and real wages that depend on unemployment rates. Private investment is determined by private savings and public and external surpluses. Domestic products and imports are imperfect substitutes. All exogenous variables and tax parameters are updated every year with the best available information. The model provides rather accurate predictions in 1991, a normal year, but it underestimates the intensity of the 1992--1993 recession. It also predicts dramatic reversals of trade balances in response to devaluations. These results suggest both that investment savings-driven models provide useful insights in the medium term but underestimate the consequences of downturns, and that Armington's elascitities typically assumed may be too large.

Updating Input-Output Tables with Benchmark Table Series

- Economic Systems Research---2015---Huiwen Wang,Cheng Wang,Haitao Zheng,Haoyun Feng,Rong Guan,Wen Long

Numerous methods have been proposed to update input-output (I-O) tables. They rely on the assumption that the economic structure will not change significantly during the interpolation period. However, this assumption may not always hold, particularly for countries experiencing rapid development. This study attempts to combine forecasting with a matrix transformation technique (MTT) to provide a new perspective on updating I-O tables. Under the assumption that changes in the trend of an economic structure are statistically significant, the method extrapolates I-O tables by combining time series models with an MTT and proceeds with only the total value added during the target years. A simulation study and empirical analysis are conducted to compare the forecasting performance of the MTT to the Generalized RAS (GRAS) and Kuroda methods. The results show that the comprehensive performance of the MTT is better than the performance of the GRAS and Kuroda methods, as measured by the Standardized Total Percentage Error, Theil's U and Mean Absolute Percentage Error indices.

Global Impacts of the Automotive Supply Chain Disruption Following the Japanese Earthquake of 2011

- Economic Systems Research---2015---Iñaki Arto,Valeria Andreoni,Jose Manuel Rueda Cantuche,José Manuel Rueda-Cantuche

This paper provides an input-output method to estimate worldwide economic impacts generated by supply chain disruptions. The method is used to analyse global economic effects due to the disruptions in the automotive industry that followed the Japanese earthquake and the consequent tsunami and nuclear crisis of March 2011. By combining a mixed multi-regional input-output model, the World Input-Output Database and data at the factory level, the study quantifies the economic impacts of the disruptions broken down by country and industry. The results show that the global economic effect (in terms of value added) of this disruption amounted to US$139 billion. The most affected (groups of) countries were Japan (39%), the USA (25%), China (8%) and the European Union (7%). The most strongly affected industries were transport equipment

(37%), other business activities (10%), basic and fabricated metals (8%), wholesale trade (7%) and financial intermediation (4%).

An Income Tax Increase to Fund Higher Education: A CGE Analysis for Chile

- Economic Systems Research---2015---Cristian Mardones

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

Adjustment of Input-Output Tables from Two Initial Matrices

- Economic Systems Research---2015---Esteban Fernández Vázquez,Geoffrey Hewings,Carmen Ramos Carvajal

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

A Test for a Functioning Market Economy: Seton'S Eigenprices of Turkey

- Economic Systems Research---2015---Nazmi Demir,Mehmet Nihat Solakoglu,Ebru Guven Solakoglu

We use Seton's eigenprices to see if some evidence can be found in support of the European Commission's official statement that the Turkish economy can be considered as a functioning market economy. Given an input-output flows matrix, there is a unique set of prices for outputs and production factors compatible with final demand, generating demand for factors. The findings based on Turkey's most recent I-O table and comparable I-O matrices for Romania and Poland (two EU members) in 2005 show that price distortions were on average five times larger in Turkey. Hence, based on price distortions alone, there was no solid evidence in support of the statement that Turkey had a functioning market economy.

Changing Productive Relations, Linkage Effects, and Industrialization

- Economic Systems Research---2015---Tsutomu Harada

This paper develops a multi-sector endogenous innovation model that is able to take changing productive relations among sectors into account. It is shown that while productivity and demand shocks do not induce any changes in productive relations and linkage effects, shocks in the productivity of R&D increase

both backward and forward linkages. Key sectors are characterized as having high forward and backward linkages, which are consistent with the definition of key sectors in the existing empirical studies. However, vertical specialization generates not only sectors with high backward and low forward linkages, but also sectors with low backward and high forward linkages. As a consequence of this vertical specialization, the latter sectors become key sectors, in the sense that they have significant effects on business fluctuations. This implies that general-purpose technology sectors emerge, and sector-specific policies for these sectors play a critical role in economic development and growth.

Using Charm to Adjust for Cross-Hauling: The Case of the Province of Hubei, China

- Economic Systems Research---2015---Anthony T. Flegg,Yongming Huang,Timo Tohmo

Data for the Chinese province of Hubei are used to assess the performance of Kronenberg's Cross-Hauling Adjusted Regionalization Method (CHARM), a method that takes explicit account of cross-hauling when constructing regional input-output tables. A key determinant of cross-hauling is held to be the heterogeneity of commodities, which is estimated using national data. However, contrary to the authors' findings for Finland, CHARM does not generate reliable estimates of Hubei's sectoral exports, imports and volume of trade, although it is more successful in estimating sectoral supply multipliers. The poor simulations of regional trade are attributed to the fact that Hubei is a relatively small region, where there is a large divergence between regional and national technology and pattern of final demand. The simulation errors are decomposed into components reflecting differences between regional and national technology, final demand and heterogeneity. The third component is found to be the least important of the three sources of error.

UNDERSTANDING ENVIRONMENTAL RESPONSIBILITY OF CITIES AND EMISSIONS EMBODIED IN TRADE

- Economic Systems Research---2015---Taelim Choi

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

ECONOMIC IMPLICATIONS OF POLICY RESTRICTIONS ON WATER WITHDRAWALS FROM SURFACE AND UNDERGROUND SOURCES

- Economic Systems Research---2015---Carlos A. López-Morales,Faye Duchin

The appropriation of water for economic activities is limited by regional surface and underground endowments, and symptoms of environmentally unsustainable withdrawals are already visible in many regions of the world. In this paper we investigate the economic implications of water policy imposing source- and region-specific restrictions on water withdrawals taking the Mexican economy as a case study. We use an inter-regional input-output model of Mexico's hydro-economic regions to allocate production subject

to the availability of water and other factors of production. Water sustainability requires a reduction of 7.5 km-super-3/yr of groundwater withdrawals, which is compensated by an increase of 3.4 km-super-3/yr of surface water, an expansion onto an additional 1.4 million hectares of rainfed land, and modifications in subnational patterns of food trade. This framework for evaluating scenarios describing sustainability-oriented water policies is readily applicable to other regions.

DEVELOPING A MULTI-SCALE MULTI-REGION INPUT-OUTPUT MODEL

- Economic Systems Research---2015---Chris Bachmann,Matthew J. Roorda,Chris Kennedy

Many efforts have recently been devoted to developing global multi-region input-output (GMRIO) models. Unfortunately, the scales of GMRIO models do not allow them to capture the heterogeneity of regions within a single country. Multi-scale models can provide more comprehensive analyses capable of capturing the interdependencies of the global economy while preserving regional differences. The primary objective of this research is to develop methods for integrating multi-region input-output data sets from multiple spatial scales into multi-scale multi-region input-output (MSMRIO) models. These methods result in models that may have unusual features such as non-square trade coefficient matrices and a mix of industry-by-industry and commodity-by-commodity technical coefficients. To demonstrate the feasibility of MSMRIO modelling, a Canada-centric model was developed. This model includes 47 countries and Canada's 13 subnational regions. A MSMRIO model provides a tool to analyse global issues with a more spatially detailed focus.

REGIONAL AND SECTORAL DISAGGREGATION OF MULTI-REGIONAL INPUT-OUTPUT TABLES - A FLEXIBLE ALGORITHM

- Economic Systems Research---2015---Leonie Wenz,Sven Norman Willner,Alexander Radebach,Robert Bierkandt,Jan Christoph Steckel,Anders Levermann

A common shortcoming of available multi-regional input-output (MRIO) data sets is their lack of regional and sectoral detail required for many research questions (e.g. in the field of disaster impact analysis). We present a simple algorithm to refine MRIO tables regionally and/or sectorally. By the use of proxy data, each MRIO flow in question is disaggregated into the corresponding sub-flows. This downscaling procedure is complemented by an adjustment rule ensuring that the sub-flows match the superordinate flow in sum. The approximation improves along several iteration steps. The algorithm unfolds its strength through the flexible combination of multiple, possibly incomplete proxy data sources. It is also flexible in a sense that any target sector and region resolution can be chosen. As an exemplary case we apply the algorithm to a regional and sectoral refinement of the Eora MRIO database.

WHITHER PANAMA? CONSTRUCTING A CONSISTENT AND BALANCED WORLD SUT SYSTEM INCLUDING INTERNATIONAL TRADE AND TRANSPORT MARGINS

- Economic Systems Research---2015---Gerhard Streicher,Robert Stehrer

This paper extends work done within the World Input-Output Database project (WIOD), which compiled supply and use tables (SUTs) for 40 countries, covering about 85% of the world economy, by adding SUTs for the "rest of the world" (RoW), the approximately 15% of the world economy not covered by the 40 countries included in the WIOD database, ensuring a consistent and balanced world SUT system. The term "consistency" means that at the world level, all flows of goods and services balance, properly accounting for trade and transport services used in international trade (the "cif-fob difference"). This results in SUTs for the RoW which, together with bilateral trade matrices for all commodities (and together with the 40 national SUTs from the WIOD project), describe a consistent SUT system at the world level.

THE COMPILATION OF CHINA'S INTERREGIONAL INPUT-OUTPUT MODEL 2002

- Economic Systems Research---2015---Zhuoying Zhang,Minjun Shi,Zhao Zhao

The increasing economic interaction among various regions in China makes the construction of an interregional input-output table relevant for economic studies. This paper elaborates the model compilation procedure of the China Interregional Input-output model 2002. The key features of the model compilation include: (1) using representative commodities to estimate the interregional commodity flows of the primary industries; (2) adopting functions to estimate the decreasing interregional transportation of manufacturing sectors in relation to distance and (3) selecting appropriate indicators to estimate the interregional commodity flows of non-material sectors. This study is an initial attempt in interregional input-output modelling and might be helpful for economic studies at the levels of micro-regions.

THE EXTENDED ECONOMETRIC INPUT-OUTPUT MODEL WITH HETEROGENEOUS HOUSEHOLD DEMAND SYSTEM

- Economic Systems Research---2015---Kijin Kim,Kurt Kratena,Geoffrey Hewings

This paper proposes an extension to the regional econometric input-output model (REIM) [Conway, R.S. (1990) The Washington Projection and Simulation Model: A Regional Interindustry Econometric Model. International Regional Science Review , 13, 141-165; Israilevich, P.R., G.J.D. Hewings, M. Sonis and G.R. Schindler (1997) Forecasting Structural Change with a Regional Econometric Input-Output Model. Journal of Regional Science , 37, 565-590]. We integrate a demand system with age and income parameters into the REIM. The extended model thus addresses concerns about the effects of household heterogeneity. The initial testing is conducted with a model for the Chicago metropolitan area. First, using aggregate expenditure data by income and age groups, the almost ideal demand system with group fixed effects is constructed. Next, the estimated demand system is linked to the REIM to reflect long-term changes in the age and income distribution of households. The long-range simulation from the extended model takes into account structural changes in expenditure type stemming from changing demographic composition. The extended model further broadens the scope of impact analysis under various scenarios associated with age and income changes.

ASSESSING THE IMPACT OF DISTRIBUTIVE POLICIES ON THE BRAZILIAN ECONOMY USING AN SCGE MODEL

- Economic Systems Research---2015---Henrique Morrone

This study investigates the impact of macroeconomic policies on the Brazilian economy. We present a two-sector, open-economy, Structuralist Computable General Equilibrium model that distinguishes among three economic classes and assumes no financial sector. The Social Accounting Matrix for Brazil in 2006 serves as a benchmark for our model. We compare the medium-run effects of five experiments: an income transfer towards formal workers, a transfer to informal labour, an investment shock, an exchange rate depreciation, and a policy mix that combines (exchange rate) depreciation with income transfer towards modern (sector) workers. The policy measures reinforce each other in terms of their potential to enhance growth. Our findings underscore the importance of redistributive policies to foster economic expansion.

LABOUR DEMAND IN GERMANY BY INDUSTRIAL SECTOR, OCCUPATIONAL FIELD AND QUALIFICATION UNTIL 2025 - MODEL CALCULATIONS USING THE IAB/INFORGE MODEL

- Economic Systems Research---2015---Tobias Maier,Anke Mönnig,Gerd Zika

By means of a trend extrapolation of microcensus structures (undertaken by the German Federal Statistical Office) for the time period 1996-2007, the projections for labour demand by industrial sector which the IAB

already has at its disposal can be transferred to demand by occupational field and subsequently by qualification level until 2025. The findings which have been claimed for some time now are upheld: production-related occupations will lose in significance, while further increases in employment particularly in occupations in the service sector are to be expected. Accordingly, the demand for personnel with a degree from a university or a university of applied sciences will go on rising, while the labour market opportunities for unskilled workers will continue to fall. However, vocational training or its academic counterparts still remain the dominant form of training in Germany. A continuing employment trend is to be expected here.

A SHOCK ABSORPTION INDEX FOR INOPERABILITY INPUT-OUTPUT MODELS

- Economic Systems Research---2015---Raymond R. Tan,Kathleen B. Aviso,Michael Angelo B. Promentilla,Francesca Dianne B. Solis,Krista Danielle S. Yu,Joost R. Santos

Recent disasters have underscored the importance of enhancing resilience in economic systems. In this work, we propose a novel shock absorption index , which provides a measure of the ability of an economic system to tolerate disruptions. It is assumed that there are externally defined initial levels of system failure or disruption, as well as maximum allowable levels of inoperability for each sector. The shock absorption index is defined as the largest fraction of the anticipated initial disruption that can be absorbed by the predefined robustness limits. It provides an overall measure of the robustness of an economic system towards a disruptive event, which is driven by both the economic structure and the individual robustness of different sectors. The results of two case studies illustrate policy-making insights in identifying and prioritizing risk management strategies for critical systems.

PROCESSING TRADE BIASES THE MEASUREMENT OF VERTICAL SPECIALIZATION IN CHINA

- Economic Systems Research---2015---Cuihong Yang,Erik Dietzenbacher,Jiansuo Pei,Xikang Chen,Kunfu Zhu,Zhipeng Tang

Vertical specialization (VS) is often measured by the import contents of the exports, using an input-output (I-O) framework. Half of China's exports are processing exports, which largely depend on imported intermediate inputs and tie up upstream as well as downstream trade partners. Thus, one would expect to find strong VS for China. Using the 'ordinary' I-O tables, however, this is not the case. Because the production of processing exports is only a small part of total production, the average input structure in the I-O table hides the typical features of processing exports. Using adapted, tripartite I-O tables (for 2002 and 2007) in which the processing exports have been singled out, indeed reveals the expected strong VS in China.

SUPPLY-USE FRAMEWORK FOR INTERNATIONAL ENVIRONMENTAL POLICY ANALYSIS

- Economic Systems Research---2015---Thijs ten Raa,Victoria Shestalova

The technical variation between countries in the production of goods and services, in terms of not only input coefficients, but also emission coefficients, creates scope for international trade to reduce environmental pressures. For this purpose we extend the theory of trade and the environment as to accommodate technical variation between countries in production and emissions. We use and steer close to the extended input and output tables, which include emission data. By treating environmental standards analogous to capital and labor capacity constraints, the aggregation problem for economic and environmental measures gets the same format as the well-understood aggregation problem for labor and capital. In a pilot application we determine the gains to free trade in products and emission permits.

COMPLEMENTARITY IN INPUT-OUTPUT ANALYSIS AND STOCHASTICS

- Economic Systems Research---2015---Thijs ten Raa,Victoria Shestalova

The complementarity between the quantity and value systems of input-output analysis is shown to be the basis of the complementarity problem approach to computable general equilibrium. The numerical superiority of the latter to the linear programming approach facilitates stochastic analysis of input-output scenarios. For the example where Kyoto targets are underachieved to uncertain degrees, confidence intervals are derived for the associated consumption reductions.

SUBSTITUTION ELASTICITIES IN A CONSTANT ELASTICITY OF SUBSTITUTION FRAMEWORK - EMPIRICAL ESTIMATES USING NONLINEAR LEAST SQUARES

- Economic Systems Research---2015---Simon Koesler,Michael Schymura

Elasticities are key parameters for any economic analysis. Using the World-Input-Output Database, we estimate substitution elasticities for a three-level nested constant elasticity of substitution KLEM production structure using up to date nonlinear least squares estimation procedures. This allows us for the first time to use one coherent data set for the estimation process. Furthermore, it gives us the opportunity to derive elasticities from the same data which researchers can use to calibrate their models. On the basis of our estimations, we demonstrate that the practice of using Cobb-Douglas or Leontief production functions in economic models must be rejected for the majority of sectors. We provide a comprehensive set of estimated substitution elasticities covering a wide range of sectors. Our results suggest that no substantial change in input substitutability takes place during the time period we consider. Moreover, there is no substantial variation in substitution elasticities across regions.

ON THE ECONOMIC INTERPRETATION OF THE BRÓDY CONJECTURE

- Economic Systems Research---2015---Henryk Gurgul,Tomasz Wójtowicz

The aim of the paper is to study the economic aspects of the Bródy conjecture: an increase in the size of a (random) input matrix causes a decline in the ratio of its subdominant and dominant eigenvalues and implies faster convergence to equilibrium [Bródy, A. (1997) The Second Eigenvalue of the Leontief Matrix. Economic Systems Research , 9, 253-258]. Simulation results provide evidence that this ratio depends inversely on the level of data aggregation and can therefore not be a good indicator of the speed of convergence of an economy to its equilibrium path. We show that this is consistent with findings based on actual input-output tables of EU member states. These results imply that theorems about the speed of convergence of random matrices are not useful in describing the cyclical dynamics of real economies.

HARMONISING NATIONAL INPUT-OUTPUT TABLES FOR CONSUMPTION-BASED ACCOUNTING - EXPERIENCES FROM EXIOPOL

- Economic Systems Research---2014---Richard Wood,Troy R. Hawkins,Edgar G. Hertwich,Arnold Tukker

Environmentally extended, multi-regional, input-output (MRIO) databases have emerged to fulfil the need for mapping the impacts of globalisation, following resource-intensive supply chains crossing country borders. EXIOBASE is one such data set designed for use in analysis relevant to resource use and European Union policy. It provides the most detailed harmonised sector classification in any MRIO and integrates data from a wide range of sources. We review the necessary steps in order to harmonise source data in MRIO databases, and describe methods to increase the product and industry detail of aggregate supply and use tables (SUTs) in order to provide a homogenous classification across countries that allows resource-specific

modelling. We cover mathematical programming approaches used to reconcile data sets, and investigate some implications of reverse engineering symmetric input-output tables and disaggregating the SUTs. We focus particularly on the footprint multiplier at the product level, where policy formation is targeted.

HOUSEHOLDS' BEHAVIOUR AND ENVIRONMENTAL EMISSIONS IN A REGIONAL ECONOMY

- Economic Systems Research---2014---Rosa Duarte,Sofiane Rebahi,Julio Sánchez-Chóliz,Cristina Sarasa

Households have significant demand-side potential to drive reductions in atmospheric emissions, including both direct and indirect emissions. Our analysis focuses on the behaviour of a regional economy (Aragon, Spain) and its impact on greenhouse gases (GHG) and sulphur dioxide (SO 2). Using a CGE model, we simulate scenarios and evaluate the environmental impact of adopting changes considered in the Aragonese Climate Change and Clean Energy Strategy. Specifically, we analyse the impact of electricity savings and the promotion of public transport (bus or train) versus private car use. The results indicate that 1 MWh of saving in electricity consumption by households could reduce emissions of GHG by 0.112 kt of equivalent CO 2 and 8.209 kg of SO 2 with a shift in demand preferences and 0.022 kt of equivalent CO 2 and 7.612 kg of SO 2 with an efficiency improvement. Moreover, household changes in demand preferences regarding private/public transport, also contribute to reduce emissions.

THE POWER OF VISIBLE HANDS: AN ENVIRONMENTAL STRUCTURAL DECOMPOSITION ANALYSIS CONSIDERING THE PEOPLE'S DAILY EFFECT

- Economic Systems Research---2014---Chen Lin,Jing Li,Dezhi Li

As an organ of the Central Committee of the Communist Party of China, the People's Daily (PD) has a critical influence on China's policies and economy. This study examines the impact of the PD on China's economic structural changes and industry environmental performance. To separate the 'PD effect' from other effects in total sectoral CO 2 emission changes, we propose a new variation of structural decomposition analysis using the frequencies of keywords employed in the PD. We use data from the PD for 2001 to 2011 and the Chinese input-output tables for 2002, 2005, 2007, and 2010. The results show that, on average, the PD effect explains about 11% of changes in total sectoral CO 2 emissions. Specifically, the PD has a relatively strong impact on the mining and utility sectors, while its impact on the manufacturing sectors is relatively weak.

REGIONAL WATER FOOTPRINTS OF THE YANGTZE RIVER: AN INTERREGIONAL INPUT-OUTPUT APPROACH

- Economic Systems Research---2014---Tomohiro Okadera,Nobuhiro Okamoto,Masataka Watanabe,Jaruwan Chontanawat

Recently, researchers have applied the multi-regional input-output (MRIO) approach to water footprint (WF) analysis. The concept of interregional input-output (R-MRIO) was developed to analyse regional issues. Researchers have concentrated on the development of global or international input-output (N-MRIO) tables. Using the N-MRIO and the R-MRIO approach allows the study of global and regional issues, respectively. The WF is an indicator influenced by trade among nations and regions. However, the treatment of imports in an R-MRIO approach differs in whether international imports are separated or combined. We evaluate the effects of the difference between these models and discuss policy implications for the Yangtze River, China. The WF calculated using the combined type model is 11% larger than that by the separated type model. This difference can be ascribed to international imports, mainly internal consumption and interregional trade. We find that this difference affects social equity in water-abundant areas.

ANALYSING THE STRUCTURE OF THE ECONOMY USING PHYSICAL INPUT-OUTPUT TABLES

- Economic Systems Research---2014---Aleix Altimiras-Martin

Analyses using physical input-output tables (PIOTs) are key to understanding the physical metabolism of economies, since they relate production to the generation of emissions and use of resources. Two methods have been developed to calculate the primary resources and emissions associated with a given final demand. However, one of these alters the PIOT, revealing different technical coefficients and Leontief inverse matrices. Which method should be used for structural analysis? In this paper, I compare both methods, explain the structural differences between them and illustrate the latter through a backward linkage analysis. I find that only one method is suited to the analysis of the physical structure of the economy, since it comprehends both the production of goods and associated emissions. The method is identified as a new model capable of tracing by-products as final outputs. Finally, I generalise both methods to analyse PIOTs including several emission types.

DEVELOPMENT OF REGIONAL SOCIAL ACCOUNTING MATRICES WITH DETAILED AGRICULTURAL LAND RENT DATA AND IMPROVED VALUE-ADDED COMPONENTS FOR THE USA

- Economic Systems Research---2014---Juan J. Monge,Henry L. Bryant,David P. Anderson

We describe a method for creating social accounting matrices (SAMs) with detailed agricultural land rent data for any arbitrary subset of the 48 contiguous states in the USA. Data on land use and land rents from various public sources is merged with national accounts data. The method reorganizes the rental income of persons concept present in national accounts to payments to conventional primary factors of production. This method also reallocates portions of the indirect business tax account to the appropriate sales and import tax accounts. SAMs created using this method should be useful inputs into input-output or computable general equilibrium models explicitly representing a heterogeneous land market and analyzing the economic effects of agricultural, bioenergy, water and climate policies on land-use change, land rents, agricultural commodity markets, trade and households' welfare. The method's implementation is freely available, enabling others to rapidly create SAMs with their own desired region and sector aggregations.

A NEW SUT CONSOLIDATION METHOD TESTED BY A DECOMPOSITION OF VALUE ADDED AND CO 2 EMBODIED IN EU27 EXPORTS

- Economic Systems Research---2014---Maaike C. Bouwmeester,Jan Oosterhaven,José Rueda-Cantuche

This paper develops a method to consolidate national supply-use tables (SUTs) into a single supra-regional SUT. The method deals with mirror trade statistics problems, such as the different valuation of imports and exports, and it corrects for double-counting re-exports. The method is tested by means of a decomposition of value added and CO 2 emissions embodied in EU27 exports to third countries. When the national SUTs for the period 2000-2007 are used, neglecting intra-European Union spillover and feedback effects results in an underestimation of the embodied value added of 12-15%. Not consolidating the national tables properly leads to a further underestimation of 11-16%. With these underestimations removed, EU27 foreign exports still only explain around 11% of EU27 Gross Domestic Product, whereas they explain 17% of the EU27 CO 2 emissions. Hence, the income benefits of these exports are, in relative terms, considerably smaller than their CO 2 emission cost.

Editors' Report

- Economic Systems Research---2014---Manfred Lenzen,Bart Los

2014

COMPARATIVE EVALUATION OF MRIO DATABASES

- Economic Systems Research---2014---Satoshi Inomata,Anne Owen

This editorial is the introduction to a special issue of Economics Systems Research on the topic of intercomparison of multi-regional input-output (MRIO) databases and analyses. It explains the rationale for dedicating an issue of this journal to this area of research. Then the six papers chosen for this issue are introduced. This is followed by a concluding section outlining future directions for developers and users of MRIO databases.

CONVERGENCE BETWEEN THE EORA, WIOD, EXIOBASE, AND OPENEU'S CONSUMPTION-BASED CARBON ACCOUNTS

- Economic Systems Research---2014---Daniel Moran,Richard Wood

In this paper, we take an overview of several of the biggest independently constructed global multi-regional input-output (MRIO) databases and ask how reliable and consonant these databases are. The key question is whether MRIO accounts are robust enough for setting environmental policies. This paper compares the results of four global MRIOs: Eora, WIOD, EXIOBASE, and the GTAP-based OpenEU databases, and investigates how much each diverges from the multi-model mean. We also use Monte Carlo analysis to conduct sensitivity analysis of the robustness of each accounts' results and we test to see how much variation in the environmental satellite account, rather than the economic structure itself, causes divergence in results. After harmonising the satellite account, we found that carbon footprint results for most major economies disagree by>10% between MRIOs. Confidence estimates are necessary if MRIO methods and consumption-based accounting are to be used in environmental policy-making at the national level.

A STRUCTURAL DECOMPOSITION APPROACH TO COMPARING MRIO DATABASES

- Economic Systems Research---2014---Anne Owen,Kjartan Steen-Olsen,John Barrett,Thomas Wiedmann,Manfred Lenzen

The construction of multi-regional input-output tables is complex, and databases produced using different approaches lead to different analytical outcomes. We outline a decomposition methodology for investigating the variations that exist when using different multi-regional input-output (MRIO) systems to calculate a region's consumption-based account. Structural decomposition analysis attributes the change in emissions to a set of dependent determinants, such as technical coefficients, the Leontief inverse and final demands. We apply our methodology to three MRIO databases - Eora, GTAP and WIOD. Findings reveal that the variation between Eora and GTAP can be attributed to differences in the Leontief inverse and emissions' data, whereas the variation between Eora and WIOD is due to differences in final demand and the Leontief inverse. For the majority of regions, GTAP and WIOD produce similar results. The approach in this study could help move MRIO databases from the academic arena to a useful policy instrument.

EFFECTS OF SECTOR AGGREGATION ON CO 2 MULTIPLIERS IN MULTIREGIONAL INPUT-OUTPUT ANALYSES

- Economic Systems Research---2014---Kjartan Steen-Olsen,Anne Owen,Edgar G. Hertwich,Manfred Lenzen

The past few years have seen the emergence of several global multiregional input-output (MRIO) databases. Due to the cost and complexity of developing such extensive tables, industry sectors are generally represented at a rather aggregate level. Currently, one of the most important applications of input-output analysis is environmental assessments, for which highly aggregate sectors may not be sufficient to yield accurate results. We experiment with four of the most important global MRIO systems available, analyzing the sensitivity of a

set of aggregate CO 2 multipliers to aggregations in the MRIO tables used to calculate them. Across databases, we find (a) significant sensitivity to background system detail and (b) that sub-sectors contained within the same aggregate MRIO sector may exhibit highly different carbon multipliers. We conclude that the additional information provided by the extra sector detail may warrant the additional costs of compilation, due to the heterogeneous nature of economic sectors in terms of their environmental characteristics.

THE 'REST OF THE WORLD' - ESTIMATING THE ECONOMIC STRUCTURE OF MISSING REGIONS IN GLOBAL MULTI-REGIONAL INPUT-OUTPUT TABLES

- Economic Systems Research---2014---Konstantin Stadler,Kjartan Steen-Olsen,Richard Wood

Incomplete data for the economic structure of numerous countries hamper the compilation of global multi-regional input-output (MRIO) tables. By themselves, most of these countries are of only limited importance for the global economy and incumbent environmental issues. Hence, in most recent global MRIO tables these countries are either roughly estimated or summarised in one rest of the world (RoW) region. Combining a wide range of countries, this RoW region may play a significant role in global economic and environmental accounts. We conceptualise the importance of RoW in several environmental footprint accounts and present algorithms to estimate the structure of RoW. The approach utilises the information of the economic structure within known parts of the MRIO table to estimate the unknown structure. Using this method, global warming potential and employment footprints remain stable irrespective of the chosen initial estimates, whereas natural land use footprints and individual product impacts vary significantly.

COMPARING THE GTAP-MRIO AND WIOD DATABASES FOR CARBON FOOTPRINT ANALYSIS

- Economic Systems Research---2014---Iñaki Arto,José Rueda-Cantuche,Glen Peters

We explore two different worldwide multi-regional input-output (MRIO) databases (Global Trade Analysis Project-MRIO and World Input-Output Database) for the calculation of the global carbon footprint (CF) of nations. We start our analysis with a description of the main characteristics of the databases and then make a comparison between their main components. Then, we calculate the CF with both databases and identify (from a global perspective) the most relevant factors underlying their differences using structural decomposition analysis. On average, certain parts of both databases (e.g. intermediate uses and final demand) can be said to be similar for around 75% to 80%, with only a few elements in each part mainly driving the major differences. The divergences in the datasets of four countries explain almost 50% of the differences in the CF (the USA, China, Russia and India). Industry-wise, 50% of the differences can be explained by the divergences in electricity, refining and inland transport industries.

INVESTIGATING ALTERNATIVE APPROACHES TO HARMONISE MULTI-REGIONAL INPUT-OUTPUT DATA

- Economic Systems Research---2014---Arne Geschke,Richard Wood,Keiichiro Kanemoto,Manfred Lenzen,Daniel Moran

Over recent years a small number of global multi-regional input-output (MRIO) databases were developed to describe the entire global economy at high sector detail. We investigate the differences that arise out of applying different construction procedures for two global MRIO databases: The EXIOBASE database, developed as part of the EU FP6 & 7 programs and the Eora database developed at the University of Sydney. The procedures used in EXIOBASE involve a high degree of interrogation and adjustment throughout the construction of the data set, whilst the Eora MRIO relies on single-step mathematical programming techniques and high-performance computing. We unravel the effect of the different approaches taken to develop the databases by undertaking a number of combinatorial experiments in which we exchange parts

of the construction process between the EXIOBASE and Eora build pipelines. We conclude that Eora's highly automated data reconciliation approach produces MRIO databases that are of comparable quality to those constructed with EXIOBASE's multi-step approach. However, the reliability and robustness of the resulting MRIO database largely depend on the level of detail and reliability of the underlying raw data.

CAN THE CARBONIZING DRAGON BE DOMESTICATED? INSIGHTS FROM A DECOMPOSITION OF ENERGY CONSUMPTION AND INTENSITY IN CHINA, 1987--2007

- Economic Systems Research---2014---Haiyan Zhang,Michael Lahr

China has relied on energy to stimulate its booming economy. As a result, its share of world energy consumption rose to 17.3% in 2009 from 7.9% in 1978. Somewhat surprisingly, through 2000 its rate of energy consumption was about half its rate of economic growth. This trend changed after 2001 as energy consumption rose about 1.3 times more rapidly than did gross domestic product through 2005. Through heavy governmental influence, energy intensity subsequently reduced through 2007, but just marginally. This paper uses the structural decomposition approach to understand key drivers behind changes in China's energy intensity and its energy consumption from 1987 to 2007. In our model, energy intensity change was decomposed into five factors: changes in energy efficiency, changes in share of value added, changes in input structure, changes in consumption structure, and changes in consumption volume. This paper provides insights into how changes in China's economic structure, technology, urbanization, and lifestyle affect energy intensity and energy consumption.

REDUCE EMPLOYERS' SOCIAL SECURITY CONTRIBUTIONS AND CONTROL LABOR FRAUD: REMEDIES FOR SPAIN'S AILING ECONOMY?

- Economic Systems Research---2014---María Teresa Álvarez-Martínez,Clemente Polo,Maria Teresa Alvarez Martinez

The aim of this paper is to quantify the impact of the reduction on social security contributions (SSCs) of employers recently claimed by the Spanish enterprisers' organizations on the main macroeconomic variables. The effects of this tax reform are evaluated with a Computable General Equilibrium model with the neoclassical closure rule. The model is calibrated with a Social Accounting Matrix for the year 2000 (SAMES-00) elaborated by the authors. Results show that lower SSCs of employers raise employment, households' welfare and real gross domestic product (GDP) but also increase the public deficit. These positive effects remain when the reduction is compensated with personal income taxes to keep the public deficit/GDP ratio constant and also when the compensating variable is value-added tax (VAT). Unlike in previous studies, the most positive effects are obtained when the lower public revenues are compensated via lower coverage of unemployment benefits.

GREENHOUSE GAS EMISSIONS AND ECONOMIC STRUCTURE IN URUGUAY

- Economic Systems Research---2014---Matías Piaggio,Vicent Alcantara,Emilio Padilla

Using input--output analysis, we identify the key sectors in greenhouse gas (GHG) emissions of the Uruguayan economy. The responsibilities of each sector in terms of its emissions are decomposed into an own component, generated during the activities of the sector, and an indirect component, generated by the induced activities in other sectors. This has important implications for the design of mitigation polices, as the appropriate policy measures are contingent on the nature of the pollution. Technical improvements and best practices are effective only when applied to directly polluting sectors, while demand policies may be more appropriate for indirectly polluting sectors. In addition, we analyze pollution generated during the production of exports. The results show that demand policies are going to be effective in the Building, the Hotel and restaurants, and the Wholesale and retail trade;

and repair of motor vehicles and motorcycles sectors. These policies complement GHG emissions' mitigation policies in directly polluting sectors (mainly the Cattle farming and the transport-related sectors). Finally, methane and nitrous oxide emissions are mainly the consequence of production for exports, while carbon dioxide emissions are mainly driven by production for domestic consumption.

USING INPUT--OUTPUT TABLES FOR ESTIMATES OF CZECH GROSS DOMESTIC PRODUCT 1970--1989

- Economic Systems Research---2014---Jaroslav Sixta,Jakub Fischer

The paper describes the transformation of original macroeconomic data for the Czech Republic in the period of socialism to the current methodology of national accounts. Since the Czech Republic was a part of former Czechoslovakia, such estimates were not usually published. The key approach is based on symmetric input--output tables (SIOTs) that allow the description of several segments of the economy. SIOTs were compiled directly from data sources on a regular basis instead of supply and use tables. We used SIOTs for 1973 and 1987 to investigate thoroughly the differences between the previously used Material Product System (MPS) and the System of National Accounts (SNA). After that, we identified the most important differences between MPS and SNA, and constructed the time series of Czech gross domestic product for 1970--1989. The estimated time series are fully consistent with official figures of the Czech Statistical Office published from 1990 onwards.

A NON-SIGN-PRESERVING RAS VARIANT

- Economic Systems Research---2014---Manfred Lenzen,Daniel D. Moran,Arne Geschke,Keiichiro Kanemoto

We have developed a variant of the RAS generalised iterative scaling method that is able to change the sign between successive iterates, and thus fulfil constraints that are infeasible for existing RAS variants. Like earlier RAS variants, our method can handle constraints on arbitrarily sized and shaped subsets of matrix elements, include reliability of the initial estimate and the external constraints, and deal with negative values.

ON BRÓDY'S CONJECTURE: THEORY, FACTS AND FIGURES ABOUT INSTABILITY OF THE US ECONOMY

- Economic Systems Research---2014---Theodore Mariolis,Lefteris Tsoulfidis

Bródy's conjecture regarding the instability of economies is submitted to an empirical test using input--output flow tables of varying size for the US economy, for the benchmark years 1997 and 2002, as well as for the period 1998--2011. The results obtained using input--output tables of various dimensions lend support to the view of increasing instability (in the sense of Bródy) of the US economy over the period considered. Furthermore, our analysis shows that only a few vertically integrated industries are enough to shape the behaviour of the entire economy in the case of a disturbance. These results may usefully be contrasted with those derived in a parallel literature on aggregate fluctuations from microeconomic 'idiosyncratic' shocks.

MEASURING SPILLOVER EFFECTS OF SHOCKS TO THE ALASKA ECONOMY: AN INTER-REGIONAL SOCIAL ACCOUNTING MATRIX (IRSAM) MODEL APPROACH

- Economic Systems Research---2014---Chang K. Seung

An inter-regional social accounting matrix (IRSAM) model is used to estimate the spillover effects occurring between economies of two US regions -- (i) Alaska, which depends heavily on imports of commodities and factors of production from outside the region, and (ii) the rest of the US (RoUS). Multiplier decomposition is used to calculate intra-regional multipliers and spillover effects between the two regions. Results show that a significant percentage (46.3--70.8%) of the total secondary impacts of a shock to Alaskan industries leaks

out of Alaska and flows to the RoUS. An analysis of household multipliers indicates that over 60% of the total secondary effects of an increase in Alaska household income accrues to the RoUS households. Policymakers are concerned with identifying the magnitude, nature, and geographic distribution of economic impacts from the policies they implement. The IRSAM model provides the framework for a better understanding of the intra-regional and spillover effects of policies.

DISASTER IMPACT AND INPUT--OUTPUT ANALYSIS

- Economic Systems Research---2014---Yasuhide Okuyama,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.

ESTIMATION OF PRODUCTION CAPACITY LOSS RATE AFTER THE GREAT EAST JAPAN EARTHQUAKE AND TSUNAMI IN 2011

- Economic Systems Research---2014---Yoshio Kajitani,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.

ANALYSING CRITICAL INFRASTRUCTURE FAILURE WITH A RESILIENCE INOPERABILITY INPUT--OUTPUT MODEL

- Economic Systems Research---2014---Olaf Jonkeren,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'

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.

TIME-VARYING DISASTER RECOVERY MODEL FOR INTERDEPENDENT ECONOMIC SYSTEMS USING HYBRID INPUT--OUTPUT AND EVENT TREE ANALYSIS

- Economic Systems Research---2014---Joost R. Santos,Krista Danielle S. Yu,Sheree Ann T. Pagsuyoin,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 can help identify critical economic sectors and ultimately provide insights for formulating preparedness decisions to expedite disaster recovery.

A VULNERABILITY INDEX FOR POST-DISASTER KEY SECTOR PRIORITIZATION

- Economic Systems Research---2014---Krista Danielle S. Yu,Raymond R. Tan,Kathleen B. Aviso,Michael Angelo B. Promentilla,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

- Economic Systems Research---2014---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.

INPUT--OUTPUT ANALYSIS: THE NEXT 25 YEARS

- Economic Systems Research---2013---Erik Dietzenbacher,Manfred Lenzen,Bart Los,Dabo Guan,Michael Lahr,Ferran Sancho,Sangwon Suh,Cuihong Yang

This year marks the 25th anniversary of the International Input--Output Association and the 25th volume of Economic Systems Research . To celebrate this anniversary, a group of eight experts provide their views on the future of input--output. Looking forward, they foresee progress in terms of data collections, methods, theory testing, and focus and scope.

BENCHMARKING LARGE ACCOUNTING FRAMEWORKS: A GENERALIZED MULTIVARIATE MODEL

- Economic Systems Research---2013---Reinier Bikker,Jacco Daalmans,Nino Mushkudiani

We present a multivariate benchmarking model for achieving consistency between large quarterly and annual accounting frameworks. The method is based on a quadratic optimization problem, for which many efficient numeric solvers exist. The method combines several features, such as linear constraints, ratio constraints, weights, and inequalities, in one model. Therefore, a wide range of modelling possibilities is supported. This method is especially interesting for national statistical offices, to simplify their processes to achieve consistency between publications.

SIMULTANEOUSLY BALANCING SUPPLY--USE TABLES AT CURRENT AND CONSTANT PRICES: A NEW PROCEDURE

- Economic Systems Research---2013---Vittorio Nicolardi

According to the 1993 System of National Accounts, the annual Supply--Use Tables (SUTs) need to be compiled at both current and constant prices by the National Institutes of Statistics. The most appropriate way to obtain consistent SUTs at both current and constant prices is to balance them simultaneously but, in this case, the main complexity is the nonlinearity that inevitably occurs. This paper proposes a new method to balance extremely large sets of National Accounts simultaneously at current and constant prices. The distinctive features of the proposed balancing method are its flexibility, which is very high compared with the

other methods in the literature, and its capability to allow the control of the consistency of the system of deflators that are used. This new balancing method has been applied to balance the Italian 2006 SUTs simultaneously at current and constant prices, and it has yielded very good outcomes.

THE BIAS OF THE MULTIPLIER MATRIX WHEN SUPPLY AND USE TABLES ARE STOCHASTIC

- Economic Systems Research---2013---José Rueda-Cantuche,Erik Dietzenbacher,Esteban Fernández,Antonio Amores

The literature on stochastic input--output (I--O) analysis has paid considerable attention to the bias in the Leontief inverse. This paper extends previous studies by assuming supply and use tables (SUTs rather than I--O tables or input coefficients matrices) to be stochastic. This is a natural starting point because SUTs have become the basic data sources for I--O applications. In a Monte Carlo simulation experiment, a given SUT is randomized in two different ways and the effects are determined for eight different multiplier matrices. The analysis is carried out for Spain, Italy, the Netherlands, Germany and Finland, using their SUTs for 2006. The findings indicate that, in general, biases are statistically significant but negligibly small. This corroborates earlier findings obtained for stochastic I--O tables.

IMPLICIT ELASTICITIES AND PRICE EFFECTS: AN UPDATED PROCEDURE

- Economic Systems Research---2013---Stephen D. Casler

Based on the general procedure described by Casler [(2011) Coefficient Change, Price Effects, and Implicit Elasticities: Estimating Microeconomic Determinants over Two Time Periods. Economic Systems Research , 23, 153--174], this paper presents an updated approach to the estimation of input coefficient changes as functions of changing prices. The procedure makes direct use of relationships that emerge from the model of cost minimization subject to producing a desired level of output. Based on an initial specification of constant cross-price derivatives, the imposition of adding up and symmetry conditions allows the actual price and coefficient changes that occur between periods to identify implicit own and cross-price derivatives and corresponding elasticities, using data for only two time periods. With this updated approach, the calculation of derivatives is far simpler and leads to far more accurate measures of price-induced input--output coefficient changes than the original version.

Editors' report

- Economic Systems Research---2013---Manfred Lenzen,Bart Los

2013

Identifying environmentally important supply chain clusters in the automobile industry

- Economic Systems Research---2013---Shigemi Kagawa,Sangwon Suh,Yasushi Kondo,Keisuke Nansai

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

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

- Economic Systems Research---2013---Youguo Zhang

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

DISAGGREGATING THE ELECTRICITY SECTOR OF CHINA'S INPUT-OUTPUT TABLE FOR IMPROVED ENVIRONMENTAL LIFE-CYCLE ASSESSMENT

- Economic Systems Research---2013---S. Lindner,J. Legault,D. Guan

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

A POST-KEYNESIAN AGE MODEL TO FORECAST ENERGY DEMAND IN SPAIN

- Economic Systems Research---2013---Óscar Dejuán,Luis Antonio López,María Ángeles Tobarra,Jorge Zafrilla

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

EXPANDING EXTRACTIONS

- Economic Systems Research---2013---Erik Dietzenbacher,Michael Lahr

In this paper, we generalize hypothetical extraction techniques. We suggest that the effect of certain economic phenomena can be measured by removing them

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

A NOTE ON THE GRAS METHOD

- Economic Systems Research---2013---Umed Temursho (Temurshoev),Ronald E. Miller,Maaike C. Bouwmeester

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

WHICH INDUSTRIES TO BAIL OUT FIRST IN ECONOMIC RECESSION? RANKING US INDUSTRIAL SECTORS BY THE POWER-OF-PULL

- Economic Systems Research---2013---Jianxi Luo

There have been intense debates regarding which industrial sectors should be prioritized for receiving bailout in economic recessions. This paper takes a network perspective to rank sectors according to the Power-of-Pull (PoP), i.e. a sector's power to pull the overall economy. An eigenvector method is employed to assess the PoP of sectors in the USA, using input--output data from 1998 to 2010. The results support bailout to the motor vehicle sector, but argue against bailout to public infrastructure, health care and information technologies design and service sectors, and also reveal the continual decline of PoP ranking of computer and electronics manufacturing sector over time. These results confirm some but also show little support to some other economic revival policies of the Obama Administration in the USA.

TESTING ASSUMPTIONS MADE IN THE CONSTRUCTION OF INPUT--OUTPUT TABLES

- Economic Systems Research---2013---José Rueda-Cantuche,Thijs ten Raa

Product input--output (IO) tables are mainly constructed on the basis of product and/or industry technology assumptions. The choice is not trivial and deserves empirical analysis using input and output data at the level of establishments. This paper offers input--output compilers econometric tests to facilitate the construction of tailored hybrid technology-based product IO tables. We provide weighted likelihood ratios of the product and industry technology assumptions. Although the proposed econometric tests are aimed to be used ex ante , we construct four variants of hybrid technology-based product IO tables using establishment data from Andalusia (Spain) and contrast them to the official product IO table and the pure product and industry technology-based tables. Our econometric tests are not valid for industry IO tables.

ECONOMIC WELFARE ANALYSIS OF THE LEGALIZATION OF DRUGS: A CGE MICROSIMULATION MODEL FOR COLOMBIA

- Economic Systems Research---2013---Laura Atuesta,Geoffrey Hewings

In this paper, a computable general equilibrium (CGE) microsimulation model is used to analyze the effects of an ex ante legalization of drugs on the Colombian economy. The model consists of 11 productive sectors, 3 different labor force categories with unemployment, and 20 households divided by income and location. Changes in wages and migration are estimated using a labor participation model, and a NIDS estimates the demands of the households. Changes in household economic welfare, measured by changes in income and prices (CV and EV measurements), are very sensitive to the reinvestments that the government makes in the economy. By analyzing six different scenarios with different assumptions about changes in drug prices, investments of the government, and the termination of the armed conflict, the results suggest that economic welfare improves when the government reinvests military expenditures in other productive sectors or when the 'economy of war' continues and the legalization does not end the armed conflict.

ESTIMATING THE ECONOMIC CONSEQUENCES OF A PORT SHUTDOWN: THE SPECIAL ROLE OF RESILIENCE

- Economic Systems Research---2013---Adam Rose,Dan Wei

This paper develops a methodology for the estimation of the total economic consequences of a seaport disruption, factoring in the major types of resilience. The foundation of the methodology is a combination of demand-driven and supply-driven input--output analyses. Resilience is included through a series of ad hoc adjustments based on various formal models and expert judgment. Moreover, we have designed the methodology in a manner that overcomes the major shortcomings of the supply-driven approach. We apply the methodology to a 90-day disruption at the twin seaports of Beaumont and Port Arthur, Texas, which is a major port area that includes a petrochemical manufacturing complex. We find that regional gross output could decline by as much as $13 billion at the port region level, but that resilience can reduce these impacts by nearly 70%.

AN INPUT--OUTPUT STUDY OF THE SINGAPORE INFORMATION SECTOR

- Economic Systems Research---2013---Mun Heng Toh,Shandre Mugan Thangavelu

The development and use of information and communication technologies is one of the key drivers of the 'knowledge economy.' In this paper, we investigate the impact of information technology on the output growth of the Singapore economy using the input--output framework. The input--output framework allows us to understand the impact of information sector in an integrated framework in terms of its linkages to the manufacturing and service sectors. In particular, we adopt the input--output approach to shed light on both production and diffusion activities of the information sector on the Singapore economy. The results indicate that the ICT sector provided the key linkages for the expansion of high-value added manufacturing activities and electronics export for the Singapore economy.

MAXIMUM-LIKELIHOOD ESTIMATES OF A US MULTIREGIONAL HOUSEHOLD EXPENDITURE SYSTEM

- Economic Systems Research---2013---Patrick Canning

This paper applies the maximum-likelihood equation to a model that produces US regional household expenditure estimates using national-level data on average expenditures by type of household and regional data on the number of households by type. Empirical results follow the analytical properties of the model and demonstrate an impressive capacity to recover regional statistics. These findings are useful in applied regional

studies since they demonstrate a general framework to assess the input data and the overall estimation model.

GLOBAL MULTIREGIONAL INPUT-OUTPUT FRAMEWORKS: AN INTRODUCTION AND OUTLOOK

- Economic Systems Research---2013---Arnold Tukker,Erik Dietzenbacher

This review is the introduction to a special issue of Economic Systems Research on the topic of global multiregional input-output (GMRIO) tables, models, and analysis. It provides a short historical context of GMRIO development and its applications (many of which deal with environmental extensions) and presents the rationale for the major database projects presented in this special issue. Then the six papers are briefly introduced. This is followed by a concluding comparison of the characteristics of the main GMRIO databases developed thus far and an outlook of potential further developments.

BUILDING EORA: A GLOBAL MULTI-REGION INPUT-OUTPUT DATABASE AT HIGH COUNTRY AND SECTOR RESOLUTION

- Economic Systems Research---2013---Manfred Lenzen,Daniel Moran,Keiichiro Kanemoto,Arne Geschke

There are a number of initiatives aimed at compiling large-scale global multi-region input-output (MRIO) tables complemented with non-monetary information such as on resource flows and environmental burdens. Depending on purpose or application, MRIO construction and usage has been hampered by a lack of geographical and sectoral detail; at the time of writing, the most advanced initiatives opt for a breakdown into at most 129 regions and 120 sectors. Not all existing global MRIO frameworks feature continuous time series, margins and tax sheets, and information on reliability and uncertainty. Despite these potential limitations, constructing a large MRIO requires significant manual labour and many years of time. This paper describes the results from a project aimed at creating an MRIO account that represents all countries at a detailed sectoral level, allows continuous updating, provides information on data reliability, contains table sheets expressed in basic prices as well as all margins and taxes, and contains a historical time series. We achieve these goals through a high level of procedural standardisation, automation, and data organisation.

EXIOPOL - DEVELOPMENT AND ILLUSTRATIVE ANALYSES OF A DETAILED GLOBAL MR EE SUT/IOT

- Economic Systems Research---2013---Arnold Tukker,Arjan de Koning,Richard Wood,Troy Hawkins,Stephan Lutter,Jose Acosta,Jose M. Rueda Cantuche,Maaike Bouwmeester,Jan Oosterhaven,Thomas Drosdowski,Jeroen Kuenen,José Manuel Rueda-Cantuche

EXIOPOL (A New Environmental Accounting Framework Using Externality Data and Input-Output Tools for Policy Analysis) was a European Union (EU)-funded project creating a detailed, global, multiregional environmentally extended Supply and Use table (MR EE SUT) of 43 countries, 129 sectors, 80 resources, and 40 emissions. We sourced primary SUT and input-output tables from Eurostat and non-EU statistical offices. We harmonized and detailed them using auxiliary national accounts data and co-efficient matrices. Imports were allocated to countries of exports using United Nations Commodity Trade Statistics Database trade shares. Optimization procedures removed imbalances in these detailing and trade linking steps. Environmental extensions were added from various sources. We calculated the EU footprint of final consumption with resulting MR EE SUT. EU policies focus mainly on energy and carbon footprints. We show that the EU land, water, and material footprint abroad is much more relevant, and should be prioritized in the EU's environmental product and trade policies.

THE CONSTRUCTION OF WORLD INPUT-OUTPUT TABLES IN THE WIOD PROJECT

- Economic Systems Research---2013---Erik Dietzenbacher,Bart Los,Robert Stehrer,Marcel Tim-

mer,Gaaitzen de Vries

This article describes the construction of the World Input-Output Tables (WIOTs) that constitute the core of the World Input-Output Database. WIOTs are available for the period 1995-2009 and give the values of transactions among 35 industries in 40 countries plus the 'Rest of the World' and from these industries to households, governments and users of capital goods in the same set of countries. The article describes how information from the National Accounts, Supply and Use Tables and International Trade Statistics have been harmonized, reconciled and used for estimation procedures to arrive at a consistent time series of WIOTs.

A MULTI-REGION INPUT-OUTPUT TABLE BASED ON THE GLOBAL TRADE ANALYSIS PROJECT DATABASE (GTAP-MRIO)

- Economic Systems Research---2013---Robbie M. Andrew,Glen Peters

Understanding the drivers of many environmental problems requires enumerating the global supply chain. Multi-region input-output analysis (MRIOA) is a well-established technique for this purpose, but constructing a multi-region input-output table (MRIOT) can be a formidable challenge. We constructed a large MRIOT using the Global Trade Analysis Project (GTAP) database of harmonised economic, IO, and trade data. We discuss the historical development of the GTAP-MRIO and describe its efficient construction. We provide updated carbon footprint estimates and analyse several issues relevant for MRIO construction and applications. We demonstrate that differences in environmental satellite accounts may be more important than differences in MRIOTs when calculating national carbon footprints. The GTAP-MRIO is a robust global MRIOT and, given its easy availability and implementation, it should allow the widespread application of global MRIOA by a variety of users.

COMPILATION AND APPLICATIONS OF IDE-JETRO'S INTERNATIONAL INPUT-OUTPUT TABLES

- Economic Systems Research---2013---Bo Meng,Yaxiong Zhang,Satoshi Inomata

International input-output (IO) tables are among the most useful tools for economic analysis. Since these tables provide detailed information about international production networks, they have recently attracted considerable attention in research on spatial economics, global value chains, and issues relating to trade in value added. The Institute of Developing Economies at the Japan External Trade Organization (IDE-JETRO) has more than 40 years of experience in the construction and analysis of international IO tables. This paper explains the development of IDE-JETRO's multi-regional IO projects including the construction of the Asian International Input-Output table and the Transnational Interregional Input-Output table between China and Japan. To help users understand the features of the tables, this paper also gives examples of their application.

POLICY-RELEVANT APPLICATIONS OF ENVIRONMENTALLY EXTENDED MRIO DATABASES - EXPERIENCES FROM THE UK

- Economic Systems Research---2013---Thomas Wiedmann,John Barrett

The impressive development in global multi-region input-output (IO) databases is accompanied by an increase in applications published in the scientific literature. However, it is not obvious whether the insights gained from these studies have indeed been used in political decision-making. We ask whether and to what extent there is policy uptake of results from environmentally extended multi-region IO (EE-MRIO) models and how it may be improved. We identify unique characteristics of such models not inherent to other approaches. We then present evidence from the UK showing that a policy process around consumption-based accounting for greenhouse gas emissions and resource use has evolved that is based on results from EE-MRIO

modelling. This suggests that specific, policy-relevant information that would be impossible to obtain otherwise can be generated with the help of EE-MRIO models. Our analysis is limited to environmental applications of global MRIO models and to government policies in the UK.

DISAGGREGATING INPUT--OUTPUT MODELS WITH INCOMPLETE INFORMATION

- Economic Systems Research---2012---Sören Lindner,Julien Legault,Dabo Guan

Disaggregating a sector within the Leontief input--output (IO) framework is not a straightforward task since there is more than one possibility for the unknown technical coefficients of the disaggregated IO table, and more information than what is embodied in the aggregated IO table is thus required. This paper presents a methodology for disaggregating sectors into an arbitrary number of new sectors when the only available information about the newly formed sectors is their output weights. A random walk algorithm is used to explore the polytope containing the admissible combinations for the unknown technical coefficients of the disaggregated IO table. These combinations are then used to construct the probability distribution of the coefficients of the inverse Leontief matrix. The methodology is illustrated by disaggregating the electricity production sector of China's 2007 IO table and by looking at the probability distribution of the CO 2 emission intensity factors of the sectors of the economy.

USING A CGE MODEL TO IDENTIFY THE POLICY TRADE-OFF BETWEEN UNEMPLOYMENT AND INFLATION. THE EFFICIENT PHILLIPS CURVE

- Economic Systems Research---2012---Francisco André,Manuel Alejandro Cardenete,M. Carmen Lima

This paper provides a new reading of a classical economic relation: the short-run Phillips curve. Our point is that, when dealing with inflation and unemployment, policy-making can be understood as a multicriteria decision-making problem. Hence, we use so-called multiobjective programming in connection with a computable general equilibrium (CGE) model to determine the combinations of policy instruments that provide efficient combinations of inflation and unemployment. This approach results in an alternative version of the Phillips curve labelled as efficient Phillips curve . Our aim is to present an application of CGE models to a new area of research that can be especially useful when addressing policy exercises with real data. We apply our methodological proposal within a particular regional economy, Andalusia, in the south of Spain. This tool can give some keys for policy advice and policy implementation in the fight against unemployment and inflation.

DO WATER-RICH REGIONS HAVE A COMPARATIVE ADVANTAGE IN FOOD PRODUCTION? IMPROVING THE REPRESENTATION OF WATER FOR AGRICULTURE IN ECONOMIC MODELS

- Economic Systems Research---2012---Faye Duchin,Carlos López-Morales

With growing demand for fresh water and uncertain supplies, there is an increasing concern about future water scarcity. Since most freshwater withdrawals are for agriculture, reliance on water embodied in imported food (trade in 'virtual water') is a possible strategy to provide food to water-stressed regions while conserving their scarce supply for other purposes. To evaluate this proposition, we extend a model of interregional trade by (1) defining endowments of water that cannot be exceeded, (2) allowing simultaneous operation of rainfed and irrigated agriculture, and (3) distinguishing sub-regional endowments within a larger economic region. An application to the Mexican economy compares region-specific water abundance with economic comparative advantage under alternative scenarios. We conclude that the water-rich regions of Mexico are relatively high-cost producers of food and that they do not pick up the slack even when the lowest-cost Mexican regions are constrained by binding water constraints.

INCOME DISTRIBUTIONS IN INPUT-OUTPUT MODELS

- Economic Systems Research---2012---Albert E. Steenge,Mònica Serrano

The analysis of income distribution (ID) has traditionally been of prime importance for economists and policy-makers. However, the standard input--output (I--O) model is not particularly well equipped for studying current issues such as the consequences of decreasing access to primary inputs or the effects of specific redistributive policies. This paper addresses this gap in the existing literature. We propose that IDs can excellently be studied by restructuring the I--O relations. A new coefficients matrix is defined, the so-called augmented input coefficients matrix. This matrix is the sum of the intermediate input coefficients matrix and newly constructed matrices of sector-specific input coefficients that represent the existing distribution of income. We show that shifts in the distribution can be modelled by attributing weights to these matrices and vary these according to system-specific rules. Numerical illustrations based on the existing literature are given throughout the paper.

A CYCLING METHOD FOR CONSTRUCTING INPUT--OUTPUT TABLE TIME SERIES FROM INCOMPLETE DATA

- Economic Systems Research---2012---Manfred Lenzen,Maria Cecilia Pinto de Moura,Arne Geschke,Keiichiro Kanemoto,Daniel Dean Moran

There are a number of approaches for constructing time series of input--output tables. Some authors generate an initial estimate for a base year, and then serially estimate tables for subsequent years using the balanced prior-year table as an initial estimate. Others first generate a series of initial estimates for the entire period, and then balance tables in parallel. Current serial methods are affected by sudden leaps in the magnitude of table elements, which occur straight after a period of data unavailability. Current parallel methods require two complete tables for base and final years in the same classification, and therefore do not work under misaligned or incomplete data. We present a new method for constructing input--output table time series that overcomes these problems by averaging over alternate forward and backward sweeps across the time series period. We also solve the problem of hysteresis causing forecast and backcast table estimates to differ.

Applied General Equilibrium: An Introduction

- Economic Systems Research---2012---Karen Turner

2012

FINANCIAL DISTRESS AND INDUSTRY STRUCTURE: AN INTER-INDUSTRY APPROACH TO THE LOST DECADE IN JAPAN

- Economic Systems Research---2012---Kazuo Ogawa,Elmer Sterken,Ichiro Tokutsu

This paper proposes a novel approach to investigating the propagation mechanism of balance sheet deterioration in financial institutions and firms, by extending the input--output analysis. First, we use a unique input--output table augmented by firm size dimension. Second, we link the input--output table with the balance sheet conditions of financial institutions and firms. Based on Japanese input--output tables, we find that the lending attitude of financial institutions affected firms' input decision in the late 1990s and the early 2000s. Simulation exercises are conducted to evaluate the effects of changes in the lending attitude toward small firms as favorable as that toward large firms on sectoral allocations. We find that output was increased for small firms and reduced for large firms. The change in output was non-negligible, about 5.5% of the initial output of each sector. In particular, it exceeded 20% in textile, iron and steel and fabricated metal products.

DISTRIBUTIONAL INVARIANCE AND THE DESIGN OF SAMS

- Economic Systems Research---2012---Graham Pyatt,Jeffery I. Round

The decomposition of a matrix multiplier derived from a social accounting matrix (SAM) by Pyatt and Round [(1979). Accounting and Fixed Price Multipliers in a Social Accounting Matrix Framework. Economic Journal , 89, 850--873] has prompted a number of subsequent applications. In one of the earliest examples Stone [(1985). The Disaggregation of the Household Sector in the National Accounts, Chapter 8. In: G. Pyatt and J.I. Round (eds.) Social Accounting Matrices: A Basis for Planning . Washington, DC, The World Bank, 145--185] made the intriguing observation that the higher order (circular) effects of an exogenous change in final demand on the distribution of income and the structure of production were more or less independent of the sectoral composition of the initial injection. Our initial objective in this article is to explore this phenomenon of distributional invariance and to derive sufficient conditions for it. We then argue that these conditions have important implications for the design of SAMs, for the taxonomies they adopt and for levels of disaggregation, all of which strongly condition the quality of results that can be generated via subsequent modelling.

HOW MUCH DO EXPORTS CONTRIBUTE TO CHINA'S INCOME GROWTH?

- Economic Systems Research---2012---Jiansuo Pei,Jan Oosterhaven,Erik Dietzenbacher,裴建锁

It is a widespread belief that exports, in particular of 'high-tech' products, contribute much to China's income growth. This study addresses this issue by applying a structural decomposition analysis to input--output (I--O) data. We employ two extended I--O tables that distinguish processing trade from ordinary exports. The contribution of exports to the value-added growth from 2002 to 2007 is found to be overestimated by 32% when standard I--O tables are used rather than the extended I--O tables. Even more strikingly, the value-added growth that may be attributed to the exports of 'high-tech' telecommunication products is overestimated by no less than 63%. A serious overestimation of the contribution to income growth of certain products (such as high-tech products) sends out misleading signals to policymakers. When measured correctly, the true contribution appears to be substantially smaller than is generally believed to be.

STRUCTURAL DECOMPOSITION ANALYSIS APPLIED TO ENERGY AND EMISSIONS: AGGREGATION ISSUES

- Economic Systems Research---2012---Bin Su,B. W. Ang

With the introduction of the environmentally extended input--output (I--O) framework, traditional economic I--O modeling and analysis can be conveniently adopted in energy and emission studies. Based on such an extended framework, many empirical studies investigating the driving forces of energy consumption and emission changes using structural decomposition analysis have been reported. Three aggregation issues are inherent in such decomposition studies, namely sector aggregation, spatial aggregation and temporal aggregation. This study, as an extension of our previous work on the first two issues, focuses on the third or temporal aggregation. An empirical study using the emission data of China from 1997 to 2007 is presented to illustrate the problems involved. How to deal with temporal aggregation and its possible interactions with the other two aggregations is also discussed.

FROM INPUT--OUTPUT TABLES TO SUPPLY-AND-USE TABLES

- Economic Systems Research---2012---Brugt Kazemier,Carlo H. Driesen,Erik Hoogbruin

In 1991, Statistics Netherlands introduced the supply-and-use tables as part of the national accounts. Since then, the supply-and-use tables have been the main statistics on the production structure of the Dutch economy. They form the basis from which input--output tables are derived. The time series of supply-and-use tables starts in 1987. However, there is a need for a time series since 1970 because benchmark revisions of the Dutch national accounts would become far easier if such time series were available. Therefore,

a method has been developed to derive supply-and-use tables from existing input--output tables. This article presents the algorithm.

CALCULATING ENERGY-RELATED CO 2 EMISSIONS EMBODIED IN INTERNATIONAL TRADE USING A GLOBAL INPUT--OUTPUT MODEL

- Economic Systems Research---2012---Kirsten Wiebe,Martin Bruckner,Stefan Giljum,Christian Lutz

The Global Resource Accounting Model (GRAM) is an environmentally-extended multi-regional input--output model, covering 48 sectors in 53 countries and two regions. Next to CO 2 emissions, GRAM also includes different resource categories. Using GRAM, we are able to estimate the amount of carbon emissions embodied in international trade for each year between 1995 and 2005. These results include all origins and destinations of emissions, so that emissions can be allocated to countries consuming the products that embody these emissions. Net-CO 2 imports of OECD countries increased by 80% between 1995 and 2005. These findings become particularly relevant, as the externalisation of environmental burden through international trade might be an effective strategy for industrialised countries to maintain high environmental quality within their own borders, while externalising the negative environmental consequences of their consumption processes to other parts of the world. This paper focuses on the methodological aspects and data requirements of the model, and shows results for selected countries and aggregated regions.

SENSITIVITY AND UNCERTAINTY ANALYSIS IN MRIO MODELLING; SOME EMPIRICAL RESULTS WITH REGARD TO THE DUTCH CARBON FOOTPRINT

- Economic Systems Research---2012---Harry C. Wilting

Environmental multi-regional input--output (MRIO) models require large amounts of data that all have their specific uncertainties. This paper presents a sensitivity and uncertainty analysis in order to gain an understanding of the directions in which efforts should be made to reduce these uncertainties. The analyses were carried out for an MRIO model to calculate the Dutch carbon footprint. A sensitivity analysis of the technical coefficients showed that changes in the coefficients in the domestic blocks and in the Dutch import blocks had the largest effects on the calculated footprint. The uncertainty analysis consisting of a Monte Carlo simulation based on probability distributions around the model coefficients showed a relatively low degree of uncertainty in the total Dutch carbon footprint; uncertainties in the carbon emissions allocated to regions, sectors and products were larger. Both analyses showed that, in certain cases, it is justified to apply a partial MRIO analysis.

INTER-REGIONAL TRADE FLOW ESTIMATION THROUGH NON-SURVEY MODELS: AN EMPIRICAL ASSESSMENT

- Economic Systems Research---2012---Ana L.M. Sargento,Pedro Nogueira Ramos,Geoffrey Hewings

Inter-regional trade estimation has been pointed out as a crucial problem when constructing a multiregional input--output system. Knowledge of inter-regional trade flows, at least of the pooled volume of exports and imports by commodity, is critical in accounting for important spillover and feedback effects deriving from inter-regional linkages. However, in most countries, there are no completely reliable survey-based statistics on inter-regional trade. Thus, this paper intends to evaluate the reasonability of using indirect inter-regional trade estimates, comparing different estimating methods and assessing the sensitivity of the model results. Based on our empirical comparisons we conclude that input--output models are not greatly affected by the insertion of different trade values. Thus, our results support the use of indirect estimates for inter-regional trade, whenever survey-based data are unavailable.

REAL-FINANCIAL LINKAGES IN THE CANADIAN ECONOMY: AN INPUT--OUTPUT APPROACH

- Economic Systems Research---2012---Danny Leung,Oana Secrieru

The recent financial crisis highlighted the importance of better understanding the interaction between macroeconomic and financial conditions. In this paper, we provide a financial social accounting matrix for the Canadian economy and use it to assess the strength of real-financial linkages by calculating and comparing multipliers with and without endogenous financial flows. It is found that taking into account financial flows increases the impact of a final demand shock on output by 4--11%. Moreover, between 2008 and 2009H1, the investment decisions of financial institutions together with the fact that non-financial institutions were unwilling or unable to increase their financial liabilities led to estimated declines in all GDP multipliers. The impact of a final demand shock on GDP declined 3--5%, while the impact of an increase in the availability of investment funds fell 30% and 55% for financial and non-financial corporations, respectively.† -super-†The views expressed in this paper are those of the authors. No responsibility for them should be attributed to Statistics Canada.

The Sustainability Practitioner's Guide to Input--Output Analysis

- Economic Systems Research---2012---Shigemi Kagawa

2012

ECONOMETRIC ESTIMATION OF ARMINGTON IMPORT ELASTICITIES FOR A REGIONAL CGE MODEL OF THE ILLINOIS ECONOMY

- Economic Systems Research---2012---Karen Turner,Soo Jung Ha,Geoffrey Hewings,Peter McGregor,John Swales

One of the main concerns associated with the development and use of regional CGE models is the determination of key parameter values, particularly substitution and other price elasticities. A common problem is the lack of appropriate regional data for econometric estimation. Consequently, it is important to identify key parameters that are likely to be important in determining quantitative results and then to prioritize these for estimation where appropriate data are available. In this paper, the focus is on the estimation of the regional trade (import) substitution parameters, which tend to be important in analysis for regional economies (given their openness to trade). Here, commodity import elasticities for the Illinois economy are estimated and tested in a single region CGE model of the Illinois economy. In our econometric estimation, we apply a model that takes account of market size and distance in estimating the substitutability between commodities produced in Illinois and other US states.

THE ROLE OF SUPPLY CONSTRAINTS IN MULTIPLIER ANALYSIS

- Economic Systems Research---2012---Manuel Alejandro Cardenete,Ferran Sancho

Multiplier analysis based upon the information contained in Leontief's inverse is undoubtedly part of the core of the input--output methodology and numerous applications and extensions have been developed that exploit its informational content, both at the national and regional levels. Nonetheless there are some implicit theoretical assumptions whose policy implications need to be assessed. This is the case for the 'excess capacity' assumption, which implies that resources are available as needed to adjust production to new equilibrium states. In an actual economy, however, new resources are often scarce and always costly. When supply constraints intervene, the assessment of the effects of government demand policies may be substantially different from that of the standard Leontief multiplier matrix. Using a closed general equilibrium model that incorporates supply constraints, we perform some simple numerical exercises and proceed to derive two 'constrained' multiplier matrices, based upon the implicit Jacobian matrix, that can be compared with the standard 'unconstrained' Leontief matrix.

A NEW SECTORAL TAXONOMY BASED ON PECUNIARY KNOWLEDGE EXTERNALITIES: KNOWLEDGE INTERACTIONS IN A VERTICALLY INTEGRATED SYSTEM

- Economic Systems Research---2012---Agnieszka Gehringer

The paper presents a new sectoral taxonomy that focuses on the existence of non-negligible external effects that derive from user--producer knowledge interactions. These are coupled with intermediate goods transactions, in a system of vertically integrated manufacturing and services sectors. These externalities, the so-called pecuniary knowledge externalities, are the main source of changing technological conditions experienced by downstream producers. A distinguishing feature of the taxonomy lies in its derivation from a particularly dynamic context of changing production functions. The taxonomy is empirically derived, examining effects generated by technological knowledge in a system of intermediate goods transactions and taking into account peculiar characteristics of sectors in European economies. The results allow for a classification of sectors in five groups. An analysis of these classes confirms previous evidence that technological characteristics of sectors across classes differ.

OPTIMIZING PRODUCTION IN THE GREEK ECONOMY: EXPLORING THE INTERACTION BETWEEN GREENHOUSE GAS EMISSIONS AND SOLID WASTE VIA INPUT--OUTPUT ANALYSIS

- Economic Systems Research---2012---Dimitrios Hristu-Varsakelis,Stella Karagianni,Maria Pempetzoglou,Athanasios Sfetsos

We explore an input--output based framework for optimizing production in the Greek economy, under constraints relating to energy use, final demand, greenhouse gas emissions and solid waste. Using empirical data, we consider the effects on the maximum attainable gross value of production when imposing various pollution abatement targets. Our results quantify those effects as well as the magnitude of economic sacrifices required to achieve environmental goals, in a series of policy scenarios of practical importance. Because air pollution and solid waste are not produced independently of one another, we identify the settings in which it is meaningful to institute a separate policy for mitigating each pollutant, versus those in which only one pollutant needs to be actively addressed. The scenarios considered here represent a range of options that could be available to policy makers, depending on the country's international commitments and the effects on economic and environmental variables.

SOCIAL ACCOUNTING MATRIX FOR INDIA

- Economic Systems Research---2012---Barun Deb Pal,Sanjib Pohit,Joyashree Roy

This paper provides the latest Social Accounting Matrix (SAM) of the year 2003--2004 for the Indian economy with a wide variety of disaggregation for the Energy sector and the sectors that are relevant for environmental and climate policy evaluation. This SAM shows the interaction between production, income, consumption and capital accumulation. It can be used to provide an analysis of the interrelationship between the production structure of an economy and the distribution of incomes and expenditures of different household groups. In addition, it can be used for multiplier analysis to capture direct, indirect and induced impact on input use due to any exogenous changes in the economy. This SAM consists of 85 sectors of the economy, three factors of production and nine categories of occupational households. The Indian economy is becoming structurally biased towards capital intensive sectors, such as service and energy production. The energy production sector itself is the most energy intensive sector as of 2003--2004.

ADDING SUPPLY-DRIVEN CONSUMPTION MAKES THE GHOSH MODEL EVEN MORE IMPLAUSIBLE

- Economic Systems Research---2012---Jan Oosterhaven

Guerra and Sancho (2011) argue that adding a supply-driven consumption function to the Ghosh model di-

minishes its implausibility in the case of centrally planned economies. Extending the Leontief model with a demand-driven consumption function does make that model more realistic. Extending the Ghosh model, however, makes it even more implausible in the case of a market economy, while it becomes even more problematic as a guide for a centrally planned economy. The prime reason is that complementarities between inputs are negated, not only for firms, but now also for households. Consequently, industry and aggregate output may now increase, while corresponding value added decreases, and vice versa.

THE INS AND OUTS OF WATER USE -- A REVIEW OF MULTI-REGION INPUT--OUTPUT ANALYSIS AND WATER FOOTPRINTS FOR REGIONAL SUSTAINABILITY ANALYSIS AND POLICY

- Economic Systems Research---2011---Peter L. Daniels,Manfred Lenzen,Steven J. Kenway

This paper reviews current knowledge about water footprints (WFs) and the role of input--output techniques. We first provide an overview of the prevailing 'bottom-up', process-based methods and their strengths and limitations. This overview leads to discussion of the benefits of combining process-based water footprints with information from input--output techniques. The central theme and proposition is that environmental multi-region input--output analysis (E-MRIO) has a powerful capacity to establish the geography of embodied water, and to complement process-based approaches to WF by expanding their supply-chain coverage. Combining process and input--output information provides valuable information for a diverse set of water planning and water policy objectives. A comprehensive and systematic outline of potential policy applications of E-MRIO (and process analysis methods) is presented.

POLICIES AND TECHNOLOGIES FOR A SUSTAINABLE USE OF WATER IN MEXICO: A SCENARIO ANALYSIS

- Economic Systems Research---2011---Carlos López-Morales,Faye Duchin

Water stress in Mexico is intimately linked to agriculture, as irrigation claims 75% of national water withdrawals. The Mexican mix of irrigation technologies is dominated by flood techniques, utilized on 93% of irrigated land, while drip and sprinkler systems, both with higher application efficiencies, are utilized on only 7% of irrigated land. This paper examines the extent to which government policies can induce the adoption of alternative irrigation technologies to promote a sustainable pattern of water withdrawals. The framework is an inter-regional input--output model formulated as a linear program that solves for cost-minimizing allocations of output that are constrained by regional factor availability. The model features endogenous choice among alternative agricultural technologies and determines commodity prices based on factor costs and on scarcity rents for limiting factors of production. The study defines and quantifies sustainable endowments of water at the regional level and analyzes scenarios that combine fees or caps on water withdrawals with the availability of alternative irrigation technologies. We find that water policies can induce technology adoption to achieve water sustainability, although the national price of agricultural output rises 5% to 8% relative to baseline levels. Furthermore, pricing water for irrigation can generate enough public revenue for the government to cover the full costs of technology adoption.

WATER RATES AND THE RESPONSIBILITIES OF DIRECT, INDIRECT AND END-USERS IN SPAIN

- Economic Systems Research---2011---Ignacio Cazcarro,Rosa Duarte,Julio Sanchez Choliz,Cristina Sarasa

Irrigation is the main user of water in Spain, and the price paid for this resource has long been lower than its cost. The recent EU Water Framework Directive requires that all costs be recovered, but application has had perverse effects. In some cases, farms have become economically unviable, while in others, cultivation has intensified and water consumption has increased. This paper applies a slightly modified version of the computable general equilibrium model developed by the In-

ternational Food Policy Research Institute (Lofgren et al., 2002), to a SAM (Social Accounting Matrix) of the province of Huesca in north-eastern Spain. The model disaggregates the agricultural sectors into irrigated and unirrigated farming, taking into account the improvements in irrigation efficiency. Within this framework, we analyse different payment scenarios affecting direct users, exporters and end-users in order to examine user responsibilities, the impact of international markets and macroeconomic effects on agriculture and industry in Spain.

AN INPUT--OUTPUT ANALYSIS OF TRENDS IN VIRTUAL WATER TRADE AND THE IMPACT ON WATER RESOURCES AND USES IN CHINA

- Economic Systems Research---2011---Zhuoying Zhang,Minjun Shi,Hong Yang,Ashok Chapagain

This study investigates the impacts of China's international trade on its water resources and uses between 2002 and 2007. The results show a significant increase in water use efficiency in most sectors, especially the manufacturing sectors. However, the total net virtual water exported increased by about 75%, from 39.0 × 10-super-9 m-super-3 to 68.2 × 10-super-9 m-super-3. The ratio of net virtual water exports to the total water resources of the country increased from 1.8% to 3.1%. In water-scarce North China, the ratio increased from 3.6% to 5.1%, which indicates a growing water resources pressure. The share of the net virtual water exports in the total water use in China increased from 7% to 12%. The results suggest that China's economic gains from intensifying international trade came with high costs regarding its water resources.

EDITORS' REPORT

- Economic Systems Research---2011---Manfred Lenzen,Bart Los

2011

ECONOMETRIC ANALYSIS OF EUROPEAN CARBON DIOXIDE EMISSIONS BASED ON RECTANGULAR SUPPLY-USE TABLES

- Economic Systems Research---2011---José Rueda-Cantuche

This paper formalises the so-called Supply-Use Based Econometric (SUBE) approach that allows for the introduction of econometric analysis in the calculation of backward input--output multipliers of the Leontief-type quantity model, using rectangular supply and use tables. The SUBE approach does not require any kind of inverse matrix and incorporates the traditional approach (with square supply-use tables) as a particular case. The empirical analysis shows that the SUBE carbon dioxide multipliers for the EU27 are considerably lower than those obtained by the traditional Leontief inverse. In an application of the SUBE approach, the European economy appears to emit about 10% less carbon dioxide than in a situation in which it would not import any intermediate inputs from outside the EU27.

SECTORS MAY USE MULTIPLE TECHNOLOGIES SIMULTANEOUSLY: THE RECTANGULAR CHOICE-OF-TECHNOLOGY MODEL WITH BINDING FACTOR CONSTRAINTS

- Economic Systems Research---2011---Faye Duchin,Stephen H. Levine

We develop the rectangular choice-of-technology model with factor constraints, or RCOT, a linear programming input--output model for analysis of the economy of a single region. It allows for one or more sectors to operate more than one technology simultaneously, with the relatively lowest-cost one supplemented by others if it encounters a binding factor constraint. The RCOT model solves for sector outputs, goods prices that are set by the highest-cost technologies in use, and scarcity rents that correspond to binding factor constraints experienced by the lower-cost technologies. The model is motivated by the fact that mineral deposits of different qualities may be exploited simultaneously, as may primary and recycled sources for the same materials

or irrigated and rain-fed techniques for producing the same crop. RCOT generalizes Carter's square choice-of-technology model, in particular adding the factor constraints that allow several alternatives to operate simultaneously. The Appendix gives a numerical example.

STRUCTURAL DECOMPOSITION ANALYSIS OF GREENHOUSE GAS EMISSIONS IN NORWAY 1990--2002

- Economic Systems Research---2011---Asuka Yamakawa,Glen Peters

The goal of this study is twofold: first, to quantify the economic factors driving greenhouse gas emissions in Norway, and second, to assess if random variations in the data affect the results. We use structural decomposition analysis (SDA) with chained constant price input--output tables and environmental extensions. We construct three sets of constant-price data using a smoothing algorithm to remove random variations from the data, and find that the results of the SDA are relatively robust to these variations. The production of exports was responsible for around 70% of the growth in greenhouse gas emissions from 1990 to 2002, household consumption of domestically produced products for about 15%, government 10%, with the remainder due to gross capital formation. The dominance of exports in the emissions growth may make future greenhouse gas mitigation challenging in Norway, particularly considering that the exports are dominated by oil and gas production.

REVISITING THE ORIGINAL GHOSH MODEL: CAN IT BE MADE MORE PLAUSIBLE?

- Economic Systems Research---2011---Ana-Isabel Guerra,Ferran Sancho

We reconsider in this paper the alleged implausibility of Ghosh's model and we do so reformulating the model to incorporate an alternative closure rule. Our proposed closure rule is in line with the original allocation rules defined by A. Ghosh. The closure solves, to some extent, the implausibility problem that was pointed out by Oosterhaven, for then value-added is correctly computed and responsive to allocation changes resulting from supply shocks. Some numerical examples illustrate the sectoral and aggregate consistency of the allocation equilibrium.

LABOUR PRODUCTIVITY CHANGES AND WORKING TIME: THE CASE OF GREECE

- Economic Systems Research---2011---Athena Belegri--roboli,Maria Markaki,Panayotis Michaelides,Athena Belegri-Roboli

In terms of the annual hours worked per employee, Greece ranks first among EU-15 countries and second among OECD countries. In this context, the austerity measures it adopted (as suggested by the EU and IMF) imply, among other things, a reduction in the overhours. If such reductions were not to be accompanied by increases in labour productivity, output would be reduced considerably. This paper therefore addresses the question: "What change in sectoral labour productivity levels would have been required to deliver the actual change in final demands in Greece between 1995 and 2005, if working hours in each sector had been reduced to their EU averages?" In this framework, we develop a methodology for calculating labour productivity change by sector of economic activity in an input--output context. Next, we apply it to the Greek economy for the time period 1995--2005, the most recent period for which the required data are available. We find that the required productivity changes are the most substantial for the hotels and restaurants sector, followed by machinery manufacturing and the trade sectors.

CONSTRUCTING AN ENVIRONMENTALLY-EXTENDED MULTI-REGIONAL INPUT-OUTPUT TABLE USING THE GTAP DATABASE

- Economic Systems Research---2011---Glen Peters,Robbie Andrew,James Lennox

The use of Multi-Regional Input-Output Analysis (MRIOA) for understanding global environmental prob-

lems is growing rapidly. Renewed interest in MRIOA has led to several large research projects focused on constructing detailed and accurate MRIOTs. However, very few researchers have made use of the already available and regularly updated database produced by the Global Trade Analysis Project (GTAP). We demonstrate and discuss how the GTAP database can be converted into an MRIOT without the need for additional balancing. An illustrative example uses the GTAP-MRIO to reallocate carbon dioxide emissions from producing to consuming countries. We suggest that an MRIOT that treats international transport exogenously is adequate until more reliable data on international transport margins and emissions are available. To focus resources and refine methods, a concerted research effort is needed to compare the results of the GTAP-MRIO model with the new MRIO datasets under development.

COEFFICIENT CHANGE, PRICE EFFECTS, AND IMPLICIT ELASTICITIES: ESTIMATING MICROECONOMIC DETERMINANTS OVER TWO TIME PERIODS

- Economic Systems Research---2011---Stephen Casler

This paper presents and estimates an input-output model in which input coefficient changes are functions of changing prices. The model produces results that mirror the characteristics of input demand functions based on the model of cost minimization subject to producing a desired level of output. It does not rely on the specification of a functional form for input coefficients, and it does not require the use of assumptions regarding the elasticity of substitution. Instead, it allows the actual price and coefficient changes that occur between periods to identify the implicit elasticities and own- and cross-price derivatives. Using this model, it is shown how accurate measures of price effects, including the full array of own and cross-elasticities of demand, can be estimated for models comprising up to 15 sectors given data for only two time periods.

CONSTRUCTION, STABILITY AND PREDICTABILITY OF AN INPUT-OUTPUT TIME-SERIES FOR AUSTRALIA

- Economic Systems Research---2011---Richard Wood

This paper documents the development of a time series of Australian input-output tables. It describes the construction techniques employed in order to overcome the major issues encountered. Environmentally important processes were delineated using a range of detailed commodity data, thus expanding the original tables from roughly 100 industries into a temporally consistent 344 industries. Data confidentiality and inconsistency were overcome using an iterative constrained optimisation method called KRAS - a recent modification of RAS (Lenzen et al. 2006; 2007; 2009). The article concludes by analysing the stability of input-output coefficients over time similar to work in Dietzenbacher and Hoen (2006). The issue of stability of coefficients and multipliers was investigated under the Leontief and Ghosh models of supply/demand. Finally, the predictability of the models was examined under updated final demand or primary inputs and over varying time scales.

EVALUATING UNCERTAINTY IN RISK-BASED INTERDEPENDENCY MODELING WITH INTERVAL ARITHMETIC

- Economic Systems Research---2011---Kash Barker,Claudio Rocco S.

Several sources of uncertainty exist in the effort to quantify the efficacy of preparedness decision-making in interdependent systems. For the Inoperability Input-Output Model (IIM), a risk-based extension of the traditional Leontief model, which describes the propagation of inoperability throughout interconnected economic sectors, uncertainty is manifested in parameters describing the strength of interdependencies among sectors and in parameters describing the adverse impacts of a disruptive event, among others. As the model is used to evaluate preparedness options to reduce the impact of these disruptive events, such uncertainty

can impact decision-making efforts. This paper introduces interval arithmetic as an approach for dealing with uncertainties in the IIM when probability distributions are not known and only variable bounds are available. Illustrative examples highlight the use of the approach as well as a means to improve the evaluation and comparison of risk management strategies in interdependent systems when only intervals are known.

DECOMPOSITION OF LABOUR DEMAND BY EMPLOYER SECTORS AND GENDER: FINDINGS FOR MAJOR EXPORTING SECTORS IN TURKEY

- Economic Systems Research---2011---Gulay Gunluk-Senesen,Umit Senesen

This paper attempts to provide insight into the likely impacts of the current global crisis on employment in Turkey. As this crisis hits the Turkish economy through a demand squeeze in the international market, our focus is on the labour demand generated by major export sectors. The decomposition of impacts with respect to gender is of particular interest given the significant gender imbalances in the labour market. The findings indicate that female (male) employment is most sensitive to wearing apparel (trade) exports. In general, employment generation potentials of major export sectors are found to be weaker for females and stronger in agriculture, trade and finance, while they are very limited in manufacturing for both genders.

Designing Public Policies. An Approach Based on Multi-criteria Analysis and Computable General Equilibrium Modeling

- Economic Systems Research---2011---Ferran Sancho

2011

OBITUARY

- Economic Systems Research---2011---Christian Lager

2011

BALANCE SHEET ECONOMICS OF THE SUBPRIME MORTGAGE CRISIS

- Economic Systems Research---2011---Masako Tsujimura,Kazusuke Tsujimura

As Copeland (1947; 1952) demonstrated with his money-flows accounts more than half a century ago, the balance sheets of economic entities are closely interrelated through a lender-borrower relationship. This paper is an attempt to describe the US subprime mortgage crisis in the framework of 'balance sheet economics', which was originally proposed by Stone (1966) and Klein (1977; 1983). Since it is almost impossible to collect all the balance sheets of economic entities, we use flow-of-funds accounts instead to simulate the negative consequences resulting from home mortgage delinquencies. We show that the pass-through sequence converges when the original delinquency is made up by loss of net worth in any of the economic entities. Most of the eventual loss is incurred by 'Households and Nonprofit Organizations' and 'Rest of the World'. A portion of pass-through loss is eventually incurred by foreign countries with excess external assets, such as Japan, Ireland, etc.

THE LIFE CYCLE ENVIRONMENTAL IMPACTS OF CONSUMPTION

- Economic Systems Research---2011---Edgar Hertwich

This paper reviews assessments of environmental impacts arising from consumption, taking into account the production and disposal of goods consumed. Assessments have mostly focused on understanding household consumption, but there is an increasing interest in understanding government consumption, as well as in the treatment of gross capital formation and trade. National economic and environmental accounts are the most frequently used data source for such studies and input-output techniques are usually applied. For many OECD countries and a few developing countries, assessments address only energy or greenhouse gas emissions. Few studies address a broader range of emissions-related environmental impacts. There is a

lack of consideration for important pressures on ecosystems such as habitat change and overexploitation of fisheries and forests. In all countries, housing and food are important. In poor countries, public services can contribute substantially, while in rich countries, mobility and the consumption of manufactured goods is important. In rapidly developing economies, investments, especially in infrastructure and buildings, are important causes of environmental pressure as well. Differences in production conditions and pollution intensities across countries are substantial, so explicitly modelling the production of internationally traded goods using multi-regional input-output analysis is necessary to account correctly for the environmental impacts arising from the consumption of imported goods.

ESTIMATION OF SYMMETRIC INPUT-OUTPUT TABLES: AN EXTENSION TO BOHLIN AND WIDELL

- Economic Systems Research---2011---Nicola Smith,Garry McDonald

This paper presents two optimisation models for use in the production of symmetric input-output tables (SIOTs) based on data contained within supply-use tables (SUTs). The first model produces commodity-by-commodity SIOTs derived from the selection of appropriate technology assumptions, while the second produces industry-by-industry SIOTs derived through the selection of appropriate sales structure assumptions. Both models address the problem of negative coefficients and also permit the use of rectangular SUTs as base input data. Additionally, this paper explores the development of a 'comprehensive model' enabling production of both commodity-by-commodity and industry-by-industry SIOTs that are conceptually and mathematically consistent.

AGGREGATION VERSUS DISAGGREGATION IN INPUT-OUTPUT ANALYSIS OF THE ENVIRONMENT

- Economic Systems Research---2011---Manfred Lenzen

Analysts carrying out input-output analyses of environmental issues are often plagued by environmental and input-output data existing in different classifications, with environmentally sensitive sectors sometimes being aggregated in the economic input-output database. In principle there are two alternatives for dealing with such misalignment: either environmental data have to be aggregated into the input-output classification, which entails an undesirable loss of information, or input-output data have to be disaggregated based on fragmentary information. In this article, I show that disaggregation of input-output data, even if based on few real data points, is superior to aggregating environmental data in determining input-output multipliers. This is especially true if the disaggregated sectors are heterogeneous with respect to their economic and environmental characteristics. The results of this work may help analysts in understanding that disaggregation based on even a small amount of proxy information can improve the accuracy of input-output multipliers significantly. Perhaps, these results will also provide encouragement for preferring model disaggregation to aggregation in future work.

PROJECTION OF SUPPLY AND USE TABLES: METHODS AND THEIR EMPIRICAL ASSESSMENT

- Economic Systems Research---2011---Umed Temursho (Temurshoev),Colin Webb,Norihiko Yamano

We present eight existing projection methods and test their relative performance in estimating Supply and Use tables (SUTs) of the Netherlands and Spain. Some of the methods presented have received little attention in the literature, and some have been slightly revised to better deal with negative elements and preserve the signs of original matrix entries. We find that (G)RAS and the methods proposed by Harthoorn and van Dalen (1987) and Kuroda (1988) produce the best estimates for the data in question. Their relative success also suggests the stability of ratios of larger transactions.

The Dynamics of Regions and Networks in Industrial Ecosystems

- Economic Systems Research---2011---Ines Costa

2011

TOURISM STUDIES AND INPUT-OUTPUT ANALYSIS: INTRODUCTION TO A SPECIAL ISSUE

- Economic Systems Research---2010---Bart Los,Albert Steenge

2010

TOWARDS A NEW FRAMEWORK FOR ACCOUNTING AND MODELLING THE REGIONAL AND LOCAL IMPACTS OF TOURISM

- Economic Systems Research---2010---Bjarne Madsen,Jie Zhang

We identify four different approaches to estimate the regional and local impacts of tourism based on national accounts and economic modelling: The supply approach, the simple demand or commodity approach, the simple satellite account approach involving tourism satellite accounts based on social accounting, and the extended satellite account approach. Based upon a general interregional quantity model for tourism, empirical evidence on the impacts of tourism on 98 Danish municipalities is presented. We conclude that the four approaches give very different results, both in absolute and in relative terms.

TOURISM SATELLITE ACCOUNTS FOR REGIONS? A REVIEW OF DEVELOPMENT ISSUES AND AN ALTERNATIVE

- Economic Systems Research---2010---Calvin Jones,Max Munday

The extension of the tourism satellite account (TSA) to the regional scale is an opportunity for regional policymakers to undertake consistent and defensible analyses of the tourism economy and its interconnections based upon high-quality and comparable data. However, limitations in the TSA structure will need to be resolved before policy useful analysis can become the rule rather than the exception. The paper reviews the development of TSAs at sub-national levels and goes on to examine their usefulness to policymakers, and how far problems with the framework can be overcome in a practical manner.

TOURISM MULTIPLIERS FOR A SMALL CARIBBEAN ISLAND STATE; THE CASE OF ARUBA

- Economic Systems Research---2010---Albert Steenge,Annemieke Van De Steeg

In this paper, we study the importance of tourism for Aruba, a small Caribbean island state within the Kingdom of The Netherlands. We present an input-output table based on the National Accounts and the Tourism Satellite Account for Aruba, with inbound tourism explicitly included, for the year 1999. Several types of multipliers are discussed. Each multiplier is relevant within a particular framework, but the choice between them is not always obvious. This paper tries to clarify a number of issues in their usage as they present themselves in the context of the study of tourism in Aruba.

COMBINING NON-MARKET VALUATION AND INPUT-OUTPUT ANALYSIS FOR COMMUNITY TOURISM PLANNING: OPEN SPACE AND WATER QUALITY VALUES IN COLORADO, USA

- Economic Systems Research---2010---Sarah Cline,Andrew Seidl

We use a combination of non-market valuation and input-output approaches to inform community scale planning for natural-resource based tourism development in rural Colorado. Contingent behavior and trip expenditure information are used in conjunction with IMPLAN input-output software to simulate the likely regional economic effects of changes in local environmental attributes. Visitor surveys reveal sensitivity to the amount of ranch open space and local water quality resulting in discernable regional economic effects

should these valuable dimensions of the local environment change. The likely total, direct, indirect, and induced effects and implications on local residents and tourists of a sales tax, mill levy, and hotel occupancy ('bed') tax to preserve ranch open space and maintain local water quality are simulated. The losses offset from maintaining environmental quality are found to significantly outweigh the regional impacts of any of the tax policies.

MACROECONOMIC EFFECTS OF A VAT REDUCTION IN THE ITALIAN HOTELS & RESTAURANTS INDUSTRY

- Economic Systems Research---2010---Mara Manente,Michele Zanette

The paper tests the effects on the Italian economy of a fiscal measure aimed at lowering the VAT rate from 10% to 5% in the Italian 'Hotels and Restaurants' sector. The analysis focuses first on the impacts in terms of tourism consumption, investments of the sector and public budget. Thereafter, by means of a multiregional-multisectoral input-output model, the increase on the total employment levels by sector and by region has been estimated. Based on a tourism demand elasticity of -1.06 and a supply elasticity of 2.0, tourist nights would increase by a maximum of 3.15% and total tourism consumption by 4.4%, while gross fixed investments by the sector would increase by 2.17%. As for the budget constraint, we have calculated the final 'cost' of the fiscal measure for the Treasury. Concerning the macroeconomic effects in terms of employment, the fiscal measure would produce a total increase of almost 100,000 jobs (expressed in fulltime equivalents).

AN IMPORTANT FACTOR IN JOB ESTIMATION: A NONLINEAR JOBS-TO-SALES RATIO WITH RESPECT TO CAPACITY UTILIZATION

- Economic Systems Research---2010---Ya-Yen Sun,Kam-Fai Wong

Many tools for economic impact evaluation, such as input-output models and computable general equilibrium models, rely on the jobs-to-sales ratio (JSR) to convert direct, indirect and induced effects of sales into employment. For service sectors, this ratio is strongly influenced by capacity utilization and exhibits a non-linear pattern, especially for short-term tourism applications that involve dramatic demand fluctuations as a consequence of mega events, natural disasters or societal instability. The purpose of this study is to decompose the relationship between capacity utilization and the JSR so that the underlying factors that cause the instability of JSR can be identified. Time-series data from the Taiwanese tourist hotels and aviation sectors are adopted to discuss the strength of the relations between price per unit and capacity utilization, total employee numbers and utilization, service capacity and utilization, and labor efficiency and utilization, respectively. The results indicate that the adjustment of labor efficiency is the prominent factor in determining the stability of the jobs-to-sales ratio, while price, to employee number and service capacity are relatively stable in response to demand, leading to changing JSRs.

BOOK REVIEW

- Economic Systems Research---2010---Viveka Palm

2010

INTEGRATING A HOUSEHOLD DEMAND SYSTEM IN THE INPUT-OUTPUT FRAMEWORK. METHODOLOGICAL ASPECTS AND MODELLING IMPLICATIONS

- Economic Systems Research---2010---Ignazio Mongelli,Frederik Neuwahl,José Rueda-Cantuche

In this paper we argue that an accurate representation of household consumption behaviour is central to the analysis and comparison of policy interventions addressing sustainable consumption. Therefore, we propose to extend an input-output model with a specific household consumption model, at the core of which is a system of equations explaining the allocation of the households' overall expenditure across different purposes, such as buying food, the consumption of fuel for heating or electricity for cooling, education of children

or travelling in terms of total expenditure and relative prices. This paper shows that the integration of a specific module for household consumption in a standard input-output model is an improvement for the analysis of the policies aimed at altering consumer behaviour.

AN ENVIRONMENTAL/INPUT-OUTPUT LINEAR PROGRAMMING MODEL TO REACH THE TARGETS FOR GREENHOUSE GAS EMISSIONS SET BY THE KYOTO PROTOCOL

- Economic Systems Research---2010---Jose San Cristobal

The Kyoto Protocol contains legally binding targets for greenhouse gas (GHG) emissions for industrialized countries. The importance of this agreement and the elaboration of a climate change policy make it necessary to define and establish national policy measures and to bring into force environmental regulations that will reduce GHG emissions. Extending our knowledge of the economic-ecologic relationships that exist within the production sphere can assist in defining and implementing successful environmental policies. In this paper, an Environmental/Input-Output linear programming model is proposed. To develop the model we consider the input-output model as a linear programming problem combining two types of restrictions: environmental restrictions establishing GHG emission targets, and economic restrictions. The model shows how targets for the emissions of GHGs may be reached and can affect production activity composition.

TRADE INTEGRATION, OUTSOURCING AND EMPLOYMENT IN AUSTRIA: A DECOMPOSITION APPROACH

- Economic Systems Research---2010---Wolfgang Koller,Robert Stehrer

Outsourcing and trade integration of advanced countries is debated with respect to employment effects, in particular for low educated workers - at least in relative terms. We study the employment effects - differentiated by educational attainment levels - of changes in the patterns of trade integration and outsourcing in the Austrian economy over the periods 1995-2000 and 2000-2005 using hierarchical decomposition analysis based on deflated input-output tables. Outsourcing is modeled as changes in the shares of domestically produced intermediates in total intermediates. A similar decomposition of the final demand vector allows us to draw conclusions on the overall employment effects of trade integration. The results suggest that the expected negative employment effects of outsourcing and rising import penetration have been overcompensated by increasing exports. Thus, the overall employment effects of Austrian trade integration have been positive for all educational attainment groups. However, whereas the total effects have been strongest for medium and high educated workers over the period 1995-2000, employment of low educated workers have been strongest and positively affected over the period 2000-2005. This pattern can be explained by a more sluggish export performance together with stronger negative effects of outsourcing and import penetration in medium and high-skill intensive products.

ANALYSING IMPLICATIONS OF LIMITED WATER AVAILABILITY FOR GREAT BARRIER REEF CATCHMENTS

- Economic Systems Research---2010---Alex Smajgl,Ludwig Liagre

Dependence on water is one of the factors that can determine regional vulnerability in Australia. Climate change is predicted to change rainfall patterns in the Great Barrier Reef (GBR) region, and scarce water resources have the potential to make regional Queensland economies increasingly vulnerable. Understanding which economic sectors depend on water as an input factor helps in understanding sectoral and regional vulnerability, and thus in guiding regional policy aimed at structural change. Using a regional Queensland Input-Output (IO) model, this paper integrates water consumption of the GBR region and then compares monetary IO multipliers with water consumption multipliers. We argue that these IO multipliers can inform regional decision makers about potential future regional vulnerability by taking into account limited

water resources.

STRUCTURAL INTERDEPENDENCE AMONG COLOMBIAN DEPARTMENTS

- Economic Systems Research---2010---Fernando Perobelli,Eduardo Haddad,Jaime Bonet,Geoffrey Hewings

This paper analyzes structural interdependence among Colombian departments. The results show that Bogota has a large influence on the other regional economies through the power of its purchases. Additionally, a center-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 Bogota 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, the effects of new investment in the lagged regions would flow through Bogota and the major regional economies.

The National Accounts as a Tool for Analysis and Policy: In View of History, Economic Theory and Data Compilation Issues

- Economic Systems Research---2010---Utz-Peter Reich

2010

EXTENSIONS TO THE MULTIPLIER DECOMPOSITION APPROACH IN A SAM FRAMEWORK: AN APPLICATION TO VIETNAM

- Economic Systems Research---2010---Marisa Civardi,Rosaria Vega Pansini,Renata Targetti Lenti

The aim of this paper is to provide an extension of a technique recently introduced by Pyatt and Round (2006) to decompose each element of the 'global multiplier matrix' in 'microscopic detail' in order to capture the linkages between each household groups' income and the exogenously injected income of other accounts. The methodology we propose allows dividing the impact of exogenous injections into four different effects: direct-direct effect (D-D); direct-indirect effect (D-I); indirect-direct effect (I-D) and indirect-indirect effect (I-I). Results using the 2000 Vietnamese SAM show that the highest direct effects on the income of household groups are related to exogenous injections into the agricultural sector, while the highest indirect effects result from investing in other agriculture-related sectors such as, for example, food processing. Policy interventions focusing on the agricultural sector and on rural households will thus have the greatest effect on reducing the level of income inequality.

FORMAL AND INFORMAL SECTORS IN CHINA AND INDIA

- Economic Systems Research---2010---Codrina Rada

This paper discusses the estimation of a social accounting matrix that distinguishes between formal and informal activities for China and India for 2000 and 1998-99 respectively. Wage shares for formal/informal employment in China and net domestic product shares for organized/unorganized sectors in India are used as weights to calculate the size of the two sectors. The proposed methodology is a first step towards an integrated approach to account for the dualism of many economies in the developing world. The results can serve as data input for any policy-driven CGE model for developing countries.

INPUT-OUTPUT ANALYSIS FOR BUSINESS PLANNING: A CASE STUDY OF THE UNIVERSITY OF SYDNEY

- Economic Systems Research---2010---Manfred Lenzen,Charlie Benrimoj,Bob Kotic

We present a multi-region input-output (MRIO) model of the University of Sydney embedded in the Australian economy, which forms the centrepiece of a new data-driven framework for strategic forecasting and planning of the University's financial operations. This

framework incorporates both Leontief's well-known demand-pull, as well as Ghosh's supply-push exercise. It is therefore able to estimate the immediate financial implications for the University, and the economy-wide flow-on effects, for example as a result of changes in demand for courses by students, or as a result of supply-side changes such as wage increases. We report on recent scenario studies on the financial performance of the teaching and research functions of the University, and the lessons learned for management practice.

ON THE ENVIRONMENTAL IMPACT OF CONSUMER LIFESTYLES - USING A JAPANESE ENVIRONMENTAL INPUT-OUTPUT TABLE AND THE LINEAR EXPENDITURE SYSTEM DEMAND FUNCTION

- Economic Systems Research---2010---Ayu Washizu,Satoshi Nakano

In this study, we undertake some hypothetical experiments and predict the environmental effects of some changes in consumer behavior, using the Japanese Input-Output Table and the Family Income and Expenditure Survey for 2000. We estimate the demand function in a linear expenditure system (LES) and attempt to determine how changes in consumer behavior affect the environmental load induced by household consumption, using the 'willingness to pay' concept. Furthermore, we define an index to show the eco-efficiency of consumer behavior. Through such a study, we can determine what action is appropriate for a 'sustainable consumption' society. If some change of consumer behavior greatly improved utility while increasing the environmental load, then technological progress to reduce the environmental load must be stimulated. However, if other changes in consumer behavior increase the environmental load while not improving utility very much, then such changes should be strongly discouraged.

PREDICTING NEGATIVE EFFECTS OF THE SECOND INTIFADA: AN EX-POST EVALUATION OF SOME MODELS

- Economic Systems Research---2010---Paul de Boer,Marco Missaglia

In 2003, the World Bank (WB), the International Monetary Fund (IMF) and de Boer and Missaglia (DBM) constructed models for the estimation of the 2002 macro-economic indicators of the economy of Palestine. In 2007, IMF and WB provided the consensus estimates of these figures using data that are more up-to-date and more complete than those available in 2003. This note proposes an ex-post evaluation of the predictive performance of the models of WB, DBM and IMF. A comparison of the models of WB and DBM, which are both micro-founded computable general equilibrium models using the same data, reveals that DBM strongly outperforms WB. We argue that the shortening of the time horizon and the quantity adjustment following the dramatic shock explain why our model performs much better. A comparison of DBM with IMF (a simple macro-founded income-expenditure model) also shows that our model performs better.

EDITORIAL

- Economic Systems Research---2010---Manfred Lenzen,Bart Los

2010

PROBABILISTIC MODELING OF WORKFORCE-BASED DISRUPTIONS AND INPUT-OUTPUT ANALYSIS OF INTERDEPENDENT RIPPLE EFFECTS

- Economic Systems Research---2010---Mark Orsi,Joost Santos

This paper extends the formulation of the input-output model to account for events that cause time varying and probabilistic workforce disruptions. One example of such an event is a pandemic, because the rates with which it affects the working population vary from period to period and are coupled with uncertainties.

To address such complexities, the paper develops two extensions: (i) a method of translating unavailable workforce into a measure of sector productivity disruption, and (ii) a simulation framework to account for the possible variations in economic output losses. These extensions are implemented via a MATLAB program to simulate a pandemic scenario in the Commonwealth of Virginia.

A CARBON FOOTPRINT TIME SERIES OF THE UK - RESULTS FROM A MULTI-REGION INPUT-OUTPUT MODEL

- Economic Systems Research---2010---Thomas Wiedmann,Richard Wood,Jan Minx,Manfred Lenzen,Dabo Guan,Rocky Harris

The framework and results of an international multi-region input-output (MRIO) model for the UK are presented. A time series of balanced input-output tables for the UK was constructed for the period 1992 to 2004 by using a matrix balancing procedure that is able to handle conflicting external data and inconsistent constraints. Detailed sectoral and country-specific trade data for the UK were compiled and reconciled with the UK input-output data, and economic and environmental accounts for three world regions were integrated in a UK-specific MRIO model. This was subsequently used to calculate a time series of national carbon footprints for the UK from 1992 to 2004. Greenhouse gas emissions embedded in UK trade are distinguished by destination of imports to intermediate and final demand. Most greenhouse gases show a significant increase over time in consumer emissions and a widening gap between producer and consumer emissions. Net CO2 emissions embedded in UK imports increased from 4.3% of producer emissions in 1992 to a maximum of 20% in 2002. The total estimated UK carbon footprint in 2004 was 730 Mt for CO2 and 934 Mt CO2 equivalents for all greenhouse gases.

UNCERTAINTY ANALYSIS FOR MULTI-REGION INPUT-OUTPUT MODELS - A CASE STUDY OF THE UK'S CARBON FOOTPRINT

- Economic Systems Research---2010---Manfred Lenzen,Richard Wood,Thomas Wiedmann

This paper reviews and demonstrates methods available for estimating standard deviations for carbon multipliers in a multi-regional input-output (MRIO) framework. We attempt to capture all possible variations of underlying data and calculation procedures in a global MRIO model constructed with particular focus on the UK. We consider these variations to be random, and determine the stochastic variation of the whole MRIO system using Monte Carlo techniques. 5000 simulation runs were carried out to determine the standard deviations of multipliers. From these, the standard deviations of components of the UK's carbon footprint were estimated using error propagation. We estimate an 89% probability that the UK's carbon footprint has increased between 1994 and 2004.

REGIONAL SHORT-RUN EFFECTS OF TRADE LIBERALIZATION IN BRAZIL

- Economic Systems Research---2010---Mauricio Bittencourt,Donald Larson,David Kraybill

We use a single-country multi-regional computable general equilibrium model to evaluate regional short-run impacts of reduction in import tariffs resulting from recent free trade area agreements, on poverty and distribution of income in Brazil. Results show that trade can reduce inter-regional income inequality, but poor urban households lose with trade liberalization. Trade policy alone is not sufficient for achieving more equitable income distribution goals in Brazil. Without greater investment in human and physical capital, incomes in most regions of Brazil are likely to lag behind incomes in the South/Southeast, the most developed regions in the country.

EVALUATING SUPPLY-SIDE AND DEMAND-SIDE SHOCKS FOR FISHERIES: A COMPUTABLE GENERAL EQUILIBRIUM (CGE) MODEL FOR ALASKA

- Economic Systems Research---2010---Chang Seung,Edward Waters

This study used computable general equilibrium (CGE) models to investigate the economic effects of three exogenous shocks to Alaska fisheries: (1) reduction in pollock allowable catch (TAC); (2) increase in fuel price; and (3) reduction in demand for seafood. Two different model versions, 'Keynesian' and 'neoclassical', were used to estimate impacts on endogenous output, employment, value added, and household income. By using a CGE model, this study overcomes the limitations of fixed-price models (such as input-output models) including (1) inability to calculate welfare effects due to fixed prices; and (2) difficulty of addressing supply-side shocks. There are currently few examples of CGE studies addressing fisheries issues appearing in the literature. Among those, this study is unique in that it uses a relatively disaggregated sector scheme and examines both supply-side and demand-side shocks.