# INTRODUCTION

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Inforum (Interindustry Forecasting Project at the University of Maryland) was set up in 1967 by Clopper Almon, now Professor Emeritus of the University of Maryland. Inforum pioneered the construction of dynamic, interindustry, macroeconomic models which portray the economy in a unique "bottom-up" fashion. This modelling approach, once called the 'modern input-output' model and now known by the more descriptive 'Macroeconomic Multisectoral Model', is described in a number of papers available on the web site www.inforum.umd.edu.

Over the last 30 years, Inforum has directed much of its efforts to developing a linked system of international macro/interindustry models, all constructed with a consistent methodology. A world-wide network of research associates has been established, each of which uses Inforum modelling methods and software. The Inforum partners have held annual conferences since 1993 to further the work of empirical input-output modelling and analysis and data development techniques, through the presentation and publication of papers representing the work of Inforum activities worldwide.

A selection of contributions presented at the XVI Inforum World Conference held in North Cyprus in September 2008 has been made in this publication. Most papers are devoted to the same two topics: energy and competitiveness. Although the studies were conducted in different countries and with different perspectives, these issues are very high in policymakers' agendas worldwide. Another set of papers refers mainly to methods and data issues, as these are both of paramount importance in economic modelling: proposing new solutions to complex problems and keeping up to date with the content of official statistics has always been crucial for the Inforum approach.

Energy policies in the US, China and Russia are analyzed in the contributions of the first section. These countries present very different situations as regards energy resources and policies but they all share the common concern of our times about energy saving and sustainable development, albeit with distinct awareness and policy strategies.

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The economic impact of the Energy Independence and Security Act (EISA) passed by the U.S. Congress in 2007 has been analyzed by **D.Meade** with the LIFT model of the U.S. economy. This work highlights the abilities of Inforum models to study structural changes brought about by either a shock or an economic policy, and the flexibility of this tool which in this specific analysis has been extended by the addition of modules for ethanol production and for increased fuel efficiency in vehicles, induced by a number of legal provisions. The main goals of this legislation are to reduce the dependence on imported oil through an increase in production and consumption of renewable fuels and an increase in fuel efficiency. Results of this study show that by 2030, aggregate GDP and real income will fall slightly in the EISA scenario due to a reduction of personal consumption expenditure and exports which can be explained by a higher price level. However, at the industry level, there are winners and losers: for instance, Agriculture, Other Chemicals and several other industries related to vehicle production are positively affected while conversely, other industries, mainly connected with oil production and refining, will reduce their output.

The energy sector is of central importance to the Russian economy, so in 2007 the government developed a long-term strategy – up to 2030 – to switch the generation of electric power from natural gas to coal so that gas resources could be exported and, at the same time, the huge existing stock of coal be consumed. In their contribution **A. Shirov** and **A.Yantovskiy** use a set of economic models to simulate the impact of this policy on the Russian economy. They also forecast the future development of the Russian oil industry carefully taking into account the size of oil reserves, extraction costs and the transition from old to new cheaper deposits. This policy, associated with a labour wage reform to increase household income and reduce the tax burden on business, will increase GDP growth in the long term and develop the energy sector further . The negative impact on the environment generated by the increased use of coal for electricity production could be overcome by investments in green technology to improve the energy efficiency of the economy.

The Chinese energy sector is analysed, albeit from different perspectives, by the contributions of **L.Shantong -H.Jianwu** and **P.Shengchu -F.Mingshuo**. Over the last decade China has enjoyed very high economic growth driven mainly by investment and foreign trade. During this period the rate of growth of energy consumption (for example 16 per cent in 2003) exceeded that of the economy (around 10 per cent). Moreover, China has a large surplus in the commodity trade with a high share of energy intensive products. Shantong and Jianwu use IO methods to analyse the *embodied energy* consumed in the entire production process of a specific commodity, concluding that China is a net exporter of

embodied energy – mainly to the U.S. and Japan – and a net importer of greenhouse gas emissions due to rapid growth in sectors such as ferrous and non-ferrous metallurgy, transportation equipment manufacturing and chemicals, required by the high investment in infrastructures and urbanization. The authors suggest a need for public intervention for better city planning and a choice in favour of railroad transportation instead of motorways to address the rising concern about energy saving and environmental protection without jeopardising economic growth. An energy saving plan has already been approved by the Chinese government to reduce energy consumption by 20 per cent by 2010. The economic effects of this policy have been analyzed using the Mudan model, a multisectoral Inforum model of the Chinese economy, by Shengchu and Mingshuo. In their study two simulations are performed: a) a reduction of energy consumption (coal, crude oil and natural gas) by 4 per cent every year from 2006 to 2010; b) the improvement of efficiency of transport fuel. Mudan shows that these policies may have a positive effect on the Chinese economy both in terms of economic growth and of the energy trade balance.

In 2004 the European Union expanded to include ten new member States among which some fast-growing small economies such as the Baltic countries. Economic growth in these countries is explained mainly by the development of the service sector while manufacturing lags behind. **R.Počs, A.Auziņa, V.Ozoliņa**, and **G.Piņķe** analyse the characteristics of Latvian manufacturing industries to estimate productivity changes and their impact on the economy up to 2020. An Inforum model for Latvia developed by the research team was used for this study: sectoral results show that further convergence towards EU levels of productivity is expected while the population and labour force will decrease, though no additional immigration is required to maintain economic development.

Another Baltic economy, Estonia, was analyzed by **T.Paas** and **J.Sepp** in a comparative study of the sectoral economic structure of EU-27 member states using Eurostat disaggregated data. By using factor analysis, aggregate indicators are computed to explore the relationship between economic structure and productivity: one factor F1 describes the development level of a post-industrial service economy and a second factor F2 can be interpreted as the indicator describing the environment of technological innovation. Both indicators are normally low in the new member countries. In particular Estonia is characterized by a low level of manufacturing-based, technological innovation suggesting that its future development will be similar to that of Southern European countries, fitting the of catching-up terziarization model .

**L.Ghezzi** and **R.Paniccià's study** presents a multisectoral, multiregional model of Italy built at IRPET, the Regional Institute for Eco-

nomic Planning of Tuscany. This work focuses on interregional trade: the model is indeed used to evaluate the impact of foreign exports on Italian regional growth. Since the 1990s, Italy has experienced a decreasing elasticity of GDP on exogenous final demand while foreign exports represent the most important driving force in the growth process. The reduction of the export-GDP multiplier can be explained partly by the outsourcing process but also by changes in the sectoral mix of Italian exports. Moreover, regional spillover effects of foreign exports among regions can be computed: international trade triggers impulses which can be transmitted through interregional trade. Simulation results show that spillovers differ from one region to another depending on economic structure but also that some low export –oriented regions can benefit from these effects, taking advantage of the impulse from the higher exporting regions.

The contribution by **P.Salmon** and **G. Özhan** presents a step-by-step description of the building process of an Inforum-type model for Turkey. From the acquisition of sectoral data and national accounts, the assumptions needed to build a first draft of an identity-centered economic model to the basic commands for running a simulation and producing an illustrative forecast: this work is an example of how to start a project and build a *tiny* multisectoral model for an economy where data availability is not fully guaranteed.

Finally, the second section ends with a paper by **Ł. Tomaszewicz** and **I. Świeczewska** which measures the extent to which the efficiency of Polish industries is driven by their potential to innovate and to what extent it is a result of the diffusion of other industries' and foreign partners' innovation. An input-output approach is used to estimate the benefits of the inter-industry diffusion of innovation via intermediate inputs. The main conclusion of this analysis is that imports play a special role as a source of innovation in Poland: R&D expenditures by trade partners increase efficiency in Polish economy more than the same amount at the domestic level.

The final section of the book gathers together s several contributions which share a common interest in the statistical environment and in the methods implemented within the framework of multisectoral econometric models such as Inforum. **J.Richter** illustrates in great detail the future developments of official statistics and their implications for economic modelling, particularly at the European level. Changes in classification systems are always a challenge for long-term model builders as they imply a disruption of all time-series especially if no backward data is requested from the national statistical institutes. The author stresses that the planned revisions do not take the needs of model builders into account: industries are still very heterogeneous and vertical integration characterizes some important sectors such as Manufacturing of paper and

paper products. Some industry divisions will be aggregated with serious repercussions on sectoral analysis. Therefore, additional efforts to transfer the existing economic models from the old classification system to the new one will be needed.

In his contribution **M.Uzyakov** illustrates a remarkable work of producing a set of I-O tables for Russia in the period 1980-2006 to perform sound economic analysis for this country undergoing major structural changes. In the last decade, the Russian economy has been characterized by positive strong dynamics of exports, imports and personal consumption while investments and government expenditures grew more slowly. This result can be explained by the adaptation of the investment process to the crisis, decline and subsequent recovery of production after the collapse of Soviet Union, while for public expenditure it reflects the decreasing role of the state in the transformation towards a market economy and the reduction of military expenditure. A detailed picture of structural changes in the Russian economy can be observed through the set of I-O tables produced by the author.

This data set was indeed used by **C.Almon** to apply an input-output based method to measure changes in the efficiency of the whole economy in producing various products for final demand. In his contribution, the author first demonstrates the fallacy of double deflation to take into account the use of intermediate inputs in measuring productivity. Double deflated value-added consists of deflating the output of a sector and then subtracting the deflated value of intermediate inputs from it. Although this is standard procedure suggested by many international organizations (such as OECD) and applied by statistical institutes, Almon demonstrates that if sectoral price changes are significant, the results of this method are nonsense or, in the author's words, *statistical muck*. Almon presents an alternative input-output method based on the calculation of how many resources go into delivering one unit of each product to final demand. This method is then applied to the Russian 44-sector I-O tables and results for the period 1995-2006 show a general negative change in productivity for several years after the demise of the Soviet Union while in the 2000-2006 period most products show a reduction of input requirements, with the fastest growth in productivity for some service sectors, construction and agriculture.

The last contribution of the book by **M.Grassini** is an example of how important bilateral trade flow datasets may be for economic analyses. The author considers the import and export flows and their forecasts, required from each member state every year according to the Stability and Growth Programmes (Convergence Programmes for member states outside the Euro area). A Bilateral Trade Tool based upon Comext data is then used to simulate several scenarios: a baseline scenario built on Inforum forecasts is compared with a second scenario including the fore-

casts produced by each EU country in the annual Programme. From the simulation results a systematic bias appears between the EU15 and the EU12 group of countries (the member states which joined after 2004): while the old member states underestimate the export growth rate, the new ones forecast an export performance which is too optimistic if compared to the bilateral trade flows registered by Eurostat. Although these Programmes are thoroughly revised by the European Commission' services, this study highlights that each Member State is considered separately from the rest of the European Union even in a matter such as international trade where bilateral relations are of the utmost importance.