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1st Comment on "MULTIMAC IV and MULTIREG"

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1. Advantages and Drawbacks of Input-Output Modelling

Various empirical analyses demonstrate the compatibility and versatility of input-output models.

Advantages of I/O models:

From a mathematical point of view I/O models are methodically quite simple. One of the most powerful uses of I/O techniques is the estimation of direct and indirect effects on macroeconomic aggregates like final demand, consumption, etc. The examination of direct and indirect demand magnifies the relationship between the sectoral structure of the economy (on a quite disaggregated basis) and infrastructure demand. Therefore, I/O is used to analyse alternative development scenarios.

But there are some *limitations* of these techniques to be mentioned. First of all, there is the assumption that each sector's output is homogenous (i.e., each sector produces exactly one product). Furthermore, basic I/O models assume linear production technology, i.e. factor inputs of each sector are proportional to the sector's production. This has two aspects: on the one hand there is no substitution possibility within the factor inputs (=> independence of relative factor prices) and on the other hand the assumption of constant returns to scale.

Secondly, feedback from foreign countries and overseas linkages are not taken into account. Increased import demand introduces additional production and demand abroad, via intermediate imports a part of the additional value added takes effect abroad). The only possible way out is the application of multi-country models.

A third drawback is the current publication timetable in Austria. I/O tables are published with a quite long time-lag (the I/O table 2000 was published in spring 2004). Structural changes and productivity shifts occurring between two publication dates are not taken into account.

The technical coefficients are per se static. But in practise, and as shown within both papers, the integration of I/O techniques within a model based on behavioural equations offers a dynamic approach to evaluate various economic and sectoral questions on a quantitative basis.

2. Comment on "MULTIMAC IV – a Disaggregated Macroeconomic Model of the Austrian Economy"

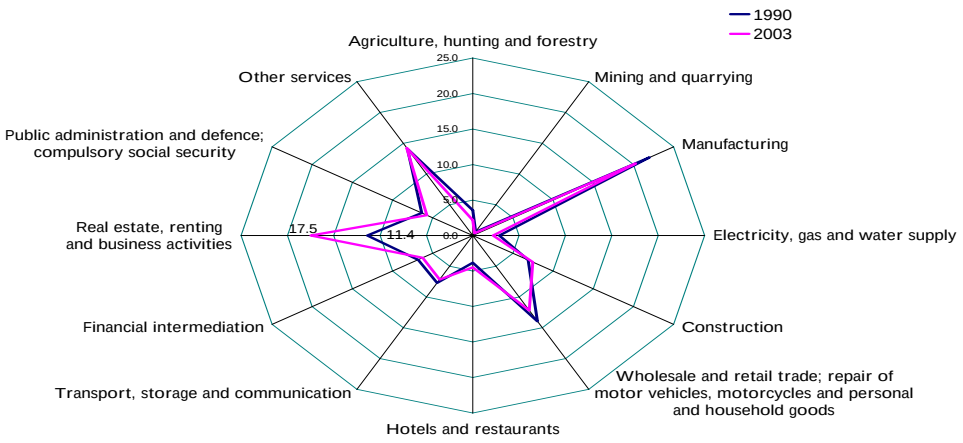
MULTIMAC is presented as a powerful tool to calculate and evaluate many policy-relevant questions and topics. It allows for estimation of various economic and environmental impacts of a proposed macroeconomic measure. Within his presentation, Kurt Kratena gives 2 examples: the analysis of road pricing effects and the implications of increased IT investment.

The model of the paper is in contrast to its predecessors following ESA 95 and includes ESA95 data starting 1988. As this is from an econometric point of view a quite short time period with a reduced number of data points available, the authors tried to expand the time series to the starting point 1976 (therefore they had to use ESA79 and Betriebssystematik 68 data). This procedure gives good results for the variables GDP, value added, salaries and employment. But it causes problems regarding the variables imports, exports and investment. Later on, this has an impact within the modelling procedure and limits the capability to use these series in regression equations. For final demand the short data series is a major restriction for the regression analyses within the model.

- *Proposal*: A restriction/drawback is the fact that investment data are not available on a more disaggregated level. Instead having them in a 37 sectors disaggregation, there are only 10 sectors implemented (the important sector manufacturing is just 1(!) sector.
- I propose to implement the investment matrices which will be produced within the I/O calculations and will be available in a 5 years rhythm.
- *Proposal*: private consumption: Within the sub sector Communication (a sector that has become more important in recent years) a further disaggregation would make sense.
- *Proposal*: Within the imports for services, import prices are set equal to consumer prices. I think setting import prices equal to the import deflator would make sense (the import prices include trade and profit margins, while the CPI displays the consumers' behaviour)
- *Problem/Question*: For linking national accounts with the I/O tables bridging tables are constructed. A drawback is the fact of keeping these bridging tables constant.
- *Problem/Question*: Inventories (and changes in inventories) are missing. They are not displayed within the model!

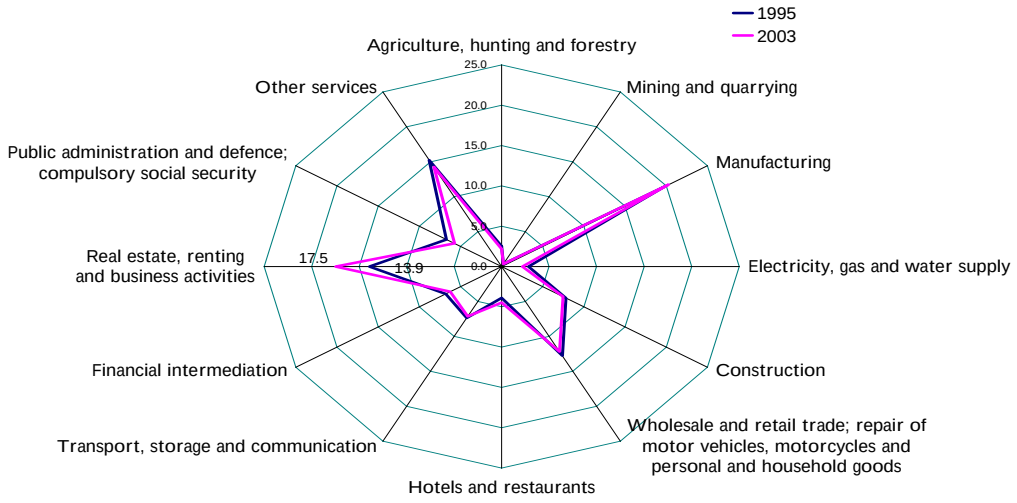
- *Problem/Question*: MULTIMAC IV is based on I/O tables 1990 and on tables based on prices 1995 respectively. But in Austria since 1990 and even since 1995, there were quite great productivity shifts within sectors. An update is strongly recommended.

Chart 1: Gross Value Added in Austria 1990–2003 (Share in % of total)



Source: Statistik Austria.

Chart 2: Gross Value Added in Austria 1995–2003 (Share in % of total)



3. The Challenges of Regional Impact Analysis

3.1 Advantages

- Evaluation of the performance of key sectors in the regional economy
- Ability to calculate a gross *regional* product
- Ability to evaluate possible direct and indirect economic effects on a regional basis

Therefore, regional I/O modelling is often used as basis for regional planning (specialisation, diversification, search for new markets, finding of economic clusters).

There exist three approaches to construct regional I/O models. The paper includes elements of all three methods:

- *top down approach* (national data are disaggregated into regional components: after 1995 a top-down disaggregation into a 2-digit level was conducted)
- *bottom up approach* (undertakes a survey of all firms of a region to obtain aggregated data for the regions input supply and outputs: for data series starting before 1995 this approach was used by incorporating secondary statistics)
- *hybrid methods* (a top down disaggregation of the national model and afterwards selective surveys of some key sectors)

3.2 Disadvantage: Missing Data for Regional I/O

- Often data series on a regional level are not available
- Calculation of regional technical coefficients
- Data on regional imports, regional exports, some price indices

4. Comment on "MULTIREG - A Multiregional Integrated Econometric Input-Output Model for Austria

- *Proposal:* In chart 1 (trade matrix) the reader does not get a clear information that the regions are the nine provinces of Austria. Later on, this is stated for the first time. It would be helpful to make this a bit clearer by adapting chart 1 in this way.

- *Proposal:* For the regionalisation of private consumption, the problem occurs that the regional consumption is measured at the *place of residence* while within the I/O tables the *place of consumption* concept is used. Adjustment for domestic tourism and shopping was done. Maybe, labour mobility information or *working place* adjustments should be implemented.
- *Proposal:* To construct the trade matrix the authors apply a gravity model based on transport survey data. A transport matrix of 99 districts is constructed. Flows between districts are positively influenced by the indicator "economic mass" and negatively influenced by the distance between them. Distance is represented by average travel time between two districts. The construction procedure (how to get from the transport matrix to the trade matrix should be explained at grater length (a chart would be helpful). I propose to consider transport costs as third indicator. Spatial and regional economic problems comprise three topics: natural-resource advantages, economies of concentration, and costs of on the one hand transport and on the other hand communication. Regional analyses identify three "foundation stones": imperfect factor mobility, imperfect divisibility, and imperfect mobility of goods and services. Especially location theory examines the role of transportation costs. Various studies focus particularly on interregional location of manufacturing industries, for which transportation costs are relatively more important than for most other sectors. The current version of the model implicitly simplifies the problem by letting transfer costs uniform per ton mile and using just travel time as indicator. But transfer costs are characteristically less than proportional to distance, and the average transfer cost per mile decreases as the length of haul increases. So, I would suggest an expansion of the model by including transport costs as third indicator for the construction of the transport matrix. Furthermore, concerning the supply side and the first "foundation stone": In which way interregional mobility of labour and capital, is taken into account with MULTIREG?
- *Problem/Question*: For constructing the trade matrix surveys were conducted. But from a statistical point of view the sample size is far too small (representativeness! – there is a response rate of 10%, the responding firms cover in terms of employment 6.7% of total employment in Austria!). Furthermore, although the trade matrix and the transport matrix are crucial for the model these surveys are only available for 1(!) year. There are papers dealing with minimum information required, especially with regard to exports and imports, how (hybrid) regional I/O tables can be constructed that provide

reasonable accuracy in comparison to a complete survey (e.g., Harris and Liu, 1998).

- *Problem/Question*: Within the RAS method explained within the paper the authors ensure that the total inbound transport of volume is equal to total outbound transport. But within the paper it is left completely unclear how inventories are treated within the model.
- *Problem/Question*: Regarding the statement: "Consequently in simulations with MULTIREG results are broken down from the regional to the district level (distinguishing between different types of districts in the process: rural, urban, peripheral) to be fed into the gravity model" How is this difference treated within the model? This is left completely unclear within the paper. Within the paper the 23 districts of Vienna are lumped together. It would be extremely important to explain this. Otherwise, the differences between two districts, like Vienna and a Tyrolean district are left unclear. These districts are from a geographical point of view and also from aspects of the supply and demand side completely different!!

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