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A Summary Report

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DIFFICULTIES IN IMPLEMENTING INPUT-OUTPUT TECHNIQUES IN MULTINATIONAL PRODUCING ENTERPRISES

A Summary Report

Carl W. Nelson*

with the collaboration of:
Axel Von Pochhammer**

Paper to be presented to the Sixth International Conference on Input-Output Techniques: Vienna, Austria 22-26 April 1974

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** Schering AG, Pharma Verkauf Ausland
I. INTRODUCTION

One of the major economic phenomena of the past two decades has been the growth of the contribution of the multinational enterprise to the world's industrial output. Large international companies currently do about five hundred billion dollars worth of annual business outside their parent countries - or about one sixth of the world's gross output. Such growth however, has its attendant problems for the parent and host countries and companies involved in the symbiotic relationships. To the parent company, not the least of these problems is that of planning for and controlling the activities of diverse and widely dispersed subsidiaries. This is a summary report of the current utilization and perceived utility of input-output techniques by sixty-one multinational enterprises at home and abroad.

Following on earlier work by one of the authors (Nelson, 1970) our research was prompted by the desire to assess the dissemination and implementation of input-output techniques in actual industrial settings. It was our general hypothesis that the few hundred concerns that have grown beyond the size of all but the wealthiest nations of the world would (and perhaps should) be vitally interested in an analytical approach that is not inconsistent with the scope and scale of these firms' operations. Our findings suggest that while only a very few enterprises are moving in the direction of constructing international input-output models, a larger number works with existing or modified national input-output tables and some also build separate models of intra-organizational operations. But given the relatively small number of current users a corollary objective of this report is to
point to the practical difficulties associated with such efforts from industry's perspective.

II. CLASSIFICATION OF FIRMS

Of the sixty-one multinational firms from which we obtained information (through correspondence and in some cases personal discussions - see Appendix), thirty-three were industrials located outside the United States. Each firm was listed by Fortune magazine either among the top five hundred United States industrials or the top two hundred industrials outside the United States as ranked by sales in 1972.

Eighteen firms reported that they currently utilized input-output techniques in one form or another. We found it helpful to establish four categories of users: (1) Those that use existing national input-output tables as published, (2) Those that use modified national tables, (3) Those that develop separate transactions tables of the activities of appropriate subsidiaries for internal planning, (4) Those that have developed corporate wide input-output transactions tables. A breakdown of users by the scope of their modelling effort, parent company location and principal products is presented in Table 1 (with code letters given for each company to preserve anonymity). Table 2 presents an aggregate profile of non-user firms arranged by country.

Although it would be foolish to draw any definitive conclusions from such scanty information it is tempting to infer that a factor influencing utilization in respective countries might possibly be the interest government
statisticians show in working with their industrial counterparts. This for example might help to explain the fact that of our sample of firms, those in Germany, where there has been much current interest and collaboration, show a high utilization rate while other countries show low utilization.

The strategy and structure of the multinational firms (Stopford, Wells, 1972) may also help to explain their particular efforts in input-output modelling. Most firms first expand the volume of their overseas operations in product lines where they have accumulated the greatest domestic expertise. But an increasing number have diversified foreign product lines and in some cases are engaged in foreign operations for which they have no domestic experience. It is particularly for those firms that we would expect greater interest in structurally based studies. The organizational structure of the multinational enterprises themselves also undoubtedly accounts for the potential utilization of sophisticated analytical approaches. Those firms that have evolved global structures and worldwide product divisions because of the diversity of their operations are more seriously interested in increasing the integration between domestic and foreign activities of the enterprise.
**Table 1**

### PROFILE OF INDUSTRIAL USERS OF INPUT-OUTPUT TECHNIQUES

<table>
<thead>
<tr>
<th>Company</th>
<th>Company Country</th>
<th>Major Products Utilization*</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Germany</td>
<td>plastics, synthetic fibers, dyestuffs (1), (3)</td>
</tr>
<tr>
<td>B</td>
<td>Germany</td>
<td>paperproducts (1)</td>
</tr>
<tr>
<td>C</td>
<td>Germany</td>
<td>electrical equipment (1)</td>
</tr>
<tr>
<td>D</td>
<td>Germany</td>
<td>iron and steel (2)</td>
</tr>
<tr>
<td>E</td>
<td>Germany</td>
<td>iron and steel (2)</td>
</tr>
<tr>
<td>F</td>
<td>Germany</td>
<td>automobiles (1), (2), (3)</td>
</tr>
<tr>
<td>G</td>
<td>United Kingdom</td>
<td>aerospace (1)</td>
</tr>
<tr>
<td>H</td>
<td>United Kingdom</td>
<td>steel, engineering products (4)</td>
</tr>
<tr>
<td>I</td>
<td>United Kingdom</td>
<td>aerospace (2)</td>
</tr>
<tr>
<td>J</td>
<td>United States</td>
<td>publishing (1), (2)</td>
</tr>
<tr>
<td>K</td>
<td>United States</td>
<td>automotive supplies (1)</td>
</tr>
<tr>
<td>L</td>
<td>United States</td>
<td>office products (1), (2)</td>
</tr>
<tr>
<td>M</td>
<td>Japan</td>
<td>cotton manufacture (2)</td>
</tr>
<tr>
<td>N</td>
<td>Japan</td>
<td>steel (1), (2)</td>
</tr>
<tr>
<td>O</td>
<td>Japan</td>
<td>electric appliances (1)</td>
</tr>
<tr>
<td>P</td>
<td>Canada</td>
<td>steel (1), (2)</td>
</tr>
<tr>
<td>Q</td>
<td>Australia</td>
<td>iron and steel (2)</td>
</tr>
<tr>
<td>R</td>
<td>Switzerland</td>
<td>electrical equipment (1), (2)</td>
</tr>
</tbody>
</table>

* Utilization is indicated as follows: (1) National input-output tables as given, are used for forecasting and planning, (2) National input-output tables, as appropriately modified, are used for forecasting and planning, (3) Separate transactions tables are developed for appropriate subsidiaries for internal planning, (4) A firm wide input-output model is constructed.
Table 2

PROFILE OF INDUSTRIAL NON-USERS OF INPUT-OUTPUT TECHNIQUES

<table>
<thead>
<tr>
<th>Country</th>
<th>Number (and Percentage)</th>
<th>Major Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>25 (94%)</td>
<td>food (7), rubber (2), oil, aerospace, farm equipment, electronic components,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>photographic supplies, drugs, automobiles, paper products, power tools.</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>6 (45%)</td>
<td>aerospace (2), textiles, industrial gases, dyestuffs, chemicals, plastics,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>food-stuffs, oil.</td>
</tr>
<tr>
<td>Canada</td>
<td>3 (67%)</td>
<td>electronic components.</td>
</tr>
<tr>
<td>Germany</td>
<td>3 (33%)</td>
<td>oil, dyestuffs, automobiles.</td>
</tr>
<tr>
<td>Japan</td>
<td>2 (75%)</td>
<td>oil, metal products.</td>
</tr>
<tr>
<td>Switzerland</td>
<td>1 (50%)</td>
<td>dyestuff, chemicals, pharmaceuticals.</td>
</tr>
<tr>
<td>Austria</td>
<td>1 (100%)</td>
<td>iron and steel.</td>
</tr>
<tr>
<td>India</td>
<td>1 (100%)</td>
<td>steel.</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1 (100%)</td>
<td>oil, electronics.</td>
</tr>
</tbody>
</table>
An examination of the major products of firms that use or do not use input-output techniques as shown in Tables 1 and 2 indicates that there is little difference between them (except for the larger number of consumer non-durable firms in the non-user group). An intriguing question, for example, is why a leading producer of German automobiles is a heavy user of this type of analysis while a major American automobile manufacturer does not employ the approach at all. While, in terms of their operations, the German and American firms are rather similarly vertically integrated, analysis and decision making within the German firm is more highly centralized. The German firm also may be typified as an enterprise with a history of aggressively widening its territorial horizons and showing great interest in new market structures. This same German firm is also presently at work on a project whose long term concept includes the possible applications of input-output techniques in view of the firm's progress toward world-wide integration.

Other multinational firms in an expansionary stage are utilizing input-output techniques to assess the market structure in countries in which they are planning new acquisitions.

- One United Kingdom based aerospace firm used the input-output framework as a basis for inter-industry and international productivity comparisons.

- Another English firm used input-output matrices in conjunction with data on unused capacity by product group as a starting point in the search for suitable acquisitions.

- One Japanese firm works with its trading companies in assessing the desirability of joint ventures in Southeast Asia with input-output data playing an important role.

- A German firm uses input-output analyses when surveying locations in order to assess the degree of intersectoral or inter-regional interlocking with the aim of quantifying the effect that their operations might have on growth and employment. This is practised in connection with the setting up of a new factory and analyzing its effects on the supplier industry sector.
III. INDUSTRY APPRAISAL OF PROBLEMS IN USING INPUT-OUTPUT ANALYSES

For the purpose of this report we have classified the significant problem areas associated with the construction and of utilization of input-output tables as reported by our sample of firms into six major categories. In order of importance they are:

- **The firm's activities and product lines do not easily lend themselves to description by input-output techniques.**

- **The degree of administrative and productive decentralization in the firm makes it difficult to develop a firm-wide transactions table.**

- **National input-output tables do not exist in all countries in which the firm has business interests.**

- **There is a lack of comparability in national input-output tables.**

- **Input-output coefficients are too unstable.**

- **Differing rates of fluctuation in inflation and/or currency valuation exist in countries in which the firm has interests.**

Almost all of the firms expressed some dissatisfaction with the lack of recency and degree of aggregation in most national input-output tables. To give an example, one highly diversified American firm that attempted to utilize input-output techniques to develop industry models to forecast production, sales and profits was frustrated because associated data from FTC-SEC sources were too aggregate and heterogeneous to permit realistic analysis and develop useful projections. As a result they have replaced this approach with detailed econometric models of basic industries of interest to them. They test the consistency of their projections with national supply-demand levels forecasted by a consulting service to which they subscribe. A Japanese iron and steel producer that once utilized input-output tables for forecasting and planning purposes had found some problems in the accuracy of their forecasts.
They reported that they also now utilize econometric procedures instead.

One American multinational firm that currently employs the University of Maryland model for United States projections would favor more disaggregated foreign tables and expressed great interest in seeing specially designed product-to-product matrices of the University of Maryland type developed for other countries.

Another major American firm with yearly sales of over three billion dollars feels that input-output is of limited value because the "coefficients are obsolete, new markets or industries do not appear in existing tables and not enough sectors or industries are shown" for their purposes.

Citing similar disadvantages, a German firm suggests that as most countries are characterized by considerable structural changes, existing input-output tables do not in most cases show the latest developments which are of interest to them. This factor would seem to be of increasing importance given the growth of multinational enterprise activities. Since the direct investment of multinational enterprises in their subsidiaries results in the transfer of resources that are not traded but simply moved from one part of the firm to another (Dunning, 1972), accounting for the structural changes in the economies of host countries can be rather difficult. Also if it pays the enterprise to earn its taxable income in one country rather than another, prices charged may differ from market prices—especially when the multinational firm is highly integrated (Arpon, 1972). Multinational firms have shown a rate of growth in sales approximately double that of domestic enterprises (Wall Street Journal, April 19, 1973) so their effect on structural changes could be expected to be rather significant.
In terms of national input-output tables the effect of the discretionary transfer pricing strategies of multinational producing enterprises on the valuation of international transfers may be rather marked although actual data necessary to test this proposition is normally unavailable. As transfer prices influence import duties, the cost of goods, liquidity, borrowing capacity, interest costs, and ultimately the profits of both buyer and seller subsidiaries of multinational firms, it is not an easy task for these enterprises to optimize transfer prices - nor for government statisticians to uncover fair market price exchanges. Even if, as in the United States, the tax authorities have the power to reallocate income to members of a corporate group, and the burden of proof is put on the company to demonstrate that fair market prices have been charged to a foreign subsidiary, distortions are likely to persist and may in fact be unavoidable. A simulation of multinational financial policies (Robbins, Stobaugh, 1973) of a hypothetical enterprise has been used to demonstrate that consolidated profits after taxes may vary considerably depending on whether an arm's length or optimum transfer pricing policy is employed. An example of the possible importance of these effects can be indicated in the light of the United Nation's Standardized Input-Output Tables of ECE Countries For Years Around 1959 (United Nations, 1972) which treats imports at ex-factory prices corresponding to the c.i.f. price plus import duties and excise taxes, thus possibly misrepresenting the actual transfer price paid.
IV. CONCLUSION

For the most part our enquiries uncovered a healthy and generally justified skepticism of the current utility of input-output analyses for industrial purposes. Where input-output techniques are employed they usually are used in conjunction with other approaches. For some firms, econometric procedures have surplanted input-output techniques as a means of forecasting. Mathematical programming and simulation models are also more generally favored for internal planning purposes, especially where firms have moved to implement computerized information systems.

While it is our judgement that each individual enterprise must evaluate the utility of any analytical tool or technique in terms of the firm's specific operations and environment, we believe that many false starts could be prevented and many profitable undertakings initiated if enough sufficiently documented case studies were made generally available. It is our hope to be able to provide this service in the near future and we would therefore welcome any support, interest and collaboration that might be made available.
(1) Letter requesting information.

September 25, 1973

Gentlemen:

The Sixth International Conference on Input-Output Techniques will be held in Vienna, 22-26 April 1974. As part of the Conference we are planning to deliver a paper focusing on the implementation experience with input-output techniques in multinational corporations.

In order to achieve wide coverage we are mailing the enclosed questionnaire to selected firms in a number of countries. We would be most grateful if you or one of your colleagues took the time to respond to our questions - whether or not your firm currently utilizes input-output techniques. In the event that it is the policy of your firm to keep such information confidential we would appreciate even an anonymous response.

It is our hope that the information we obtain will be of practical and academic interest, and we will be most happy to provide you with a copy of the final report upon request.

Thank you for your aid and cooperation. Please return the completed questionnaire in the enclosed envelope by 30 October 1973.

Sincerely,

Carl Nelson, Boston University
Axel Von Pochhammer, Schering, AG.
APPENDIX - Continued

(2) Questions.

1. a. Does your firm currently utilize input-output techniques?
   
   Yes ..... (Proceed to question 2)
   
   No ..... 
   
   b. If not, were they ever used?
   
   Yes ..... 
   
   No ..... (Proceed to question 3)
   
   c. Why was their use discontinued and what approaches have replaced input-output techniques?
   
   2. Which of the following characterizes your firm's utilization of input-output techniques. (Check as many as appropriate).
   
   ..... We develop a single transactions table describing the activities of the firm as a whole, i.e. with all appropriate subsidiaries in each country in which we have interests.
   
   ..... We develop separate transactions tables for appropriate subsidiaries but do not attempt to integrate the results into an overall transactions table.
   
   ..... We utilize national input-output tables as given (where they are available) for forecasting and planning purposes.
   
   ..... We use modified national input-output tables that suit the particular information needs of our firm.
   
   ..... Please briefly describe any other way in which your firm establishes and utilizes input-output transactions tables.
3. In your estimation, which of the following constitutes significant problem areas in the construction and utilization of input-output transactions tables within your firm?

...... National input-output tables do not exist in all countries in which we have business interests.

...... Lack of comparability in national input-output tables.

...... Stability of the coefficients.

...... Differing rates of fluctuation in inflation and/or currency valuation in the countries in which your firm has interests.

...... The degree of administrative and productive decentralization in our firm makes it difficult to develop a firm-wide transactions table.

...... Our firm's activities and product lines do not easily lend themselves to description by input-output techniques.

...... Please briefly mention any other significant problems in the construction and utilization of input-output tables.

4. If your firm constructs its own input-output tables or modifies national input-output tables approximately how many man hours are involved in an average year? ..............................

5. Please list the principle products of your firm for which input-output techniques are utilized.

6. If there are any other factors related to the construction or utilization of input-output transactions tables that you believe to be important please feel free to make additional comments below.

7. Name of Firm .....................................................

8. Name of Respondent ............................................

9. Position of Respondent ........................................

10. Number of years respondent has been with this firm ................

Thank you for your assistance. Please mail the completed questionnaire in the enclosed envelope by 30 October 1973.
REFERENCES


