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THE OECD INPUT-OUTPUT DATABASE

Invited Paper submitted by OECD*

Background

1. This paper describes progress on the updating of the OECD Input-Output database, including commentary on the specific changes made to country data in the interests of harmonisation. On-going work and future plans are also described. This work, jointly produced by the Directorate for Science, Technology and Industry (STI) and the Statistics Directorate (STD) in the OECD, has been, largely, made possible thanks to a voluntary contribution from the Department of Trade and Industry in the UK.

* This document is an abstract of a paper which was also presented at the OECD Meeting of National Accounts experts, 9-12 October 2001, Paris. The abstract is distributed at the Joint Meeting to support the discussion on Supply and Use tables.

2. To date, harmonised input-output domestic use and import penetration current price tables have been produced for 14 countries: Australia, Denmark, Finland, France, Germany, Greece, Italy, Japan, Netherlands, New Zealand, Norway, Spain, UK, and US. In addition, Input-output tables for Canada, Korea, The Czech Republic, Portugal, and Hungary should be available soon. Only Japan and Norway have been able to provide Constant price tables so far but plans to directly deflate other current price tables are in place, and these tables will start to be available towards the end of this year on a country by country basis.

3. The OECD Secretariat also called for support and data on investment flow matrices. Unfortunately these tables are not generally, or at least readily, available for most countries. Indeed only four countries have been able to supply detailed breakdowns of investment flows – Canada, Japan, UK and US.

4. In addition to the above work areas OECD is also investigating the feasibility of producing input-output tables consistent with the STAN (Structural analysis) industrial database. These tables are intended to complement the IO tables, providing a framework that will allow the STAN database to be compared with National Accounts final demand components. The production of these tables is still at an experimental stage, and the approach used for each country is necessarily different; depending on the degree of coherence between STAN estimates and the original (supplied) input-output estimates. For some countries, e.g. Finland, the differences amount to little more than normal national accounts' revisions. However for others e.g. the US, the differences can be significant. Part of this work includes reworking estimates in the original (old) OECD IO database to concord with the industrial classification systems and national accounts conventions used in the very latest tables. The final objective of this area of work is to create a time series of STAN consistent input-output tables, in constant and current prices, that complement the original IO tables provided by Members; providing an illustrative insight into structural change over time.

Purpose

5. Input-output tables lend themselves to a number of uses. In the main, they can be categorised under two headings: Analytical or Statistical. Examples of the former include analyses that identify the importance of any industrial sector or product to economic output or growth, not just as a share of gross value-added, say, but as a contributor of activity or growth in other sectors e.g.: embodied technology diffusion (see Para 24). Increasingly, they are also been used in environmental analysis, for example, to measure direct and indirect pollutants produced by industrial sectors. For the latter, (statistical analyses), input-output and supply-use tables are increasingly becoming the vehicles used to balance the income, expenditure and production estimates of GDP and as the basis for other statistical measures such as productivity estimates. For these reasons the most recent input-output tables are very important.

6. The current (old) OECD input-output database contains data for 10 countries (G7, Australia, Netherlands, Denmark), spanning a time period from 1973 to 1990, on an ISIC Rev 2 and SNA68 basis. The updating exercise has 5 main aims:

- To update the database to include more recent years;
- To increase country coverage;
- To reflect the latest system of national accounts conventions (SNA93);
- To increase the industry detail given a greater emphasis to services; and
- To concord with the latest system of industrial classifications (ISIC Rev 3), (partly, in order to facilitate comparisons with the STAN database).

To achieve, at least the last two of these aims, the Sectoral definitions shown in Table 1 have been established.

Process

7. Countries have been asked to conform to the above definitions if at all possible. However in order to minimise compliance costs, and to maximise co-operation, OECD has stipulated that the pro-forma presented above is not a pre-requisite, and that data (input-output or /and supply-use tables) at the most detailed and practicable level would be welcomed in any format. This follows up on one of the suggestions made at the OECD National Accounts Meeting in 2000. So far most countries have chosen to deliver data in the latter way.

Data

8. The tables A and B provide an inventory of the data so far available. Table A describes the information held on supply-use tables and Table B input-output tables. Each table includes supporting information on the industrial classification system used; whether the estimates conform to SNA93; and the valuation system used in intermediate consumption (detailed cell estimates), value-added, and output. Also included are columns describing what types of tables have been made available: e.g. domestic use, import use, capital flow.

Table 1

CLASSIFICATION TABLE FOR OECD INPUT-OUTPUT TABLES		
No	Description	ISIC Rev 3 Codes
1	Agriculture, forestry and fishing	1, 2, 5
2	Mining and quarrying	10, 11, 12, 13, 14
3	Food, beverages and tobacco	15, 16
4	Textiles, apparel and leather	17, 18, 19,
5	Wood and products of wood and cork	20
6	Paper, paper products and printing	21,22
7	Petroleum, coke and nuclear fuel	23
8	Chemicals ex pharmaceuticals	24 ex 2423
9	Pharmaceutical	2423
10	Rubber and plastics	25
11	Other non metallic mineral products	26
12	Iron and Steel	2710, 2731
13	Non-Ferrous Metals	2720, 2732
14	Fabricated Metal products	28
15	Machinery & equipment N.E.C.	29
16	Office and computing machinery	30
17	Electrical machinery and apparatus N.E.C.	31
18	Radio, television and communication equipment	32
19	Medical, precision and optical instruments	33
20	Motor vehicles & trailers	34
21	Building & repairing of ships & boats	351
22	Aircraft & spacecraft	353
23	Other transport equipment	352, 359
24	Manufacturing N.E.C; recycling	36, 37
25	Electricity gas and water	40, 41
26	Construction	45
27	Wholesale and retail trade; Repairs	50, 51, 52
28	Hotels and restaurants	55
29	Transport and storage	60, 61, 62, 63
30	Post and telecommunications	64
31	Finance and insurance	65, 66, 67
32	Real estate renting and other business services	70, 71, 74
33	Computer services	72
34	Research and development	73
35	Public administration	75
36	Education	80
37	Health and social work	85
38	Other services	90,91,92,93,95,99
39	Sales by final demand, other, and statistical discrepancy	

Table A. Supply and Use tables											
Country	Year	Supply table	Total use table	Domestic use table	Import use table	SNA93	Capital flow	Classification	Price system (IC)	Value-added	Output
Canada	1997	x	x			x	x	Can Sic 80	Market ¹	Factor Cost	Market ¹
Czech Republic	1995	x	x			x		NACE	M	Basic	Basic
Denmark	1995-96	x	x			x		NACE	Market ¹	Basic	Basic
Finland	1995	x	x	x	x	x		NACE	Basic	Basic	Basic
France	1995		x			x		NACE	Market	Basic	Basic
Germany	1995	x	x	x	x	x		NACE	Market	Basic	Basic
Greece	1996	x	x			x		NACE	Market	Basic	Basic
Italy	1992	x	x	x	x	x			Market ¹	Producers	Producers
Korea	1995	x	x	x	x	x		ISIC	Market ¹	Producers	Producers
Netherlands	1995-98	x	x			x		NACE	Market	Basic	Basic
New Zealand	1995/96	x	x	x	x	x		ANZSIC	Basic	Basic	Basic
Spain	1995-96	x	x	x	x	x		NACE	Basic	Basic	Basic
United Kingdom	1992-98		x			x	x	NACE	Market	Basic	Basic
USA	1997	x	x			x	x	US SIC	Market ¹	Market	Market ¹

Table B: Input-Output tables received/available											
Country	Year	Total	Domestic output	Import matrix	SNA93	Capital flow	Constant Prices	Classification	Price system (IC)	Value-added	Output
Australia	94/95	x	x	x	x			ANZSIC	Basic	Basic	Basic
Finland	1995	x	x	x	x			NACE	Basic	Basic	Basic
Germany	1995	x	x	x	x			NACE	Basic	Basic	Basic
Greece	1994	x			x			NACE	Basic	Basic	Basic
Japan	1995	x	x	x	a	x		ISIC rev 3	Market ¹	Market	Market ¹
	1996	x			a		At 95	ISIC rev 3	Market ¹	Market	Market ¹
	1997	x			a		At 95	ISIC rev 3	Market ¹	Market	Market ¹
Netherlands	1995-98		x		x			NACE	Basic	Basic	Basic
New Zealand	1995/96	x	x	x	x			ANZSIC	Basic	Basic	Basic
Norway	1997	x	x	x	x		PYP	NACE	Basic	Basic	Basic
Spain	1995	x	x	x	x			NACE	Basic	Basic	Basic
USA	1997	x	x		x	x		US SIC	Market ¹	Market	Market ¹

1: Market prices excluding trade margins

(a) Does not include estimates for own-account software production.

Transformation to the harmonised 39 sector level

9. The type of data received varies considerably. Some countries for example have been able to provide industry by industry input-output tables at basic prices and others only supply-use tables. Furthermore, what the tables do not show is the difference in industry, or product, detail used across countries.

10. Of those countries that have produced input-output tables (Table B) seven are Industry by Industry input-output tables. But Germany, Greece and Spain have supplied Commodity by Commodity tables. These have been converted to Industry by Industry tables using standard input-output techniques¹ together with the supplementary Supply-Use tables each country provided. This is also the case for Denmark where supply-use information only was available. For the UK, France, and Italy however detailed supply (Make) matrices were not made available because of disclosure restrictions and as such secondary production has been allocated separately to industries, meaning that the tables are closer to commodity by commodity tables than industry by industry. Where the original supply-use tables are at market prices, trade margins have been removed using supplementary data sources. More information on the approach used for each country can be found in Annex A.

11. For each country it has been necessary to produce a concordance between the input-output or supply-use data supplied, the classifications' system in use, and ISIC revision 3. For those countries using NACE classifications, and where input-output sectors have a strong concordance with NACE, this is fortunately a relatively simple task. However for the US, Japan and Australia and New Zealand this has not been the case and very detailed concordances have been required.

Table C below presents a summary of the harmonised tables currently available

Table C : Harmonised Input-Output tables			
Country	Year	I X I	C X C
Australia	1994/95	x	
Denmark	1995	x	x
Finland	1995	x	x
France	1995		b
Germany	1995	x	x
Greece	1994	x	x
Italy	1992		b
Japan	1995-97	x	
Netherlands	1995-98	a	
New Zealand	1995/96	x	
Norway	1997	x	
Spain	1995	x	x
UK	1998		b
USA	1997	x	x

(a) - Netherlands includes a transfer of trade margins from other industries to the 'margin' industry-

(b) - UK, France, and Italy – IO tables produced by including secondary production as a separate row.

FISIM Adjustment

12. FISIM is treated differently across countries. Australia, New Zealand, Japan and the US allocate imputed bank service charges directly to purchasing sectors. Finland, France, Italy, Netherlands, Norway, Spain, UK include these charges in a separate FISIM column, and Denmark, Germany and Greece record FISIM as intermediate consumption of the finance industry (ISIC65) with a corresponding deduction from gross operating surplus and value-added of the same industry.

13. For analytical purposes, and harmonisation, FISIM has been allocated separately to consuming industries as intermediate consumption of financial services, on the basis of each industry's share of total gross value-added (excluding FISIM) (for all countries, except Australia, NZ, Japan and the US, where FISIM has already been allocated). Value-added in each industry is reduced by a corresponding amount. This treatment is consistent with the approach used in the current (old) IO database. SNA93 recommends that FISIM should be allocated to all consumers; including final demand; however the information to do this is not readily available, in any case, doing so would lead to estimates of GDP and gross value-added that differed from those published by NSOs.

Imported intermediate Flows Matrix

14. Of the fourteen countries where harmonised tables have currently been produced 5 - Denmark, France, UK, US and Japan (1996 and 1997) - have not been able to provide import penetration matrices. As a consequence assumptions have been used to construct these matrices. The approach used in each country is necessarily different.

15. For the US the approach is based on the import proportionality assumption. However it differs from the application of this method used in the current (old) IO database in one respect. Imports of water transportation and the trade sector - which in the US are negative, reflecting the c.i.f./f.o.b. adjustment - are allocated to purchasers in proportion to their ratio of imported goods to whole economy imported goods. The rationale behind this adjustment is that these services support the movement of imported goods and so expenditure on these services should be closely aligned to the expenditure of imported goods generally. Applying the import proportionality assumption for all imported products cannot ensure this. The approach taken for Japan for 1996 and 1997 is based on the import penetration matrix supplied for 1995. For each item of consumption in the 1995 tables a ratio of imported consumption to total consumption is calculated. These ratios are then applied, cell by cell, to the consumption figures used in the 1996 and 1997 tables. Finally each import row generated in this manner is constrained to the imported total for that row. For Denmark, France and the UK, the import proportion assumption has also been used. Further information on each country is available in Annex A.

Public Administration

16. The harmonised tables produced so far, include public administration as an industry and not as a final demand purchaser, unless already specified as such in the original data. A group of Test Users has been asked for their views on their preferred treatment: That is: all Government 'out'; all government 'in'; or whether the tables should concord with individual country practice (since making the change to harmonise the tables is a relatively trivial exercise). The same question is asked of the NAWP.

Constant Price Tables

17. Constant price tables have been produced so far for Norway and Japan only. Tables for other countries will be produced at previous year's prices using implied gross output price indices from the STAN database, national accounts database final demand sources, and any other price information countries have readily available. If however countries are able to supply basic, or even producer price indices, for each industry, or product, aggregated to the classifications presented above, the process of producing harmonised constant price tables will be greatly simplified, and improved. The danger of using implied price indices from the STAN database, for example, is that the current price and constant price estimates of production are assumed to be consistent, and this is, unfortunately, not always the case.

Other On-Going Work

18. One of the main benefits of input-output tables is the link they provide between final demand sectors and producers, home and abroad, not just for analytical purposes but for overall national accounts' coherence. Any lack of coherence between the input-output tables and other economic and national accounts' aggregates can make analysis doubly hard. To some extent this problem of incoherence comes to light when comparisons are made between the input-output tables presented here and equivalent data (value-added and output) used in the STAN database; even after adjustments for FISIM have been made.

19. As a consequence, on-going work focuses on resolving this incoherence by producing STAN consistent input-output tables for each country. The production of these tables is still at an experimental stage, and the approach used for each country is necessarily different; depending on the degree of coherence between STAN estimates and the input-output estimates included here. For some countries, e.g. Finland, the differences amount to little more than normal national accounts' revisions, and STAN consistent tables can be produced relatively easy. For others however, e.g. the USA, the differences can be significant. For each country an attempt is made to identify the cause of differences between STAN and IO estimates. The reasons for differences are varied.

20. For example the German input-output table for 1995 records the gross output of public administration at 562 bn DM, whereas the STAN database records only 297 bn DM of output. Value-added in both measures is the same however. The implication is that gross output recorded in the input-output tables includes intermediate consumption flows not recorded or recognised in STAN estimates.

21. More commonly however the differences between STAN output estimates and input-output estimates, where value-added is comparable, reflect internal flows, not identified by STAN, of any particular sector's output. In input-output tables this flow is recorded as increased intermediate consumption and sales (of the same sector-output). A simple, although not strictly speaking correct way to describe these flows is 'double-counting' output. For STAN comparability these flows can be easily rectified, although doing so will change input-output relationships. Where the changes reflect the types of 'double-counting' flows described above, analyses, such as embodied diffusion, should not be significantly affected, so long as a modified Leontief inverse is used (Miller and Blair 1985). Although where these flows are not the result of 'double-counting' flows but other market dynamics, embodied diffusion analyses will be affected. One area where the mechanism for bringing products to market can differ significantly across countries, and possibly with STAN, is 'bundled products' (PC and software). Either way, the problems presented by these flows, and the peculiarities of market dynamics in the public administration sector, highlights the importance of treating the output of public administration as value-added only for analytical purposes. Nevertheless despite the downstream problems these flows may pose they present little difficulty in reconciling input-output estimates with STAN data.

22. In 1997 the gross output of the US construction industry was \$944 bn, on an IO basis. The equivalent STAN estimate is only \$603 bn dollars. This appears to reflect the fact that maintenance activities are not recorded under the output of the construction industry in the STAN database. The output of the maintenance product in the input-output tables is equivalent to \$304 bn.

23. As already stated this work is still at an exploratory and experimental stage. If these differences can be modified in a mechanical, and statistically meaningful way, such that only small differences remain the tables can then be 'RASSed'² to be fully consistent with STAN estimates. In this way, and by applying a similar process to the tables in the current (old) database, with additional changes for ISIC rev 2 and SNA68, we hope to create a time-series of STAN consistent input-output tables. Once the exploratory stage is out of the way, and we have established that meaningful input-output tables can be created a working paper describing this process will be circulated.

Work-plan for the year ahead

24. As well as continuing to expand the country coverage, and the production of constant price IO tables, OECD plans to update the analysis on embodied technology diffusion last done in 1996 – (see doc. OECD/GD(96)26: Papaconstantinou, Sakurai, Wyckoff). Unfortunately this will require

detailed investment flow matrices, which, for most countries, were not readily available when this data was first requested. However, it is hoped that this situation may have improved since then and as such the Member States have been asked to support this new request.

Dissemination Program

25. The Input-Output Database³, with the information on the 14 countries supplied so far, is nearly ready to go live. The tables have already been circulated to some key Test Users asking them for their views on the format, style, classification lists.

NOTES

¹ For more information on creating Input-Output industry by industry tables from Supply-Use and Input-Output commodity by commodity tables readers are referred to Handbook of Input-Output Table Compilation and Analysis – United Nations.

² See Handbook of Input-Output Table Compilation and Analysis – Chapter IX for more background on the RAS process.

³ Country notes for 13 OECD countries can be viewed at the OECD web page under OECD meeting of National Accounts experts, 9-12 October 2001, Paris, document STD/NA(2001)22.
