Thirteen International Conference on Input-Output Techniques

August 21-25, 2000
Macerata, Italy

Changes in technical coefficients :
The experience with Swiss I/O Tables

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Session 3.2 Projecting / Updating I/O Coefficients
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Abstract

At previous I/O conferences, reports have been presented on the development by non-survey techniques of input-output tables for Switzerland, under several research projects for the Swiss Federal Statistical Office. Tables for 1985, 1990 and 1995 are now available, and appropriate price indexes allow for their use both at current and constant prices.

The paper concentrates on the analysis of changes of coefficients and structures, using both qualitative and quantitative approaches.

1. Background

Switzerland is a special country in the field of Input-Output tables as it has no official tables; the available ones have been developed by the Laboratory of Applied Economics at the University of Geneva.

The first attempt to estimate a Swiss Input-Output table relates to the year 1975. The results have been published in (1), (2), (3) and (4) where the methodology used as well as some analysis are presented. The Swiss Input-Output table for this year rests on the utilisation of an enlarged RAS method which allows to take into consideration the knowledge of important coefficients and of their dispersion by introducing intervals in the procedure of estimation. The departure matrix of the RAS adjustment is the input output table of Germany. This country was chosen on the base of the results of comparisons between Switzerland and respectively Germany, France, Italy, Netherlands, Denmark, Spain and the United Kingdom

These first results can unfortunately not be taken into consideration in our study of changes in technical coefficients for two reasons. The first one is due to a change in the classification of industries which occurred in 1985; the second one is due to the fact that it was impossible to obtain production price indexes going back to 1975. The study we present in this paper covers thus only the period 1985 to 1995.

Concerning this period we have for each year 1985, 1990 and 1995 a Make and a Use matrix, as well as an Input-Output matrix (commodity by commodity) in a comparable classification of 37 industries. (see Annex 1).

The results for 1985 which were produced using the same methodology as the one developed for 1975 are presented in (5) and (6). For this year we were able to introduce exogenous information in the adjustment procedure. For the year 1990 and 1995 a more simple methodology was used, see (7), (8), (9) and (10). It relies only on RAS for the Input-Output matrix, where the departure matrix is the most recent matrix available. For the three years, the final uses by commodity were computed on the basis of Swiss data, and then the intermediate uses were obtained as the difference between total resources and final uses. As far as the intermediate consumption is concerned, it was evaluated making the difference between total production and value added by commodity. These data are published by industry in the production account of the Swiss national account, and are transformed into data by commodity using the Make matrix[1].

It is important to notice that the Swiss Statistical Office is now conscious of the importance of building Input-Output tables, in order namely to introduce a possibility to establish the equilibrium between resources and uses at a more disaggregated level than it is done today. In order to achieve this goal, the Swiss Statistical Office requested a report on the feasibility of such a construction. (see (11)).

The three Input-Output tables for 1985, 1990 and 1995 are computed in current prices. In order to study the changes in the technical coefficients these matrices have been evaluated

[1] The data available in Switzerland are in fact by enterprises. They have been transformed into data by establishments. We nevertheless use the denomination industry and commodity in order to be compatible with the international standards.

at constant 1990 prices. For the main commodities produced by industries we have a production price index. The sources of theses indexes are the following:

- for Agriculture as well as for all the manufacturing sectors (with the exception of 7 Wearing apparel, 18 Machinery and vehicles and 19 Electrical machinery) we used the Swiss production price index from the Swiss Statistical Office (see (12) and (13)). As these price indices are available since 1993 only, a linkage has been made by the Statistical Office with the wholesale price index which were calculated before 1993 (see (14) and (15)).
- for the construction sectors, for all the services sectors and for the manufacturing sectors 7, 18 and 19 we had to use non official price indices which are elaborated by the St.-Gall Center for Futures Research, after having established a correspondence between their classification and ours.

All together, the information available on long term price changes is well in line with a priori expectations : the relative prices of commodities in high productivity sectors (mostly in manufacturing) are shown to be declining over the period, while for those in low productivity sectors (mostly in services) the relative prices are observed to be increasing.

Table 1 – Selected relative prices in 1995 (1990 = 1)

3.	Food	0.88
13.	Chemicals	0.85
19.	Electrical machinery	0.99
24.	Hotels and restaurants	1.31
29.	Financial services	1.10
32.	Other business services	1.13
34.	Health services	1.10

The Swiss manufacturing industry is highly competitive in international markets and the gains of innovation (TFP gains) are mostly transferred to intermediate and final consumers through the reduction of relative prices of manufactured commodities.

In Annex 2 is provided the 1995 matrix of total technical coefficients A, at constant prices.

2. Quantitative structural changes

In order to analyse changes in technical coefficients over time, the first idea is to measure some indicators of statistical distances between the I/O tables.

When pairs of Input-Output tables are compared, it is possible to compute an Index of similarity (Le Masne (see (17) page 217)) for the sector j:

$$S_j = 100 \cdot \left(1 - 0,5 \cdot \sum_{i=1}^{N} \left| a_{ij}^{*\,t} - a_{ij}^{*\,t+n} \right| \right)$$

where $a_{ij}^{*\,t}$ and $a_{ij}^{*\,t+n}$ correspond to the normalized input-output coefficient at constant prices of each one of the two tables compared (e.g. each pair of yearly tables). Normalized means that $\sum_{i=1}^{N} a_{ij}^{*\,t} = 1$.

The Le Masne index will be close to 100 in cases of high similarity, and is therefore one of the many statistical distance indicators that can be established for the purpose of studying the similarity between tables.

These index are calculated for the years 1985-1990 and 1990-1995:

Table 2: Similarity index

Sectors	1985 - 1990	1990 - 1995
1	83.31	90.02
2	88.41	88.70
3	86.77	93.59
4	84.59	92.43
5	89.43	94.39
6	88.36	91.93
7	62.62	91.66
8	87.84	89.62
9	90.27	92.83
10	<u>92.41</u>	<u>94.65</u>
11	88.96	94.03
12	66.43	87.46
13	<u>93.03</u>	91.16
14	37.31	94.61
15	91.45	89.33
16	91.03	92.97
17	<u>93.54</u>	<u>94.96</u>
18	89.41	93.09
19	89.15	89.29
20	88.33	91.62
21	90.85	89.00
22	84.65	90.27
23	88.41	91.89
24	82.02	92.84
25	88.01	86.02
26	84.99	88.04
27	84.10	87.88
28	87.18	89.22
29	<u>96.41</u>	<u>97.20</u>
30	88.78	<u>94.92</u>
31	83.40	84.20
32	84.90	90.62
33	<u>92.63</u>	<u>95.84</u>
34	87.70	88.29
35	82.40	91.50
36	81.94	88.32
37	73.09	93.37

The five highest results are underlined

They show that the 1995 table is structurally closer to the 1990 than the 1990 table to the 1985 table as the indices are almost always higher for the 1990-95 period, thus pointing to a general idea that the Swiss structure has been more stable in the second period.

This is confirmed when rank correlation coefficients are computed.

The coefficients we used are the Spearman and the Kendall rank correlation coefficient.

- The Spearman rank correlation coefficient : r_s, is defined as (see (16)):

$$r_s = 1 - \frac{6 \cdot \sum_{i=1}^{N} d_i^2}{N^3 - N}$$

where *N* is the number of observations (37 in our case) and d_i is the difference between the ranks of the observations in the two situations observed.

- The Kendall rank correlation coefficient τ is defined as (see(16)):

$$\tau = \frac{S}{\frac{1}{2} N(N-1)}$$

where *N* is the number of observations and *S* is a sum obtained as follows:

- rank the first set of observations in their natural order.
- rank the second set of observations in the same order as the first one.
- for each pair of ranks of the second set of observations, assigned 1 if their order is natural and –1 if not.
- S is the sum of all these scores.

τ can be interpreted as the ratio of the sum of the actual scores (S) to the maximum possible sum of scores.

More the two coefficients are closer to one, less the change between the two years is important.

In our application, the observations for each commodity (j = 1…N) consist in their intermediate coefficients at constant prices.

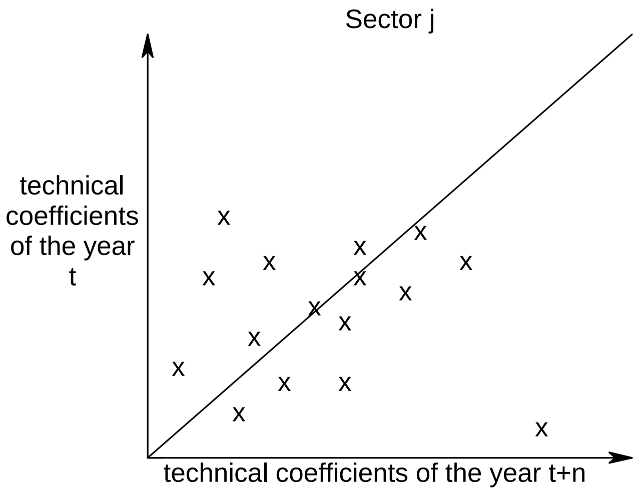
The results for these coefficients are given in Table 3.

Table 3 : Rank correlation coefficients

Rank correlation between 1985 and 1990				Rank correlation between 1990 and 1995			
Spearman		**Kendall**		**Spearman**		**Kendall**	
1	0.962	1	0.853	1	0.985	1	0.916
2	0.977	2	0.892	2	0.987	2	0.928
3	0.977	3	0.894	3	<u>0.992</u>	3	<u>0.949</u>
4	0.972	4	0.869	4	0.983	4	0.915
5	<u>0.985</u>	5	0.908	5	0.987	5	0.932
6	0.974	6	0.890	6	0.984	6	0.909
7	0.957	7	0.864	7	0.987	7	0.926
8	0.963	8	0.876	8	0.981	8	0.916
9	0.959	9	0.866	9	0.960	9	0.872
10	0.981	10	0.899	10	0.988	10	0.930
11	0.973	11	0.892	11	0.981	11	0.908
12	0.969	12	0.882	12	0.977	12	0.897
13	0.979	13	0.904	13	0.982	13	0.907
14	<u>0.989</u>	14	<u>0.930</u>	14	<u>0.994</u>	14	<u>0.954</u>
15	0.976	15	0.888	15	0.980	15	0.918
16	0.978	16	0.897	16	0.984	16	0.913
17	0.976	17	0.883	17	0.987	17	0.922
18	0.977	18	0.898	18	0.982	18	0.907
19	0.967	19	0.877	19	0.973	19	0.883
20	0.983	20	<u>0.909</u>	20	0.987	20	0.933
21	<u>0.989</u>	21	<u>0.927</u>	21	0.989	21	0.930
22	0.966	22	0.865	22	0.977	22	0.904
23	0.958	23	0.838	23	0.974	23	0.883
24	0.965	24	0.849	24	0.984	24	0.910
25	0.941	25	0.837	25	0.988	25	0.922
26	0.973	26	0.880	26	0.986	26	0.922
27	0.958	27	0.841	27	<u>0.991</u>	27	<u>0.937</u>
28	0.974	28	0.888	28	0.966	28	0.885
29	<u>0.987</u>	29	<u>0.921</u>	29	<u>0.991</u>	29	<u>0.936</u>
30	0.978	30	0.894	30	0.985	30	0.918
31	<u>0.985</u>	31	<u>0.919</u>	31	<u>0.992</u>	31	<u>0.946</u>
32	0.931	32	0.792	32	0.973	32	0.889
33	0.972	33	0.868	33	0.982	33	0.916
34	0.936	34	0.819	34	0.979	34	0.900
35	0.947	35	0.817	35	0.971	35	0.883
36	0.918	36	0.771	36	0.973	36	0.876
37	0.969	37	0.872	37	0.986	37	0.918

Inspection of Table 3 shows that with one exception, all sectors of 1995 are also more rank correlated with those of 1990 than those of 1990 were with those of 1985.

Another approach to this type of analysis consists in portraying the coefficients for two years in two dimensional axes corresponding to the years for each sector.



Measuring the dispersions for sectors can give an indication of how much a column of coefficients has changed from t to t+n. In order to obtain a single indicator of this distance, we proceed as follows :

we rank the two distributions of technical coefficients (corresponding to the two years) for each column j, according to the value of :

$$\varphi_{ij} = \frac{a_{ij}^{t}}{a_{ij}^{t+n}}$$

A small value of $a_{ij}^{t} / a_{ij}^{t+n}$ (<1) shows the cases when the technical coefficient has increased while a large value of $a_{ij}^{t} / a_{ij}^{t+n}$ (>1) shows the reverse.

If we then proceed to compute (using the order of coefficients defined by φ_{ij}) the cumulated sums of the normalized coefficients for each year, we obtain the cumulated coefficients, $F_k = \sum_{l=1}^{k} \left(a_{lj}^{t+n} \Big/ \sum_{i=1}^{N} a_{ij}^{t+n} \right)$ and $G_k = \sum_{l=1}^{k} \left(a_{lj}^{t} \Big/ \sum_{i=1}^{N} a_{ij}^{t} \right)$, used to compute a Gini index for sector j.

$$Gini_j^{t,t+n} = \sum_{i=1}^{N-1} F_i \cdot G_{i+1} - \sum_{i=1}^{N-1} F_{i+1} \cdot G_i$$

Inspection of Table 4 shows that the Gini indexes for 1995 / 1990 are almost always closer to 0 that those for 1990 / 1985, thus confirming the previous results concerning a greater stability during the second period of observation.

Table 4 : Gini indexes.

Sectors	1990 / 1985	1995 / 1990	Ordered by value 1990 / 1985		1995 / 1990	
1	0.21	0.13	29	0.05	29	0.04
2	0.17	0.14	17	0.09	14	0.06
3	0.15	0.08	33	0.09	17	0.07
4	0.21	0.10	13	0.10	33	0.07
5	0.13	0.08	10	0.11	30	0.08
6	0.15	0.11	15	0.12	3	0.08
7	0.45	0.12	16	0.12	5	0.08
8	0.16	0.15	18	0.12	10	0.09
9	0.13	0.10	21	0.12	11	0.09
10	0.11	0.09	5	0.13	37	0.09
11	0.16	0.09	9	0.13	24	0.09
12	0.40	0.18	19	0.13	18	0.10
13	0.10	0.10	6	0.15	9	0.10
14	0.64	0.06	3	0.15	13	0.10
15	0.12	0.13	20	0.16	4	0.10
16	0.12	0.11	11	0.16	16	0.11
17	0.09	0.07	25	0.16	6	0.11
18	0.12	0.10	8	0.16	23	0.12
19	0.13	0.14	30	0.17	7	0.12
20	0.16	0.13	2	0.17	35	0.13
21	0.12	0.15	23	0.17	20	0.13
22	0.20	0.15	34	0.17	15	0.13
23	0.17	0.12	28	0.18	1	0.13
24	0.24	0.09	26	0.19	28	0.13
25	0.16	0.18	27	0.19	2	0.14
26	0.19	0.16	32	0.20	32	0.14
27	0.19	0.15	22	0.20	19	0.14
28	0.18	0.13	31	0.20	22	0.15
29	0.05	0.04	1	0.21	21	0.15
30	0.17	0.08	4	0.21	8	0.15
31	0.20	0.19	35	0.23	27	0.15
32	0.20	0.14	36	0.24	34	0.16
33	0.09	0.07	24	0.24	26	0.16
34	0.17	0.16	37	0.33	36	0.16
35	0.23	0.13	12	0.40	25	0.18
36	0.24	0.16	7	0.45	12	0.18
37	0.33	0.09	14	0.64	31	0.19

The four indicators used (Le Masne, Kendall, Spearman and Gini) are also compared in order to measure the stability over time of the coefficients.

Table 5 : Top ranks (first five positions) of the sectors, for the two periods 1985-90 and 1990-95

	Period 1985 - 1990				Period 1990 - 1995			
Rank	**Le Masne**	**Spearman**	**Kendall**	**Gini**	**Le Masne**	**Spearman**	**Kendall**	**Gini**
1	29	14	14	29	29	14	14	29
2	17	21	21	17	33	3	3	14
3	13	29	29	33	17	31	31	17
4	33	5	31	13	30	27	27	33
5	10	31	20	10	10	29	29	30

Inspection of Table 5 shows that the results of the two rank correlation coefficients (Kendall and Spearman) are very similar, while the distance measures (Le Masne and Gini) also show comparable results.

The only sector with a highly constant production technology, and consequently appearing as top ranked with all quantitative measures adopted is sector 29, Financial services. Considering the great importance of the financial activity for Switzerland, it is interesting to note the great stability of the input structure of this sector during the entire period of observation 1985-1995.

3. Qualitative structural change

To analyse more in depth the change in the structural relations of the Swiss input-output tables, a qualitative analysis has been performed[*], using a more aggregated sectorial classification with the following 10 sectors :

		Original classification in Annex 1 :
1.	Agricultural and Energy	1, 2
2.	Consumption goods	3, 4, 5, 6, 7, 8, 9, 10, 11, 12
3.	Intermediate goods	13, 14, 15, 16, 17
4.	Equipment goods	18, 19
5.	Construction	20, 21
6.	Trade, hotels and restaurants	22, 23, 24
7.	Transport	25, 26, 27, 28
8.	Financial and other business services	29, 30, 31, 32
9.	Education and health	33, 34
10.	Non-market activities	35, 36, 37

Structural qualitative analysis has first been performed using the matrix A of technical coefficients at constant prices :

$$a_{ij} = \frac{x_{ij}}{x_j}$$

where x_{ij} is the flow at constant prices of commodities i for the production of commodity j and x_j is the total output of commodity j at constant prices.

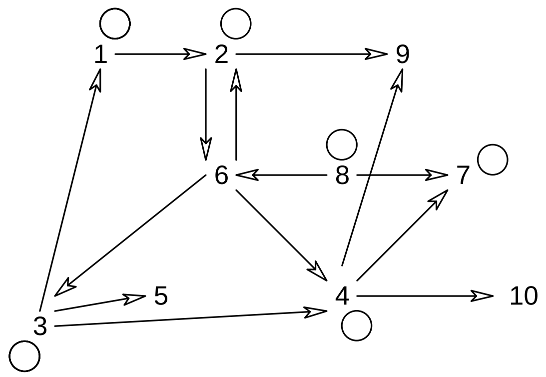
Binary qualitative matrices W_A have been computed for the years 1985, 1990 and 1995 using filters that left 20 flows in the matrices A (i.e. cells with 1).

The portrayed flows in the W_A matrices for 1985, 1990 and 1995 (Annex 3) can be interpreted as **strong technological links** between an input and an output.

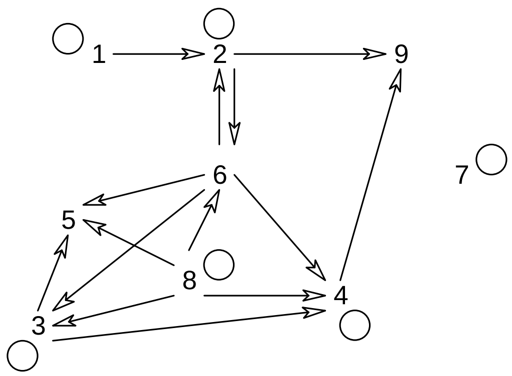
[*] Computations have been made by Sophie du Pasquier and Maik Gudehus.

These matrices can be easily represented by oriented graphs. For the three matrices W_A for 1985, 1990 and 1990 these graphs are :

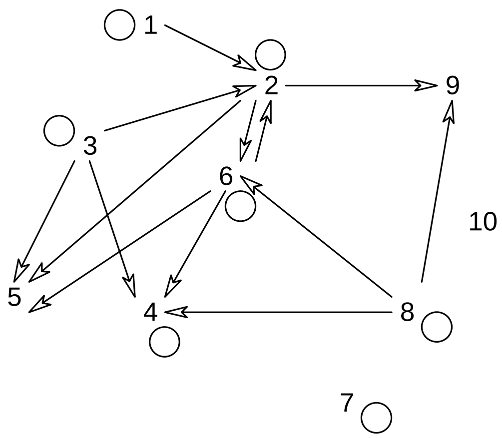
Graph matrix W_A 1985 (constant prices)



Graph matrix W_A 1990

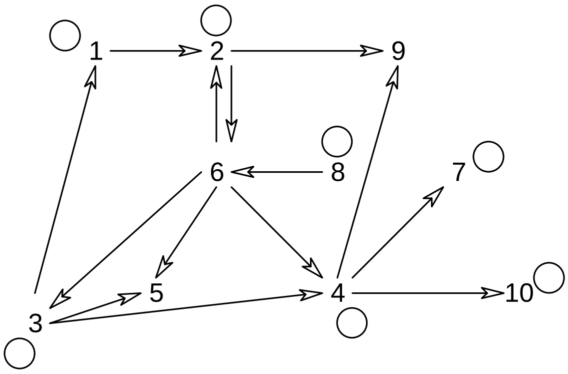


Graph matrix W_A 1995 (constant prices)

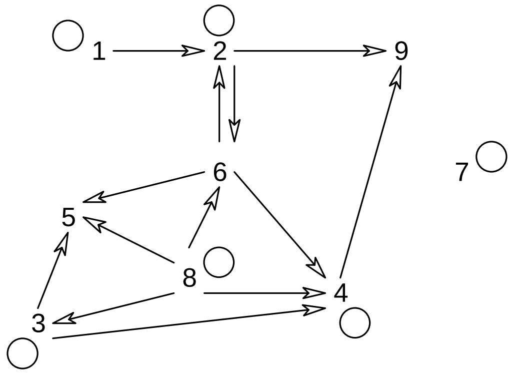


Looking at these graphs we notice that some relations between sectors are present all over the period. They concern for example the reciprocal link between the sectors producing Consumption goods (2) and Trade, hotels and restaurants (6) or the fact that Intermediate goods (3) always appear as providing goods to Equipment goods (4) and Construction (5). On the contrary the Equipment goods sector (4) which was delivering goods to three other sectors in 1985 has lost this position in 1995. The Financial and other business services sector (8) do not depend from any other sector concerning his intermediate inputs but has increasing activity in delivering services. This last observation is even emphasised if we do the same analysis with the A matrix at current prices. In this case we left the value of the filter, corresponding to 20 flows in 1985, constant for the two other years. The binary qualitative matrices for 1985, 1990 and 1995 are given in Annex 4 and the corresponding graphs are :

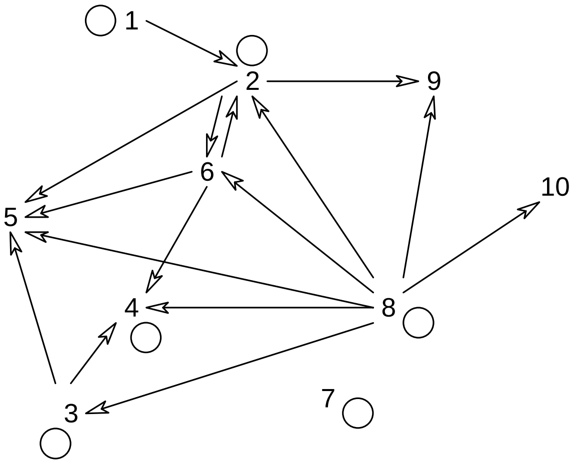
Graph matrix W_A 1985 (current prices)



Graph matrix W_A 1990



Graph matrix W_A 1995 (current prices)



Inspection of these graphs shows the central position of sector Commerce (6), as in the results at constant prices. This was expected from a sector that manages most intermediate flows. The most interesting feature of the evolution in time of these highly simplified structures deals with sector (8), Financial and other business services, that at current prices become even more essential for the functioning of the Swiss production system. This growing importance is due to the evolution of the prices of these services (Annex 5)

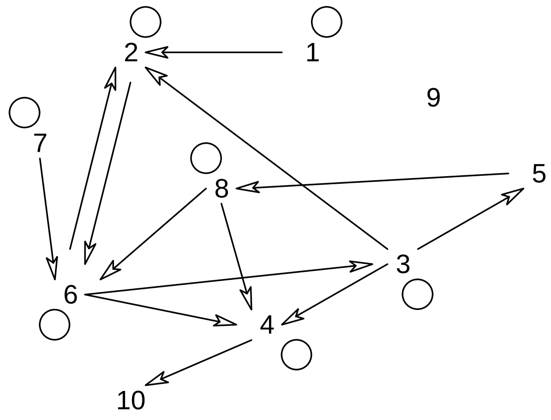
Finally we also performed the structural qualitative analysis for the B matrices at current prices, where

$$b_{ij} = \frac{x_{ij}}{\sum_{j=1}^{n} x_j}$$

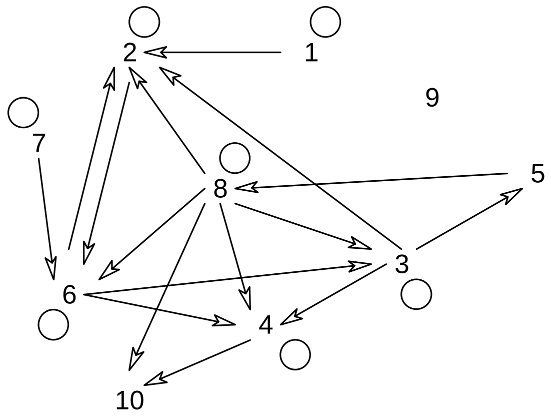
The flows portrayed in the W_B matrices for 1985, 1990 and 1995 (Annex 6) can be interpreted as **links with special economic relevance**.

For the three matrices W_B, the graphs are the following :

Graph Matrix W_B 1985 (current prices)



Graph Matrices W_B 1990 and 1995 (current prices)



Inspection of these graphs shows a remarkable stability of the structure of large flows : only sector (8), Financial and other business services, increases its centrality, thus confirming the results from the W_A matrix.

It is clear that the W_A matrix was portraying some very large, aggregated technological changes, and that matrix W_B shows the high stability of the Swiss production structure at current prices, or eventually some undesirable effects of the methodology of the construction of the table.

4. Final remarks

The comparison of the Swiss input-output tables of 1985, 1990 and 1995 (at 1990 prices) has shown, in quantitative terms, a greater stability of the coefficients during the second period of observation, and a very slow change of technical input coefficients of the Financial services sector.

The use of simple qualitative methods to compare the evolution of structures has further shown that, despite the fact that its input structure has remained nearly constant, the Financial services sector has become a very important supplier of services to the rest of the economy, thus reaching a position of centrality in the Swiss economy.

These remarks have obviously to be qualified by the fact that the Swiss tables have been constructed with limited available statistical information, and further adjusted with a RAS procedure.

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1 ANNEX

ANNEX 1: Classification

1 Agriculture, fishing
2 Electricity, gas and water supply
3 Food products
4 Beverages
5 Tobacco products
6 Textiles
7 Wearing apparel
8 Wood and products of wood
9 Wood sawing and industrial transformation of wood
10 Paper and paper products
11 Publishing and printing
12 Leather and footwear
13 Chemicals and chemical products
14 Petroleum products
15 Rubber and plastics products
16 Non-metallic mineral products
17 Basic metal and metal products
18 Machinery and vehicles
19 Electrical machinery and apparatus, other manufacturing
20 Construction
21 Installation and finishing
22 Wholesale trade
23 Retail trade
24 Hotels and restaurants
25 Railway transports
26 Road transport, air transport and auxiliary transport activity
27 Water transport
28 Post and telecommunications
29 Financial services
30 Insurance
31 Real estate
32 Other business services
33 Education, research, recreational, cultural and sporting activities
34 Health services
35 Households services
36 Public administration
37 Social insurances

ANNEX 2: Swiss 1995 Input-Output table at constant 1990 prices

	1	2	3	4	5	6	7	8	9	10	11
1	0.0776	0.0000	0.3288	0.0546	0.1001	0.0313	0.0148	0.0111	0.1584	0.0088	0.0000
2	0.0139	0.1747	0.0120	0.0162	0.0045	0.0395	0.0080	0.0029	0.0033	0.0318	0.0046
3	0.0973	0.0001	0.2002	0.0905	0.0002	0.0001	0.0003	0.0000	0.0000	0.0002	0.0001
4	0.0003	0.0001	0.0008	0.0369	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000
5	0.0001	0.0004	0.0001	0.0008	0.0195	0.0004	0.0000	0.0002	0.0002	0.0000	0.0003
6	0.0003	0.0000	0.0001	0.0000	0.0001	0.1878	0.3848	0.0093	0.0003	0.0018	0.0003
7	0.0003	0.0001	0.0003	0.0009	0.0002	0.0014	0.0786	0.0001	0.0000	0.0000	0.0000
8	0.0080	0.0007	0.0019	0.0035	0.0027	0.0003	0.0005	0.1253	0.0027	0.0075	0.0001
9	0.0005	0.0002	0.0000	0.0000	0.0001	0.0000	0.0000	0.0820	0.1113	0.0111	0.0001
10	0.0013	0.0004	0.0113	0.0137	0.0346	0.0075	0.0063	0.0045	0.0042	0.2441	0.1215
11	0.0067	0.0009	0.0155	0.0189	0.0092	0.0006	0.0000	0.0000	0.0043	0.0173	0.1211
12	0.0000	0.0000	0.0001	0.0000	0.0000	0.0001	0.0053	0.0011	0.0001	0.0001	0.0025
13	0.0305	0.0228	0.0074	0.0158	0.0234	0.1189	0.0045	0.0142	0.0548	0.0445	0.0636
14	0.0030	0.0019	0.0021	0.0021	0.0005	0.0054	0.0022	0.0022	0.0030	0.0061	0.0007
15	0.0028	0.0006	0.0053	0.0063	0.0033	0.0074	0.0182	0.0227	0.0056	0.0109	0.0098
16	0.0098	0.0010	0.0074	0.0406	0.0001	0.0005	0.0008	0.0146	0.0031	0.0102	0.0000
17	0.0076	0.0207	0.0080	0.0172	0.0052	0.0013	0.0130	0.0353	0.0038	0.0037	0.0053
18	0.0157	0.0167	0.0089	0.0137	0.0061	0.0208	0.0069	0.0063	0.0126	0.0162	0.0165
19	0.0040	0.0110	0.0022	0.0071	0.0030	0.0052	0.0106	0.0145	0.0041	0.0107	0.0047
20	0.0117	0.0075	0.0001	0.0010	0.0000	0.0002	0.0002	0.0023	0.0039	0.0004	0.0002
21	0.0071	0.0185	0.0011	0.0154	0.0005	0.0028	0.0086	0.0019	0.0052	0.0021	0.0028
22	0.0381	0.0103	0.0493	0.0611	0.0233	0.0555	0.1093	0.0546	0.0512	0.0521	0.0246
23	0.0003	0.0027	0.0399	0.0236	0.0052	0.0124	0.0311	0.0545	0.0347	0.0176	0.0101
24	0.0003	0.0010	0.0012	0.0052	0.0030	0.0048	0.0186	0.0059	0.0041	0.0021	0.0045
25	0.0048	0.0007	0.0118	0.0062	0.0096	0.0037	0.0049	0.0011	0.0049	0.0087	0.0078
26	0.0009	0.0061	0.0301	0.0393	0.0122	0.0130	0.0229	0.0196	0.0306	0.0314	0.0182
27	0.0010	0.0032	0.0008	0.0002	0.0002	0.0001	0.0001	0.0002	0.0004	0.0007	0.0003
28	0.0020	0.0060	0.0048	0.0114	0.0007	0.0104	0.0300	0.0123	0.0068	0.0070	0.0106
29	0.0039	0.0078	0.0036	0.0046	0.0000	0.0091	0.0251	0.0080	0.0082	0.0041	0.0047
30	0.0036	0.0094	0.0014	0.0018	0.0014	0.0037	0.0050	0.0038	0.0049	0.0026	0.0023
31	0.0000	0.0009	0.0026	0.0034	0.0008	0.0015	0.0081	0.0044	0.0002	0.0007	0.0042
32	0.0195	0.0316	0.0247	0.0854	0.1098	0.0379	0.1632	0.0374	0.0230	0.0357	0.0508
33	0.0005	0.0009	0.0015	0.0051	0.0060	0.0035	0.0047	0.0022	0.0020	0.0021	0.0033
34	0.0050	0.0007	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
35	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
36	0.0024	0.0050	0.0037	0.0066	0.0062	0.0014	0.0111	0.0023	0.0014	0.0018	0.0022
37	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.3806	**0.3645**	**0.7890**	**0.6091**	**0.3917**	**0.5886**	**0.9979**	**0.5568**	**0.5536**	**0.5941**	**0.4978**

	12	13	14	15	16	17	18	19	20	21	22
1	0.0721	0.0009	0.0001	0.0088	0.0007	0.0001	0.0001	0.0006	0.0002	0.0000	0.0021
2	0.0060	0.0182	0.0157	0.0211	0.0821	0.0158	0.0092	0.0022	0.0062	0.0006	0.0048
3	0.0002	0.0026	0.0002	0.0001	0.0001	0.0001	0.0001	0.0004	0.0001	0.0000	0.0010
4	0.0000	0.0002	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0007
5	0.0003	0.0002	0.0001	0.0000	0.0002	0.0002	0.0001	0.0002	0.0000	0.0001	0.0053
6	0.0157	0.0002	0.0000	0.0071	0.0011	0.0002	0.0021	0.0013	0.0000	0.0016	0.0011
7	0.0045	0.0003	0.0001	0.0001	0.0005	0.0001	0.0001	0.0003	0.0001	0.0000	0.0001
8	0.0207	0.0006	0.0002	0.0003	0.0065	0.0047	0.0050	0.0033	0.0142	0.0996	0.0049
9	0.0006	0.0003	0.0000	0.0024	0.0010	0.0006	0.0014	0.0023	0.0057	0.0104	0.0000
10	0.0101	0.0094	0.0000	0.0132	0.0117	0.0014	0.0010	0.0073	0.0003	0.0018	0.0077
11	0.0032	0.0045	0.0000	0.0076	0.0147	0.0035	0.0063	0.0107	0.0000	0.0000	0.0167
12	0.0492	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000
13	0.0381	0.3186	0.0102	0.2705	0.0315	0.0211	0.0114	0.0409	0.0050	0.0308	0.0023
14	0.0017	0.0020	0.7869	0.0006	0.0231	0.0010	0.0010	0.0013	0.0045	0.0012	0.0020
15	0.0331	0.0096	0.0011	0.0681	0.0046	0.0039	0.0191	0.0309	0.0038	0.0095	0.0038
16	0.0014	0.0083	0.0002	0.0092	0.1636	0.0326	0.0043	0.0138	0.1468	0.0395	0.0005
17	0.0164	0.0099	0.0023	0.0149	0.0113	0.2861	0.0835	0.0892	0.0328	0.0373	0.0018
18	0.0084	0.0109	0.0032	0.0123	0.0222	0.0132	0.2617	0.0364	0.0045	0.0278	0.0105
19	0.0138	0.0042	0.0017	0.0094	0.0051	0.0078	0.0476	0.1463	0.0082	0.0228	0.0131
20	0.0011	0.0003	0.0003	0.0003	0.0010	0.0004	0.0011	0.0002	0.0219	0.0000	0.0017
21	0.0056	0.0013	0.0021	0.0057	0.0047	0.0021	0.0028	0.0021	0.0000	0.0004	0.0039
22	0.0737	0.0363	0.0417	0.0430	0.0359	0.0471	0.0413	0.0559	0.0367	0.0261	0.0546
23	0.0154	0.0066	0.0075	0.0113	0.0174	0.0130	0.0159	0.0187	0.0282	0.0330	0.0046
24	0.0101	0.0035	0.0004	0.0053	0.0034	0.0029	0.0054	0.0085	0.0013	0.0002	0.0215
25	0.0045	0.0056	0.0044	0.0020	0.0075	0.0134	0.0003	0.0023	0.0022	0.0012	0.0201
26	0.0139	0.0147	0.0216	0.0130	0.0343	0.0115	0.0103	0.0145	0.0139	0.0084	0.0322
27	0.0001	0.0011	0.0019	0.0005	0.0017	0.0006	0.0002	0.0003	0.0011	0.0002	0.0009
28	0.0265	0.0100	0.0013	0.0114	0.0049	0.0050	0.0090	0.0151	0.0072	0.0096	0.0254
29	0.0109	0.0029	0.0011	0.0055	0.0055	0.0033	0.0075	0.0116	0.0076	0.0038	0.0382
30	0.0033	0.0019	0.0002	0.0032	0.0030	0.0012	0.0016	0.0029	0.0076	0.0026	0.0152
31	0.0027	0.0015	0.0000	0.0019	0.0011	0.0006	0.0011	0.0022	0.0054	0.0062	0.0121
32	0.0324	0.0482	0.0089	0.0586	0.0612	0.0229	0.0472	0.0668	0.0499	0.0283	0.0846
33	0.0048	0.0015	0.0000	0.0021	0.0021	0.0016	0.0023	0.0030	0.0006	0.0013	0.0062
34	0.0000	0.0001	0.0000	0.0000	0.0001	0.0000	0.0001	0.0002	0.0002	0.0000	0.0003
35	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
36	0.0017	0.0049	0.0013	0.0050	0.0028	0.0023	0.0035	0.0031	0.0033	0.0004	0.0039
37	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.5022	**0.5414**	**0.9147**	**0.6147**	**0.5671**	**0.5204**	**0.6035**	**0.5948**	**0.4195**	**0.4048**	**0.4036**

	23	24	25	26	27	28	29	30	31	32	33
1	0.0004	0.0636	0.0003	0.0001	0.0005	0.0000	0.0001	0.0005	0.0111	0.0066	0.0006
2	0.0172	0.0279	0.0548	0.0049	0.0050	0.0086	0.0045	0.0060	0.0007	0.0050	0.0369
3	0.0001	0.1372	0.0007	0.0028	0.0158	0.0000	0.0000	0.0002	0.0000	0.0088	0.0004
4	0.0000	0.0407	0.0001	0.0001	0.0009	0.0000	0.0000	0.0003	0.0000	0.0024	0.0003
5	0.0015	0.0282	0.0000	0.0014	0.0006	0.0000	0.0001	0.0018	0.0004	0.0014	0.0010
6	0.0003	0.0026	0.0009	0.0003	0.0007	0.0012	0.0000	0.0009	0.0001	0.0015	0.0007
7	0.0004	0.0068	0.0002	0.0007	0.0003	0.0035	0.0001	0.0014	0.0003	0.0036	0.0010
8	0.0035	0.0036	0.0008	0.0003	0.0002	0.0044	0.0002	0.0008	0.0029	0.0066	0.0002
9	0.0005	0.0009	0.0004	0.0000	0.0001	0.0002	0.0000	0.0003	0.0000	0.0000	0.0000
10	0.0060	0.0049	0.0003	0.0028	0.0007	0.0004	0.0005	0.0030	0.0004	0.0068	0.0115
11	0.0428	0.0145	0.0039	0.0218	0.0108	0.0212	0.0079	0.0142	0.0008	0.0156	0.3393
12	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
13	0.0016	0.0107	0.0021	0.0034	0.0011	0.0021	0.0004	0.0042	0.0003	0.0293	0.0024
14	0.0057	0.0024	0.0104	0.0192	0.0114	0.0018	0.0005	0.0002	0.0001	0.0018	0.0005
15	0.0017	0.0015	0.0011	0.0041	0.0005	0.0013	0.0000	0.0002	0.0000	0.0025	0.0006
16	0.0006	0.0146	0.0020	0.0004	0.0001	0.0019	0.0000	0.0000	0.0001	0.0020	0.0003
17	0.0012	0.0038	0.0154	0.0062	0.0038	0.0017	0.0001	0.0021	0.0007	0.0030	0.0011
18	0.0073	0.0079	0.0033	0.0424	0.0631	0.0101	0.0004	0.0061	0.0010	0.0087	0.0016
19	0.0062	0.0091	0.0052	0.0102	0.0039	0.0202	0.0013	0.0144	0.0035	0.0316	0.0058
20	0.0016	0.0006	0.0409	0.0030	0.0011	0.0017	0.0000	0.0009	0.0552	0.0020	0.0012
21	0.0034	0.0004	0.0274	0.0050	0.0001	0.0148	0.0013	0.0060	0.0551	0.0078	0.0000
22	0.0078	0.0474	0.0006	0.0160	0.0200	0.0070	0.0006	0.0041	0.0006	0.0141	0.0058
23	0.0033	0.0651	0.0022	0.0078	0.0192	0.0035	0.0002	0.0021	0.0005	0.0090	0.0028
24	0.0011	0.0022	0.0001	0.0318	0.0018	0.0012	0.0026	0.0047	0.0008	0.0118	0.0055
25	0.0026	0.0005	0.1544	0.0154	0.0009	0.0271	0.0012	0.0029	0.0000	0.0011	0.0004
26	0.0071	0.0301	0.0016	0.1180	0.0072	0.0098	0.0029	0.0069	0.0003	0.0109	0.0050
27	0.0005	0.0004	0.0012	0.0028	0.1995	0.0003	0.0000	0.0000	0.0000	0.0005	0.0000
28	0.0181	0.0225	0.0021	0.0191	0.0080	0.1570	0.0093	0.0322	0.0017	0.0126	0.0181
29	0.0125	0.0233	0.0011	0.0082	0.0062	0.0032	0.2062	0.1631	0.0807	0.0243	0.0026
30	0.0045	0.0080	0.0005	0.0290	0.0166	0.0001	0.0000	0.0140	0.0176	0.0201	0.0058
31	0.0424	0.0172	0.0003	0.0050	0.0002	0.0050	0.0008	0.0009	0.0000	0.0037	0.0015
32	0.0384	0.0391	0.0061	0.0172	0.0272	0.0016	0.0184	0.2186	0.0281	0.1406	0.0105
33	0.0044	0.0031	0.0018	0.0014	0.0021	0.0012	0.0013	0.0077	0.0010	0.0211	0.0220
34	0.0002	0.0001	0.0022	0.0005	0.0004	0.0006	0.0001	0.0048	0.0001	0.0004	0.0001
35	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
36	0.0013	0.0028	0.0003	0.0049	0.0007	0.0012	0.0007	0.0043	0.0304	0.0048	0.0012
37	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.2462	**0.6438**	**0.3448**	**0.4059**	**0.4309**	**0.3138**	**0.2618**	**0.5300**	**0.2948**	**0.4222**	**0.4869**

	34	35	36	37
1	0.0082	0.0116	0.0031	0.0020
2	0.0206	0.0162	0.0045	0.0042
3	0.0038	0.0364	0.0053	0.0056
4	0.0000	0.0082	0.0001	0.0003
5	0.0000	0.0001	0.0000	0.0000
6	0.0025	0.0029	0.0008	0.0007
7	0.0022	0.0054	0.0036	0.0015
8	0.0011	0.0023	0.0038	0.0005
9	0.0001	0.0002	0.0000	0.0003
10	0.0008	0.0024	0.0027	0.0041
11	0.0046	0.0134	0.0117	0.0024
12	0.0006	0.0001	0.0000	0.0001
13	0.0545	0.0393	0.0103	0.0884
14	0.0023	0.0023	0.0018	0.0005
15	0.0036	0.0021	0.0017	0.0020
16	0.0123	0.0027	0.0015	0.0000
17	0.0005	0.0020	0.0076	0.0005
18	0.0040	0.0087	0.0521	0.0052
19	0.0820	0.0102	0.0170	0.0210
20	0.0005	0.0029	0.0146	0.0000
21	0.0010	0.0050	0.0103	0.0030
22	0.0243	0.0188	0.0117	0.0212
23	0.0045	0.0215	0.0188	0.1123
24	0.0005	0.0037	0.0026	0.0030
25	0.0006	0.0023	0.0036	0.0043
26	0.0151	0.0178	0.0061	0.0103
27	0.0001	0.0007	0.0001	0.0000
28	0.0119	0.0103	0.0137	0.0099
29	0.0041	0.0516	0.0125	0.0067
30	0.0208	0.0040	0.0044	0.0007
31	0.0118	0.0019	0.0083	0.0007
32	0.0540	0.0561	0.0255	0.0081
33	0.0037	0.0022	0.0059	0.0018
34	0.0086	0.0003	0.0058	0.1867
35	0.0000	0.0000	0.0000	0.0000
36	0.0070	0.0041	0.0069	0.1818
37	0.0000	0.0000	0.0000	0.0000
	0.3722	**0.3697**	**0.2787**	**0.6898**

ANNEX 3

Matrix W_A 1985 (constant prices), 20 flows

	1	2	3	4	5	6	7	8	9	10
1	1	1	0	0	0	0	0	0	0	0
2	0	1	0	0	0	1	0	0	1	0
3	1	0	1	1	1	0	0	0	0	0
4	0	0	0	1	0	0	1	0	1	1
5	0	0	0	0	0	0	0	0	0	0
6	0	1	1	1	0	0	0	0	0	0
7	0	0	0	0	0	0	1	0	0	0
8	0	0	0	0	0	1	1	1	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0

Filter = 0.0588

Matrix W_A 1990, 20 flows

	1	2	3	4	5	6	7	8	9	10
1	1	1	0	0	0	0	0	0	0	0
2	0	1	0	0	0	1	0	0	1	0
3	0	0	1	1	1	0	0	0	0	0
4	0	0	0	1	0	0	0	0	1	0
5	0	0	0	0	0	0	0	0	0	0
6	0	1	1	1	1	0	0	0	0	0
7	0	0	0	0	0	0	1	0	0	0
8	0	0	1	1	1	1	0	1	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0

Filter = 0.0611

Matrix W_A 1985 (constant prices), 20 flows

	1	2	3	4	5	6	7	8	9	10
1	1	1	0	0	0	0	0	0	0	0
2	0	1	0	0	1	1	0	0	1	0
3	0	1	1	1	1	0	0	0	0	0
4	0	0	0	1	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	1	0	1	1	1	0	0	0	0
7	0	0	0	0	0	0	1	0	0	0
8	0	0	0	1	0	1	0	1	1	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0

Filter = 0.061

ANNEX 4

Matrix W_A 1985 (current prices), 20 flows

	1	2	3	4	5	6	7	8	9	10
1	1	1	0	0	0	0	0	0	0	0
2	0	1	0	0	0	1	0	0	1	0
3	1	0	1	1	1	0	0	0	0	0
4	0	0	0	1	0	0	1	0	1	1
5	0	0	0	0	0	0	0	0	0	0
6	0	1	1	1	1	0	0	0	0	0
7	0	0	0	0	0	0	1	0	0	0
8	0	0	0	0	0	1	0	1	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0

Filter = 0.06165

Matrix W_A 1990, 19 flows

	1	2	3	4	5	6	7	8	9	10
1	1	1	0	0	0	0	0	0	0	0
2	0	1	0	0	0	1	0	0	1	0
3	0	0	1	1	1	0	0	0	0	0
4	0	0	0	1	0	0	0	0	1	0
5	0	0	0	0	0	0	0	0	0	0
6	0	1	0	1	1	0	0	0	0	0
7	0	0	0	0	0	0	1	0	0	0
8	0	0	1	1	1	1	0	1	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0

Filter = 0.06165

Matrix W_A 1995 (current prices), 22 flows

	1	2	3	4	5	6	7	8	9	10
1	1	1	0	0	0	0	0	0	0	0
2	0	1	0	0	1	1	0	0	1	0
3	0	0	1	1	1	0	0	0	0	0
4	0	0	0	1	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	1	0	1	1	0	0	0	0	0
7	0	0	0	0	0	0	1	0	0	0
8	0	1	1	1	1	1	0	1	1	1
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0

Filter: 0.06165

ANNEX 5

Production price index (base year 1990 = 1)

	1985	1990	1995
1	0.94	1.00	1.16
2	0.93	1.00	1.06
3	0.94	1.00	1.07
4	0.87	1.00	0.93
5	0.80	1.00	0.86
6	0.88	1.00	1.05
7	0.89	1.00	1.14
8	0.80	1.00	1.26
9	0.87	1.00	1.17
10	0.90	1.00	1.23

ANNEX 6

Matrix W_B 1985 (current prices), 20 flows

	1	2	3	4	5	6	7	8	9	10
1	1	1	0	0	0	0	0	0	0	0
2	0	1	0	0	0	1	0	0	0	0
3	0	1	1	1	1	0	0	0	0	0
4	0	0	0	1	0	0	0	0	0	1
5	0	0	0	0	0	0	0	1	0	0
6	0	1	1	1	0	1	0	0	0	0
7	0	0	0	0	0	1	1	0	0	0
8	0	0	0	1	0	1	0	1	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0

Filter = 0.0055

Matrices W_B 1990 and 1995 (current prices), 23 flows

	1	2	3	4	5	6	7	8	9	10
1	1	1	0	0	0	0	0	0	0	0
2	0	1	0	0	0	1	0	0	0	0
3	0	1	1	1	1	0	0	0	0	0
4	0	0	0	1	0	0	0	0	0	1
5	0	0	0	0	0	0	0	1	0	0
6	0	1	1	1	0	1	0	0	0	0
7	0	0	0	0	0	1	1	0	0	0
8	0	1	1	1	0	1	0	1	0	1
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0

Filter = 0.0055