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ANALYZING ECONOMIC GROWTH: A DESCRIPTION OF THE BASIC DATA AVAILABLE FOR THE NETHERLANDS AND AN APPLICATION

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Abstract

This paper presents a description of the STAN project of the OECD and the processing and disaggregation of Dutch National Accounts data in order to contribute to the STAN database. This international database will serve as the basis for OECD structural analysis of the major industrial economies. It is designed for the analysis of the relationship between technology and economy in an international framework. Following an OECD analysis for other industrial countries, the importance of international trade for a small and open economy such as the Netherlands has been investigated using the Dutch STAN data.

Contents

1. Introduction

Marked by the rise of a new theory of endogenous economic growth and a shift away from demand management to supply oriented macro-economic policies during the previous decade, the relation between technology and economic performance has gained in interest, both in economic research and in policy making. This in turn has led to an increasing demand for internationally comparable data to facilitate an assessment of changes in the state of technology and in the structure of economies. The Structural Analysis (STAN) project of the OECD represents a response to this demand. The project was launched by the Directorate for Science, Technology and Industry of the OECD in the beginning of 1988 as a part of the Technology and Economy Programme (TEP, see OECD, 1992). According to this TEP, STAN has three broad goals:

- to establish a comprehensive, disaggregated, internationally comparable, analytical database, linking R&D expenditures, industrial and foreign trade data at the individual industry level, in order to serve as the basis for OECD (and member country) structural analysis in OECD countries
- to construct a wide range of industry level and aggregate indicators of the evolution of technological and economic performance in OECD countries for use within the OECD and member countries
- to undertake a number of empirical studies of the role of technology in international competitiveness, productivity growth and structural change.

To achieve these objectives, the OECD invited the statistical offices of member countries to participate in the data collection and data assembling stage of STAN. Through the commitment of the CBS to participate in STAN, the Netherlands has obtained the status of core country. This status opens two opportunities: first STAN data of all core countries will be made available on request to Dutch researchers together with analytical support, and secondly the Netherlands will be included in OECD STAN studies and publications.

This paper reports on the compilation of disaggregated National Accounts compatible data in order to comply with the STAN data requirements and presents a relatively simple analytical application of the database. To begin with we present a brief description of the STAN project (section 2), an indication of the present state of the database and the proposed analytical studies. Section 3 summarises the processing of National Accounts data and the use of other statistical sources for the construction of National Accounts compatible disaggregated times series data, input-output tables and investment matrices, both in current and constant prices. Section 4 discusses the results of an analysis of changes in the patterns of sourcing of manufactured intermediates in the two previous decades. Finally section 5 summarises the results.

2. Description of the STAN project[1)]

2.1 The database

The STAN database is a large database combining industrial and technological data for all OECD members where data are available. At the moment there are 13 core countries: the United States of America (US), Japan, Canada, Germany, France, United Kingdom (UK), Italy, Denmark, Norway, Sweden, Australia, New Zealand and the Netherlands, with Finland likely to enter in the near future. The database consists of time series data on business research and development expenditure (R&D), gross output, value added, investment (gross fixed capital formation) employment (of employees and total number employed), wages and total labour costs and exports. Apart from time series data, STAN requires input-output and investment matrices (by industry of origin and industry of destination) for several benchmark years. The data for gross output, value added and investment and the input-output and investment matrices have also been made available in constant prices.

The database is designed to be fully consistent with the National Accounts data of all participating OECD countries, i.e. the sectoral data sum up or are directly related to reported National Accounts figures. The database extends to 36 manufacturing industries and 14 other industries and covers approximately 20 years (1970 - 1990). Table 1 presents the sectoral breakdown of the time series data, the input-output and investment matrices and the correspondence with the ISIC classification (revision 3). For several reasons (e.g. confidentiality of data or inter-country differences in survey designs) it has been decided to restrict the aggregation level of business R&D data and its analytical use to the aggregation level of the input-output and investment matrices.

STAN input-output and investment data requirements consist of the

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1) This section is based on several OECD progress reports pertaining to the STAN database and programme.

following submatrices:

- domestic intermediate goods flow submatrices;
- the imported intermediate goods flows submatrices;
- the domestically sourced capital goods flows submatrices;
- the imported capital goods flows submatrices.

Table 1. STAN level of aggregation for time series data and input-output (I/O) and investment matrices (CF)

No[a]		Description	Row number time series	Row number I/O and CF	ISIC code
1		Agriculture, forestry & fishing	1	1	1000
2		Mining	2	2	2000
3	L	Food	3	3	3120
4	L	Beverages	4	3	3130
5	L	Tobacco	5	3	3140
6	L	Textiles	6	4	3210
7	L	Wearing apparel	7	4	3220
8	L	Leather & leather products	8	4	3230
9	L	Footwear	9	4	3240
10	L	Wood	10	5	3310
11	L	Furniture & fixtures	11	5	3320
12	L	Paper products	12	6	3410
13	L	Printing & publishing	13	6	3420
14	M	Industrial chemicals	14	7	3510
15	M	Other chemicals excl pharmaceuticals	15	7	3520-3522
16	H	Pharmaceuticals	16	8	3522
17	L	Petroleum refining	17	9	3530
18	L	Petroleum & coal	18	9	3540
19	M	Rubber products	19	10	3550
20	M	Plastic products	20	10	3560
21	L	Pottery & china	21	11	3610
22	L	Glass products	22	11	3620
23	L	Cement, clay etc	23	11	3690
24	L	Iron & steel	24	12	3710
25	M	Non-ferrous metals	25	13	3720
26	L	Metal products excl machinery	26	14	3810
27	M	Other machinery	27	15	3820-3825
28	H	Computers & office machinery	28	16	3825
29	H	Electrical products	29	17	3830
30	H	Communications & semiconductors[b]	not available		3832
31	L	Shipbuilding	30	19	3841
32	M	Railroad equipment	31	20	3842
33	M	Motor vehicles	32	21	3843
34	M	Motorcycles & bicycles	33	20	3844
35	H	Aircraft	34	22	3845
36	M	Other transport	35	20	3849
37	H	Instruments	36	23	3850
38	M	Other manufacturing	37	24	3900
39		Electricity, gas & water	38	25	4000
40		Construction	39	26	5000
41		Wholesale & retail trade	40	27	6100+6200
42		Hotels & restaurants	41	28	6300
43		Transport & storage	42	29	7100
44		Communications	43	30	7200
45		Finance & insurance	44	31	8100+8200
46		Real estate & business services	45	32	8300
47		Social & personal services	46	33	9000
48		Government services	47	34	
49		Other producers	48	35	
50		Not elsewhere classified	49	36	

a) The letter refers to the OECD classification of High, Medium and Low technology manufacturing industries;
b) Included in 29 Electrical products.

These submatrices are requested in current and constant prices and for four benchmark years centered around the "two oil crises": preferably one 'early' and one 'late' year in the seventies and similar years in the eighties. Constructing these matrices is a rather time-consuming process. These data - and the R&D data - are at the heart of the STAN database because they are indispensable for the success of several analytical studies of structural change and the diffusion of technology (see section 2.3). However, it has not been possible to meet all OECD requirements in question. Due to data restrictions no constant price import tables for the years before 1980 could be compiled. For similar reasons it proved not possible to compile separate investment matrices for domestically sourced and imported capital goods. Instead tables for total capital goods flows were compiled.

2.2 The present state of the database

When complete, the STAN database will be one of the most comprehensive international databases of industry, industrial trade and R&D data available. At the moment the estimated National Accounts compatible time series data of STAN, the analytical business enterprise R&D database (ANBERD) and the international trade database are readily available to anyone, allowing researchers to combine R&D and industry data on gross output, value added, compensation of employees, employment and international trade. An exception should be made for the Dutch R&D time series data. Dutch R&D is highly concentrated in a small number of large international enterprises. Solving the confidentiality problems involved in releasing Dutch R&D data is rather time consuming. The ANBERD database should be completed with the Dutch R&D data in the very near future. The only data as yet unavailable at all is the input-output part of the STAN database. Here the Netherlands is a positive exception. With the restriction mentioned in the previous subsection, Dutch input-output matrices and investment matrices are available in current and constant prices for four years: 1972, 1977, 1981 and 1986.

2.3 Analytical studies

The STAN database has been designed to contribute to the OECD's and member states' needs for analytical studies of the role of technology in international competitiveness, structural change and economic growth. The analytical studies proposed can be divided into two categories: on the one hand the construction of descriptive measures referred to as the scoreboard of indicators of technology, competitiveness and structural change; and on the other hand several input-output based empirical explanatory analyses of structural change and the relation between technology and investment and the relation between technology and international competitiveness.

2.3.1 Descriptive measures

The indicators scoreboard project is a response to the demand for disaggregated industrial and technological comparative indicators which distinguish between high, medium and low technology groups. This distinction is based on the standard OECD ranking of industries by their R&D intensity (ratio of R&D expenditure to gross output averaged across 11 countries, (see OECD, 1986)). The scoreboard covers some 50 indicators of different types including trade-based measures of international competitiveness, indicators of structural adjustment and the industrial profile of economies (output and employment shares, measures of investment rates, labour costs, labour productivity and technological performance)[2]. The derivation of alternative aggregate comparative measures of industrial performance is another objective of the project. These measures explicitly take into account inter-country differences in the structures of the industries of the participating OECD member countries, so these measures are better suited to the task of assessing aggregate industrial performance (see e.g. OECD, 1991 for an example of an aggregate measure of industrial R&D performance).

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2) At the moment OECD is half-way through the indicators scoreboard project.

2.3.2 Explanatory studies

Three empirical explanatory studies of the STAN project are scheduled to provide an analytical framework for the interpretation of various scoreboard indicators: the structural change project, the study on technology and competitiveness and the technology and investment project. In the structural change project the decomposition of growth - measured by the average change of real gross output and employment - during the two previous decades is the central issue. In OECD (1992) structural change in terms of its extent, direction and underlying factors are analysed for Australia, Canada, France, Germany, Japan, the UK and the US[3]. Using input-output matrices the effects of export growth, import penetration, growth in domestic final demand, labour productivity and "technology" on real output and employment for total manufacturing and the partition according to technological intensity (high, medium and low) are examined.

In the structural change project "Technology" was used in the narrow input-output sense: changes in the use of materials or the adoption of new processes that affect the pattern of links between industries. One of the main findings in the seven-country analysis is that "technology" in this sense has been a more important explanation for the declining output share of low technology industries than import penetration, whereas growth in high technology industries has been driven primarily by growth in exports and domestic final demand. The analytical study on technology and competitiveness has been undertaken to provide an explanation for the relatively better export performance of high technology industries. This study examines the role of R&D expenditures, capital investment expenditure and unit labour costs on exports of individual industries.

Technology in the more usual sense of technological changes in the production process due to the embodiment of new technology in recent additions to the capital stock is a subject to be dealt with in the third analytical study of the STAN project: the technology and investment project. The diffusion of technology through the acquisition of new

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3) In the very near future this project will be extended to other core countries, including the Netherlands.

physical capital is a central issue in this study. The study tries to link the increase of the technological content of capital goods induced by the R&D efforts of the industries producing these goods and the economic performance of the industries using them (see OECD (1989) for a model of technology and economic growth in a vintage framework). This project is very demanding with respect to data: investment submatrices (both for domestically produced and imported capital goods) and lengthy time series data for real investment, output and business R&D are indispensable. Furthermore the relevant part of the database may be used in the construction of a R&D module of the National Accounts. This module will enable a more extensive look at the role of R&D in the national economy.

For the Netherlands the international dimension of the technology-investment relationship is evident. With only relatively little R&D efforts in domestic capital-goods producing industries[4)] and relatively large import shares for machinery and related equipment, the acquisition of embodied technological progress heavily depends on foreign creation of knowledge. Table 2 shows that the import share of gross fixed capital formation in machinery, electrotechnical products and transport equipment gradually increased from 65% in 1972 to 78% in 1988. For machinery these percentages are 73 and 83 respectively, the latter being an average of 76% for office machinery and 96% for other non-electrical machinery. On the other hand the export share of the machinery producing industry has improved substantially from 57% in 1972 (non-electrical machinery 53%) to 69% in 1988 (non-electrical machinery 66%). Once again these simple figures reflect the increased openness and specialisation[5)] of the manufacturing industries involved in the period under consideration, a conclusion which also appears to be applicable to other industries or other commodities. In section 4 we will return to this subject.

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4) See Minne (1992) for an extensive description of the Dutch technological position.

5) It is self-evident that the relatively high levels of import and export shares merely reflect international patterns of specialisation (for instance Dutch investments in aircraft are mostly imported whereas almost all production of the Dutch aircraft industry was exported).

Table 2. Dutch gross domestic capital formation by industries of origin

Industry of origin	Total					Share of imports				
	1972	1977	1981	1986	1988	1972	1977	1981	1986	1988
	million guilders					%				
1 Machinery	3485	6000	6836	12331	14431	73	72	76	82	83
2 Electrotechnical industry	1971	2759	3732	5810	6025	56	56	59	61	65
3 Motor vehicles	1951	3519	3308	6218	6097	75	80	85	84	82
4 Other transport equipment[a]	1122	2308	2043	3630	2789	42	45	59	60	70
Total 1 - 4	8529	14586	15919	27989	30622	65	67	71	75	78
5 Manufacture of metal products	1093	1710	1751	2866	3049	21	22	25	20	21
6 Construction	18128	26136	31859	32399	38091	0	0	0	0	0
7 Other manufacturing	1558	2585	3336	3931	4286	28	27	31	34	35
8 Agriculture, forestry, fishing	223	172	173	-159	-96	5	4	7	.	.
9 Trade, transport	2128	3599	4011	6867	7405	4	0	0	0	0
10 Other services	1646	4111	4718	5678	5708	0	4	1	7	2
Total	33305	52899	61767	79585	87983	19	21	21	29	29
Idem ex construction	15177	26763	29908	47186	49892	42	41	43	50	51

Source: National Accounts and input-output matrices (figures before revision).

a) Shipbuilding, repairing and other transport equipment.

3. The compilation of Dutch STAN data

In this section we summarise the processing of internal CBS data sources for the construction of the Dutch STAN data. As mentioned in the introduction, the STAN data will be made available on request in machine readable form. Appendix I lists the files containing the Dutch part of the STAN database, which is available to researchers. As mentioned before, the R&D data are not available yet at the STAN level of disaggregation. Furthermore the extent of the data series has been restricted to the years 1970 - 1988. Due to the second revision of the Dutch National Accounts - starting with the reporting year 1988 - we were not able to extend the series forwards in time. At the moment past National Accounts figures are being revised. It is foreseen that in the course of this project the STAN data will also be revised, so that fully compatible data for the whole period will become available.

3.1 Current price data

Throughout the project primary emphasis has been placed on the use of Dutch National Accounts input-output and time series data beyond the aggregation level of the yearly publications of National Accounts. Industry-by-industry I/O tables have been published on a comparable basis from 1969 onwards. These are derived by means of aggregation from more detailed provisional tables. The level of detail of these tables has increased in the course of years due to the improved availability of basic data.

Since 1981 the published I/O tables are derived from relatively large provisional tables consisting of about 250 rows (industry groups or commodities) and 135 columns (industry groups, commodities and final expenditure categories). With a few exceptions - the omission of the input structure of the pharmaceutical industry (ISIC 3522), the input and output structure of the footwear industry (ISIC 3240) and leather products industry (ISIC 3230) this level of detail is sufficient to comply with all STAN data requirements of National Accounts compatible time series and I/O

tables for these years. For here onwards, we use the term 'sector' for an industry available in the provisional I/O tables and the term 'subsector' for an industry not available in the provisional tables.

3.1.1 Disaggregation of I/O sectors

The years before 1981, however, posed more difficulties. To meet the STAN data requirements for the years comprising the period 1970-1980, additional estimates had to be made for a substantially larger number of breakdowns:

a. leather products & footwear (ISIC 3230+3240) into leather products (ISIC 3230) and footwear (ISIC 3240);
b. wood & furniture (ISIC 3300) into wood (ISIC 3310) and furniture & fixtures (ISIC 3320);
c. other chemicals (ISIC 3520) into pharmaceuticals (ISIC 3522) and other chemical products (ISIC 3520-3522);
d. petroleum (ISIC 3530+3540) into petroleum refining (ISIC 3530) and petroleum & coal (ISIC 3540);
e. rubber & plastic products (ISIC 3550+3560) into rubber products (ISIC 3550) and plastic products (ISIC 3560);
f. nonmetal mineral products (ISIC 3600) into pottery & china (ISIC 3610), glass products (ISIC 3620) and cement, clay etc (ISIC 3690);
g. basic metals (ISIC 3700) into iron & steel (ISIC 3710) and non-ferrous metals (ISIC 3720);
h. engines & turbines (ISIC 3820) into other machinery (ISIC 3820-3822) and computers & office machinery (ISIC 3822);
i. transport equipment exclusive of motor vehicles' into shipbuilding (ISIC 3841), motorcycles & bicycles (ISIC 3844), aircraft (ISIC 3845) and other transport equipment (ISIC 3849);
j. scientific instruments & other manufacturing' into scientific instruments (ISIC 3850) and other manufacturing (ISIC 3900).

Some of the disaggregations, notably a, b, d, e and f, could be bypassed for the purpose of compiling I/O tables, import and domestic investment

matrices on the STAN-level of aggregation. For the purpose of compiling time series data on gross output, intermediate consumption, value added, labour costs, foreign trade and employment, however, basic statistical data for all subsectors had to be collected and adjusted to a National Accounts compatible basis in order to split up the available I/O figures.

3.1.2 Current price subsector estimates for gross output, exports, value added, labour costs and employment

The basic statistical sources which we used in the adjustment process were the yearly Production Statistics, the quarterly General Statistics of Manufacturing and the yearly Labour Force Statistics. The yearly Production Statistics provide information on gross output, sales, purchases and consumption of raw materials, semi-manufactures, energy, labour costs, employment and (from 1978 onwards) other operating expenses for firms with 10 or more employees. However, for several reasons, the National Accounts data could not be disaggregated straightforwardly using the yearly production surveys. First, for some subsectors involved, data from yearly production surveys were not available for all years under consideration, e.g. the Production Statistics of Instruments and Optical Goods (this survey started in 1980). Secondly, as mentioned before, the yearly production surveys are restricted to firms employing 10 or more employees. Both sources of undercoverage have been attacked with the help of the General Statistics of Manufacturing and the Labour Force Statistics, respectively providing figures for total sales, exports and employment for all subsectors of industry from 1970 onwards, and data on employment for all firms by firm size.

The procedure applied to these data to split up the available National Accounts estimates consisted of three stages. First, in line with the adjustment procedures of the National Accounts department, the undercoverage due to the omission of firms with fewer than 10 employees in the Production Statistics was eliminated by using data on employment of the smallest firms and average sales, output, intermediate consumption, and labour costs of the smallest firms available in the Production

Statistics. Subsequently, we calculated the differences between the available National Accounts sector estimates and the corresponding totals derived from the subsector estimates after the scaling procedure. These differences were proportionally distributed across the subsectors involved. This was done for each year under consideration - including the years from 1980 onwards - and for all subsectors. In the final stage the validity of the adjustment procedure was judged on the basis of the correspondence between the time path of the I/O table subsector estimates for the period 1981-1988 and that pertaining to the results of the underlying production surveys before and after the scaling procedure.

In this way plausible results for the time path of gross output, labour costs and employment could be obtained for almost all subsectors listed in section 2.1.1. One exception was the transport equipment industry excluding motor vehicles. Due to special transactions in the years 1980 - 1988 - especially in the aircraft industry - the interpolation procedure was not feasible. Here additional information pertaining to the overall balancing process (including all commodity flows) was used to achieve a National Accounts compatible distribution of the I/O sector totals.

Information pertaining to the overall balancing process also had to be used for the purpose of disaggregating I/O sector totals of exports. Due to exports of trading firms, reported exports in the industry surveys are likely to underestimate national exports. The distribution of the exports figures across subsectors was calculated by adjusting small sector by destination tables with industries of origin as rows and two columns representing domestic sales and exports respectively. Marginal totals were obtained from available National Accounts sector export ratios and the subsector estimates of gross output. Provisional estimates of the interior were obtained from industry survey export ratios for subsectors.

Finally, additional calculations had to be made for the purpose of splitting up the I/O sector figures for value added. Measurement of value added in the production surveys started in 1978. Before that, measurement was restricted to the so-called census value added, i.e. value added inclusive of other operating expenses. Ratios of value added and census

value added per subsector derived from industry survey data for the years from 1978 onwards were used to estimate value added from census value added in the preceding years before applying the adjustment procedure for gross output.

3.1.3 I/O tables for the benchmark years 1972, 1977, 1981 and 1986

As mentioned in the introduction, I/O provisional tables for 1981 and 1986 were readily available in sufficient detail. With the exception of the columns of the subsectors pharmaceuticals and other final chemical products, the STAN I/O tables for these years could easily be derived by means of simple aggregation of provisional tables. Estimates of the input structure for pharmaceuticals and other final chemical products were derived from pre-balancing data made available by National Accounts branch specialists and by taking into account the restraints imposed by the corresponding time series results for gross output and value-added.

The level of detail of the provisional 1981 and 1986 tables was also used for the adjustment of less detailed 1972 and 1977 I/O tables to the STAN level of aggregation. We started with proportional fitting of the subsectors of 1972 and 1977 which had to be disaggregated. Taking into account the restraints imposed by the results of corresponding time series estimates for gross output, exports and value-added, initial estimates for the division of inputs and outputs across STAN subsectors were derived from the more detailed provisional tables of 1981 and 1986 and - for some subsectors - pre-balancing data obtained from the National Accounts branch specialists concerned. In the final stage all estimates were balanced, taking into account the additional restraint that the elements which could be directly derived from the existing I/O tables by means of simple aggregation should remain unaltered in the adjustment process.

3.1.4 Investment tables and time series for gross fixed capital formation

As mentioned before, investment tables are required for the same benchmark

years. Also detailed time series of gross fixed capital formation by industry of destination had to be constructed for the years from 1970 onwards. In the National Accounts two time series for gross fixed capital formation are published. First, fixed capital formation by classes of destination. This is a high level of aggregation, with, for example, no breakdown for the manufacturing industry. Secondly the National Accounts publishes time series of fixed capital formation for several types of capital goods, e.g. dwellings, buildings for enterprises and government, external transport equipment and machinery and other equipment. The National Accounts time series for fixed capital formation by class of destination have been broken down with the help of internal data of the National Accounts department and external information pertaining to fixed capital formation from investment surveys of other departments. As a result of this procedure National Accounts compatible time series for investment by industry of destination - segregated by type of capital goods - were constructed on the STAN time series level of aggregation.

The estimates for the benchmark years 1970, 1977, 1981 and 1986 were used in the construction of investment tables. These tables give a description of the flows of physical capital. The figures in the intersections of rows and columns of the investment table represent the value of the capital goods delivered by the industries of origin (the rows of the table) to the industries of use or destination (the columns of the table). The time series estimates for fixed capital formation by industry of destination were used to serve as column totals of the investment tables. Row totals of the investment tables were obtained from the investment columns of the corresponding I/O tables and import matrices and provisional estimates for the interior were made taking into account the relation between industry of origin and the type of capital good. Finally, the provisional tables were balanced using the method of adjusting tables with Lagrange multipliers (see Harthoorn and Van Dalen, 1987).

3.2 Constant price data

STAN requirements with respect to constant price data for I/O tables and

corresponding time series together with implicit deflators could not be met easily because the deflating methods for National Accounts data have been changed substantially in the course of time and the availability of constant price I/O tables was limited to the years from 1981 onwards. According to the new deflating method - applied since the reporting year 1981 - the balancing procedures simultaneously take into account the plausibility of yearly price and volume changes. Additionally, this method has the advantage that weighting schemes for the calculation of deflators for National Accounts aggregates are based on the most recent information (for an extensive discussion see e.g. Al et al. (1985) and De Boer and Broesterhuizen (1986)). STAN requires I/O tables and time series in constant prices of a fixed base year. In principle these data can be obtained by chaining the yearly price mutations from the I/O tables in the years available. However, due to the emergence of aggregation differences this is not an optimal procedure to obtain simultaneously 'true' volume and price indices of a fixed base year. Moreover - as mentioned before - no constant price I/O-tables are available for the period 1970 - 1980. Thus, to comply with the STAN data requirements other sources had to be used.

3.2.1 Data sources

Paasche price indices of a fixed base year were taken from datafiles constructed for the so-called Price Analysis Research Project (PARP) of the Department of Price Statistics. In the PARP three periods were distinguished: 1970 - 1977, 1977 - 1982 and 1982 - 1987 (see e.g. CBS, 1981). For each period Paasche price indices of a fixed but varying base year and weights (current price values) were available for all elements of yearly I/O tables, however, with different levels of detail for the I/O tables involved. Data availability is summarised in table 3.

As can be seen from table 3 the level of disaggregation used in the PARP has increased in the course of the years. In the period 1977 - 1982 the weighting schemes and price tables are directly related to the I/O tables published before the first revision of the National Accounts 1977.

In the other periods the PARP level of aggregation is somewhat in between the level of detail published and the level of aggregation used in the provisional I/O tables. None of the three levels of detail, however, meet the sectoral breakdown requested in the STAN I/O tables. Especially many problems had to be solved for the period 1972 - 1977, not only because of the lack of detail, but also because of the inappropriate value base - buyers' prices instead of sellers' prices - and the complication that the weighting schemes were related to pre-revision 1977 figures.

Table 3. Data available from the Price Analysis Research Project

Period	Number of tables	Level of detail	Base[a]	Comments
1972-1977	6	42 x 41	Buyers' prices 1970=100	compatible with I/O tables *before* the first revision of the National Accounts
1977-1982	6	68 x 67	Buyers' prices 1977=100	compatible with I/O tables *after* the first revision of the National Accounts
1977-1982	6	68 x 67	Sellers' prices 1977=100	compatible with I/O tables *after* the first revision of the National Accounts
1980-1988	9	85 x 81	Buyers' prices 1980=100	compatible with I/O tables *after* the first revision of the National Accounts
1980-1986	6	85 x 81	Sellers' prices 1980=100	compatible with I/O tables *after* the first revision of the National Accounts

a) Buyers' prices: allocation of indirect taxes and subsidies to the buyers;
Sellers' prices: allocation of indirect taxes and subsidies to the sellers.

3.2.2 The construction of deflators using the PARP data

3.2.2.1 Collecting additional data and preliminary processing of the 1972 - 1977 tables

Due to the varying levels of detail and value base differences across the three periods, additional data had to be collected and processed for the

estimation of STAN I/O tables in constant prices of a fixed base year and for consistent time series deflators for gross output and value-added. To begin with, we collected or calculated - for each period considered - price indices on the time series level of aggregation both for gross output and intermediate material consumption. These additional figures were also available from the department of Price Statistics. Secondly, we converted the 1972 - 1977 PARP weighting schemes to the preferred sellers'-price base by adding up the buyers'-price-based tables and the corresponding pre-revision matrix of indirect taxes less subsidies. Thirdly, for all years in the 1972 - 1977 period we recalculated Paasche prices indices pertaining to the sellers'-price-based tables with the help of the value indices derived from the sellers'-price-based tables and the corresponding Laspeyres volume indices[6]. In this way all price tables were brought to a comparable basis.

3.2.2.2 Calculating constant price I/O tables and consistent deflators for time series data

Having prepared the appropriate fixed base price tables and corresponding weighting schemes for the period 1972 - 1977, a two-stage procedure was followed to calculate both constant price I/O tables on the STAN level and consistent deflators for gross output, intermediate consumption and value added for all periods under consideration. In the first stage we calculated for each period - and within each period for each year - Paasche price indices for gross output and intermediate consumption on the STAN time series level of aggregation, by means of implicit weighting of the PARP price tables. For an N-to-one or one-to-one correspondence between the PARP price table and the STAN time series levels of aggregation, this operation was straightforward. In the event of a one-to-N correspondence between the two levels of detail, however, we had to use additional price data for the underlying subsectors and to eliminate the inevitable aggregation differences. These differences were proportionally distributed across the subsectors involved. In this way we obtained

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6) Laspeyres volume indices for all transactions were derived from the current price I/O tables and Paasche price tables pertaining to the buyers'-price base.

constant price time series data and implicit Paasche price indices and Laspeyres volume indices for gross output, intermediate consumption and value added for each period, developed from and consistent with an I/O framework. For the years 1987 and 1988 (the years not covered in the PARP) we used the provisional I/O tables in 1986 and 1987 prices respectively. Finally, the different periods were linked together in order to obtain value, price and volume indices on a common base year, i.e. 1970.

In the final stage constant price I/O tables and implicit Paasche price indices on the STAN level were derived by extending the procedure referred to above to other transactions, i.e. the transactions pertaining to the interior of the I/O tables. For the majority of these transactions the data needed could also be easily derived by means of implicit weighting of the PARP price and I/O tables into constant price tables on the STAN level of detail, leaving the interior of rows and columns of the STAN subsectors with an N-to-one correspondence with the PARP sectors to be estimated separately. Provisional estimates for the distribution of PARP sectors across STAN subsectors were calculated using additional data on export prices and prices for domestic sales pertaining to the subsectors involved, with deflators for subsector domestic intermediate sales and domestic final expenditure sales arbitrarily taken identical to price indices for total domestic sales. In this way we compiled five provisional but complete constant price I/O tables: 1972 and 1977 in 1970 prices, 1981 in prices of 1977, and 1981 and 1986 in 1980 prices. Finally, we balanced the five provisional tables using the method of adjusting tables with Lagrange multipliers taking into account the various restraints imposed by the time series for gross output, intermediate consumption and value added and the restraint that the elements which could be directly derived from the existing PARP I/O and price tables by means of simple aggregation should remain unaltered in the adjustment process.

3.2.3 Constant price investment tables and consistent deflators for time series of fixed capital formation

For the compilation of constant price investment data we used two data

sources: the 1980 based price indices for fixed capital formation by type of capital goods published in the National Accounts and the implicit price index pertaining to the investment column of for constant price I/O tables. After rebasing the latter indices we constructed row totals of the investment tables in 1980 prices for the benchmark years. The price indices by type of capital goods were used to construct provisional column totals of the investment tables. To this end the 'type' price indices were weighted using the industry-specific composition of investment. The difference between the sum of the column totals and the sum of the row totals was proportionally distributed across the industries of destination. Provisional estimates for the interior of the constant price tables were calculated by deflating the current price values with the implicit price index for the column total. In the final stage the provisional tables were also balanced using method of Lagrange multipliers. Compatible constant price investment by industry of destination for the other years were derived along the same lines, i.e. by calculating the 1980 price figures for total investment by industry of destination with the help of 'type deflators' and the industry-specific 'type composition' of investment.

4. The international sourcing of intermediates

4.1 Theoretical background

In section 2.3 we briefly introduced three explanatory analytical studies which are current or foreseen in the near future to investigate the relation between technology and economic performance. The policy objectives underlying these and other 'technology oriented' OECD studies are set forward in OECD (1990). For a small and open economy like the Netherlands economy the international setting is self-evident. The economic performance of the Dutch economy heavily depends on its relative position in international trade. The impact of international trade on the relation between technology and economic performance has been extensively discussed in the literature. Van Hulst et al. (1991) reduce the many theoretical reflections pertaining to the complex interrelations involved to their bare essence: (changes in) trade patterns are reflections of (changes in) technology gaps, i.e. differences in the technological position between industries of different countries.

Empirical studies which investigate the technology-trade relation often focus on the export performance of particular industries or countries. relatively few address the technology-trade relation from the 'import side'. For an open economy, however, imports are equally important. The economic implications of imports are multifaceted. On the one hand imports - in general - compete with domestic production, which among other things causes expenditure multipliers to become smaller than in a closed economy. On the other hand imports play an important role in the process of technology diffusion. It is well known that to the extent technological progress is generated abroad and embodied in commodities, its benefits may be inherited by means of imports[7]. In Dutch macro econometric models this type of diffusion is incorporated in the vintage production function via investment in fixed assets (table 2 shows that imported machinery and equipment largely contribute to gross domestic fixed capital formation).

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7) Literature reporting the results of very specific case studies of technology diffusion suggests that this description is a shortcut through a very complex process (see e.g. Hagedoorn et. al., 1989).

The importance of other commodity imports for the process of technology diffusion has gained in interest recently. According to e.g. Minne (see CPB, 1987) the role of imported intermediates in general, and in the technology diffusion context in particular, should be revaluated and its impact should be given greater attention in empirical research. The increased interest in international trade in intermediates originates from observed changes in trade patterns. Loosely stated there has been a shift from inter-industry trade (international trade between different industries) to intra-industry trade (international trade in commodities which belong to the same industry) or even intra-firm trade (trade between affiliates of multinational enterprises). The literature relates the changes in the nature of international trade to the phenomena of globalisation of production and production factors via cross-border networks or industrial clusters. As noted by Soete and Verspagen (1993), these phenomena may be viewed as the revival of the old concepts of upstream and downstream linkages in an international framework.

Until recently the magnitude and trends in globalisation could not be quantified satisfactorily due to the lack of appropriate data. The availability of input-output matrices and import matrices in the STAN database, however, created the opportunity of filling this gap. For six important industrialised countries (i.e. USA, UK, Canada, France, Germany and Japan) the extent of international sourcing has been studied by the OECD for three years (Germany two years). The results were reported in OECD (1992). The compilation of Dutch input-output and import matrices for the four benchmark years enables us to extend the OECD analysis with a small and open economy and to compare the results with those for the other countries. Here the analysis is restricted to a comparison of inter-country differences in levels and industry patterns of trends for the sourcing of intermediate inputs.

4.2 Indicators of international sourcing

4.2.1 Direct sourcing of intermediates

To quantify the magnitude of the international sourcing of intermediate inputs, i.e. the relative importance of imported intermediates, we calculated two indicators: the ratio of imported to total sourcing of intermediates (R) and the international linkage ratio (L). The first indicator looks at the commodity side by asking which part of the use of intermediate commodities has been imported and which part has been produced domestically:

$$R_i = (\sum_j W^M_{ij})/(\sum_j W^T_{ij}) \qquad (1)$$

In (1) R_i is the ratio of imported intermediate inputs to total intermediate inputs produced by industry i, W^M_{ij} the value of imported commodities of industry i used by industry j, and W^T_{ij} the sum of imported and domestically produced commodities of industry i used by industry j. The ratio R reflects the direct use of foreign intermediates. The indirect "downstream impact" will be taken into account when using the international linkage ratio (see section 4.2.2).

Table 4 presents the outcomes for the Dutch direct import ratios for all input-output industries in 1972, 1977, 1981 and 1986. For the construction of R in 1981 and 1986 we used the current price tables as well as constant price equivalents[8]. With the exception of the petrol industry there are only minor differences between the constant price and current price based ratios, so it seems legitimate to restrict the discussion to the latter indicator. Using the current instead of the constant price based ratios, moreover, enables us to compare the Dutch results to the results of the OECD analysis for other countries[9].

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8) We cannot calculate a constant price based ratio R for 1972 and 1977 because there are no constant price import tables available for these years.

9) The results of the OECD study were based on current price table (except for France).

Table 4. Ratio of imported to total sourcing of manufacturing intermediates in 1972, 1977, 1981, 1986

Row I/O table	Industry of origin	Output 1980	1972[a]	1977[a]	1981[a]	1986[a]	1981[b]	1986[b]
		million guilders						
3	Food, beverages, tobacco	56578	0.23	0.29	0.27	0.29	0.26	0.29
4	Textile, wearing apparel, footwear	8609	0.63	0.67	0.76	0.79	0.75	0.78
5	Wood, furniture	5157	0.48	0.54	0.52	0.53	0.52	0.53
6	Paper, printing	16822	0.23	0.24	0.27	0.31	0.26	0.32
7	Chemicals excl pharmaceuticals	25978	0.65	0.59	0.61	0.67	0.62	0.65
8	Pharmaceuticals	2135	0.46	0.49	0.55	0.62	0.52	0.63
9	Petrol industry	31577	0.27	0.34	0.64	0.56	0.64	0.62
10	Rubber and plastic products	3896	0.47	0.49	0.56	0.54	0.55	0.53
11	Stone, glass, clay and earthenware	5822	0.28	0.33	0.33	0.32	0.33	0.33
12	Ferrous metals	8755	0.71	0.72	0.73	0.77	0.73	0.78
13	Non ferrous metals	†	0.63	0.63	0.65	0.54	0.65	0.53
14	Metal products	12096	0.26	0.29	0.31	0.35	0.31	0.36
15	Non-electrical machinery	9783	0.56	0.59	0.61	0.60	0.61	0.60
16	Office machinery	1689	0.81	0.82	0.84	0.83	0.83	0.81
17	Electrotechnical products	17173	0.72	0.76	0.74	0.71	0.73	0.71
19	Shipbuilding and repairing	4359	0.03	0.04	0.02	0.02	0.02	0.02
20	Other transport equipment	721	0.54	0.59	0.65	0.49	0.63	0.49
21	Motor vehicles	4557	0.74	0.84	0.71	0.78	0.70	0.76
22	Aircraft, aerospace	1947	0.87	0.88	0.94	0.98	0.93	0.97
23	Instruments	1908	0.40	0.41	0.50	0.65	0.46	0.64
24	Other manufacturing	1147	0.66	0.63	0.62	0.61	0.60	0.61
	Manufacturing (3-24) unweighted		0.51	0.53	0.56	0.57	0.55	0.57
	Manufacturing (3-24) weighted[c]		0.43	0.45	0.50	0.51	0.49	0.51

a) Calculated using current price I/O tables;
b) Calculated using 1980 price I/O and import tables;
c) As weights we used the total value of intermediates.

From table 4 it can be seen that the relative extent of foreign sourcing for Dutch manufacturing as a whole increased gradually from 0.43 in 1972 to 0.51 in 1986 (weighted average). The time pattern and levels differ widely between industries. For intermediate petrol products the erratic patterns can be explained by the second oil price shock of 1979 - 1980 and the collapse of oil prices in 1986: a sharp rise in the ratio between 1977 and 1981 and a sharp decrease between 1981 and 1986). From the last two columns, however, it can be concluded that the relative use of intermediates produced by the foreign petrol industry did not change very much between 1981 and 1986 if price changes are taken into account.

The decrease for (very energy-intensive) non-ferrous metal products between 1981 and 1986 may also be related to the sharp rise of the energy prices in the beginning of the eighties. On the other hand, the results for other 'energy related' commodities such as chemicals and rubber and plastic products are less erratic. The ratio for chemicals increases from 0.59 in 1977 to 0.67 in 1986 (constant price based ratio 0.65), that for rubber and plastic products from 0.49 to 0.54 in the same period (constant price based ratio 0.53 in 1986).

On average a relatively stable pattern - constant or gradual increase - can be observed for the use of foreign intermediates by industries producing food, beverages and tobacco, wood, paper and printing, ferrous metals, metal products, non-electrical machinery and office machinery. Generally, the latter three industries use intermediates as parts for the production of new capital goods or the maintenance of existing capital goods. These inputs and the imports of intermediates used in the motor vehicle, aircraft and electrotechnical industry, are becoming increasingly important in the context of embodied technology diffusion by means of international trade. The majority of the imports for these commodities are 'intra-industry', i.e. they refer to transactions between international competitors or transactions between affiliates of international enterprises or cross-border international clusters, with all actors operating in the same branch of industry.

Some of the industries referred to above are - according the OECD - 'high-tech' industries (e.g. office machinery, electrical products and aircraft), other industries as 'medium-tech' (other machinery and motor vehicles). Pharmaceuticals, instruments and communication and semiconductor equipment also belongs to the top six 'high-tech' industry groups[10].

Of these industries we see large increases in the ratio R for aircraft, pharmaceuticals and instruments between 1977 and 1986. Also high levels of relative foreign sourcing can be observed for the office machinery - and

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10) It should be remembered that the communication and semiconductor equipment industry is included in the electrotechnical industry.

electrotechnical industry. These results do confirm the general opinion that the increased proportion of international sourcing of intermediates in 'high-tech' industries are also applicable to the Dutch situation. The results for the 'high-tech' industries, however, should be interpreted with care, because of the 'denumerator' effect: e.g. with only one domestic firm manufacturing aircraft (parts) and very few domestic car manufacturers, the outcomes for R will be very sensitive to special transactions or changes in institutional setting due to the start or ending of cross-border industrial alliances. An example is the F-16 project (the assembly of imported parts and engines) in the aircraft industry. The increase of the ratio R for the aircraft industry in table 4 can be almost exclusively attributed to this project.

The trends and magnitudes in the ratio of foreign to domestic sourcing for other industrialised OECD countries together with the Dutch results are presented in table 5, which demonstrates that the Dutch trend of foreign sourcing is in agreement with the OECD conclusions for the other OECD countries: relative foreign sourcing has grown in each country and the increase was generally greatest between the second half of the seventies and the mid-eighties. By far the highest level of relative foreign sourcing of intermediates can be found for the Netherlands: e.g. over double that of Germany. Starting from a low level the USA had the largest relative increase in the ratio of foreign to domestic sourcing.

Table 5. Manufacturing foreign sourcing in selected OECD countries

Country[a]	Early 1970-s	Mid-late 1970s	Mid 1980s
USA	0.07	0.07	0.12
UK	0.15	0.24	0.27
Canada	0.25	0.27	0.33
France	0.17	0.20	0.28
Germany	x	0.17	0.22
Japan	0.05	0.05	0.07
The Netherlands	0.43	0.45	0.51

a) Source: OECD report 'The international sourcing of manufactured intermediate inputs (OECD, 1992); for the Netherlands own calculations.

All in all these figures illustrate the general growth in international

sourcing of intermediates. According to OECD (1992) this general trend can be largely associated with the trend towards global production of high quality commodities or mass-produced goods. The globalisation trend and the reduction of trade tariffs are the major factors underlying the observed growth in the international sourcing of intermediates. This can also be inferred from the industry pattern for the ratio R. Industries which manufacture 'medium or high-tech R&D intensive' intermediates such as parts for aircraft, motor vehicles and office machinery and industries producing mass goods such as textiles and ferrous metals are among the top five of the industries with the highest ratio of international to domestic sourcing of intermediates. These conclusions also apply to the Netherlands. In 1986 (see table 4) the Dutch top five consisted of the same industries in the following sequence: aircraft, office machinery, textiles, apparel and footwear, motor vehicles and ferrous metals.

4.2.2 The overall import dependency of industries

The trends in globalisation of production can also be analysed from the viewpoint of the user industries. The second part of the OECD analysis of international sourcing looks at all international links of user industries by taking into account direct imports and the imports incorporated in the domestically produced intermediate inputs. In this way the overall dependence by industry on international sources are studied. For example: the aircraft industry may use parts imported from foreign aircraft industries, and domestically produced electronics, the latter production will depend on imported communication and semiconductor equipment. The latter imports also are taken into account when using an alternative indicator of international sourcing.

Following the OECD analysis we calculated for the Netherlands the international linkage indicators using the input-output matrices and standard input-output techniques. The linkage indicator is defined as the ratio between the import gross output multiplier and the total gross output multipliers. The two multipliers are expressions for the effect of an increase in gross output on the imports of intermediates and the total

use (sum of imports and domestic production) of intermediates. Let A^T be the total direct requirement matrix calculated by dividing the total use of intermediate inputs by gross output, then the row vector M^T represents the output multiplier associated with the sales of one unit of additional output:

$$M^T = \iota'(I - A^T_{ij})^{-1} \tag{2}$$

In an analogous way the domestic output multiplier can be calculated using the domestic direct requirement matrix A^D which is derived by dividing only domestic intermediate inputs by gross output:

$$M^D = \iota'(I - A^D_{ij})^{-1} \tag{3}$$

The import gross output multiplier can be simply calculated by subtracting the domestic multiplier M^D from the total multiplier M^T for each industry:

$$M^M = M^T - M^D \tag{4}$$

Finally the index of international linkage for industry j is defined as

$$L^D_j = M^M_j / M^T_j \tag{5}$$

This procedure starts from the simplifying assumption that the technology used for the production of imported intermediate inputs is the same in the user and in the producing country. Because, so far, no links between the use of imported products in one country and the creation of that product in other countries can be established, this seems to be the only way to estimate an industries relative (overall) reliance on foreign and domestic intermediate inputs.

The gross output multipliers and link indicator defined in (2) - (4) are calculated for 1972, 1977, 1981 and 1986 using current price I/O tables and import matrices. To assess the importance of price effects we also calculated the same variables for 1981 and 1986 on the basis of 1980 price

tables. Table 6 summarises the results for all industries and manufacturing. Similar to the indicator presented in subsection 4.2.1. there are relatively small differences between the current and constant price based gross output multipliers. This conclusion applies to all industries[11]. According to the linkage ratios of table 6 the average overall reliance on foreign intermediates increased from 0.231 in 1972 to 0.264 in 1986. For manufacturing these figures are 0.328 and 0.362 respectively. The increase was largest between 1977 and 1981 and remained relatively stable in the period 1981 - 1986 (a relatively small decrease in current price ratio and a constant ratio when corrected for the effects of price changes). Averaged across all industries the yearly growth for the overall reliance on foreign intermediates was 1.2 % between 1977 and 1986. For manufacturing this figure was 0.7 %. These results are quite similar to the OECD results for the other countries. For the USA, UK, Canada, France, Germany and Japan the average growth rates - averaged across all industries - for roughly the same period were 1.1, 0.3, 1.5, 0.0, 0.7 and 0.4 respectively.

Table 7 lists the linkage indicator for all industries. It shows that growth was strongly positive between 1977 and 1981 in nearly all industries and negative between 1981 and 1986. The linkage indicator was stable on average between 1981 and 1986 when using constant price data, so it is expected that the high growth between 1977 and 1981 may be partially attributed to the neglect of price changes in this period. Table 7 also shows that there are large differences in the overall dependence on foreign intermediates as between industries. Strong international links occur for the production of aircraft, textile, waering appartel and footwear, motor vehicles, electrotechnical and petrol products. Increasing international links can be observed for the office machinery industry, the other transport equipment industry and the transport and storage industry.

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11) See Appendices II and III for a listing of total and domestic gross output multipliers for all industries.

Table 6. Average gross output multipliers and linkage ratios

	All industries		Manufacturing	
	Current prices	1980 prices	Current prices	1980 prices
I) Total gross output multipliers (M^T)				
1972	1.890	x	2.129	x
1977	1.964	x	2.218	x
1981	2.099	2.060	2.401	2.341
1986	2.007	2.022	2.276	2.319
II) Domestic gross output multipliers (M^D)				
1972	1.409	x	1.398	x
1977	1.426	x	1.413	x
1981	1.430	1.427	1.418	1.415
1986	1.418	1.411	1.409	1.401
III) Linkage indicators[a]				
1972	0.231	x	0.328	x
1977	0.247	x	0.341	x
1981	0.284	0.274	0.384	0.372
1986	0.264	0.272	0.362	0.372

a) Defined as $(M^T - M^D)/M^T$;

Table 7. Linkage ratios for STAN industries

Industry	Output 1980	1972	1977	1981	1981	1986	1986
		LP[a]	LP[a]	LP[a]	CP[b]	LP[a]	CP[b]
		%	%	%	%	%	%
1 Agriculture, forestry, fishing	27370	13.8	17.3	20.6	19.2	17.3	18.9
2 Mining	21893	5.1	3.8	8.2	9.8	8.9	9.7
3 Food, beverages, tobacco	56578	23.8	28.1	30.7	28.8	27.6	29.7
4 Textile, wearing apparel, footwear	8609	43.4	47.6	51.0	50.0	51.4	50.9
5 Wood, furniture	5157	31.4	36.0	40.5	39.6	38.5	39.7
6 Paper, printing	16822	22.5	24.1	28.4	26.4	27.6	29.1
7 Chemicals excl pharmaceuticals	25978	28.1	35.1	45.7	44.2	37.5	37.9
8 Pharmaceuticals	2135	28.6	31.9	36.0	33.3	34.0	36.5
9 Petrol industry	31577	42.1	44.7	48.8	48.0	41.0	45.2
10 Rubber and plastic products	3896	36.0	36.1	45.4	43.8	41.9	42.4
11 Stone, glass, clay and earthenware	5822	16.9	18.4	23.5	22.8	20.7	21.0
12 Ferrous metals	8755	30.2	27.4	30.2	29.7	26.4	25.9
13 Non ferrous metals	†	40.3	36.0	35.7	37.6	32.8	38.4
14 Metal products	12096	29.0	29.8	33.7	32.7	31.0	31.8
15 Non-electrical machinery	9783	31.8	32.2	35.8	35.0	32.7	33.6
16 Office machinery	1689	32.2	26.6	28.2	27.3	38.4	37.6
17 Electrotechnical products	17173	38.2	41.4	42.0	40.8	42.2	42.1
19 Shipbuilding and repairing	4359	30.2	29.5	36.6	35.6	30.1	31.0
20 Other transport equipment	721	29.4	30.7	37.7	37.1	41.8	42.6
21 Motor vehicles	4557	38.8	42.2	44.7	43.0	45.6	45.3
22 Aircraft, aerospace	1947	46.1	51.2	66.9	66.1	56.6	57.8
23 Instruments	1908	28.8	30.1	31.2	29.6	29.8	30.9
24 Other manufacturing	1147	40.3	37.1	33.6	29.9	32.4	32.1
25 Electricity, gas, water	18511	7.0	5.0	15.9	16.4	6.5	7.5
26 Construction	55239	20.9	22.7	24.1	23.2	23.2	22.4
27 Trade	62732	5.5	5.9	8.2	7.4	7.1	7.8
28 Hotels. restaurants	9809	12.7	14.6	18.2	17.0	15.9	16.9
29 Transport and storage	26745	8.2	9.9	16.2	14.3	13.0	15.2
30 Communication services	7470	4.7	4.7	6.9	6.1	6.0	5.9
31 Finance and insurance	23003	4.9	5.7	8.5	7.5	7.5	8.3
32 Real estate. business services	36333	4.0	4.3	5.3	4.8	4.1	4.8
33 Social and personal services	49181	11.6	11.0	13.3	12.7	12.9	13.6
34 Government producers	63920	8.1	7.7	11.9	10.8	11.6	11.2
35 Other producers	1049	0.0	0.0	0.0	0.0	0.0	0.0
36 Not elsewhere classified	1609	13.9	34.5	30.6	28.2	30.5	27.9
Average all industries		23.1	24.7	28.4	27.4	26.4	27.2
Average manufacturing (3 - 24)		32.8	34.1	38.4	37.2	36.2	37.2

a) LP: calculations based on current prices;
b) CP: calculations based on 1980 prices.

The Dutch international linkage indices for some of the subsectors referred to above are compared with the equivalents for the other OECD countries in table 8. The dependency on foreign intermediates for the

Netherlands - compared with that for other OECD countries - is particularly manifest for aircraft, motor vehicles (industries with only few domestic producers) and 'textiles'. Increasing foreign links can be observed for the office machinery industry: growth of the overall dependency on foreign intermediates was largest in the USA (starting from a low level) and the Netherlands in this industry. Furthermore the foreign links for the petrol industry were approximately the same for Germany and the Netherlands and remained relatively stable between the mid-seventies and the mid-eighties.

Table 8. Linkage ratios for selected sectors and OECD countries[a]

Country	Aircraft		Motor vehicles		Office machinery		Petrol		Textiles etc	
	M70s	M80s	M70s	M80s	M70s	M80s	M70s	M80s	M70s	M80s
USA 1977, 1985	0.06	0.08	0.10	0.15	0.06	0.12	0.22	0.12	0.07	0.11
UK 1979, 1984	0.31	0.33	0.21	0.28	0.25	0.30	0.40	0.26	0.31	0.34
Canada 1976, 1986	0.22	0.29	0.45	0.48	0.40	0.40	0.31	0.18	0.24	0.25
France 1977, 1985	0.21	0.21	0.20	0.25	0.28	0.30	0.57	0.51	0.22	0.26
Germany 1978, 1986	0.20	0.19	0.17	0.19	0.16	0.22	0.47	0.42	0.24	0.26
Japan 1975, 1985	0.31	0.36	0.06	0.06	0.10	0.09	0.45	0.43	0.12	0.14
The Netherlands[b]	0.51	0.57	0.42	0.46	0.27	0.38	0.45	0.41	0.48	0.51

a) Source: OECD report 'The international sourcing of manufactured intermediate inputs (OECD, 1992);

b) Own calculations for 1977 and 1986.

5. Summary

This paper presents a description of the STAN project of the OECD and the processing and disaggregation of Dutch National Accounts data in order to contribute to the STAN database. The STAN database will be used by the OECD for internal research underlying the OECD Technology and Economy Programme (TEP). As a result of the Dutch participation in the data collecting and assembly stage of the project the STAN database as a whole will in principle also be available to other researchers. Through their comprehensiveness the STAN-data are suited to the task of analyzing the relation between technology and economy in an international framework.

The importance of international trade for a small and open economy such as the Netherlands has been investigated for intermediate inputs using two indicators, one reflecting direct use, the other indicating the overall dependence on intermediates produced abroad. The results for both indicators suggest that foreign sourcing of intermediates has increased relatively since 1972 - in particular in the years between 1977 and 1981 - and that strong or increasing overall international links can be observed for the aircraft industry, the motor vehicle industry, the electro-technical and office machinery industry and mass produced commodities like textiles and wearing apparel and petrol products.

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Appendix I. Contents of the Dutch STAN database (LOTUS 1-2-3 spreadsheets)*)

No	Filename	Ext	Code[a)]	Description
1	GVA	WK1	T	Gross value-added in market prices
2	INPUT	WK1	T	Intermediate input (domestic & import)
3	GOUT	WK1	T	Gross output in producer prices
4	GVA70	WK1	T	Value, price and quantity indices of value-added 1970=100
5	INPUT70	WK1	T	Value, price and quantity indices of intermediate input 1970=100
6	GOUT70	WK1	T	Value, price and quantity indices of gross output 1970=100
7	EMP	WK1	T	Employment of employees in 1000 full time equivalents
8	WAGES	WK1	T	Wages and salaries
9	COMPEMP	WK1	T	Compensation of employees
10	EMPTOT	WK1	T	Total employment in 1000 full time equivalents
11	EXP	WK1	T	Export of goods and services
12	IO72	WK1	I/O	Current price input-output table 1972
13	IO77	WK1	I/O	Current price input-output table 1977
14	IO81	WK1	I/O	Current price input-output table 1981
15	IO86	WK1	I/O	Current price input-output table 1986
16	IO7270	WK1	I/O	Input-output table 1972 in 1970 prices
17	IO7770	WK1	I/O	Input-output table 1977 in 1970 prices
18	IO8177	WK1	I/O	Input-output table 1981 in 1977 prices
19	IO8180	WK1	I/O	Input-output table 1981 in 1980 prices
20	IO8680	WK1	I/O	Input-output table 1986 in 1980 prices
21	IO7270P	WK1	I/O	Input-output table 1972 price indices 1970=100
22	IO7770P	WK1	I/O	Input-output table 1977 price indices 1970=100
23	IO8177P	WK1	I/O	Input-output table 1981 price indices 1977=100
24	IO8180P	WK1	I/O	Input-output table 1981 price indices 1980=100
25	IO8680P	WK1	I/O	Input-output table 1986 price indices 1980=100
26	IMP72	WK1	I/O	Current price import matrix 1972
27	IMP77	WK1	I/O	Current price import matrix 1977
28	IMP81	WK1	I/O	Current price import matrix 1981
29	IMP86	WK1	I/O	Current price import matrix 1986
30	IMP8180	WK1	I/O	Import matrix 1981 in 1980 prices
31	IMP8680	WK1	I/O	Import matrix 1986 in 1980 prices
32	IMP8180P	WK1	I/O	Import matrix 1981 price indices 1980=100
33	IMP8680P	WK1	I/O	Import matrix 1986 price indices 1980=100
34	TCAP72	WK1	I/O	Current price investment matrix 1972
35	TCAP77	WK1	I/O	Current price investment matrix 1977
36	TCAP81	WK1	I/O	Current price investment matrix 1981
37	TCAP86	WK1	I/O	Current price investment matrix 1986
38	TCAP7280	WK1	I/O	Investment matrix 1972 in 1980 prices
39	TCAP7780	WK1	I/O	Investment matrix 1977 in 1980 prices
40	TCAP8180	WK1	I/O	Investment matrix 1981 in 1980 prices
41	TCAP8680	WK1	I/O	Investment matrix 1986 in 1980 prices
42	CFTOTLP	WK1	T	Total gross fixed capital formation in current prices
43	CFMACHLP	WK1	T	Gross fixed capital formation in machinery in current prices
44	CFTOTCP	WK1	T	Total gross fixed capital formation in 1980 prices
45	CFMACHCP	WK1	T	Gross fixed capital formation in machinery in 1980 prices

*) To be ordered separately

a) T: time series data; I/O: input-output tables and submatrices

Appendix II. Domestic gross output multipliers for industries

Industry	Output 1980	1972	1977	1981	1981	1986	1986
		LP[a]	LP[a]	LP[a]	CP[b]	LP[a]	CP[b]
1 Agriculture, forestry, fishing	27370	1.786	1.858	1.855	1.834	1.740	1.758
2 Mining	21893	1.096	1.057	1.053	1.073	1.065	1.073
3 Food, beverages, tobacco	56578	1.955	1.969	2.003	2.000	1.916	1.951
4 Textile, wearing apparel, footwear	8609	1.351	1.365	1.349	1.334	1.321	1.315
5 Wood, furniture	5157	1.393	1.430	1.418	1.412	1.419	1.406
6 Paper, printing	16822	1.577	1.613	1.621	1.612	1.572	1.601
7 Chemicals excl pharmaceuticals	25978	1.434	1.553	1.511	1.491	1.506	1.492
8 Pharmaceuticals	2135	1.485	1.501	1.549	1.529	1.427	1.419
9 Petrol industry	31577	1.089	1.097	1.098	1.105	1.124	1.115
10 Rubber and plastic products	3896	1.297	1.434	1.379	1.355	1.343	1.331
11 Stone, glass, clay and earthenware	5822	1.454	1.514	1.570	1.541	1.518	1.514
12 Ferrous metals	8755	1.232	1.293	1.304	1.293	1.241	1.258
13 Non ferrous metals	†	1.459	1.474	1.442	1.412	1.490	1.498
14 Metal products	12096	1.383	1.428	1.443	1.435	1.444	1.465
15 Non-electrical machinery	9783	1.335	1.356	1.393	1.395	1.423	1.436
16 Office machinery	1689	1.564	1.472	1.526	1.536	1.510	1.492
17 Electrotechnical products	17173	1.216	1.217	1.242	1.239	1.246	1.248
19 Shipbuilding and repairing	4359	1.574	1.544	1.584	1.583	1.611	1.627
20 Other transport equipment	721	1.568	1.572	1.500	1.513	1.492	1.525
21 Motor vehicles	4557	1.469	1.434	1.480	1.477	1.435	1.467
22 Aircraft, aerospace	1947	1.300	1.282	1.210	1.214	1.210	1.220
23 Instruments	1908	1.459	1.525	1.508	1.499	1.514	1.507
24 Other manufacturing	1147	1.337	1.412	1.364	1.330	1.420	1.363
25 Electricity, gas, water	18511	1.417	1.567	1.607	1.586	1.648	1.591
26 Construction	55239	1.599	1.629	1.632	1.624	1.685	1.632
27 Trade	62732	1.324	1.327	1.342	1.334	1.346	1.357
28 Hotels. restaurants	9809	1.639	1.609	1.571	1.553	1.552	1.564
29 Transport and storage	26745	1.281	1.304	1.299	1.292	1.293	1.264
30 Communication services	7470	1.132	1.140	1.153	1.144	1.139	1.125
31 Finance and insurance	23003	1.751	1.767	1.740	1.723	1.731	1.719
32 Real estate. business services	36333	1.187	1.177	1.172	1.171	1.150	1.168
33 Social and personal services	49181	1.247	1.246	1.260	1.251	1.249	1.258
34 Government producers	63920	1.279	1.291	1.303	1.288	1.332	1.306
35 Other producers	1049	1.000	1.000	1.000	1.000	1.000	1.000
36 Not elsewhere classified	1609	1.654	1.448	1.580	1.767	1.534	1.317
Average all industries		1.409	1.426	1.430	1.427	1.418	1.411
Average manufacturing (3 - 24)		1.398	1.413	1.418	1.415	1.409	1.401

a) LP: calculations based on current prices;

b) CP: calculations based on 1980 prices;

Appendix III. Total gross output multipliers for industries

Industry	Output 1980	1972	1977	1981	1981	1986	1986
		LP[a]	LP[a]	LP[a]	CP[b]	LP[a]	CP[b]
1 Agriculture, forestry, fishing	27370	2.073	2.246	2.337	2.268	2.105	2.166
2 Mining	21893	1.155	1.099	1.148	1.189	1.169	1.187
3 Food, beverages, tobacco	56578	2.565	2.738	2.889	2.810	2.646	2.776
4 Textile, wearing apparel, footwear	8609	2.389	2.602	2.755	2.669	2.715	2.672
5 Wood, furniture	5157	2.032	2.234	2.383	2.338	2.306	2.330
6 Paper, printing	16822	2.035	2.125	2.264	2.190	2.169	2.257
7 Chemicals excl pharmaceuticals	25978	1.994	2.392	2.785	2.673	2.408	2.402
8 Pharmaceuticals	2135	2.078	2.205	2.419	2.293	2.161	2.233
9 Petrol industry	31577	1.879	1.984	2.145	2.126	1.904	2.033
10 Rubber and plastic products	3896	2.026	2.244	2.524	2.411	2.310	2.312
11 Stone, glass, clay and earthenware	5822	1.748	1.856	2.053	1.995	1.915	1.917
12 Ferrous metals	8755	1.765	1.781	1.870	1.838	1.686	1.698
13 Non ferrous metals	†	2.443	2.304	2.242	2.264	2.216	2.433
14 Metal products	12096	1.948	2.032	2.175	2.134	2.092	2.149
15 Non-electrical machinery	9783	1.957	2.000	2.170	2.147	2.116	2.164
16 Office machinery	1689	2.306	2.003	2.125	2.114	2.452	2.390
17 Electrotechnical products	17173	1.968	2.076	2.142	2.094	2.154	2.155
19 Shipbuilding and repairing	4359	2.255	2.189	2.498	2.459	2.305	2.358
20 Other transport equipment	721	2.221	2.269	2.408	2.404	2.562	2.657
21 Motor vehicles	4557	2.399	2.481	2.674	2.589	2.636	2.681
22 Aircraft, aerospace	1947	2.410	2.628	3.650	3.580	2.784	2.893
23 Instruments	1908	2.047	2.183	2.191	2.128	2.156	2.181
24 Other manufacturing	1147	2.237	2.242	2.054	1.896	2.100	2.008
25 Electricity, gas, water	18511	1.523	1.649	1.911	1.898	1.762	1.720
26 Construction	55239	2.021	2.108	2.150	2.113	2.193	2.102
27 Trade	62732	1.402	1.410	1.462	1.440	1.449	1.472
28 Hotels. restaurants	9809	1.878	1.885	1.920	1.872	1.845	1.882
29 Transport and storage	26745	1.396	1.447	1.550	1.507	1.486	1.490
30 Communication services	7470	1.187	1.197	1.238	1.218	1.212	1.196
31 Finance and insurance	23003	1.842	1.875	1.900	1.862	1.871	1.875
32 Real estate. business services	36333	1.237	1.229	1.237	1.230	1.199	1.226
33 Social and personal services	49181	1.411	1.401	1.454	1.432	1.435	1.456
34 Government producers	63920	1.391	1.398	1.478	1.444	1.507	1.471
35 Other producers	1049	1.000	1.000	1.000	1.000	1.000	1.000
36 Not elsewhere classified	1609	1.919	2.210	2.277	2.462	2.207	1.828
Average all industries		1.890	1.964	2.099	2.060	2.007	2.022
Average manufacturing (3 - 24)		2.129	2.218	2.401	2.341	2.276	2.319

a) LP: calculations based on current prices;

b) CP: calculations based on 1980 prices;

Statistics Netherlands
National Accounts Occasional Papers

NA/01 Flexibility in the system of National Accounts, Van Eck, R., C.N. Gorter and H.K. van Tuinen (1983).
This paper sets out some of the main ideas of what gradually developed into the Dutch view on the fourth revision of the SNA. In particular it focuses on the validity and even desirability of the inclusion of a number of carefully chosen alternative definitions in the "Blue Book", and the organization of a flexible system starting from a core that is easier to understand than the 1968 SNA.

NA/02 The unobserved economy and the National Accounts in the Netherlands, a sensitivity analysis, Broesterhuizen, G.A.A.M. (1983).
This paper studies the influence of fraud on macro-economic statistics, especially GDP. The term "fraud" is used as meaning unreporting or underreporting income (e.g. to the tax authorities). The conclusion of the analysis of growth figures is that a bias in the growth of GDP of more than 0.5% is very unlikely.

NA/03 Secondary activities and the National Accounts: Aspects of the Dutch measurement practice and its effects on the unofficial economy, Van Eck, R. (1985).
In the process of estimating national product and other variables in the National Accounts a number of methods is used to obtain initial estimates for each economic activity. These methods are described and for each method various possibilities for distortion are considered.

NA/04 Comparability of input-output tables in time, Al, P.G. and G.A.A.M. Broesterhuizen (1985).
It is argued that the comparability in time of statistics, and input-output tables in particular, can be filled in in various ways. The way in which it is filled depends on the structure and object of the statistics concerned. In this respect it is important to differentiate between coordinated input-output tables, in which groups of units (industries) are divided into rows and columns, and analytical input-output tables, in which the rows and columns refer to homogeneous activities.

NA/05 The use of chain indices for deflating the National Accounts, Al, P.G., B.M. Balk, S. de Boer and G.P. den Bakker (1985).
This paper is devoted to the problem of deflating National Accounts and input-output tables. This problem is approached from the theoretical as well as from the practical side. Although the theoretical argument favors the use of chained Vartia-I indices, the current practice of compilating National Accounts restricts to using chained Paasche and Laspeyres indices. Various possible objections to the use of chained indices are discussed and rejected.

NA/06 Revision of the system of National Accounts: the case for flexibility, Van Bochove, C.A. and H.K. van Tuinen (1985).
It is argued that the structure of the SNA should be made more flexible. This can be achieved by means of a system of a general purpose core supplemented with special modules. This core is a fully fledged, detailed system of National Accounts with a greater institutional content than the present SNA and a more elaborate description of the economy at the meso-level. The modules are more analytic and reflect special purposes and specific theoretical views.

NA/07 Integration of input-output tables and sector accounts; a possible solution, Van den Bos, C. (1985).
The establishment-enterprise problem is tackled by taking the institutional sectors to which the establishments belong into account during the construction of input-output tables. The extra burden on the construction of input-output tables resulting from this approach is examined for the Dutch situation. An adapted sectoring of institutional units is proposed for the construction of input-output tables.

NA/08 A note on Dutch National Accounting data 1900-1984, Van Bochove, C.A. (1985).
This note provides a brief survey of Dutch national accounting data for 1900-1984, concentrating on national income. It indicates where these data can be found and what the major discontinuities are. The note concludes that estimates of the level of national income may contain inaccuracies; that its growth rate is measured accurately for the period since 1948; and that the real income growth rate series for 1900-1984 may contain a systematic bias.

NA/09 The structure of the next SNA: review of the basic options, Van Bochove, C.A. and A.M. Bloem (1985).
There are two basic issues with respect to the structure of the next version of the UN System of National Accounts. The first is its 'size': reviewing this issue, it can be concluded that the next SNA should contain an integrated meso-economic statistical system. It is essential that the next SNA contains an institutional system without the imputations and attributions that pollute the present SNA. This can be achieved by distinguishing, in the central system of the next SNA, a core (the institutional system), a standard module for non-market production and a standard module describing attributed income and consumption of the household sector.

NA/10 Dual sectoring in National Accounts, Al, P.G. (1985).
Following a conceptual explanation of dual sectoring, an outline is given of a statistical system with complete dual sectoring in which the linkages are also defined and worked out. It is shown that the SNA 1968 is incomplete and obscure with respect to the links between the two sub-processes.

NA/11 Backward and forward linkages with an application to the Dutch agro-industrial complex, Harthoorn, R. (1985).
Some industries induce production in other industries. An elegant method is developed for calculating forward and backward linkages avoiding double counting. For 1981 these methods have been applied to determine the influence of Dutch agriculture in the Dutch economy in terms of value added and labour force.

NA/12 Production chains, Harthoorn, R. (1986).
This paper introduces the notion of production chains as a measure of the hierarchy of industries in the production process. Production chains are sequences of transformation of products by successive industries. It is possible to calculate forward transformations as well as backward ones.

NA/13 The simultaneous compilation of current price and deflated input-output tables, De Boer, S. and G.A.A.M. Broesterhuizen (1986).
A few years ago the method of compiling input-output tables underwent in the Netherlands an essential revision. The most significant improvement is that during the entire statistical process, from the processing and analysis of the basic data up to and including the phase of balancing the tables, data in current prices and deflated data are obtained simultaneously and in consistency with each other.

NA/14 A proposal for the synoptic structure of the next SNA, Al, P.G. and C.A. van Bochove (1986).

NA/15 Features of the hidden economy in the Netherlands, Van Eck, R. and B. Kazemier (1986).
This paper presents survey results on the size and structure of the hidden labour market in the Netherlands.

NA/16 Uncovering hidden income distributions: the Dutch approach, Van Bochove, C.A. (1987).

NA/17 Main national accounting series 1900-1986, Van Bochove, C.A. and T.A. Huitker (1987).
The main national accounting series for the Netherlands, 1900-1986, are provided, along with a brief explanation.

NA/18 The Dutch economy, 1921-1939 and 1969-1985. A comparison based on revised macro-economic data for the interwar period, Den Bakker, G.P., T.A. Huitker and C.A. van Bochove (1987).
A set of macro-economic time series for the Netherlands 1921-1939 is presented. The new series differ considerably from the data that had been published before. They are also more comprehensive, more detailed, and conceptually consistent with the modern National Accounts. The macro-economic developments that are shown by the new series are discussed. It turns out that the traditional economic-historical view of the Dutch economy has to be reversed.

NA/19 Constant wealth national income: accounting for war damage with an application to the Netherlands, 1940-1945, Van Bochove, C.A. and W. van Sorge (1987).

NA/20 **The micro-meso-macro linkage for business in an SNA-compatible system of economic statistics**, Van Bochove, C.A. (1987).

NA/21 **Micro-macro link for government**, Bloem, A.M. (1987).
This paper describes the way the link between the statistics on government finance and national accounts is provided for in the Dutch government finance statistics.

NA/22 **Some extensions of the static open Leontief model**, Harthoorn, R.(1987).
The results of input-output analysis are invariant for a transformation of the system of units. Such transformation can be used to derive the Leontief price model, for forecasting input-output tables and for the calculation of cumulative factor costs. Finally the series expansion of the Leontief inverse is used to describe how certain economic processes are spread out over time.

NA/23 **Compilation of household sector accounts in the Netherlands National Accounts**, Van der Laan, P. (1987).
This paper provides a concise description of the way in which household sector accounts are compiled within the Netherlands National Accounts. Special attention is paid to differences with the recommendations in the United Nations System of National Accounts (SNA).

NA/24 **On the adjustment of tables with Lagrange multipliers**, Harthoorn, R. and J. van Dalen (1987).
An efficient variant of the Lagrange method is given, which uses no more computer time and central memory then the widely used RAS method. Also some special cases are discussed: the adjustment of row sums and column sums, additional restraints, mutual connections between tables and three dimensional tables.

NA/25 **The methodology of the Dutch system of quarterly accounts**, Janssen, R.J.A. and S.B. Algera (1988).
In this paper a description is given of the Dutch system of quarterly national accounts. The backbone of the method is the compilation of a quarterly input-output table by integrating short-term economic statistics.

NA/26 **Imputations and re-routeings in the National Accounts**, Gorter, Cor N. (1988).
Starting out from a definition of 'actual' transactions an inventory of all imputations and re-routeings in the SNA is made. It is discussed which of those should be retained in the core of a flexible system of National Accounts. Conceptual and practical questions of presentation are brought up. Numerical examples are given.

NA/27 **Registration of trade in services and market valuation of imports and exports in the National Accounts**, Bos, Frits (1988).
The registration of external trade transactions in the main tables of the National Accounts should be based on invoice value; this is not only conceptually very attractive, but also suitable for data collection purposes.

NA/28 **The institutional sector classification**, Van den Bos, C. (1988).
A background paper on the conceptual side of the grouping of financing units. A limited number of criteria are formulated.

NA/29 **The concept of (transactor-)units in the National Accounts and in the basic system of economic statistics**, Bloem, Adriaan M. (1989).
Units in legal-administrative reality are often not suitable as statistical units in describing economic processes. Some transformation of legal-administrative units into economic statistical units is needed. This paper examines this transformation and furnishes definitions of economic statistical units. Proper definitions are especially important because of the forthcoming revision of the SNA.

NA/30 **Regional income concepts**, Bloem, Adriaan M. and Bas De Vet (1989).
In this paper, the conceptual and statistical problems involved in the regionalization of national accounting variables are discussed. Examples are the regionalization of Gross Domestic Product, Gross National Income, Disposable National Income and Total Income of the Population.

NA/31 The use of tendency surveys in extrapolating National Accounts, Oudde-ken, Frank and Gerrit Zijlmans (1989).
This paper discusses the feasibility of the use of tendency survey data in the compilation of very timely Quarterly Accounts. Some preliminary estimates of relations between tendency survey data and regular Quarterly Accounts-indicators are also presented.

NA/32 An economic core system and the socio-economic accounts module for the Netherlands, Gorter, Cor N. and Paul van der Laan (1989).
A discussion of the core and various types of modules in an overall system of economy related statistics. Special attention is paid to the Dutch Socio-economic Accounts. Tables and figures for the Netherlands are added.

NA/33 A systems view on concepts of income in the National Accounts, Bos, Frits (1989).
In this paper, concepts of income are explicitly linked to the purposes of use and to actual circumstances. Main choices in defining income are presented in a general system. The National Accounts is a multi-purpose framework. It should therefore contain several concepts of income, e.g. differing with respect to the production boundary. Furthermore, concepts of national income do not necessarily constitute an aggregation of income at a micro-level.

NA/34 How to treat borrowing and leasing in the next SNA, Keuning, Steven J. (1990).
The use of services related to borrowing money, leasing capital goods, and renting land should not be considered as intermediate inputs into specific production processes. It is argued that the way of recording the use of financial services in the present SNA should remain largely intact.

NA/35 A summary description of sources and methods used in compiling the final estimates of Dutch National Income 1986, Gorter, Cor N. and others (1990).
Translation of the inventory report submitted to the GNP Management Committee of the European Communities.

NA/36 The registration of processing in supply and use tables and input-output tables, Bloem, Adriaan M., Sake De Boer and Pieter Wind (1993).
The registration of processing is discussed primarily with regard to its effects on input-output-type tables and input-output quotes. Links between National Accounts and basic statistics, user demands and international guidelines are examined. Net recording is in general to be preferred. An exception has to be made when processing amounts to a complete production process, e.g. oil refineries in the Netherlands.

NA/37 A proposal for a SAM which fits into the next System of National Accounts, Keuning, Steven J. (1990).
This paper shows that all flow accounts which may become part of the next System of National Accounts can be embedded easily in a Social Accounting Matrix (SAM). In fact, for many purposes a SAM format may be preferred to the traditional T-accounts for the institutional sectors, since it allows for more flexibility in selecting relevant classifications and valuation principles.

NA/38 Net versus gross National Income, Bos, Frits (1990).
In practice, gross figures of Domestic Product, National Product and National Income are most often preferred to net figures. In this paper, this practice is challenged. Conceptual issues and the reliability of capital consumption estimates are discussed.

NA/39 Concealed interest income of households in the Netherlands; 1977, 1979 and 1981, Kazemier, Brugt (1990).
The major problem in estimating the size of hidden income is that total income, reported plus unreported, is unknown. However, this is not the case with total interest income of households in the Netherlands. This makes it possible to estimate at least the order of magnitude of this part of hidden income. In this paper it will be shown that in 1977, 1979 and 1981 almost 50% of total interest received by households was concealed.

NA/40 Who came off worst: Structural change of Dutch value added and employ-- ment during the interwar period, Den Bakker, Gert P. and Jan de Gijt (1990).
In this paper new data for the interwar period are presented. The distribution of value added over industries and a break-down of value added into components is given. Employment by industry is estimated as well. Moreover, structural changes during the interwar years and in the more recent past are juxtaposed.

NA/41 The supply of hidden labour in the Netherlands: a model, Kazemier, Brugt and Rob van Eck (1990).
This paper presents a model of the supply of hidden labour in the Netherlands. Model simulations show that the supply of hidden labour is not very sensitive to cyclical fluctuations. A tax exempt of 1500 guilders for second jobs and a higher probability of detection, however, may substantially decrease the magnitude of the hidden labour market.

NA/42 Benefits from productivity growth and the distribution of income, Keuning, Steven J. (1990).
This paper contains a discussion on the measurement of multifactor productivity and sketches a framework for analyzing the relation between productivity changes and changes in the average factor remuneration rate by industry. Subsequently, the effects on the average wage rate by labour category and the household primary income distribution are studied.

NA/43 Valuation principles in supply and use tables and in the sectoral accounts, Keuning, Steven J. (1991).
In many instances, the valuation of transactions in goods and services in the national accounts poses a problem. The main reason is that the price paid by the purchaser deviates from the price received by the producers. The paper discusses these problems and demonstrates that different valuations should be used in the supply and use tables and in the sectoral accounts.

NA/44 The choice of index number formulae and weights in the National Accounts. A sensitivity analysis based on macro-economic data for the interwar period, Bakker, Gert P. den (1991).
The sensitivity of growth estimates to variations in index number formulae and weighting procedures is discussed. The calculations concern the macro-economic variables for the interwar period in the Netherlands. It appears, that the use of different formulae and weights yields large differences in growth rates. Comparisons of Gross Domestic Product growth rates among countries are presently obscured by the use of different deflation methods. There exists an urgent need for standardization of deflation methods at the international level.

NA/45 Volume measurement of government output in the Netherlands; some alternatives, Kazemier, Brugt (1991).
This paper discusses three alternative methods for the measurement of the production volume of government. All methods yield almost similar results: the average annual increase in the last two decades of government labour productivity is about 0.7 percent per full-time worker equivalent. The implementation of either one of these methods would have led to circa 0.1 percentage points higher estimates of economic growth in the Netherlands.

NA/46 An environmental module and the complete system of national accounts, Boo, Abram J. De, Peter R. Bosch, Cor N. Gorter and Steven J. Keuning (1991).
A linkage between environmental data and the National Accounts is often limited to the production accounts. This paper argues that the consequences of economic actions on ecosystems and vice versa should be considered in terms of the complete System of National Accounts (SNA). One should begin with relating volume flows of environmental matter to the standard economic accounts. For this purpose, a so-called National Accounting Matrix including Environmental Accounts (NAMEA) is proposed. This is illustrated with an example.

NA/47 Deregulation and economic statistics: Europe 1992, Bos, Frits (1992).
The consequences of deregulation for economic statistics are discussed with a view to Europe 1992. In particular, the effects of the introduction of the Intrastat-system for statistics on international trade are investigated. It is argued that if the Statistical Offices of the EC-countries do not respond adequately, Europe 1992 will lead to a deterioration of economic statistics: they will become less reliable, less cost effective and less balanced.

NA/48 The history of national accounting, Bos, Frits (1992).
At present, the national accounts in most countries are compiled on the basis of concepts and classifications recommended in the 1968-United Nations guidelines. In this paper, we trace the historical roots of these guidelines (e.g. the work by King, Petty, Kuznets, Keynes, Leontief, Frisch, Tinbergen and Stone), compare the subsequent guidelines and discuss also alternative accounting systems like extended accounts and SAMs.

NA/49 Quality assessment of macroeconomic figures: The Dutch Quarterly Flash, Reininga, Ted, Gerrit Zijlmans and Ron Janssen (1992).
Since 1989-IV, the Dutch Central Bureau of Statistics has made preliminary estimates of quarterly macroeconomic figures at about 8 weeks after the end of the reference quarter. Since 1991-II, a preliminary or "Flash" estimate of GDP has been published. The decision to do so was based on a study comparing the Flash estimates and the regular Quarterly Accounts figures, which have a 17-week delay. This paper reports on a similar study with figures through 1991-III.

NA/50 Quality improvement of the Dutch Quarterly Flash: A Time Series Analysis of some Service Industries, Reininga, Ted and Gerrit Zijlmans (1992).
The Dutch Quarterly Flash (QF) is, just like the regular Quarterly Accounts (QA), a fully integrated statistic based on a quarterly updated input-output table. Not all short term statistics used to update the QA's IO-table are timely enough to be of use for the QF, so other sources have to be found or forecasts have to be made. In large parts of the service industry the latter is the only possibility. This paper reports on the use of econometric techniques (viz. series decomposition and ARIMA modelling) to improve the quality of the forecasts in five parts of the service industry.

NA/51 A Research and Development Module supplementing the National Accounts, Bos, Frits, Hugo Hollanders and Steven Keuning (1992).
This paper presents a national accounts framework fully tailored to a description of the role of Research and Development (R&D) in the national economy. The framework facilitates to draw macro-economic conclusions from all kinds of data on R&D (also micro-data and qualitative information). Figures presented in this way can serve as a data base for modelling the role of R&D in the national economy.

NA/52 The allocation of time in the Netherlands in the context of the SNA; a module, Kazemier, Brugt and Jeanet Exel (1992).
This paper presents a module on informal production, supplementing the National Accounts. Its purpose is to incorporate informal production into the concepts of the SNA. The relation between formal and informal production is shown in the framework of a Social Accounting Matrix (SAM). To avoid a controversial valuation of informal production, the module constists of two SAMs. One expressed in actual prices with informal labour valued zero, and one which expresses the embedded informal labour input measured in terms of hours worked.

NA/53 National Accounts and the environment: the case for a system's approach, Keuning, Steven J. (1992).
The present set of main economic indicators should be extended with one or a few indicators on the state of the environment. This paper lists various reasons why a so-called Green Domestic Product is not suitable for this purpose. Instead, a system's approach should be followed. A National Accounting Matrix including Environmental Accounts (NAMEA) is presented and the way to derive one or more separate indicators on the environment from this information system is outlined.

NA/54 **How to treat multi-regional units and the extra-territorial region in the Regional Accounts?**, De Vet, Bas (1992).
This paper discusses the regionalization of production and capital formation by multi-regional kind-of-activity units. It also examines the circumstances in which a unit may be said to have a local kind-of-activity unit in the extra-territorial region and what should be attributed to this "region".

NA/55 **A historical Social Accounting Matrix for the Netherlands (1938)**, Den Bakker, Gert P., Jan de Gijt and Steven J. Keuning (1992).
This paper presents a Social Accounting Matrix (SAM) for the Netherlands in 1938, including related, non-monetary tables on demographic characteristics, employment, etc. The distribution of income and expenditure among household subgroups in the 1938 SAM is compared with concomittant data for 1987.

NA/56 **Origin and development of the Dutch National Accounts**, Den Bakker, Gert P. (1992).
This paper describes the history of national accounting in the Netherlands. After two early estimates in the beginning of the nineteenth century, modern national accounting started in the 1930s on behalf of the Tinbergen model for the Dutch economy. The development spurred up after World War II to provide data to the government for economic planning purposes. In the 1980s, the development was towards a flexible and institutional approach.

NA/57 **Compiling Dutch Gross National Product (GNP); summary report on the final estimates after the revision in 1992**, Bos, Frits (1992).
This summary report describes the sources and methods used for compiling the final estimate of Dutch Gross National Product after the revision of the Dutch National Accounts in 1992. Attention is focused on the estimation procedures for 1988. A more extensive report is also available.

NA/58 **Major changes and results of the revision of the Dutch National Accounts in 1992**, Department of National Accounts (1992, forthcoming).
The revision in 1992 has improved the Dutch National Accounts in three ways. First, new and other data sources have been used, like Production statistics of service industries, the Budget Survey and Statistics on fixed capital formation. Secondly, the integration process has been improved by the use of detailed make- and use-tables instead of more aggregate input-output tables. Thirdly, several changes in bookkeeping conventions have been introduced, like a net instead of a gross registration of processing to order.

NA/59 **A National Accounting Matrix for the Netherlands**, Keuning, Steven and Jan de Gijt (1992).
Currently, the national accounts typically use two formats for presentation: matrices for the Input-Output tables and T-accounts for the transactions of institutional sectors. This paper demonstrates that presently available national accounts can easily be transformed into a National Accounting Matrix (NAM). This may improve both the transparency and analytic usefulness of the complete set of accounts.

NA/60 **Integrated indicators in a National Accounting Matrix including environmental accounts (NAMEA); an application to the Netherlands**, De Haan, Mark, Steven Keuning and Peter Bosch (1993).
In this paper, environmental indicators are integrated into a National Accounting Matrix including Environmental Accounts (NAMEA) and are put on a par with the major aggregates in the national accounts, like National Income. The environmental indicators reflect the goals of the environmental policy of the Dutch government. Concrete figures are presented for 1989. The NAMEA is optimally suited as a data base for modelling the interaction between the national economy and the environment.

NA/61 Standard national accounting concepts, economic theory and data compilation issues; on constancy and change in the United Nations-Manuals on national accounting (1947, 1953, 1968 and 1993), Bos, Frits (1993).
In this paper, the four successive guidelines of the United Nations on national accounting are discussed in view of economic theory (Keynesian analysis, welfare, Hicksian income, input-output analysis, etc.) and data compilation issues (e.g. the link with concepts in administrative data sources). The new guidelines of the EC should complement those of the UN and be simpler and more cost-efficient. It should define a balanced set of operational concepts and tables that is attainable for most EC countries within 5 years.

NA/62 Revision of the 1987-1992 Dutch agricultural accounts, Pauli, Peter and Nico van Stokrom (1994, forthcoming).
During the recent revision of the Dutch national accounts, new agricultural accounts have been compiled for the Netherlands. This paper presents the major methodological and practical improvements and results for 1987, the base year for this revision. In addition, this paper demonstrates that a linkage can be established between the E.C. agricultural accounting system and the agricultural part of the standard national accounts.

NA/63 Implementing the revised SNA in the Dutch National Accounts, Bos, Frits (1993).
This paper discusses the implementation of the new United Nations guidelines on national accounting (SNA) in the Netherlands. The changes in basic concepts and classifications in the SNA will be implemented during the forthcoming revision. The changes in scope will be introduced gradually. Important changes scheduled for the near future are the incorporation of balance sheets, an environmental module and a Social Accounting Matrix.

NA/64 Damage and insurance compensations in the SNA, the business accounts and the Dutch national accounts, Baris, Willem (1993).
This paper describes the recording of damages to inventories and produced fixed assets in general, including damages as a result of legal product liability and of the liability for damage to the environment. In this regard, the 1993 System of National Accounts and the practice of business accounting are compared with the Dutch national accounts.

NA/65 Analyzing economic growth: a description of the basic data available for the Netherlands and an application, Van Leeuwen, George, Hendrie van der Hoeven and Gerrit Zijlmans (1994).
This paper describes the STAN project of the OECD and the Dutch national accounts data supplied to the STAN database, which is designed for a structural analysis of the role of technology in economic performance. Following an OECD analysis for other industrial countries, the importance of international trade for a small open economy such as the Netherlands is investigated. The STAN database is also available on floppy disk at the costs of DFL. 25, an can be ordered by returning the order form below (Please mention: STAN floppy disk).

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