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ANALYZING RELATIVE FACTOR INPUTS OF DUTCH EXPORTS: AN APPLICATION OF THE 1991 SOCIAL ACCOUNTING MATRIX FOR THE NETHERLANDS

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Abstract

The paper analyses the human and physical capital content of Dutch trade and tests the validity of the controversial Heckscher-Ohlin-Vanek (HOV) theorem of international trade for the Netherlands. In contrast to previous studies that test the HOV theorem, human capital is represented by educational categories of labour. The factor content analysis shows that the Netherlands is abundant in machinery and equipment and low-skilled labour and is poor in intermediate and high-skilled labour and construction. These findings are in line with the true Dutch factor endowments relative to 20 other industrialized countries. This underlines the relevance of the HOV theorem in the Dutch case.

Keywords: factor content, human capital, international trade.

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1. Introduction

One of the prominent features of the world economy in the last centuries is the ever increasing importance, both absolutely and relatively, of international trade in goods and services. Apparently, there are strong incentives for nations to participate in international economic relations.

As early as the beginning of the nineteenth century "classical" economic science has "isolated" the principal factor accounting for the growth of international trade: comparative (cost) advantages enables nations to engage in a mutual advantageous trade. Classical economists explain comparative cost advantages by differences in production techniques particularly related to divergent endowments of natural resources. Neoclassical trade theory - "founded" by Ohlin (1933) and Heckscher (1919) - assumes equal production technologies in the countries participating in international trade and explain cost differences by different factor endowments. The relative factor input structure of exports compared to imports should reflect these differences of relative availability of production factors. Recent analysis (e.g. Minne and Verbruggen (1989), and Kusters and Minne (1992)) claims that Dutch trade patterns are poorly explained by neoclassical theory. Rather, it is stated that classical "local" opportunities explain the importance of such items as agricultural products and mineral gas for Dutch international trade.

This paper has two purposes. Firstly, it analyses the factor endowments of Dutch production factors as these are revealed in trade figures, distinguishing between seven educational categories of labour and two types of physical capital. This factor content analysis is carried out using data from input-output tables and from recently constructed Social Accounting Matrices. It will show that the trade-revealed abundances of production factors are indicated by the factor content of net trade (i.e. exports minus imports) relative to the factor content of domestic final use. Secondly, the paper tests the Heckscher-Ohlin-Vanek (HOV) theorem in the Dutch case. The HOV theorem is also known as the factor content version of the Heckscher-Ohlin-Samuelson theorem, and states that a

country exports the services of its relatively abundant production factors and imports the services of its relatively scarce production factors. It can be shown (see section 4) that the Leontief analysis is a special case of the factor content analysis, valid only under a specific condition. The HOV theorem can be tested for the Netherlands by comparing, for the production factors mentioned above, the trade-revealed factor endowments with the true factor endowments. The true factor endowments of the Netherlands are calculated relative to those of 20 other industrialized countries.

The method of calculating factor contents is largely based on the use of input-output (I-O) tables. The success of the I-O table as a model of the economic process can be largely attributed to its appeal to the empirical economists. Leontief was the first to realize that I-O tables provide empirical economists with a consistent data-set that relates final demand to various inputs: semi-finished products, labour and capital. Testing the Heckscher-Ohlin theorem using I-O tables became an important field of research after Leontief's seminal work (1953, 1956). The possibility of calculating the direct and indirect use of a factor in production, final use, exports and imports may account for this prominent position.

Measurements of human capital in international trade studies are often based on discounted sector-wage differentials (e.g. Balassa (1977) Branson and Monoyios (1977), Koekkoek et al. (1978), and Stern and Maskus (1981)), which has the disadvantage of being only an indirect measure of labour skills. Human capital has also been measured by occupational categories of workers (e.g. Keesing (1966), Baldwin (1971), Baldwin (1979), Fortune (1976), Hulsman-Vejsová and Koekkoek (1980), Leamer (1984), Bowen et al. (1987)), which has the disadvantage of being based on the type of work done rather than on the skill level of the labour inputs. In our opinion, human capital should be measured by the level of education of the workforce rather than by discounted sector-wage differentials or occupational categories (see Reininga (1994)). The human capital content calculations in this paper are based on recently constructed Social Accounting Matrices (see Timmerman and Van de Ven (1994), and Reininga

(op. cit.)), which contain detailed data on educational levels of labour inputs per industry. This dataset is drawn from the Labour Accounts (LA) and is consistent with the input-output data of the National Accounts (NA). This illustrates one of the major advantages of SAMs as statistical tools: they make it possible to use statistical information from various sources.

The remainder of the paper is organized as follows. In section two traditional and modern theories of international trade are evaluated. As a historical example of an input-output based analysis, Leontief's test on the relevance of neoclassical trade theory for U.S. trade patterns is briefly introduced in section three. This test resulted in the famous so-called Leontief paradox. The next section presents the theoretical framework of factor content studies and relates the framework to Leontief's analysis. Section five discusses the methodology used for generating the data from I-O tables and the SAMs. Section six measures the trade-revealed factor endowments for seven educational categories of labour and two types of physical capital, both for the whole economy and the main economic sectors. The next section presents the Netherlands' true factor endowments in labour, by three educational levels, and in two types of physical capital relative to twenty other industrialized countries. These true factor endowments are compared to the trade-revealed factor endowments measured in section 6. In the final section some conclusions are presented.

2. A Brief Overview of the Economic Theory of International Trade

2.1 Introduction

In this section traditional and modern theories of international trade are discussed[1]. All theories discussed here ultimately explain international trade by comparative advantages. Moreover, all theories try to explain both the emergence of international trade and the composition of the commodity bundles exported and imported. They differ, however, in the factors introduced to account for the divergent comparative advantages. Traditional trade theory assumes trading of homogeneous commodities - including labour and capital - on perfect competitive markets. On these markets entrepreneurs can only compete by lowering their costs. Consequently, traditional theory considers differences in production costs as the relevant factor explaining comparative advantages. In connection with the assumption of perfect competitive markets, entrepreneurs cannot benefit from economies of scale in production! Modern trade theory, however, assumes imperfect competitive markets. Here numerous factors might lead to comparative advantages, e.g.: consumer's preferences for a certain brand, economies of scale, research and development activities, and specific market expertise giving rise to a leading position in the market. Unlike his colleague of the traditional theory, the "modern" entrepreneur shapes, so to speak, his own comparative advantage. These various theories are not considered here to be mutual exclusive. Rather they are seen as complementary; each theory explains part of international trade patterns.

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1) The economic theory of international trade should be distinguished sharply from open-economy macroeconomics. The former is primarily concerned with the causes and gains of international trade, the latter is concerned with the implications of international economic relations for the efficiency of - internal - stabilization policies. Spencer (1990) surveys new developments in the field of open-economy macroeconomics.

2.2 Traditional and Modern Theories of International Trade

2.2.1 Traditional Theories

The classical theory of international trade - based on the postulates of perfect competitive markets and (implicitly) constant returns to scale - explains trade patterns by differences in production technology connected to different endowments of natural resources between the various countries[2]. These differences give rise to differences in production cost and prices, as perfect competitive markets are presumed. Comparative cost advantages govern international trade patterns for the benefit of all inhabitants of the nations participating in international trade. The bundle of exported and imported commodities should reflect the distribution of available natural resources in the countries participating in international trade. Serious shortcomings of the classical theory are (i) its neglect of the role of capital and (ii) the postulate of different production technologies as a *conditio sine qua non* for international trade.

Minne and Verbruggen (1989, p. 23) argue that the classical explanation of international trade flows still might be very valid for commodities with production cost that are heavily depending on specific local endowments of natural resources. Agricultural products (including fish) and mineral ores are examples of these so-called Ricardo-commodities.

The neoclassical or Heckscher-Ohlin-Samuelson (HOS) theory, likewise based on the assumption of perfect competition, tries to circumvent the shortcomings of classical theory. Contrary to the classical theory the set of possible production technologies is assumed to be the same worldwide. International trade is explained by comparative cost (price) differences that are attributable to differences in prices of primary factors of production, including capital. In turn, these price differences are caused by different endowments of production factors in the various countries.

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2) Labour and natural resources are the only production factors considered by the classical economists in explaining international trade (Kol and Mennes (1989), pp. 4-5).

The HOS theorem thus predicts that a country will export those commodities that are produced using a relatively large amount of the production factors that are abundant.

The neoclassical explanation of international trade seems especially valid for so-called *footlose* commodities, "..that can in principal be produced anywhere with a single common technique.." (Minne and Verbrugge, op.cit., p. 23). The (relative) prices of labour and capital will then decide where firms producing such commodities are set up. Clothing, textiles, and footwear are examples of Heckscher-Ohlin-Samuelson commodities.

Deardorff (1984) and Leamer (1984) both conclude that the neoclassical theory generally gives a satisfactory explanation of the commodity composition of international trade flows. However, the continuing predominance of intra-industry trade[3], even after distorting trade barriers are lifted[4], made economists somewhat uneasy with traditional trade theory. Therefore, Deardorff (op. cit.) recommends the introduction of non-competitive markets and (related) economies of scale to complete the explanation of international trade flows.

2.2.2 Modern Theories

Modern trade theory mainly evolves along two lines to account for real world phenomena that cannot be explained by the neoclassical theory. All modern theories assume non-competitive commodity markets.

According to the so-called dynamic trade theory[5] introduction of new

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3) Intra-industry trade should be distinguished from intra-firm trade. The latter refers to trade between affiliates belonging to the same legal entity, whereas the first refers to international trade between corresponding industries in the participating countries. See Bonturi and Fukasaku (1993) for the relation between intra-industry and intra-firm trade. See Kol (1988) on the measurement of intra-industry trade.

4) This could be observed for instance in Europe after the start of the European Common Market. See Balassa (1963) and Grubel and Lloyd (1975). Grubel (1981) evaluates a number of theories on intra-industry trade.

technologies is the source of comparative advantage. Experience with the new technique and possible economies of scale might enable the pioneering country to keep the lead for some time. However, diffusion of the technology and standardization of the production process will inevitably erode its position as relative factor remunerations will become increasingly more important. The commodities produced with these new techniques become foot-lose, and Heckscher-Ohlin conditions will prevail once again. "Technology-gap" trade is replaced by "low-wage" trade.

Strategic trade theory[6], however, deals with the deliberate creation and maintaining of comparative advantages. Brand preference, economies of scale, and market expertise are introduced as a new source of international specialization and international trade. Contrary to the dynamic trade theory, the pioneering country is thought able to keep the lead as foreign competitors cannot obtain equivalent advantages.

In contrast with traditional theory, the composition of the bundle of internationally traded commodities cannot be predicted as historical and accidental factors play an important role. However, introduction of non-competitive markets does enable modern theory to explain intra-industry trade. Production of differentiated commodities in markets characterized by monopolistic competition leads to international specialization whenever economies of scale are present.

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5) Vernon (1966), Posner (1961), and Hufbauer (1966) are associated with the dynamic theory of international trade.

6) Helpman (1984), Krugman (1986,1987), Helpman and Krugman (1985), Krugman and Obstfeld (1988), and Kierzkowski (1984) all deal with the strategic trade theory.

3. The Leontief Paradox

3.1 Introduction

Leontief's research (1953, 1956) on the empirical validity of the neo-classical theory puzzled economists of his days: reducing America's exports with one million dollar would reduce labour requirements more than would be absorbed by increasing output with one million dollars worth of competitive imports. The opposite was true for capital. As America was generally seen as a nation characterized by capital abundance, this result was quite contrary to predictions on the basis of neoclassical theory. His findings are summarized in table 3.1

table 3.1 Factor requirements per million dollars of U.S. exports and of competitive import replacements[a)]

	exports	import replacements
capital (in 1947 $)	2,550,780	3,091,339
labour (1947 man-years)	182.313	170.004

a) Source: Leontief 1953, table 5-3, p. 81

So, Leontief concluded that "..the widely held opinion that - as compared with the rest of the world - the U.S. economy is characterized by a relative surplus of capital and a relative shortage of labour proves to be wrong. As a matter of fact the opposite is true.." (op.cit., p. 81). And ".. America's participation in the international division of labour is based on its specialization on labour-intensive rather than capital-intensive, lines of production. In other words, this country resorts to foreign trade in order to economize its capital and to dispose of its surplus labour.." (op.cit., p. 81). So, instead of refuting the neoclassical theory, Leontief stated that the U.S. is, apparently, a country with abundant labour! Although he was not able to account for the exact cause of the phenomenon, he explained his results by the high relative efficiency of U.S. manpower. "..This, I submit is the analytical explanation of the results of our empirical findings. In terms of the relative production possibilities here and abroad, the United States is rich in manpower and poor in capital.." (op. cit., p. 83). This alleged

abundance of human capital in the US was corroborated in his 1956 analysis.

3.2 Explanations of the Leontief Paradox[7)]

In discussing the various explanations put forward to explain the paradox, one has to make a distinction between explanations which are stating that at least one of the sufficient conditions for the theorem is violated[8)] and explanations based on supposed inadequacies of Leontief's analysis itself.

Explanations of the first type frequently put forward are: (1) factor-intensity reversals that are sufficiently extensive to upset the HOS proposition, (2) a strong U.S. demand bias in favor of capital-intensive commodities so that these are imported even though the United States is capital-abundant, and (3) high tariffs and other trade-distorting measures.

Explanations of the second type were based on the supposed inadequate modeling of the production technology by Leontief. Notably he did not deal adequately with: (1) the efficiency advantage in favor of the United States in research and development (R&D) oriented industries, and (2) the scarcity of natural resources in the United States coupled with a complementary relationship between natural resources and capital. In short, Leontief did not take the right number of factors into account.

More importantly, Leamer (1980) showed that the Leontief test discussed here can only be regarded as a proper test of the Heckscher-Ohlin-Samuelson theory under a rather restrictive assumption (see the next section .) Leamer (op. cit.) also shows that the latter test should be

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7) This subsection draws heavily on Baldwin (1971).

8) Bhagwati (1965) listed the sufficient conditions: (1) identical production functions throughout the world for each commodity as well as qualitatively identical productive factors, (2) production functions homogeneous of degree one with diminishing marginal productivity for each factor, (3) non-reversibility of factor intensities, (4) identity of consumption patterns among countries at any given set of international commodity prices, (5) perfect, competitive markets, free trade, no transport costs, and complete international immobility of productive factors.

replaced by the analysis of the so-called factor content of trade flows. The latter analysis is also known as the Heckscher-Ohlin-Vanek (HOV) version of neoclassical trade theory.

In the next sections we will analyze the relevance of the human capital factor for the Dutch trade patterns using factor content analysis instead of the Leontief test of capital/labour ratio's. But first we will develop the theoretical framework of factor content analysis. This will provide us with the proper test of the empirical validity of neoclassical trade theory.

4. Theoretical Framework

This section develops the theoretical framework that is required for a factor content analysis. Consider the following equation of country i, in which T, Q and C represent the nxl vectors of net trade (i.e. exports minus imports), value added and domestic final use (absorption), respectively, and where n represents the number of tradeable commodities[9]:.

$$(1)\quad T_i = Q_i - C_i$$

Assume that individuals have identical homothetic preferences and that production functions are equal in all countries and exhibit constant returns to scale. Furthermore, perfect competition in the goods and factors markets, and factor price equalization, are assumed. Pre-multiplying the last equation with the mxn input-output matrix A of direct and indirect factor requirements[10], in which m represents the number of production factors that are perfectly immobile between countries, leads to equation (2).

$$(2)\quad AT_i = AQ_i - AC_i$$

In the first equation, net trade is regarded as the difference between the goods produced and the domestic final use of goods in country i, whereas in the second equation net trade is regarded as the difference between the supply of factor services and the domestic final use of factor services in country i. Define F_i as the mxl vector of factor services of net trade, which equals AT_i by definition. Moreover, define E_i as the vector of factor endowments, which equals AQ_i by definition. Finally, due to the above assumptions, the factor content of domestic final use equals the share s_i that country i uses from the mxl vector of total world factor

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9) In our analysis we deal with output per industry instead of commodities. However, this does not alter the implications of the HOV theorem.

10) The matrix A is the result of premultiplying the Leontief inverse with the matrix of direct factor input coefficients.

endowments, E_w. Moreover, this share equals the share of national income, corrected for

the trade balance B_i, in total world income. In other words, $s_i = (Y_i - B_i)/Y_w$. If the above definitions and results are substituted into equation (2), this leads to equation (3) for a particular production factor k.

$$(3)\quad F_{ki} = E_{ki} - [(Y_i - B_i)/Y_w] \times E_{kw}$$

This equation can be rewritten as follows:

$$(4)\quad \frac{(F_{ki}/E_{kw})}{(Y_i/Y_w)} - \frac{B_i}{Y_i} = \frac{(E_{ki}/E_{kw})}{(Y_i/Y_w)} - 1$$

The right-hand side of this equation reflects the relative factor endowments of country i, which will be used in section 7 to calculate the Dutch factor endowments of human and physical capital relative to twenty other industrialized countries. If the right-hand side is positive for a particular factor k in country i, then the country has a <u>true</u> abundance of this factor. The left-hand side of the equation reflects the <u>trade-revealed</u> factor endowments indicated by a country's net trade, and will be used for the factor content analysis of this paper. If the left-hand side of equation (4) is positive, then country i has a revealed abundance of this factor. This implies that country i has a revealed comparative advantage in goods that make intensive use of factor k. The relationship between the true factor abundance and the trade-revealed factor abundance is a consequence of the HOV theorem, which implies that countries which have an abundance of a particular production factor k should export (i.e. exports minus imports) the factor services of factor k.

From the left-hand side of the equation, it follows that a country is revealed to be more abundant in factor k than in factor k' if the following inequality holds.

$$(5)\quad (F_{ki}/E_{kw}) > (F_{k',i}/E_{k',w})$$

Since $Ek_w = (AC_i)k_i/s_i$ and $(AC_i)k_i$ represents the domestic final use of factor k, which is renamed D_{ki} for convenience, inequality (5) can be rewritten to give the final inequality that will be used in the empirical analysis of this paper.

(6) $(F_{ki}/D_{ki}) > (F_{k',i}/D_{k',i})$

Inequality (6) implies that if the ratio of the factor content of net trade to the factor content of domestic final use, for a production factor k such as high-skilled workers, is larger than the same ratio for production factor k', for example low-skilled workers, then high-skilled workers are more abundant than low-skilled workers in country i. The rank order of the factor content ratios of net trade relative to domestic final use indicates the revealed factor abundancies of the production factors within a country: the larger the ratio, the larger the revealed factor abundance.

It is relatively easy to show that the factor abundance condition of inequality (6) is similar to that of Leontief (1953) only under the important condition that the net exports of the factor services of factor k are opposite in sign to the net exports of the factor services of factor k'.

Suppose factor k is more abundant than factor k'. Moreover, by equation (2) F_{ki} equals $(X_{ki}-M_{ki})$ and $F_{ki'}$ equals $(X_{k',i}-M_{k',i})$, with X representing the factor (k or k') content of exports and M representing the factor (k or k') content of imports. Under the condition that F_k and F_{ki} are opposite in sign it follows that $(X_{ki}-M_{ki})>0$ and $(X_{k',i}-M_{k',i})<0$. (Remember that factor k is assumed to be more abundant than factor k'!). Then, and only then it follows that $(X_{ki}/M_{ki})>1$ and $(X_{k',i}/M_{k',i})<1$, and, therefore, $(X_{ki}/M_{ki})>(X_{k',i}/M_{k',i})$. This results in Leontief's factor abundance inequality (7).

(7) $(X_{ki}/X_{k',i})/(M_{ki}/M_{k',i})$

So, without the assumption that the net exports of the factor services of

factor k are opposite in sign to the net exports of the factor services of factor k' the Leontief inequality is not be the proper test of the HOV-theorem. Suppose that factor k represents physical capital and factor k' represents labour, as in Leontief's study. If the factor services of physical capital embodied in net exports are positive and the factor services of labour embodied in net exports are negative, then the above inequality implies that the capital per man embodied in exports exceeds the capital per man embodied in imports. The latter condition was not satisfied for the 1947 U.S. data in Leontief's study.

5. Methodology of Data Generation

This section first briefly discusses the methodology behind the input-output (I-O) tables, social accounting matrices (SAMs) and supply and use tables from which the data are drawn. It also discusses how we have dealt with two well-known methodological problems of I-O tables, i.e. the homogeneity of I-O tables and the production technology of imports, to make the I-O framework suitable for calculating the factor content of production, exports and imports. Next, the valuation of I-O tables will be briefly touched upon. Finally, the construction of a consistent set of labour and capital data will be discussed.

5.1 Input-Output Tables

I-O tables are widely used in national accounting. They have proven to be a suitable framework for utilizing production statistics from different sources[11]. However the intra-industry structure of I-O tables does not match the structure of basic data. A firm does typically know the type of products purchased and produced, but usually does not know in what category statisticians classify the firms with which it does business. Consequently, since 1968 the System of National Accounts (SNA) has advocated the use of 'supply and use' tables as a balancing device (United Nations (1968)). The use table shows commodity usage by using industry and final demand category. The supply table gives a corresponding picture of the supply of commodities, distinguishing between the supplying industries and imports. Since 1987 Statistics Netherlands has employed supply and use tables to arrive at accurate estimates of total production (GDP). However, Statistics Netherlands still constructs I-O tables because they are still very much valued as an analytical tool. In contrast to the practice before 1987, these I-O tables are now derived indirectly from the supply and use tables (see e.g. Konijn (1994)).

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11) Den Bakker (1993) decribes the use of the I-O table as a balancing framework at Statistics Netherlands until 1987.

5.2 Social Accounting Matrices

SAMs offer a very convenient framework to combine the description of the production process in supply and use tables with detailed information on other aspects of the economic process. This is confirmed in Chapter 20 of the 1993 System of National Accounts (SNA), on SAMs: ". A SAM is defined here as the presentation of SNA accounts in a matrix which elaborates the linkages between a supply and use table and institutional sector accounts.." (op. cit., p. 461). Because a SAM might be considered as an extension of an I-O table incorporating the distribution and use of income, the analytical applications of SAMs are broader than those of I-O tables. Basically, both SAM and I-O analysis are based on the assumption of a linear relation between an endogenous (target) variable, e.g. (aggregate) output and employment, and the exogenous part of the SAM, e.g. government spending and exports (see Keuning and Thorbecke (1992)). In contrast to I-O analysis, however, the SAM model is 'closed' with respect to income distribution and income use.

As stated before, the Dutch SAMs contain supply and use tables instead of an I-O table to describe the production process. Inverting this SAM for our analytical purposes implicitly leads to the mechanical construction of an industry-by-industry I-O table (see below) based on the 'assumption of fixed industry sales structures' (Konijn (1994), pp. 110-111). According to this assumption, each industry has its own specific sales structure irrespective of its product mix. In other words, it is assumed that all products of a specific industry are sold in exactly the same proportion to other industries, households, the government, and other countries. As this assumption is rather implausible, using the SAM would lead to a distorted mapping of final demand to the use of production factors. Consequently, we have used an industry-by-industry I-O table for our analysis. This table is derived by Statistics Netherlands from supply and use tables, using additional information on commodity flows between industries. The SAM provides detailed additional data on the educational levels of the labour used by industry that is consistent with the data from the industry-by-industry I-O table. This paper therefore utilizes one of the major advantages of SAMs as a statistical tool: the balancing of statistical

information from various sources.

5.3 The Homogeneity of the I-O Table

An I-O table reflects the output of commodities (products) on the one hand, and the intermediate goods, labour, and capital used to produce these commodities on the other hand. In many cases a firm, and therefore an industry defined as a group of firms engaged primarily in the same activity, does not produce a single product. In addition to its primary, characteristic product, it may produce one or more secondary, non-characteristic products[12]. If firms are categorized in the various industries in the I-O table solely on the basis of their primary products, without taking specific account of the problem of secondary products, the result is an 'industry-by-industry table'. In a 'commodity-by-commodity' table the secondary products, including this input structure, are separated from the primary products whenever possible, and reallocated to other industries to obtain a more or less homogeneous table[13].

However there is as yet no labour market data consistent with the categorization of productive activities in the commodity-by-commodity table. As a consequence, the test has to be conducted using the less appropriate 60x60 industry-by-industry table. This table had to be aggregated to a corresponding 40x40 table to make it possible to use the detailed labour data in the SAM.

5.4 Production Technology of Imports

Because no data is available on the production techniques actually used in the countries producing the imports, the analysis discussed here has to be based on some assumptions with regard to the production technology of

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12) Two cases can be distinguished (see Konijn (1994), pp. 60-64): (1) subsidiary products,: the products are technically unrelated, so that it is in principle possible to attribute inputs to each of the various products; (2) by-products and joint product(s) are produced simultaneously, and inputs cannot be attributed to each of the various products.

13) Statistics Netherlands has compiled such a commodity-by-commodity table for 1991 (see Konijn and De Boer (1993)).

imports. In line with one of the postulates of the Heckscher-Ohlin-Vanek theory, we follow the 'equal technology' assumption, i.e., that the production technology of competitive imports is assumed to be equal to the production technology in competing industries in the importing country[14].

5.5 Valuation of I-O Tables

According to SNA'93, I-O tables can be valued in (i) basic prices, (ii) producer prices, and (iii) purchasers' prices. It is important in testing the Heckscher-Ohlin-Vanek theory to use basic prices as only this valuation excludes the distorting effect of government taxes and subsidies on products. Valuations in basic prices can be considered to reflect relative abundances of production factors more accurately than other valuation methods. For our analysis we used the 1991 I-O table for the Netherlands valued in basic prices.

5.6 Remarks on the Labour Data Used

In the SAM, total employment data in full-time equivalents for 40 industries are split into 7 different subtotals based on the levels of education of the employees: (i) primary education (BO), (ii) junior general secondary education (MAVO), (iii) junior secondary vocational education (LBO), (iv) senior general secondary education and pre-university education (HAVO/VWO), (v) senior secondary vocational education (MBO), (vi) higher vocational education (HBO), and (vii) university education (WO)[15].

Moreover, the Social Accounting Matrix supplies corresponding detail on the wages per industry. Consequently, the SAM offers ample opportunities to derive proxies for the human capital used in producing goods and services in the Netherlands. Three well-known methods to assess the volume

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14) As has been argued before, most international trade of the Netherlands is between the Netherlands and other industrialized countries. (In 1990 83% of Dutch imports was imported from OECD countries, whereas 89% of Dutch exports was exported to OECD-countries; source: Statistics Netherlands.) It may be expected that these countries have more or less similar input-output coefficients.

15) The figures include the self-employed.

of human capital inputs are: (i) valuation based on years of initial education, (ii) valuation based on wages paid per educational level and per industry, and (iii) valuation based on the average wage per educational level of the total economy. The last of these methods avoids the possible effect of industry-specific elements but, as Reininga (1994) has shown, the choice of valuation method does not influence the outcome of the factor content calculations, at least for the Netherlands. In our analysis we have adopted valuation method (ii), since this method values human capital in monetary units (like physical capital, see below) and at the most disaggregated level.

5.7 Remarks on the Capital Data Used

The capital input is assumed to be equal to depreciation costs. However in the Netherlands no depreciation data detailed at the level of our 40x40 I-O table is available. In line with standard Leontief I-O theory regarding fixed I-O coefficients, the data on depreciation is disaggregated on the basis of output data. Two types of physical capital are distinguished: machinery and (transport) equipment, and construction, which covers all residential construction, non-residential construction and other construction[16].

16) This may not be the most adequate measurement of capital input, as e.g. the input cost of financial capital is then overlooked (see Keuning and Reininga (1996)).

6. The Revealed Factor Endowments Of Dutch Trade

The factor content analysis in this section includes all industries of the Dutch economy[17]. First, the results for the total economy are shown. Then the factor content analysis is repeated at a more detailed level, distinguishing 8 classes of industries. Moreover, a regression analysis is carried out for 40 individual industries to test the robustness of the results presented in subsections 7.1 and 7.2. This section closes with some conclusions based on the factor content analysis.

As indicated by equation (6), the larger the ratio between the factor content of net trade and the factor content of consumption is for a given production factor, the larger the revealed factor endowment of the factor and therefore the larger the revealed comparative advantage in goods that make intensive use of this production factor. The ranking of factor content ratios is presented for seven educational categories of labour and for two types of physical capital. For a more comprehensive analysis, the seven categories of labour are also aggregated to three levels of educational qualifications: low, intermediate and high-skilled labour.

6.1 Analysis at the Macro Level

Table 1a shows the factor content ratios of net exports relative to domestic consumption of all sectors of the Dutch economy. The ratios are high for machinery and equipment, primary education (BO), junior secondary vocational education (LBO) and junior secondary general education (MAVO) and low for higher vocational education (HBO) and academic education (WO). The table shows moderate factor content ratios for senior secondary general education (HAVO/VWO), for senior secondary vocational education (MBO) and for the construction component of physical capital.

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17) The results presented here are based on an analysis using a 40x40 industry-by-industry I-O table. This I-O table matches the detail on labour input derived from the 1991 SAM for the Netherlands.

Table 1a

Dutch factor contents (millions of guilders) of net exports (F) and domestic final use (D), for seven educational categories, 1991

Production factor (k)	Fk	Dk	Fk/Dk	ranking
all industries				
BO	4,091	14,332	0.285	2
MAVO	2,208	10,648	0.207	4
LBO	6,850	25,461	0.269	3
HAVO/VWO	1,570	8,336	0.188	6
MBO	13,596	71,042	0.191	5
HBO	4,654	35,787	0.130	8
WO	2,175	20,614	0.106	9
construction	2,696	18,820	0.143	7
machinery and equipment	8,322	20,803	0.400	1

Note: BO = primary education, MAVO = junior general secondary education, LBO = junior secondary vocational education, HAVO = senior general secondary education, VWO = pre-university education, MBO = senior secondary vocational education, HBO = higher vocational education, WO = university education.

Table 1b shows results similar to those in table 1a, except that the seven educational categories of labour have been aggregated to three levels of educational qualifications: low-skilled labour (BO, MAVO, LBO), intermediate-skilled labour (HAVO/VWO, MBO) and high-skilled labour (HBO, WO).

Table 1b

Dutch factor contents (millions of guilders) of net exports (F) and domestic final use (D), for three levels of educational qualifications, 1991

Production factor (k)	Fk	Dk	Fk/Dk	ranking
all industries				
low-skilled	13,149	50,440	0.261	2
intermediate-skilled	15,166	79,379	0.191	3
high-skilled	6,828	56,402	0.121	5
construction	2,696	18,820	0.143	4
machinery and equipment	8,322	20,803	0.400	1

The rankings of factor ratios in tables 1a and 1b show that the rank order from the most abundant to the least abundant production factor in the Netherlands is as follows: machinery and equipment, low-skilled labour, intermediate-skilled labour, construction, high-skilled labour. Although the absolute abundance cannot by determined by the ranking of the factor content ratios, one might expect that machinery and equipment and low-skilled labour are abundant and that high-skilled labour is scarce in the Netherlands.

Finally, table 2 confirms the relative significance of low-skille labour for net exports of the Netherlands.

Table 2

Dutch factor content shares of low, intermediate and high-skilled in the total labour content of net exports (F) and domestic final use (D), 1991

Skill category	F	D
low-skilled	0.37	0.27
intermediate-skilled	0.43	0.43
high-skilled	0.19	0.30
total	1.00	1.00

6.2 Analysis at Industry Class Level

Table 3 shows the factor content calculations for 8 classes of industries. The ranking of the factor content ratios for the agriculture and fisheries sector shows that this sector specializes in goods in which low-skilled labour is intensively used, in contrast to the mining and quarrying sector and the manufacturing sector. The manufacturing sector specializes in goods that make intensive use of high-skilled labour, whereas the mining and quarrying sectors specializes in goods that make intensive use of physical capital (both machinery and equipment and construction). Another point of interest is the high ratio of net exports to domestic consumption in the agriculture and fisheries sector and the mining and quarrying sector.

The ranking of the factor content ratios shows that the utilities and construction industry, the transportation, storage and communication industry and the commercial services industry all specialize in goods that make intensive use of high-skilled labour. The trade, storage and repair of consumer goods and the other services industry specialize in goods that make intensive use of low-skilled labour and machinery and equipment. The utilities and construction industry and the trade, hotels and repair of consumer goods industry also specialize in goods that make intensive use of construction.

Table 3

Dutch factor contents (millions of guilders) of net exports (F) and domestic final use (D) per classes of industries, 1991

Production factor (k)	Fk	Dk	Fk/Dk	ranking
Agriculture and fisheries (agr)				
low-skilled	2,461	314	7.843	1
intermediate-skilled	2,341	308	7.600	2
high-skilled	486	65	7.512	5
construction	648	85	7.578	4
machinery and equipment	1,495	197	7.593	3
Mining and quarrying (min)				
low-skilled	110	3	33.901	5
intermediate-skilled	236	5	42.922	3
high-skilled	170	4	42.634	4
construction	127	2	52.344	2
machinery and equipment	444	8	54.029	1
Manufacturing (man)				
low-skilled	7,089	5,976	1.186	5
intermediate-skilled	8,664	7,045	1.230	4
high-skilled	4,563	2,977	1.532	1
construction	1,423	1,093	1.301	3
machinery and equipment	3,992	2,876	1.388	2
Utilities and construction (uti)				
low-skilled	-1,744	9,630	-0.181	5
intermediate-skilled	-1,882	10,449	-0.180	4
high-skilled	-552	3,092	-0.178	3
construction	-321	1,880	-0.171	1
machinery and equipment	-538	3,050	-0.176	2
Trade, hotels, repair of consumer goods (hot)				
low-skilled	-241	3,222	-0.075	3
intermediate-skilled	-534	4,272	-0.125	4
high-skilled	-167	1,258	-0.133	5
construction	-37	539	-0.069	1
machinery and equipment	-76	1,037	-0.073	2
Transport, storage and communication (trp)				
low-skilled	2,555	2,819	0.906	5
intermediate-skilled	2,553	2,773	0.921	4
high-skilled	1,013	891	1.137	1
construction	421	415	1.014	3
machinery and equipment	1,865	1,829	1.020	2
Commercial services (com)				
low-skilled	342	4,651	0.074	3
intermediate-skilled	658	9,743	0.068	4
high-skilled	784	6,354	0.123	2
construction	65	8,864	0.007	5
machinery and equipment	229	1,749	0.131	1
Other services (oth)				
low-skilled	2,576	23,824	0.108	1
intermediate-skilled	3,131	44,784	0.070	3
high-skilled	532	41,761	0.013	5
construction	371	5,942	0.062	4
machinery and equipment	911	10,058	0.091	2

6.3 Analysis at Industry Level

Bowen and Sveikauskas (1992) argue that if the vector of net exports T_i is regressed on the input requirements (given by matrix A), the signs of the estimated coefficients indicate the revealed factor abundances of the respective production factors. Although Leamer and Bowen (1981) note that this regression analysis is not theoretically correct, their theoretical concern seems to be of little empirical importance with regard to the reliability of the positive and negative signs of the estimated coefficients as indicators of revealed factor abundance and scarcity, respectively (Bowen and Sveikauskas, 1992). While the factor content ratios found in the analysis at country level (see above) could only indicate the relative abundance of production factors, the signs of the estimated coefficients in the regression analysis show the absolute (positive or negative) trade-revealed factor endowments. Moreover, the reliability of the estimated coefficients as indicators of revealed factor abundance improves if net exports per industry are corrected for the trade imbalance. This correction has been made, for each of the 40 industries, and the adjusted net exports are then regressed on the input requirements of low, intermediate and high-skilled labour, and construction and machinery and equipment. The results of the regression analyses are presented in table 5.

Table 4

Estimated indicators of revealed factor endowments: net exports adjusted for trade imbalance regressed on input requirements, for 40 industries, 1991

	all	all-	manu
constant	-206 (-0.16)	-544 (-0.42)	-2,185 (-1.37)
low-skilled labour	8,707 (0.91)	12,757 (1.27)	-146,187 (-1.77)[a]
interm.-skilled labour	-38,244 (-2.11)[b]	-47,078 (-2.28)[b]	-159,634 (-1.73)
high-skilled labour	-14,506 (-1.21)	-13,540 (-1.14)	209,606 (1.81)[a]
construction	-80,422 (-1.90)[a]	-76,882 (-1.83)[a]	270,652 (0.37)
machinery and equipment	180,755 (3.33)[c]	199,883 (3.29)[c]	706,595 (3.78)[c]
adjusted R^2	0.24	0.24	0.75
F-stat.	3.40[b]	3.22[b]	10.66[c]
observations	40	36	17

Notes: absolute t-values between brackets; the abbreviations all, all-, and manu stand for all industries, all industries excluding natural resource industries (agriculture and mining), and only manufacturing industries respectively.

a = significant at the 10% level; b = significant at the 5% level; c = significant at the 1% level

The positive signs of low-skilled labour and machinery and equipment in the regression equation for all sectors reveal that these production factors are abundant. Intermediate-skilled labour, high-skilled labour and construction are all scarce. These results are not dependent on including the resource-intensive industries, as is often stated (see e.g. Branson and Monoyios (1977)). Table 5 also shows that the manufacturing industries make intensive use of high-skilled labour. These findings confirm the above results of the factor content analysis at the level of classes of industries.

The factor content analysis shows that the Dutch economy is revealed to be abundant in machinery and equipment and low-skilled labour, and scarce in intermediate and high-skilled labour and the construction component of physical capital. This implies that, overall, the Netherlands has a revealed comparative advantage in goods that are intensive in the use of machinery and equipment and low-skilled labour, and a revealed comparative

disadvantage in goods that are intensive in the use of intermediate-skilled labour, high-skilled labour and construction. In general, the data suggest a relatively high net exports of industries with little skill content, namely agriculture and mining.

However, analysis at the industry class level shows a number of important exceptions to the overall picture. In a number of classes of industries, such as the manufacturing industry and the transport, storage and communication industry, the Netherlands is specialized in goods that make intensive use of high-skilled labour. In manufacturing a low propensity to substitute between high-skilled labour and machinery and equipment may partly explain this different result (see Gelauff and Graafland (1994)).

7. The True Factor Endowments of the Netherlands

The factor content analysis of the last section is based on the left-hand side of equation (4), which measures the trade-revealed factor endowments. The right-hand side of this equation measures the true factor endowments, which will be examined in this section. The true factor endowments of the Netherlands are calculated relative to 20 OECD countries. For this reason the true factor endowments are also called relative factor endowments. Equation (4) indicates that the two definitions of factor abundances must correspond to each other. If the factor contents of trade flows are not in line with the true factor endowments then the HOV theorem must be rejected. This section will (qualitatively) test whether the HOV theorem can be confirmed or must be rejected for the case of the Netherlands.

However the data used in this section is different from that used in the previous section, with regard to both sources and definitions[18]. First, the relative factor endowments of low-skilled, intermediate-skilled and high-skilled labour have been calculated from the OECD data (1992, 1993) and refer to the level of educational attainment of the whole population between 15 and 64 years old. The factor content data used in section 6 was drawn from national statistics (see section 5) and referred to the wage sum of the three skill categories of the working population[19]. Second, relative factor endowments of physical capital (machinery and equipment and construction) have been calculated from the Penn World Tables (mark 5.6) and refer to the stock of physical capital instead of depreciation used in section 6. As a result, there may be differences between the Dutch revealed factor abundances on the one hand (section 6) and the Dutch true factor abundances on the other hand (this section).

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18) The reference year for the data in this section is 1990. This differs from the reference year (1991) in the previous sections. This is not considered to be a problem, since factor endowments and trade patterns generally change only slightly over time.

19) Nevertheless, the definitions of the levels of educational qualifications are similar in the two data sources. Low-skilled labour refers to ISCED 0/1/2, intermediate-skilled labour refers to ISCED 3, and high-skilled labour refers to ISCED 6/7.

Table 5 presents the relative factor endowments of low (LSW), intermediate (ISW) and high-skilled (HSW) labour, machinery and equipment (PRO) and construction (CON) for 21 OECD countries, including the Netherlands (NET). The right-hand side of equation (4) indicates that the relative factor endowments, $(E_{ki}/E_{kw})/(Y_{ki}/Y_{kw})$[20], will be larger than one in case of a true factor abundance. The rank order of the true factor endowments for the Netherlands is (from high to low): low-skilled labour, machinery and equipment, intermediate-skilled labour, construction, high-skilled labour. The differences between the last three relative factor endowments are very small. The Netherlands takes an intermediate position in the rank orders of all relative factor endowments shown in table 5, except for the low ranking of the construction component of physical capital. This shows the moderate pattern of specialization of the Netherlands compared to most other countries.

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20) A is measured in 1990 international prices (source: Penn World Table (Mark 5.6)).

Table 5

Relative factor endowments of low (LSW), intermediate (ISW) and high-skilled (HSW) labour, machinery and equipment (PRO) and construction (CON) per country, 1990

LSW		ISW		HSW		CON		PRO	
1. TUR	7.71	1. AUT	1.61	1. CAN	1.48	1. SWI	2.04	1. SWI	1.52
2. POR	4.54	2. JAP	1.49	2. AUS	1.30	2. SWE	1.41	2. SWE	1.40
3. SPA	2.40	3. GER	1.45	3. USA	1.24	3. GER	1.41	3. GER	1.31
4. IRE	2.02	4. NOR	1.30	4. JAP	1.18	4. CAN	1.25	4. JAP	1.24
5. ITA	1.90	5. UKI	1.29	5. NEZ	1.15	5. NOR	1.23	5. FIN	1.15
6. BEL	1.46	6. SWI	1.29	6. NOR	1.08	6. SPA	1.21	6. AUS	1.09
7. NEZ	1.40	7. DEN	1.21	7. SWE	1.03	7. DEN	1.13	7. FRA	1.08
8. FRA	1.31	8. SWE	1.09	8. DEN	0.91	8. JAP	1.12	8. UKI	1.02
9. DEN	1.27	9. FIN	1.08	9. TUR	0.88	9. SWE	1.11	9. DEN	1.02
10.FIN	1.19	10.NEZ	0.91	10.IRE	0.84	10.ITA	1.05	10.NEZ	1.01
11.AUS	1.18	11.USA	0.90	11.FIN	0.83	11.AUS	0.99	**11.NET**	**1.00**
12.NET	**1.14**	12.TUR	0.90	**12.NET**	**0.81**	12.AUT	0.99	12.ITA	0.99
13.JAP	1.08	**13.NET**	**0.83**	13.BEL	0.80	13.FRA	0.93	13.AUT	0.98
14.UKI	1.06	14.FRA	0.81	14.SWI	0.77	14.BEL	0.92	14.NOR	0.94
15.AUT	1.00	15.CAN	0.74	15.UKI	0.76	15.NEZ	0.92	15.BEL	0.90
16.SWE	0.94	16.IRE	0.70	16.GER	0.73	16.USA	0.90	16.USA	0.88
17.GER	0.60	17.AUS	0.58	17.FRA	0.63	17.POR	0.85	17.IRE	0.88
18.NOR	0.58	18.BEL	0.53	18.SPA	0.48	**18.NET**	**0.82**	18.TUR	0.70
19.CAN	0.57	19.ITA	0.50	19.AUT	0.33	19.IRE	0.79	19.CAN	0.69
20.SWI	0.47	20.SPA	0.32	20.POR	0.30	20.TUR	0.69	20.SPA	0.64
21.USA	0.38	21.POR	0.13	21.ITA	0.25	21.UKI	0.56	21.UKI	0.56

Sources: Penn World Table (Mark 5.6); Education at a Glance (OECD, 1992, 1993).
Notes: German figures refer to the former Federal Republic of Germany; German levels of educational attainment are from 1989; Japanese levels of educational attainment are from 1987. See the appendix for the abbreviations of the countries.
AUS=Australia; AUT=Austria; BEL=Belgium; CAN=Canada; DEN=Denmark; FIN=Finland; FRA=France; GER=Germany; IRE=Ireland; ITA=Italy; JAP=Japan; NET=Netherlands; NEZ=New Zealand; NOR=Norway; POR=Portugal; SPA=Spain; SWE=Sweden; SWI=Switzerland; TUR=Turkey; UKI=United Kingdom; USA=United States

The rank order of the true factor endowments of the Netherlands is almost identical to the rank order of the trade-revealed factor endowments except for the switched ranking of machinery and equipment and low-skilled. Moreover, the true factor abundance of low-skilled labour is consistent with the positive trade-revealed factor endowment of low-skilled labour in section 6. The scarcity of intermediate-skilled labour, high-skilled labour and the construction component of physical capital is also reflected by the negative trade-revealed factor endowments of these production factors in the previous section. However, the true factor endowment of machinery and equipment in the Netherlands in table 5 does not indicate a true factor abundance, since it equals one, although it was the most abundant revealed Dutch factor endowment in the factor content analysis of section 6. It follows that the HOV theorem cannot be rejected for the case of the Netherlands, although our results do not provide a

very strong confirmation.

8. Conclusions

This paper has shown that the Netherlands has factor abundances in machinery and equipment and low-skilled labour, whereas it has factor scarcities in intermediate-skilled labour, high-skilled labour and the construction component of physical capital. However, according to the ranking of the Dutch true factor endowments relative to other industrialized countries, the Netherlands has a very moderate pattern of specialization. Although it may be surprising to find that the Dutch economy has a factor abundance in low-skilled labour and a factor scarcity in intermediate and high-skilled labour, it is promising that a number of classes of industries, particularly the manufacturing industry, are specialized in goods that use high-skilled labour intensively, rather than low-skilled labour. Moreover, the factor content analysis at sector level revealed that the factor services of high-skilled labour are used particularly for domestic final use.

The differing results of the factor content ratios for the manufacturing industries and other industries highlight the relevance of including all industries when drawing conclusions about trade-revealed factor abundances of human and physical capital. In other words, conclusions with regard to factor abundances based on an empirical analysis of only the manufacturing industries (as in e.g. Koekkoek and Mennes (1984), for the Netherlands), may be misleading.

A comparison of the trade-revealed factor endowments with the true factor endowments of the Netherlands leads to the conclusion that there is some empirical evidence in favour of the HOV theorem for the case of the Netherlands. The HOV theorem can at least not be rejected for the Netherlands. It will not be possible to draw a final conclusion with regard to the value of the HOV theorem until more countries are analyzed using the method followed in this paper. However, this is only possible if statistical information from various national data sources can be consistently used, for example by means of a social accounting matrix.

Our main conclusion - the empirical relevance of the HOV theorem - corresponds to other studies using factor content analysis, e.g. Leamer (1984), Cörvers and De Grip (1995), Clifton and Marxsen (1984), Webster (1993), Maskus et al.(1994), and Webster and Gilroy (1995). However, as has been stated in section 2, we do not consider the HOV theorem the sole explanation of the composition of international trade flows. An eclectic view, taking also classical and modern views into account, seems more promising. Especially, the importance of agriculture and mining in net exports in the Netherlands may also point to the relevance of Ricardian explanations of our international trade pattern.

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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).
This paper presents a proposal for the synoptic structure of the next SNA. This system is easier to explain than 1986 SNA; it provides a complete integration of input-output data and the income distribution data; it is more flexible and greatly facilitates micro-macro linkage.

NA/15 Features of the hidden economy in the Netherlands, Van Eck, R. and B. Kazemier (1986).
This paper presents the results of extensive and rigorous survey research into the black labour market in the Netherlands. It reveals the quantitative relevance of the hidden economy and gives detailed information on its structure.

NA/16 Uncovering hidden income distributions: the Dutch approach, Van Bochove, C.A. (1987).
The three modules in this paper constitute a system of Socio-Economic Accounts that provides a complete description of the distribution of income, both primary, secondary, tertiary and informal, as well as a complete description of the distribution of consumption and saving.

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 of the main problems associated with the compilation of long-term series. It is the purpose of this paper to make the historical series accessible to non-Dutch readers.

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).
The issue of the proper way to account for the consequences of crisis and disaster is best brought into focus by studying a practical case. In this paper the damage caused by the second world war in the Netherlands is used as an example. Constant wealth national income is introduced as an alternative income concept.

NA/20 **The micro-meso-macro linkage for business in an SNA-compatible system of economic statistics**, Van Bochove, C.A. (1987).
The new system of national accounts will be a fully integrated meso system: not only will each process be described at the meso level, but the linkages between the processes will also be shown at the meso level. A central role is played by the three-dimensional generation of value added matrix.

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 to form a basis for the classification of these units. The system is constructed in such a way that the sector classification of the SNA and the ESA can be derived from it.

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 employment 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/57_Ext.**).

NA/57_Ext. **Compiling Dutch Gross National Product (GNP); full report on the final estimates after the revision in 1992**, Bos, Frits and Cor N. Gorter (1993).
This report describes the compilation of 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. The description covers i.a. data sources, sampling features of the surveys, grossing up procedures, adjustments for underreporting and the integration process.

NA/58 The 1987 revision of the Netherlands' National Accounts, Van den Bos, C and P.G. Al (1994).
The 1987 revision that was completed 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 Dutch agricultural accounts, Pauli, Peter and Nico van Stokrom (1994).
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).

NA/66 **Comparability of the sector General Government in the National Accounts, a case study for the Netherlands and Germany**, Streppel, Irene and Dick Van Tongeren (1994).
This paper questions the international comparability of data concerning the sector General Government in the National Accounts. Two differences are distinguished: differences due to lack of compliance with international guidelines and institutional differences. Adjustments to National Accounts data are reflected in a separate module which comparises Germany versus The Netherlands. The module shows that total General Government resources as well as uses are substantially higher in the Netherlands.

NA/67 **What would Net Domestic Product have been in an environmentally sustainable economy?, Preliminary views and results**, De Boer, Bart, Mark de Haan and Monique Voogt (1994).
Sustainable use of the environment is a pattern of use that can last forever, at least in theory. This pattern is likely to render a lower net domestic product than the present economy. The coherence between reductions in pressure on the environment and changes in net domestic product is investigated with the help of a simple multiplier model. This model is based on a National Accounting Matrix including Environmental Accounts (NAMEA).

NA/68 **A Social Accounting Matrix for the Netherlands, concepts and results,** Timmerman, Jolanda G. and Peter J.M. van de Ven (1994).
In this paper a Social Accounting Matrix (SAM) for the Netherlands is presented. Two years are covered: 1988 and 1990. The SAM is an integrated data framework based on national accounts extended with information on distribution of income, consumption and wealth among household. Furthermore, labour income and employment are subdivided into several labour categories. The tables of the SAMs of both 1988 and 1990 are available on separate floppy disks at the costs of DFL. 65 each.

NA/69 **Analyzing relative factor inputs of Dutch exports: An application of the 1991 Social Accounting Matrix for the Netherlands**, Cörvers, Frank and Ted Reininga (1996).
The paper analyses the human and physical capital content of Dutch trade and tests the validity of the controversial Heckscher-Ohlin-Vanek (HOV) theorem of international trade for the Netherlands. The factor content analysis shows that the Netherlands is abundant in machinery and equipment and low-skilled labour and is poor in intermediate and high-skilled labour and construction. These findings are in line with the true Dutch factor endowments. This underlines the relevance of the HOV theorem in the Dutch case.

NA/70 **SESAME for the evaluation of economic development and social change**, Keuning, Steven J. (1994).
This paper elaborates on the concept of a System of Economic and Social Accounting Matrices and Extensions, or SESAME for short. The SESAME-concept serves to meet the criticism that conventional national accounts take a too limited view at social, environmental and economic development. SESAME details the monetary accounts and couples non-monetary information in an integral system approach. SESAME is meant as a synthesis of national accounts and the social indicators approach.

NA/71 New revision policies for the Dutch National Accounts, Den Bakker, Gert P., Jan de Gijt and Robert A.M. van Rooijen (1994).
This paper presents the (new) revision policy for the Dutch National Accounts. In the past, several major revisions of national accounting data have been carried out in the Netherlands. In the course of time, the policy has changed several times. Recently, the aim has become to publish relatively long time-series shortly after the publication of the revised benchmark year data.

NA/72 Labour force data in a National Accounting framework, Den Bakker, Gert P. and Jan de Gijt (1994).
This paper deals with the Dutch interwar labour force data. Starting with census data the estimation of the working and non-working labour force by industry and by occupational type is described and the results are discussed. The data have been estimated within the national accounts framework. It is the first time that labour market figures at a meso-level have been estimated which are linked to other national accounting figures.

NA/73 Integrated estimates of productivity and terms-of-trade changes from a Social Accounting Matrix at constant prices, Keuning, Steven J.(1994).
This paper demonstrates that measures of real income change for the total economy can best be derived from real income changes per subsector. For this purpose a Social Accounting Matrix (SAM) at constant prices has been compiled. By breaking down value added at constant prices into constant price estimates for each primary input category, productivity changes by industry can be estimated as an integral part of the regular national accounts compilation. The national total trading gain or loss from a change in the terms of trade is as well allocated to subsectors, thus embedding the estimation of this macro-measure into a meso-consistency framework. These ideas have been applied in a case-study for Indonesia.

NA/74 Taking the environment into account: The Netherlands NAMEA's for 1989, 1990 and 1991, De Haan, Mark and Steven Keuning (1995).
The National Accounting Matrix including Environmental Accounts (NAMEA) contains figures on environmental burdens in relation to economic developments as reflected in the National accounts. NAMEA's for the Netherlands in 1989, 1990 and 1991 have now been completed. They include a more detailed industrial classification and a series of environment taxes and levies, plus environmental protection expenditures by industry and households. Further, the depletion of two important mineral resources in the Netherlands is now incorporated in the NAMEA's.

NA/75 Economic theory and national accounting, Bos, Frits (1995).
This paper describes the relationship between economic theory and national accounting. This relationship is often misunderstood, by economic theorists and national accountants alike. Attention is drawn to the consistency required in a national accounting system, to national accounts figures as a transformation of primary data and to the fundamentally different valuation principles employed in economic theory and national accounting (forward looking and analytic versus backward looking and descriptive). The gap between economic theory and national accounting can only be bridged by satellite accounts, as in these accounts consistency with the overall system and valuation at current exchange value are not strictly required.

NA/76 An information-system for economic, environmental and social statistics, Keuning, Steven J. and Jolanda G. Timmerman (1995).
The 1993 SNA mentions that a SAM can also be extended to deal with environmental issues. This entails the integration of a SAM and a NAMEA into a SAMEA (Social Accounting Matrix including Environmental Accounts), a further extension into the direction of a so-called SESAME (System of Economic and Social Accounting Matrices and Extensions). This paper shows how environmental data and environmental indicators can be integrated into such a system. A Dutch case-study shows the interrelations between e.g. the employment of various types of workers (by sex/educational level) and the environmental problems caused by the activities in which they are employed. Moreover, this pollution is also allocated to the subsectors that receive value added. This enables a comparison with the consumption-based pollution by subsector. The SAMEA yields a framework for an integrated analysis and modelling of social, economic and environmental issues.

NA/77 Material flows, energy use and the structure of the economy, Konijn, Paul J.A., Sake de Boer and Jan van Dalen (1995).
Many environmental problems are connected to production and use of materials and energy. It would therefore be desirable to have an information system that gives consistent, complete and detailed information on material and energy flows. Such a system would even be more useful if it could be connected directly to economic data. This paper presents such a system. Based on the foundation laid by the national accounts the authors construct a system for the analysis of flows of materials and energy through the economy. In this paper the proposed system is illustrated with an application to the flows of iron/steel and energy. An input-output table is presented that describes the production processes in the ferrous metal branch entirely in physical units. Subsequently, steel contents of final products are calculated, and an analysis is made of the consequences of a new technology in the basic steel industry on total energy use in the economy.

NA/78 Calendar effects on quarterly GDP-growth rates, Reininga, Ted K. and Brugt Kazemier (1996).
Since 1986 Statistics Netherlands publishes Quarterly National Accounts. The earliest estimates of quarterly GDP, the so-called flash estimates, are published some seven weeks after the reference quarter. In this paper we examine a new, faster flash estimate, some three to four weeks earlier than its original counterpart. The gain is made by using a simple regression technique and incomplete data. To compensate for the lack of data, information on the number of working-days and shopping-days was added to the regression. It turns out that these calendar-aspects significantly affect GDP-growth: 0.30%-points extra GDP-growth for one extra working-day. One extra shopping-day accounts for about 0.17%-points extra GDP-growth.

NA/79 The NAMEA experience. An interim evaluation of the Netherlands' integrated accounts and indicators for the environment and the economy, Keuning, Steven J. (1996).
The national accounts publication in the Netherlands contains not only the conventional economic accounts and indicators, but also an integrated system of environmental and economic accounts, the NAMEA (National Accounting Matrix including Environmental Accounts). This paper reports on the present status of the NAMEA-approach and gives a concise summary of this approach. It reviews the present applications of this framework in the Netherlands and, finally, a comparison with the SEEA is made and various common misunderstandings regarding Green National Income are set out.

NA/80 What's in a NAMEA? Recent results of the NAMEA-approach to environmental accounting, Keuning, Steven J. and Mark de Haan (1996).
The National Accounting Matrix including Environmental Accounts (NAMEA) shows environmental pressures in physical units that are consistent with the monetary figures in the national accounts. This paper introduces the NAMEA-concept, provides some illustrative analyses of the recently cpmpleted NAMEA time-series, and demonstrates that social accounts and social indicators can easily be intgrated. This results in a fairly broad, multi-purpose statistical information system.

NA/81 Balance sheet valuation: produced intangible assets and non-produced assets, Pommée, Marcel and Willem Baris (1996).
This paper deals with the estimation of opening and closing stocks of produced intangible assets such as mineral exploration, computer software and artistic originals and non-produced assets such as land, subsoil assets, patented entities and purchased goodwill. The first section elaborates on the main conceptual issues related to the compilation of stock data such as the asset boundary, the relation between flows and stocks and principles of valuation. The following sections discuss each of the asset categories in detail.

NA/82 Micro-meso-macro linkage for labour in The Netherlands, Leunis, Wim P. and Jolanda G. Timmerman (1996).
This paper describes recent developments in the area of labour market statistics and shows the advantages of integrating these data in the system of Labour accounts and in Social Accounting Matrices. The benefits of such integrated information surpasses the sum of the benefits of various source data. A subsequent effort to adjust the micro data and aggregate figures increases the possible uses of statistics even further.

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