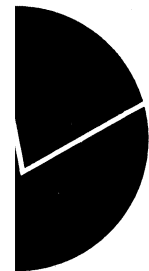Statistics Norway
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**Contributions of Ragnar Frisch
to National Accounting**

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Abstract:
The paper demonstrates that Ragnar Frisch already in the late 1920's presented a conceptual system of national accounts similar to that of modern national accounts, and how this system was further developed during the 1930's and 1940's. It also describes an attempt by Frisch to develop numerical national accounts for Norway. Pointing out how these contributions occurred as a part of an international trend, the paper concludes that their impact on official national accounting appears dominating to such a degree that Frisch perhaps, even internationally, deserves the distinction as a major originator of national accounting.

Keywords:
Conceptual clarification, standardization of concepts, numerical national accounting and impact on official national accounts.

1. Introduction

During a period of about 20 years Ragnar Frisch frequently worked on the definition of macro-economic concepts and the relationships between them. He did this to make the theory of macro-economics more precise, to develop a standardized system for national economic accounting and to construct macroeconomic models.

In 1928-29, 1933-34, 1935, the fall of 1940 and the spring of 1942 Frisch held series of lectures at the University of Oslo dealing, *inter alia* , with conceptual systems. Records of these lectures are filed at the Institute of Economics of this university. In addition he delivered a few lectures in Stockholm on the same kind of subjects.

Frisch also published papers, dealing more or less with similar issues in the following years:

- 1931, a paper delivered to a meeting of Nordic economists,
- 1933, a famous article in honour of Gustav Cassel,
- 1935, an annex to an official Norwegian report on Open Market Operations,
- 1939, a paper delivered to a meeting of Nordic statisticians, dealing with an attempt at numerical national accounting,
- 1942, a mimeographed paper on the so-called Ecocirc-System (the Economic circulation System),
- 1943, a condensed version of this paper, published in the Swedish Ekonomisk Tidskrift,
- 1948, a mimeographed paper of 8 March to the United Nations Subcommittee on Employment and Economic Stability,
- 1948, a mimeographed note of 22 December, describing the national accounting work done at the Institute of Economics since 1932, and
- 1952, an annex to the recommendations of the Norwegian Council for Monetary and Financial Policy, of which he was a member.

Records of the lectures and most of the other presentations mentioned above, are available in Norwegian only. Quotations from these presentations are translated into English by me.

The first two series of lectures focused on conceptual clarification. These are discussed in section 2. The three subsequent series, and several presentations which placed emphasis on standardization, are dealt with in section 3. An attempt at numerical national accounting is briefly described in section 4. The contributions of Frisch to national accounting have had a major impact on official national accounting in Norway, and to some degree also internationally. This is the subject of section 5.

2. Conceptual clarification

At the time when Ragnar Frisch began his scientific career, literature on economic theory was characterized by concepts that were not clearly defined, and by terms used in everyday language, often with several meanings. As a consequence, misunderstandings frequently occurred and disagreements resulted even when there were no real differences of opinion. Frisch obviously considered it important to tidy up this confusion, not least in macroeconomics.

He focused to a high degree on this in the first series of the lectures mentioned above. Already in 1928-29 Frisch succeeded in defining a system of macroeconomic concepts surprisingly similar to that of modern national accounts. He presented this system both algebraically and by a graph termed «Tableau Economique».[1] In Table 1, the system is represented by a set of accounts.

Table 1. A set of concepts and definitional relationships defined in 1928-1929

Accounts / Entries	Production Debit	Production Credit	Use of resources Debit	Use of resources Credit	Application of income Debit	Application of income Credit	Increase of capital Debit	Increase of capital Credit
Gross product		a	a					
Input of commodities	v_0			v_0				
Depreciation of fixed capital	v^o			v^o				
Wage income	e					e		
Capital income (interest)	d					d		
Current surplus	r					r		
Land rent	s					s		
Change per unit of time in:								
Stocks of commodities				w			w	
Land				o			o	
Claims (pos. and neg.)				h			h	
Goodwill (capitalized surplus)				k			k	
Consumption				z	z			
Change per unit of time in total net wealth equalling net saving					f			f
Sum	v_0+v^o $+g$ =	a	a =	v_0+v^o $+f+z$	z+f =	g	w+o $+h$ = $+k$	f

This table includes the main concepts and relations that Frisch defined in 1928-1929. The account for Production shows gross product(a) which after deduction for the intermediate input of commodities (v_0) and the depreciation of real capital (v^o) equals the net income (g). This income is derived from labour (e), capital income (interest) (d), surplus (r) and land rent (s). The account for Use of resources shows the application of gross product classified by seven categories. Among these the sum of the

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[1] The list of contents of the first series includes a section on the Tableau Economique, but no record of this section exists.

increases of commodity stocks (w), land (o), claims (h) and goodwill (k) equals the increase of net wealth (f) or the net saving. The account for Application of income shows saving (f) as a difference between the sum of incomes (g) and the consumption (z). The account for the Increase of capital finally indicates that the increase of net wealth equals net saving.

For students of economics in the late 1920s such a conceptual system was rather unusual. According to the records Frisch tried to justify it as follows: «In economics it is of great importance that one to a certain degree standardizes the designations of quantitative concepts. This is mnemotechnically of great usefulness. It helps sticking to each single concept in the thinking and getting an overview of them». This may be considered as a programme declaration which he to a high degree followed up later on.

The conceptual system of 1928-29 did not include imports and exports and was apparently designed for a closed sector. Nevertheless, it contained both «interest» and «claims (pos. and neg.)». This suggests that Frisch at that time did not distinguish clearly neither between real capital and financial capital nor between real and financial flows, as he did later on. Furthermore, for some of the concepts he used terms taken from business accounting in contrast to the terms of subsequent systems which are clearly those of national accounting. In spite of this, the 1928-1929 system may be regarded as an important contribution to national accounting[2].

In the Cassel article, Frisch presented graphically, in a separate section II on «Le Tableau Economique», a closed system of macroeconomics concepts. He explained that «The complete macrodynamic problem, as I conceive of it, consists in describing as realistically as possible the kind of relations that exist between the various magnitudes in the Tableau Economique ..., and from the nature of these relations to explain the movements, cyclical or otherwise, of the system» (Frisch 1933a, p. 174). Thus, the purpose of the graph was to clarify the definitional relations of a macrodynamic model.

In the lectures held in 1933-1934 on Macrodynamics, Frisch presented two graphs indicating the definitional relationships between major macroeconomic concepts, one of which is identical with that published in the Cassel article. The explanation of these graphs was introduced as follows: «In the macro-dynamic analysis of the economic development, one focuses on considering the interdependence of the economic phenomena. Production of the society, turnover, distribution and consumption are analyzed as a closed circulation» (Frisch 1940 b).

The conceptual system indicated by these graphs, differs from the 1928-1929 system in several respects. In the first place, it clearly concerns the real circulation of a closed sector without such concepts as interest and claims. Frisch now apparently considered such magnitudes of no interest for a closed sector. Secondly, the system does not include concepts of a business accounting nature, such as «goodwill». Thirdly, each of the concepts for production, depreciation, labour, land rent and increase of commodity stocks is specified by consumption and capital goods. The idea behind this specification is that the time of production and the duration of use differ for consumption and capital goods, and that these differences represent important structural elements in macrodynamic analyses. Finally, consumption is specified by the use of commodities, personal services and land rent.

Pointing out that the conceptual system included goods and services only, Frisch added that «Later on the system can be extended by monetary concepts. Doing this it may be useful to include in our Tableau Economique new stocks and flows which illustrate stocks of money, circulation of money etc.» This was done already in 1935.

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[2] In (Frisch 1948, p.1) the initiation of national accounting at the University Institute of Economics is dated back to 1932 where «After preliminary spade work on principles by Ragnar Frisch a tentative actual survey was made by Johan Einarsen, who started to apply the scheme to an important segment of Norwegian industry: forestry». The «scheme» referred to is most likely the one described above.

3. Standardization

From the middle of the 1930s, Frisch, in conformity with his program declaration of 1928-29, increasingly emphasized the need for standardizing the macroeconomic concepts, *inter alia,* to facilitate comparisons between theories of different authors[3]. This is most clearly expressed in (Frisch 1943, p.106) where he points out that the standardization «must aim at several things: the logic, the terminology, the letter symbolism, the graphic representation and the bookkeeping by means of a system of accounts. These forms of expression must be made as conform as possible so that we from one form can find the others». Records of the lectures held in 1935, 1940 and 1942 show that several years passed before he was satisfied by having achieved these aims. In these lectures Frisch dealt with both real economic concepts and financial concepts. However, as a contribution to national accounting the former group of concepts is most interesting and is the main subject for discussion below.

Table 2. A set of real concepts and relationships defined in 1935 for a closed sector.

Accounts	Production		Use of resources		Application of income		Increase of capital	
Entries	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit
Gross product		A	A					
Input of commodities	B			B				
Depreciation	D			D				
Net product	R					R		
Net investment				I			I	
Consumption				E	E			
Saving					S			S
Sum[1]	B + D + R =	A	A =	B + D + I + E	E + S =	R	I =	S

1) $D + R = N$ = value added and $I + D = J$ = gross investment

A set of concepts and relationships for a closed sector presented in 1935 in lectures on Modern monetary theories, is reproduced in Table 2 (Frisch 1935 a). It will be noted that Frisch now introduced mnemotechnically more effective symbols than before, using capital letters and to a considerable extent front letters common for terms used in both English and other major languages, for instance, D for Depreciation and I for Investment.

The system of this table is very similar to that of Table 1. The equation $v_0 + v^0 + g = a$ in Table 1 corresponds with $B + D + R = A$ in Table 2, the equation $a = v_0 + v^0 + f + z$ corresponds with $A = B + D + I + E$, the equation $z + f = g$ corresponds with $E + S = R$ and the equation $w + o + h + k = f$ with $I = S$. However, the logical content is not quite the same for all corresponding concepts. Thus, as already pointed out, Table 2 includes real concepts only, while Table 1 includes interest and claims. Secondly, Table 2 does not include the goodwill concept in Table 1. Thus, in 1935 Frisch did not mix real and financial concepts, neither did he include magnitudes of a business accounting nature.

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[3] Such comparisons were in fact published in (Bjerve 1944 a and b), applying concepts defined in (Frisch 1942).

Table 3. A set of real concepts and relationships defined in 1935 for an open sector

Accounts / Entries	Production		Internal use of resources		External use of resources		Application of income		Increase of real capital	
	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit
Production for internal use		A©	A©							
Total exports		A*			A*					
Input of internally produced commodities	B©			B©						
Input of imported commodities	B*					B*				
Value added	N							N		
Depreciation							D			D
Gross investment internally produced				J©					J©	
Gross investment internationally produced						J*			J*	
Consumption internally produced				E©			E©			
Consumption of imported commodities						E*	E*			
Export surplus						Δ*			Δ*	
Saving (net real saving)							S			S
Sum [1]	B+N =	A	A©=	B©+ J© + E©	A* =	B* + J* + E* + Δ*	D+ E + = S	N	I+Δ*=	S

[1] $N-D = R = E + S =$ net product and $J - D = I =$ net investment

In a system of concepts for an open sector Frisch in 1935 introduced exports and imports, such as indicated in Table 3. Internal flows are symbolized by the superscript © and external flows by * , so that $A = A© + A*$, $B = B© + B*$, $J = J© + J*$, and $E = E© + E*$. By such a specification the system gets only one export concept (A*), but three import concepts (B*, J*, and E*). While export of services obviously is included in A*, import of services may be included in both B* and E*, but the text does not make this clear. Statistically, the import concepts defined in 1935, would have been difficult to observe, and would hardly have been of great analytical interest. Seven years passed before Frisch found a better solution.

Records of the lectures held in the fall of 1940 on Monetary theory show practically the same system of concepts as the one presented in 1935 (Frisch 1940 b). The main differences are that the 1940 system has an additional concept for government use of goods and services (T), and that value added is split into a domestically produced part and an imported part.

In the 1940 lectures Frisch, as he did in 1935, strongly emphasized the distinction between real and financial concepts, and explained the difference more precisely than before. He said, according to the records, that the real concepts were concerned with «physical goods and services - matters that can be defined even if ownership is not defined». The financial concepts were «attached to claims between physical and juridical persons». This distinction he repetedly emphasized later on too.

In a large part of the 1940 lectures Frisch dealt with financial concepts. To provide an impression of the multiplicity of such concepts , he presented a list of no less than 155 accounts to be applied in numerical national accounting, most of them for financial magnitudes. However, this discussion of financial concepts is of little interest as a contribution to national accounting.

In the spring of 1942 Frisch for the last time lectured on macroeconomic concepts. These lectures were attended by some of the teachers at the University, and frequently a discussion took place so that Frisch later on characterized the lectures as a colloquium «with valuable contributions by everybody participating» (Frisch 1942).

Many of the issues discussed were further dealt with during the fall of 1942 in a number of meetings at the Institute of Economics. During these meetings the discussion was in particular focused on a graph which Frisch had presented already in the 1940 lectures, but not found satisfactory. Unbelievably many kinds of graphs went into the waste basket before a final result was agreed upon. Whether the graphical changes caused conceptual changes or vice versa is not easy to know, but clearly there was an interaction between the two kinds of changes.

The final system arrived at was published in October 1942 in a mimeographed paper (Frisch 1942) and later printed in (Frisch 1943). Frisch coined the term «Økosirksystemet» (the Ecocirc-System) as the name of this system, and correspondingly «Økosirkfiguren» (the Ecocirc-Graph). He now for the first time used a set of accounts as a means of presentation, in addition to algebraic and graphic representations. The Ecocirc-Graph is less applied by Norwegian economists today than during the first decades after its presentation.[4]

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[4] The presentation in (Aukrust 1994 pp. 18-21 and pp. 63-64) in some respects supplements the description of the Ecocirc-System below, *inter alia* by including Ecocirc-Graphs.

Table 4. A simplified representation of the Ecocirc-System for the real economy of an open sector

Accounts / Entries	Internal production Debit	Internal production Credit	External production Debit	External production Credit	Use of resources Debit	Use of resources Credit	Application of income Debit	Application of income Credit	Increase of capital Debit	Increase of capital Credit
Commodities and services internally produced		A^{in}			A^{in}					
Input of commodities in internal production	H^{in}					H^{in}				
Internal value added	E^{in}							E^{in}		
Export surplus				A^{ex}					A^{ex}	
Input of commodities in production for exports			H^{ex}			H^{ex}				
External value added			E^{ex}					E^{ex}		
Depreciation							D			D
Gross investment					J				J	
Consumption					C	C				
Real tax					T	T				
Saving							S			S
Sum[1]	H^{in} $+E^{in}=$	A^{in}	H^{ex} $+E^{ex}=$	A^{ex}	$A^{in}=$	$H+J$ $+C+T$	$D+C$ $+T+$ $S=$	E	A^{ex} $+J=$	$D+S$

[1] $E - D = R =$ net product and $J - D = I =$ net investment $= S - A^{ex}$

A simplified version of the Ecocirc-System is presented in Table 4. It will be noted that Frisch in 1942 used the superscripts «ex» and «in» symbolizing external and internal flows respectively. Positive and negative external flows were symbolized by the superscripts ex^+ and ex^- respectively.

To a large extent he used «letter symbols» in conformity with the principle established in 1935. Below the most important of them are listed:

A = Total product «All» the product, gross output
C = Consumption, «Consomption», «Consumo»
D = Depreciation, «Dépréciation», «Depreziazone»
E = Value added, «Earnings», «Ertrag», «Excédent», «Entrata»
F = Exogenous increase of real capital, «Free», «Frei»
G = Revaluation, Gain, «Gewinn», «Guadagno»
H = Intermediate input, «Hardware»
I = Net investment, «Investment», Investissement», «Investition», «Investimento»
J = Gross investment (neighbouring letter to I)
K = Capital, «Kapital»
M = Money, «Monnaie», «Moneta»
N = Labor, Number, «Numerus»
O = Organization, «Organisation»
R = Revenue, «Reinertrag» , «Reditto»
S = Saving, «Spargeld»
T = Tax, «Taxe»

The Ecocirc-System improved the presentation of external flows compared with the 1935 and 1940 systems. Both exports and imports are classified by commodities (H) and services (E). The net exports of commodities $H^{ex} = H^{ex+} - H^{ex-}$ and the net exports of services $E^{ex} = E^{ex+} - E^{ex-}$, where E^{ex} equals the net exports of primary services R^{ex} plus net exports of depreciation D^{ex}. The export surplus $A^{ex} = A^{ex+} - A^{ex-}$. Statistically, these magnitudes are less difficult to observe and analytically more interesting than the export and import concepts of the preceding systems. Much time was spent before Frisch found this solution. Furthermore, in the Ecocirc-System gross investment (J) and consumption (C) are not specified by external and internal origin. This solution too appears preferable, both for statistical and for analytical reasons.

It may also be worth mentioning that in the Ecocirc-System real capital (K) may increase not only by net investment (I), but also as consequences of gains by exogenous events (F) and of revaluation (G). Thus, the total increase of real capital equals $I + F + G$. Decades later these concepts were introduced in the international standard for national accounts.

The Ecocirc-System includes financial concepts and definitional relations which are completely analogous with those for the real economy. The symbols are also the same, except that they are distinguished by boldface letters. Thus, for instance, the financial capital is symbolized by $\mathbf{K} = \mathbf{K}^{+} - \mathbf{K}^{-}$.

From a national accounting point of view only a few of the financial concepts and relations are interesting. One definitional relationship worth mentioning is:
$\mathbf{S} = \mathbf{R} - \mathbf{T} - \mathbf{C}$, where $\mathbf{S}$ is financial saving, $\mathbf{R}$ net income from external claims, $\mathbf{T}$ net financial taxes to other sectors, and $\mathbf{C}$ net external dividends from financial stocks. Another relation is:
$\mathbf{I} = \mathbf{S} + \mathbf{A}^{ex} + \dot{\mathbf{M}}$ where $\mathbf{I}$ is net investment in financial capital and $\dot{\mathbf{M}}$ increase of the volume of money in circulation. Money is defined as an asset with a creditor, but without a debtor. The idea is that money is a claim on the national product, not on the Central Bank. The relationship between the corresponding real concepts is according to table 4: $I = S - A^{ex}$. Adding these relationships we get :
Total investment $I + \mathbf{I} = S + \mathbf{S} + \dot{\mathbf{M}}$. At a constant volume of money in circulation ($\dot{\mathbf{M}} = 0$), total investment equals total saving.

Similar to real capital the financial capital may increase as a consequence of exogenous factors ($\mathbf{F}$) and by a revaluation of such assets ($\mathbf{G}$). Thus, the total increase of financial capital is equal to $\mathbf{I} + \mathbf{F} + \mathbf{G}$. Thereby, the total increase of national wealth becomes equal to $I + \mathbf{I} + F + \mathbf{F} + G + \mathbf{G}$.

In the 1948 paper submitted to the United Nations Subcommission on Employment and Economic Stability (Aukrust, Bjerve and Frisch 1948), Frisch «stressed such aspects as the axiomatic foundation of the distinction between financial and real flows, the degrees of freedom of the system (72 variables with 32 degrees of freedom) and also gave a descriptive nomenclature of the concepts» (p.4). The purpose of this paper was to provide the basis for a better debate in the subcommission. Frisch disliked that this debate was much concerned with the «evils of inflation» (Bjerve 1989).

The conceptual system presented in this paper differs in some respects from that of the Ecocirc-System. In the first place, it has not full analogy between the financial and real concepts. Only three financial concepts are retained, viz. financial income ($\mathbf{R}$), financial saving ($\mathbf{S}$), and financial investment ($\mathbf{I}$). Secondly, money is treated in the same way as other financial objects, i.e. with both debtor and creditor. Consequently, financial investment is defined as $\mathbf{I} = \mathbf{S} + \mathbf{A}^{ex}$. Thirdly, an additional income concept is introduced, viz. disposable national income equalling the sum of net real product, interest and dividends from abroad, and net income transfers from abroad. Finally, some concepts are specified by a private and a government part. This means that the 1948 system does not maintain the principle that it can relate to only one sector, such as the Ecocirc-System.

Table 5. Changes of claims and debts by financial object and by sector

Sectors Financial objects	Government	Central bank	Other banks	Other sectors[1]	All sectors

Internal claims
    Government
    Central bank
    Other banks
    Other sectors[1]					

Total internal claims					
Net internal claims (sums of columns minus sums of rows) Norwegian claims on other countries minus foreign claims on Norway Notes (including gold and coins)					
Total net claims and cash					

[1] Including government enterprises

On several occasions during the 1930s Frisch dealt with intersectorial financial accounts, for instance in connection with (Frisch 1935 b). He returned to this subject after the war (Bjerve 1995, pp 6-8). In (Frisch 1952) he presented a multisector accounting system for changes of claims and debts by financial object and by sector.

A simplified version of this system is presented in Table 5, where the claims of each sector on other sectors are indicated in the columns and debts towards other sectors are indicated in the rows. The upper part of the table shows internal, the lower part foreign claims and debts, and cash. In addition, an identical cross-classification for *grants* of credit was included, so that for each sector the sum of all kinds of grants could be added to the total net claims and cash. Subclassifications for the government sector, the banks and other sectors were also presented *inter alia*, in (Frisch 1935 a and b).

Data for 1948 according to this accounting system were roughly calculated by an associate of Frisch (Arne Amundsen). He concluded that sufficiently reliable estimates could not be made until standardized credit market statistics had been developed.

4. Numerical national accounting

A first attempt at numerical national accounting was made by the Institute of Economics already in 1932 for forestry. However, «due to limited financial resources of the Institute no great advances in actual numerical work on accounting systems were possible in the years immediately following 1932» (Frisch 1948, p.1).

Four years later, the Institute was granted money for preparing a «Structural Survey for Norway», and the work began in 1937. The idea was to collect available data for this purpose and to co-ordinate them in the form of national accounts. The latter part of the work was to be directed by Ragnar Frisch. In a section of the plan for this survey, obviously formulated by Frisch, the purpose of the national accounting was to «co-ordinate the most important numerical data that gradually will be collected for the various fields of the economy, so that these data will appear as parts of a total. The national accounts will constitute the same kind of survey for the country as a whole as the ordinary balance and current accounts for a single enterprise» (Frisch, Keilhau and Wedervang 1936, p.29).

Frisch further explained that the national accounts should provide «an important basis for the appraisal of which industries are the contributing and which are the receiving in the complex system of support provided by the various government arrangements of industrial kind. Likewise which sum of the various kinds of income for wage and salary earners, for leaders, as well as income from interest and profit - constitutes the total national income. And so on.» In addition, he used much space on a discussion of the valuation principle, which was rather abstract.

The plan was accepted and grants were made which enabled the Institute to hire a few research assistants for its implementation. Frisch himself dealt with the principles upon which the national accounts were to be based, such as the system of accounts, the classification of sectors for which the accounting was to be applied, and the evaluation of data to be included. These principles were to be tested by numerical calculations for the year 1935, *inter alia*, by utilizing the result of a census of establishment which was being carried out for this year. These calculations were the main task of the research assistants.

After a couple of years, Frisch presented a summary of the principles so far established to a meeting of Nordic statisticians (Frisch 1940 a). According to the records from this meeting he defined national accounting as «a survey not only over the national income in a certain year, or the national wealth at a certain point of time, but a fairly complete overview of the entire national economic operations during a year, arranged in such a manner that the relationships between the various data clearly emerge. The set-up must be done in such a way that the relationships in which we are particularly interested, appear with the necessity of bookkeeping. For instance, the change of wealth shall with the necessity of bookkeeping agree with the data on income, consumption, and saving».

On the system of accounts he stated that: «For each single sector, large or small, the information will be organized within a system of *business accounts*. This must be a standard system of accounts to be used everywhere for any sector». About this system he mentioned the following main characteristics: «In the first place, we have tried to distinguish clearly between the real activity and the financial activity, i.e. between that which Keynes and other English authors designate as respectively «industrial circulation» and «financial circulation». Secondly, it may be mentioned that we have not carried out such a use of the different production and turnover accounts that the balance on each production account will show whether this special production is profitable for the sector or not. For many reasons we have chosen an accounting by which the balance shows what in our production statistics is called «the processing value» and in English terminology «the value added». There is a small nuance that distinguishes our concept of balance from the valued added, but this is of no practical significance».

On the sector classification Frisch, *inter alia*, informed that «We establish a sector classification in two directions. In the first place by the *form of organization* of the enterprise, which leads to the large

organization sectors indicated horizontally in the document distributed, and secondly by the industrial classification indicated vertically. A cell in this two dimensional classification - for instance, all single enterprises in the wood industry, we term a *structural sector*. And it is for these structural sectors that the accounting will be attempted carried out». As industry classification an international standard developed by the League of Nations would be applied. The classification by organizational form had been developed by the Institute.

Having described the system of accounts and the sector classification, Frisch stated that «By the threefold classification of the entries of national accounts, by organizational form, by industrial sectors and by business accounts, we shall - if the accounting is satisfactory - derive the national income both according to the production method and the personal method. And we shall also get a classification by income categories such as return of workers, return of functionaries, return of leaders and income from interest. And all these final numbers for national income will necessarily be the same». In addition, he asserted that numbers for «consumption, net investment within this country, and net investment abroad also will emerge, viz. as a balance on the consumption account and as the increase of the balances in respectably the account for real capital, the account for financial capital and the account for the total sector Norway, when this sector is defined as the sum of the subsectors».

On the evaluation of data to be included in the national accounts Frisch conceded that a system of «evaluation coefficients» suggested in the plan of 1936, would require a long time of development and that «in the meantime we must be satisfied by using the usual value calculations based on price times volume». He mentioned three kinds of pricing, viz. actual cost, market price, and discounted value of prospective results. Basically, the accounting would be done at actual cost, but a system of supplementary accounts would be used to indicate income and wealth according to the two other kinds of pricing.

Evidently, the approach aimed at deriving structural data for the country as a whole according to the conceptual system described in the lectures of 1935, by aggregating the calculations for all structural sectors. This would not provide information on transactions between the structural sectors, or the so-called «from whom to whom» transactions, which implied a lack of important information.The system was to be applied for any sector. The external transactions between such a standard sector and other sectors were to be combined in exports and imports, respectively, such as for the Ecocirc-System later developed.

The paper by Frisch was supplemented by a paper by one of his research assistants, Hans Luihn, dealing with the possibility of obtaining the data required (Ragnar Frisch 1940a). He informed that explorations on this had been done and justified optimism. However, he did not present results of the numerical work.

The papers presented to the Nordic meeting, naturally dealt with only the most important aspects of the system of structural accounts. More detailed, typewritten descriptions are filed at the Institute of Economics. These show, *inter alia*, that the system included separate accounts for stocks and flows, for the capital value of persons and nature, and for real capital leased from other sectors in addition to that owned by the sector itself,

When the University in Oslo was closed by the Germans in 1943, numerical results had been arrived at for two structural sectors only, viz. Shipping (Rossen 1942) and Official and semi-official banks (Bjerve 1940). For the latter sector «A total of 127 individual accounts were used which through contractions at successive levels were finally reduced to a minimum of 14 main accounts» (Frisch 1948, p.2). These results proved that the accounting system was practicable. However, the computing of similar results for the entire country would have required much larger resources than those available.

13

5. Impact on official national accounting

The fact that Frisch in his 1928-29 lectures defined a conceptual system remarkably similar to that of modern national accounts, does not necessarily mean that his aim already at that time was the development of such accounts. The presentation in (Frisch 1931) and more explicitly in (Frisch 1933a) indicates that his main aim was to develop macroeconomic models for explanation of the business cycles. This required precise definitions and definitional relationships.

However, as explained in (Bjerve 1995, p 1), during the Great Depression he became very critical towards the free market system, and attempted actively to influence policy. Thus, in a popular pamphlet published in 1933, Frisch advocated the elaboration of «a financial plan providing a complete picture not only of the activity of the central government, but also of the interdependence between the central and local government budgets and of other fundamental factors of the economy. Such an overview will appear as a united set of national accounts». (Frisch 1933b)[5].

During the 1930s work on national accounting concepts was initiated by economists in several countries. Their aim was in the beginning to clarify concepts required for business cycle analyses. Later, financing of the Second World War and macroeconomic planning became major aims. In the late 1930s elaboration of numerical national accounts also began. Thus, the contributions of Frisch to national accounting represented a part of an international trend [6]. However, his conceptual contribution in 1928-29 and his attempt at numerical national accounting in 1931 occurred ahead of this trend.

Frisch may have been stimulated to engage in these activities during his stay at Yale University in 1927-28, where he had close contact with Irving Fisher. Fisher had dealt with national income and wealth concepts already from the beginning of the century. (Kennesey 1994 b, p 119). His contributions, expounded by Morris Copeland and Robert Martin in the 1930s, may justify crediting to America the «intellectual fatherhood» of the idea of double entry accounting of national income and expenditure (Kennesey 1993, p. 58). Nevertheless, the conceptual systems presented by Frisch from 1928-29 on, represented major steps forward.

The conceptual contributions of Ragnar Frisch had an important impact on official Norwegian national accounting. The fact that Norway became one of the countries where modern national accounts were first developed, can substantially be attributed to Frisch. In 1943 Statistics Norway, for reasons described in (Bjerve 1995, pp. 8-9), began calculations of the annual gross national product from 1935 on and of the reduction of national wealth during the war. For this work a group of recently graduated economists, with thorough knowledge of the Ecocirc-System, was recruited. Two members of this group had even worked for Frisch, as research assistants, on structural national accounting. This group implemented a more comprehensive approach than originally envisaged. Thus, for the period 1940-1943 estimates were made of exports and imports, the German use of goods and services, and the residual consumption (public and private), in addition to calculations of the national product and the reduction of national wealth (Statistisk Sentralbyrå 1946).

In making these estimates the knowledge of the Ecocirc-System facilitated the achievement of consistency between them. The former research assistants of Frisch could take advantage of their experience gained at the Institute of Economics. Thus, they also ensured that some methodological developments made at the Institute were applied, for instance, the sector classification previously described.

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[5] Presumably , this was the first time that the term «natioanl accounts» was mentioned in Norwegian public discussion. At a meeting on 29 January 1940, from which a record exists, Frisch also suggested the name «national budget» for projections of a set of entries in the national accounts. This name was actually adopted by the Ministry of finance for projections presented for 1946 and subsequent years.

[6] Reviews of this trend are published, *inter alia*, in (Bakker 1994) and in (Kennesey 1993, 1994a and 1994b).

The estimates of components of the national product, made during the war, were rather crude. After establishment in 1946 of a new Division for National Accounts in Statistics Norway (headed by Odd Aukrust), a major extension and a quality improvement of the national accounting were initiated. The methods applied in other countries were thoroughly studied and after six years of preparations new national accounts were published including, *inter alia*, annual input-output tables. The data resulting covered the periods 1930-1939 and 1946-1951. The new accounts were designed in conformity with the Ecocirc-System, in particular, a clear distinction between real and financial concepts was made. However, contributions by others, in particular by R. Stone and W. Leontief, were also taken advantage of.

Data were calculated mainly for real flows. For changes in financial assets and liabilities no data were included. Attempts made at estimating such data did not succeed, due to the lack of sufficiently co-ordinated credit market statistics. Preparations for a better co-ordination began in 1952. Statistics Norway first established standards for the definitions and classifications of claims and debts by type, and of debtor and creditor sectors by kind of economic activity. The standards were prepared in co-operation with the organizations of credit institutions. These standards were made obligatory for all suppliers of credit market data. Thereby, numerical financial accounts could be prepared, in accordance with the logical framework of Table 5, but with a more detailed classification by sectors and by financial objects. These statistics were first published in (Statistisk Sentralbyrå 1957). In the preface to this publication, Statistics Norway stated: «The accounting framework is greatly influenced by the theoretical work of Professor Ragnar Frisch».

The financial accounting system is described in detail in (Bjerve and Selsjord 1959), where also problems of integrating the financial accounts within the traditional national accounts are considered. However, this integration turned out to be numerically more difficult than anticipated. It was not implemented to a large extent until 1995 in connection with the last revision of SNA, but still problems remain.

The contributions of Frisch to national accounting were not known outside Scandinavia until after the Second World War. Even then, due to the lack of translations into foreign languages, decades elapsed before knowledge of these contributions were widely spread. In other Scandinavian countries numerical national accounting was initiated before the Ecocirc-System was designed, but in 1946 a close Nordic co-operation on national accounting began. Gradually, this co-operation had the effect of co-ordinating the Nordic views on many national accounting problems.

International standard national accounts developed after the war, had an important impact on official national accounting, but a long period of time elapsed before ideas of Frisch were incorporated in these standards.[7] When the OEEC in 1950 established its «Simplified System of National Accounts», the Anglo-American countries had for many years applied quite the same accounting systems, which in the main were adopted in the Simplified System. Even the world standard for national accounting established by the United Nations in 1953, was essentially Anglo-American. For instance, it did not distinguish clearly between real and financial objects, implying that it in many respects differed from the Scandinavian Systems which at that time had become rather similar. During the preparatory discussions of the UN standard, the Scandinavian participants were unable to make an impact. Consequently, Norway and Sweden decided to maintain their existing standards for own use, and apply the international standard only for the reporting of statistics to international organizations.

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[7] In 1940 Frisch drafted a 93 page paper on «Suggestion for a coordinated system of notions in monetary theory», hoping perhaps to contribute to an international standardization of macroeconomic concepts. But he did not publish this paper. [8] Scandinavian contributions are spesified in (Aukrust 1994, p. 53).

Scandinavian members of the Conference of European Statisticians from 1955 on and the Norwegian member of the United Nations Statistical Commission during the 1960s repeatedly requested a revision of the existing international standard for national accounts, hoping to bring it more in line with the national accounting applied in Scandinavia. These requests were not accommodated until 1968, when a new international standard was adopted which according to (Aukrust 1994, p. 53) «was greeted in Scandinavia as a blend of ideas to which the Scandinavian countries had contributed significantly». A third version of the international standard recently adopted, includes additional features consistent with Scandinavian thinking (Bos 1994) [8].

The «Scandinavian thinking» is, of course, not only that of Ragnar Frisch, but a result of efforts made by many experts, such as explained in (Aukrust 1994, pp 35-45). However, the impact of the contributions of Frisch appears dominating to such a degree that he perhaps, even internationally, deserves the distinction as a major originator of national accounting.

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[8] Scandinavian contributions are specified in (Aukrust 1994, p.53).

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