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Measurement of distribution and redistribution of income with national accounts.

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Abstract

The contribution of Richard Stone (1913-1991) to the development of national accounts, awarded him with the Nobel Prize in Economics in 1984. In the scope of the first versions of the system of national accounts (SNA), conceived under his chairmanship, his attention was mainly focused on the production and consumption of goods and services. However, the distribution and redistribution of income was also addressed by him, in a way that, from our point of view, continues to make sense. This perception motivated its adoption as the basis for the interpretation and adaptation to the latest versions of the SNA, now presented.

Thus, after the measurement of the income generated in the production of goods and services and its distribution through the institutional sectors, a chain of redistribution is developed into four rounds. The description, accompanied by a numerical example, involves the so-called distributive transactions of the national accounts and ends with the identification of the institutional sectors' use of income in goods, services and non-produced non-financial assets.

A possible approach based on a so-called social accounting matrix (SAM) is also briefly presented, as a possible tool to measure and model the economic activity of a country, with emphasis on our topic. This is, in turn, an interpretation and adaption of the approaches of Graham Pyatt (1936-2023) and his associates.

Key words

Income distribution and redistribution; national accounts; social accounting matrix

JEL Codes

E01; E16

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ACRONYMS AND ABBREVIATIONS

Chap … Chapter

EU … European Union

INE … Instituto Nacional de Estatística

ISWGNA … Intersecretariat Working Group on National Accounts

NPISHs … Non-Profit Institutions Serving Households

p. … page; pp … pages

SAM … Social Accounting Matrix

SNA … System of National Accounts

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1. Introduction[3]

Awarded with the Nobel Prize in Economics in 1984, Richard Stone (1913-1991) dedicated a significant part of his life to the measurement of economic systems and the underlying functioning, that is, to the development of national accounts. For that it was determinant his directorship of the Department of Applied Economics in Cambridge, started after the second world war with Keynes involvement, and the development of the Cambridge Growth Project (Stone, 1992, p.111; Pesaran, 1991, p.94). His previous knowledge and sensibility, allies with the experience with that project allowed him to conceive "A System of National Accounts", in two versions – 1953 and 1968. With attention mainly focused on the production and consumption of goods and services, the network of transactions in terms of that system was then identified as relevant. Later, he also mentions the importance of "the distribution of income", together with "accounting of pollution", "international trade and world models", and "wealth and flow of funds". (Stone, 1986a, pp. 21-23). However, in what concerns the first, flows regarding distribution and redistribution of income, did not go beyond the totals by broad institutional sectors of origin and destination.

A study of Graham Pyatt[4] and his associates - Pyatt, G., & Roe, A. (1977), with a Foreword by Richard Stone, is mentioned by him as illustrative of a way of studying the part relating distribution and redistribution of income and underlying network of transactions. (Stone, 1981, pp. 62-63). In fact, Graham Pyatt (1936-2023) dedicated a significant part of his life to that study, often developed in collaboration with others, namely, Jeffery Round.

Conceived under the responsibility of the Intersecretariat Working Group on National Accounts[5], without an "A" before, two versions of the "System of National Accounts"(SNA, for short), were released after 1968, one in 1993 and the current in 2008 (ISWGNA, 1993 and 2009). A new one is scheduled to 2025[6]. From versions of 1993, 2008 and the pre edit version (available when this paper was prepared) of 2025, the distribution and redistribution of income of institutional sectors have been measured by the so-called distributive transactions, organised and classified in almost the same way, although registered in accounts which names have been changed.

Therefore, after this introduction, Chapter 2, starting from an approach on the functioning of the national accounts, presented by Richard Stone in his Nobel Lecture, uses the underlying ideas to justify the role of the national accounts, system and data, to support economic studies. A summary of successive versions of "System of National Accounts" is then made, mentioning the way how the distribution and redistribution of income and the associated transactions were treated.

[3] This paper is based and integrates parts of that presented to the *30th International Input-Output Conference*, promoted by IIOA (International Input-Output Association). Santiago (Chile), 2-5/7/2024, available at the reference Santos (2024).

[4] Who was Richard Stone' assistant in the Department of Applied Economics, at the University of Cambridge.

[5] ISWGNA, for short, with representatives of the United Nations, European Commission, International Monetary Fund, Organisation for Economic Cooperation and Development and World Bank.

[6] See in: https://unstats.un.org/unsd/nationalaccount/ .

Chapter 3 introduces some of the concepts and definitions currently associated with distributive transactions showing what is supposed to be produced and made available by the national accounts. The positioning of the nine categories of distributive transactions in the sequence of national accounts and in a so-called distribution process is identified in parallel. The latter follows a methodology adapted from the one developed by Richard Stone, throughout the 60s and 70s of the last century.

Chapter 4 makes an exercise of measuring and modelling the activity of a country with the national accounts, with emphasis on distribution process. Through an interpretation and adaptation of the approach developed by Graham Pyatt and his associates, throughout the 70s and 80s of the last century, numerical and algebraic versions of a social accounting matrix are constructed and experiments with changes in distributive transactions are performed.

Finally, Chapter 5 summarizes the previous chapters and brings together some concluding remarks regarding some of the aspects considered as important within the scope of the measurement of distribution and redistribution of income with national accounts, data and system, and the corresponding modelling.

This paper is illustrated by an estimate of a numerical example based on the national accounts for Portugal in 2022, in millions of euros, produced by *Instituto Nacional de Estatística* (*INE*) - Statistics Portugal (Portuguese Statistical Office), and the totals for financial account produced by *Banco de Portugal* (Portuguese Central Bank). Both sources of information follow the current version (2010) of the ESA - European System of National and Regional Accounts in the European Union (EU, 2013), which is the adaptation of 2008 SNA to the European Union. The presentation of this numerical example is adapted to the Annex 3 of the 2025 SNA, but no effort was made to confirm the adequacy of the data to this system, that's why it is considered as an "estimate". To simplify, it will be used without any reference to the sources of information and answers to the usual questions: when? where? in which currency units? The adopted terminology will be that of the 2025 SNA, with the amended parts of the 2008 SNA being referred to in the summary presented in the Annex - Tables A.1. and A.2.

Associated SNA codes, almost always, in parenthesis, accompany the description.

2. National accounts to support economic studies

Economic studies were identified as one of the three pillars in which an analysis of society ought to rest. With the other two pillars being socio-demographic and environmental studies, Richard Stone consider them as important to understand how society functions and emphasises the usefulness of accounting. This is how he introduces his Nobel Lecture in 1984, entitled "The Accounts of Society" (Stone, 1986).

To the economic studies, retaking a framework underlying a diagram entitled "models, policies and plan", he continues his lecture considering that the 'facts', represented by data organized in accounts, can provide pictures of the stocks and flows of the economic system, as a whole or in parts. By combining facts and 'theories' – defined by us or by others, on relationships of facts, descriptive

'models' can quantify the functioning of the economic system, in a comprehensive form. Experiments can then be performed, and scenarios be constructed with specific 'aims', representing 'policies', and 'controls'. The run of a 'plan', that became possible to draw up, can show possible repercussions of the intended changes throughout the system, which 'events' will confirm, or not. With that 'experience', the feedback of that process will allow its improvement.

National accounts, data and systems, represent the 'facts', and the sequence of that diagram illustrates their functioning and role in any economic study.

Prepared by a group of national income experts under the chairmanship of Richard Stone, "A System of National Accounts" was published by the United Nations (UN), in the form of report, in a first version in 1953[7] (UN, 1953, 43 pages long) and in a second version in 1968 (UN, 1968, 229 pages long). As mentioned in the corresponding prefaces, with the former, "the purpose (…) is to set out a standard national accounting system in order to provide a framework for reporting national income and product statistics which is of general applicability" (UN, 1953, p. vii), being the latter, a "new System" that is a "revision and extension of the SNA which was formulated in 1952" (UN, 1968, p. iii).

In fact, with that new version and according with its introduction, "a start is made" in order that: "the production account could be subdivided so as to display the commodity flows between industries which are the central feature of input-output studies..."; "be possible to introduce all relevant financial flows"; "the accounting structure ... be completed by adding balance sheets..."; "... the principal product flows and stocks ... be ... express(ed) in constant prices". It is also recognized that "The information needed for input-output and flow-of-funds analysis is treated in considerable detail; the information relating to holdings of assets and liabilities is treated more summarily. Information on distribution and redistribution of income..., is confined to flows between broad sectors …" (UN, 1968, pp. 1, 14). However, the latter are only confined to the totals by broad institutional sectors of origin and destination. We are talking about those then designated corporations and quasi-corporations, or non-financial enterprises, financial institutions, general government, households, and private non-profit institutions. The flows associated to distribution and redistribution of income were mainly, transactions recorded, within consumption accounts, in income and outlay accounts, that "delineate" (delineated) "the receipt and the disposition of incomes by institutional units; and are" (were) "linked directly with the production accounts and the final consumption expenditure" (UN, 1968, p. 120). Establishing parallelism with the current distributive transactions, defined since the next version of that system, we also have capital transfers, recorded, within accumulation accounts, in capital finance accounts, which "portray" (portrayed) "the ways in which institutional units finance their accumulation of capital; and have" (had) "direct ties with the capital formation and income and outlay accounts" (UN, 1968, p. 120).

As systematized in "an illustration of the complete system" and described in the Chapter II (the structure of the system), in which it is integrated, transactions recorded in income and outlay accounts

[7] Under the title "A System of National Accounts and Supporting Tables". With two revisions: UN (1960) and UN (1964).

were components of the value added and forms of income. Compensation of employees, operating surplus, and (net) indirect taxes were components of the value added. Wages and salaries, employers' contributions, social security contributions, property income and current transfers are examples of forms of income. (UN, 1968, pp.17-34).

As mentioned previously, the following versions of the SNA were prepared by the ISWGNA with much more detail, judging by the volume of pages of each - 1993 (ISWGNA, 1993, 814 pages long), 2008 (ISWGNA, 2009, 610 pages long), and 2025 (ISWGNA, 2025, 1260 pages long pre edit version[8], available when this paper was prepared).

From now on, each of the previous versions will be referred to as "SNA" preceded by the year of release (scheduled, in the case of 2025).

The treatment of transactions associated with production and generation of income, in the form of supply and use tables, continue to pay great attention to the treatment of transactions associated with production and generation of income, in the form of supply and use tables. Financial transactions have also had an increasing attention, with the flow-of-funds tables (2008 SNA – Chap.27) and from-whom-to-whom tables (2025 SNA– Chap.37). Although the 2025 SNA foresees the extension of from-whom-to-whom tables to some distributive transactions, its unclear treatment, leads us to assume that the complexity of financial transactions treatment will remain. That means that distribution and redistribution of income transactions and the corresponding institutional interrelations, which will be approached in next chapter, continue to be left out, or almost invisible. Thus, countries or groups of countries who adopt or adapt the SNA to produce their national accounts, continue not to have guidelines to produce data on institutional interrelations of transactions associated to distribution and redistribution of income, for any form of economic planning.

Therefore, although an effort of exhaustiveness and (I believe) improvement in the organization of the facts and production of data representing the functioning of the economic system, over time, through the various versions of the SNA is being done, the part relating to the distribution and redistribution of income continues to not deserve the due attention (in my opinion). This leads users to make estimates that can be much more subjective than they would be if they were made by national accountants.

[8] In: https://unstats.un.org/unsd/nationalaccount/docs/2025_SNA_Pre-edit.pdf

3. Distributive transactions measured by the national accounts

Within the flows measured by the national accounts, transactions result from mutual agreement interactions between institutional sectors and are organized in four groups – one of which is that related to distribution and redistribution of income and wealth, or distributive transactions (2025 SNA – Chap.4).

Institutional sectors are groups of entities, or institutional units, with economic functions and legal responsibility for their actions in a country, or nation (2025 SNA – Chap.5). They are considered as resident if they are involved in the country's economic activity for a year or more, or non-resident if they are not. The former constitute the total (domestic) "economy" (code S1) and the latter the "rest of the world" (code S2).

In (domestic) "economy", institutional sectors are organized according with their main functions, behaviours and objectives, being firstly grouped in two types: 1) persons or groups of persons; and 2) legal or social entities whose existence is recognized by law or by society, regardless of the persons, or other entities, that may own or control them. The institutional sector corresponding to the first type is that of “households" (code S14). The second type is organized in the following sectors: "non-financial corporations" (code S11); "financial corporations" (code S12); "general government" (code S13); and "non-profit institutions serving households"- NPISHs for short (code S15).

National accounts provide for the disaggregation of institutional sectors, which will not be considered here.

Distributive transactions are recorded in the current and capital accounts (the latter, within accumulation accounts). Their positioning is identified below in the corresponding parts of the sequence of accounts, defined by the 2025 SNA and summarized in the Annex (with the amended terminology of the 2008 SNA in parentheses). To simplify the exposition, only gross balancing items (codes B..g) will be considered.

Along with that description the so-called distribution process will also be presented in a sequence of columns, distributed across several tables, covering the various categories of distributive transactions and related balancing items. It is a description based on a Richard Stone’s version, conceived in 1968 and published in 1977, on “generation, distribution and use of income” (Stone and Stone, 1977, pp. 67-74), which adopts part of its terminology, and is adapted to the 2025 SNA.

a) Current accounts - record the expenditures and revenues of transactions associated, on the one hand, to the production and (intermediate and final) consumption of goods and services, and, on the other hand, to the generation, distribution, and redistribution of income. The former are transactions in products (codes P). The latter are distributive transactions (codes D).

Since our focus is on distribution and redistribution of income, we will exclude here the production account – the first current account.

[Numerical example based on the national accounts for Portugal in 2022, in millions of euros, produced by *INE* and *Banco de Portugal*]

a.1) Earned income accounts (2025 SNA – Chap.8) are composed of generation and allocation of earned income accounts, record the distribution of income generated in the production process - added value, or domestic product (code B1), through the receipt and payment of remuneration of production factors and taxes on product and imports, net of subsidies. Tables 3.1 and 3.2 represent them with records relating to four categories of distributive transactions: remuneration of employees (code D1); taxes on production and imports (code D2); subsidies (code D3); and property income (code D4). For the total economy (all domestic sectors), the balancing item of these accounts is the balance of earned incomes, also known as national income (code B5), whereas operating surplus (code B2) and mixed income (code B3) can be seen as parts of the remuneration of factors of production. In turn, the part relating to these transactions with the rest of the world integrates the current external balance (code B12).

Table 3.1. Generation of earned income account.

Total	S.2 **Rest of the world**	S.1 **Total economy**	S.15 **NPISHs**	S.14 **Households**	S.13 **General government**	S.12 **Financial corporations**	S.11 **Non-financial corporations**	Code	Transactions and balancing items
Expenditures									
								B1g	*Value added, gross / Gross domestic product*
113 604		113 604	3 595	2 448	25 977	4 087	77 498	D1	Remuneration of employees
36 670		36 670						D2	Taxes on production and imports
33 031		33 031						D21	Taxes on products
3 639		3 639	9	1 075	0	542	2 012	D29	Other taxes on production
-4 783		-4 783						D3	Subsidies
- 467		- 467						D31	Subsidies on products
-4 315		-4 315	- 358	- 760	- 439	- 5	-2 754	D39	Other subsidies on production
72 727		*72 727*	*851*	*13 611*	*6 801*	*6 744*	*44 720*	*B2g*	*Operating surplus, gross*
25 374		*25 374*		*25 374*				*B3g*	*Mixed income, gross*

Code	Transactions and balancing items	S.11 **Non-financial corporations**	S.12 **Financial corporations**	S.13 **General government**	S.14 **Households**	S.15 **NPISHs**	S.1 **Total economy**	S.2 **Rest of the world**	**Total**
									Revenues
B1g	*Value added, gross / Gross domestic product*	*121 477*	*11 368*	*32 339*	*41 747*	*4 097*	*243 957*		*243 957*
D1	Remuneration of employees								
D2	Taxes on production and imports								
D21	Taxes on products								
D29	Other taxes on production								
D3	Subsidies								
D31	Subsidies on products								
D39	Other subsidies on production								
B2g	*Operating surplus, gross*								
B3g	*Mixed income, gross*								

[Numerical example based on the national accounts for Portugal in 2022, in millions of euros, produced by *INE* and *Banco de Portugal*]

Table 3.2. Allocation of earned income account.

Total	S.2 Rest of the world	S.1 Total economy	S.15 NPISHs	S.14 Households	S.13 General government	S.12 Financial corporations	S.11 Non-financial corporations	Code	Transactions and balancing items
Expenditures									
								B2g	*Operating surplus, gross*
								B3g	*Mixed income, gross*
1 544	1 544							D1	Remuneration of employees
								D2	Taxes on production and imports
								D21	Taxes on products
								D29	Other taxes on production
2 037	2 037							D3	Subsidies
250	250							D31	Subsidies on products
1 787	1 787							D39	Other subsidies on production
51 035	8 511	42 524	3	1 004	4 610	12 997	23 911	D4	Property income
239 550		*239 550*	*915*	*163 832*	*37 612*	*6 170*	*31 022*	*B5g*	*Balance of earned incomes, gross / National income, gross*

Code	Transactions and balancing items	S.11 Non-financial corporations	S.12 Financial corporations	S.13 General government	S.14 Households	S.15 NPISHs	S.1 Total economy	S.2 Rest of the world	Total
									Revenues
B2g	*Operating surplus, gross*	*44 720*	*6 744*	*6 801*	*13 611*	*851*	*72 727*		*72 727*
B3g	*Mixed income, gross*				*25 374*		*25 374*		*25 374*
D1	Remuneration of employees				114 912		114 912	236	115 148
D2	Taxes on production and imports			36 512			36 512		36 512
D21	Taxes on products			33 031			33 031		33 031
D29	Other taxes on production			3 481			3 481		3 481
D3	Subsidies			-2 746			-2 746		-2 746
D31	Subsidies on products			- 217			- 217		- 217
D39	Other subsidies on production			-2 528			-2 528		-2 528
D4	Property income	10 212	12 423	1 654	10 939	67	35 295	15 740	51 035
B5g	*Balance of earned incomes, gross / National income, gross*								

From Tables 3.1 and 3.2, we can see that both taxes on production and imports and subsidies have two components. In the former are taxes on products (code D21), and other taxes on production (D29). In the latter are subsidies on products (code D31), and other subsidies on production (D39). We can also see that national accounts do not provide information regarding the expenditures of institutional sectors for the first components, that is for taxes and subsidies on products (codes D21 and D31).

Table 3.3. Net taxes on production and imports.

		net taxes on production and imports (D2-D3)		
		Revenues	*less expenditures*	Net gain or loss (-)
		a	b	c = a+b
S11	Non-financial corporations		742	742
S12	Financial corporations		-537	-537
S13	General government	33 766	439	34 205
S14	Households		-315	-315
S15	NPISHs		349	349
	residual difference (D21-D31)		-32 929	-32 929
S1	All domestic sectors (total economy)	33 766	-32 253	1 514
S2	Rest of the world	-1 514	0	-1 514
	Total	32 253	-32 253	0

[Numerical example based on the national accounts for Portugal in 2022, in millions of euros, produced by *INE* and *Banco de Portugal*]

Therefore, in the summary shown in Table 3.3, with the taxes on production and imports net of subsidies, which will support our systematization of the distribution process, we must consider a residual *difference,* to fulfil the totals. This is the usual treatment, which will also be adopted here, although the importance of a separate treatment, especially without *residual difference*, should not be neglected and seriously considered in deepen studies and the purpose of having data on the distribution process from the national accounts[9].

Starting the systematization of the distribution process, the remuneration of production factors is summarized in Tables 3.4 and 3.5 by considering the income associated to the use of production factors, or factor income, in which we identify income from employment and other income. Income from employment corresponds to remuneration of employees (code D1). Other income corresponds to the following items: property income (code D4); compensation of self-employed workers and employers, generated within the scope of the activity of unincorporated households' enterprises, that is, the gross mixed income (code B3g); and, compensation of capital, that is, the gross operating surplus (code B2g).

Table 3.4. Factor income originating.

		Factor income originating			Factor income originating, with net taxes on production and imports (B1g, GDP; B12 part)
		Income from employment (D1)	Other income (B2&3g,D4)	Total	
		1	2	3 =1+2	3-b
S11	Non-financial corporations	77 498	44 720	122 218	121 477
S12	Financial corporations	4 087	6 744	10 831	11 368
S13	General government	25 977	6 801	32 778	32 339
S14	Households	2 448	38 984	41 432	41 747
S15	NPISHs	3 595	851	4 445	4 097
	residual difference (D21-D31)				32 929
S1	All domestic sectors (total economy)	113 604	98 100	211 704	243 957
S2	Rest of the world	1 544	8 511	10 055	10 055
	Total	115 148	106 611	221 759	254 012

In turn, Table 3.4, in columns 1-3, shows the decomposition of the so-called factor income originating in each institutional sector, that is, of the gross value added of the domestic sectors and a part of the current external balance of the rest of the world. If we add the expenditures in net taxes on production and imports (column b of Table 3.3) to that total, we obtain the gross domestic product (code B1g) for domestic sectors, remaining the same the part for the rest of the world, relating to a part of the current external balance (code B12). For example, the factor income originating in non-financial corporations totalled 122218, with 77498 of income from employment and 44720 of other income, in this case, income from capital, in the form of gross operating surplus. The households totalled 41432, with 2448 of income from employment and 38984 of other income, in this case, 25374

[9] See a simulation of the distribution process without *residual difference,* in Santos (2024) - Annex 3.

of gross mixed income and 13611 of gross operating surplus. The rest of the world totalled 10055, 1544 of income from employment and 8511 of other income, in the form of property income. The same reading can be made for the other sectors.

Note that the totals of 221759 and 254012, without and with net taxes on production and imports, will remain until the end of the distribution process, as described below. In fact, we will see that, throughout that process and the four rounds of the redistribution chain, which we will identify in it, the composition of these totals will change, that is, some sectors will become richer to the detriment of others. In the whole, however, nothing changes, that is no value is added. This is the big difference between the distribution process and the production process, where there is value added, that is, where income is generated.

Table 3.5, in columns 4-12, shows how the factor income originating in each sector is paid to and retained by other sectors. Thus, the factor income originating from employment in various sectors, including the rest of the world, is paid to and retained by the households and the rest of the world. In the same way, property income, in the form of investment income and rent, is paid to and received by all sectors - domestic and rest of the world. Therefore, factor income retained in each sector is measured by adding to the corresponding factor income originating the factor income received from the other sectors and subtracting all factor income paid by the sector. If we add the revenues of net taxes on production and imports (column a of Table 3.3) to the sum of the factor income retained, we obtain the gross national income (code B5g), for domestic sectors, and the part of the rest of the world, relating to a part of the current external balance (code B12).

Table 3.5. From factor income originating to factor income retained.

		Factor income originating	Redistribution: receipts and payments of factor income						Factor income retained			Factor income retained, with net taxes on production and imports (B5g; B12 part)
			Income from employment (D1)			Other income (D4)			Income from employment (D1)	Other income (B2&3g,D4)	Total	
			Revenues	*less expenditures*	Net gain or loss (-)	Revenues	*less expenditures*	Net gain or loss (-)				
		3	4	5 = -1	6 =4+5	7	8	9 =7+8	10 =1+6	11 =2+9	12 =10+11	12+a
S11	Non-financial corporations	122 218	0	-77 498	-77 498	10 212	-23 911	-13 699	0	31 022	31 022	31 022
S12	Financial corporations	10 831	0	-4 087	-4 087	12 423	-12 997	-574	0	6 170	6 170	6 170
S13	General government	32 778	0	-25 977	-25 977	1 654	-4 610	-2 956	0	3 845	3 845	37 612
S14	Households	41 432	114 912	-2 448	112 465	10 939	-1 004	9 935	114 912	48 919	163 832	163 832
S15	NPISHs	4 445	0	-3 595	-3 595	67	-3	64	0	915	915	915
S1	All domestic sectors (total economy)	211 704	114 912	-113 604	1 308	35 295	-42 524	-7 229	114 912	90 871	205 783	239 550
S2	Rest of the world	10 055	236	-1 544	-1 308	15 740	-8 511	7 229	236	15 740	15 976	14 462
	Total	221 759	115 148	-115 148	0	51 035	-51 035	0	115 148	106 611	221 759	254 012

Therefore, from the distributive transactions and balancing items measure by the earned income national accounts, as summarized in Tables 3.1 and 3.2, the measurement of institutional sectors' contribution to the production of goods and services is systematized in columns 1-12 of Tables 3.4 and 3.5.

From here, the chain of redistribution will link the factor income retained by institutional sectors with their use of these same goods and services (and non-produced non-financial assets), measured through their net spending, within the scope of their current and capital (national) accounts.

[Numerical example based on the national accounts for Portugal in 2022, in millions of euros, produced by *INE* and *Banco de Portugal*]

a.2) Transfer of income accounts (2025 SNA – Chap.9) are composed of income transfers other than transfers in kind account and social transfer in kind account, record the redistribution of the balance of earned incomes - national income, through the receipt (revenues) and payment (expenditures) of current transfers. Table 3.6 represents the first with records relating to three categories of distributive transactions: current taxes on income, wealth, etc. (code D5); social contributions and benefits (code D6); and other current transfers (code D7). The partition of transactions relating to social contributions and benefits (code D6), on the one hand, into social contributions less service charges (code D61) and social benefits except social transfers in kind (code D62) and, on the other hand, into social transfers in kind (code D63), is associated to the distinction between the two above mentioned components of the transfer of income accounts. The former records the redistribution through the current transfers other than social transfers in kind, which balancing item for the economy is the disposable income (code B6). The latter records the redistribution through the social transfers in kind, made by the general government and the NPISH to households, which balancing item is the disposable income adjusted for social transfers in kind (code B7). The latter is equal to the former to the total economy and financial and non-financial corporations and is different for the remaining institutional sectors. The transactions with the rest of the world, within the scope of the redistribution of income accounts, are also part of the current external balance (code B12). Because social transfers in kind do not represent monetary flows between the involved institutional sectors, we will not consider it here.

Table 3.6. Income transfers other than transfers in kind account.

Total	S.2 **Rest of the world**	S.1 **Total economy**	S.15 **NPISHs**	S.14 **Households**	S.13 **General government**	S.12 **Financial corporations**	S.11 **Non-financial corporations**	Code	Transactions and balancing items
Expenditures									
								B5g	*Balance of earned incomes, gross / National income, gross*
26 259	449	25 810	9	17 524	24	1 089	7 163	D5	Current taxes on income, wealth, etc.
25 559	449	25 109	7	16 945	21	1 048	7 088	D51	Taxes on income
700		700	2	579	4	41	75	D59	Other current taxes
34 600	84	34 516		34 516				D61	Social contributions less service charges
48 162	3 147	45 014	328	20	40 296	2 174	2 196	D62	Social benefits other than social transfers in kind
28 262	8 079	20 184	189	6 181	6 497	4 699	2 618	D7	Other current transfers
3 805	70	3 735	66	1 240	37	1 367	1 024	D.71	Non-life insurance premiums less service charges
3 671	655	3 016				3 016		D.72	Non-life insurance claims
0	0	0			0			D.73	Current transfers within general government
3 288	745	2 543			2 543			D.74	Current international cooperation
17 499	6 609	10 890	123	4 941	3 916	316	1 594	D.75	Miscellaneous current transfers
244 278		*244 278*	*5 024*	*162 671*	*49 141*	*4 814*	*22 627*	*B6g*	*Disposable income, gross*

[Numerical example based on the national accounts for Portugal in 2022, in millions of euros, produced by *INE* and *Banco de Portugal*]

Code	Transactions and balancing items	S.11 Non-financial corporations	S.12 Financial corporations	S.13 General government	S.14 Households	S.15 NPISHs	S.1 Total economy	S.2 Rest of the world	Total
									Revenues
B5g	*Balance of earned incomes, gross / National income, gross*	*31 022*	*6 170*	*37 612*	*163 832*	*915*	*239 550*		*239 550*
D5	Current taxes on income, wealth, etc.			25 693			25 693	566	26 259
D51	Taxes on income			24 993			24 993	566	25 559
D59	Other current taxes			700			700	0	700
D61	Social contributions less service charges	2 196	1 877	29 685	20	366	34 144	456	34 600
D62	Social benefits other than social transfers in kind				47 880		47 880	282	48 162
D7	Other current transfers	1 387	4 729	2 969	9 181	4 269	22 535	5 728	28 262
D.71	Non-life insurance premiums less service charges		3 034				3 034	771	3 805
D.72	Non-life insurance claims	767	1 289	32	1 427	58	3 574	97	3 671
D.73	Current transfers within general government			0			0	0	0
D.74	Current international cooperation			745			745	2 543	3 288
D.75	Miscellaneous current transfers	620	406	2 193	7 753	4 211	15 182	2 317	17 499
B6g	*Disposable income, gross*								

From here we begin the description of the so-called chain of redistribution. Thus, the first round, represented in Table 3.7, columns 13-16, consists in the transformation of the factor income retained into income before taxes, through the revenues and expenditures of social benefits other than social transfers in kind (code D62) and other current transfers (code D7).

Table 3.7. Chain of redistribution – first round.

		Factor income retained	Redistribution: social benefits.., other current transfers (D62,D7)			Income before taxes
			Revenues	*less expenditures*	Net gain or loss (-)	
		12	13	14	15 =13+14	16 =12+15
S11	Non-financial corporations	31 022	1 387	-4 814	-3 427	27 594
S12	Financial corporations	6 170	4 729	-6 872	-2 143	4 027
S13	General government	3 845	2 969	-46 793	-43 824	-39 979
S14	Households	163 832	57 060	-6 201	50 859	214 691
S15	NPISHs	915	4 269	-517	3 752	4 667
S1	All domestic sectors (total economy)	205 783	70 414	-65 198	5 217	211 000
S2	Rest of the world	15 976	6 010	-11 226	-5 217	10 759
	Total	221 759	76 424	-76 424	0	221 759

For example, the non- financial corporations, with a factor income retained of 31022, have 1387 of revenues of other current transfers (non-life insurance claims and miscellaneous current transfers); and 4814 of expenditures, corresponding to 2196 of social benefits other than social transfers in kind and 2618 of other current transfers (1024 of non-life insurance premiums less service charges and 1594 of miscellaneous current transfers). This results in a net loss of 3427 and an income before taxes of 27594. In the case of the households, with a factor income retained of 163832, in this round, the income before taxes is transformed into 214 691. In fact, to the net gain of 50859, contributed: 57060 of revenues, relating to 47880 of social benefits other than social transfers in kind and 9181 of other

[Numerical example based on the national accounts for Portugal in 2022, in millions of euros, produced by *INE* and *Banco de Portugal*]

transfers (1427 of non-life insurance claims and 7753 of miscellaneous current transfers); and 6201 of expenditures, composed by 20 in social benefits other than social transfers in kind, and of 6181 of other current transfers (1240 of non-life insurance premiums less service charges and 4941 of miscellaneous current transfers). The same reading can be made for the other sectors.

Note that in the total income (retained and before taxes) of 221759, in this round, the total of domestic sectors' income increases from 205976 to 211000 to the detriment of the rest of the world, that decreases from 15976 to 10759.

The second round, represented in Table 3.8, columns 17-20, consists in the transformation of the income before taxes into disposable income, through the revenues and expenditures of current taxes on income, wealth, etc. (code D5) and social contributions less service charges (D61).

Table 3.8. Chain of redistribution – second round.

		Income before taxes	Redistribution: .. taxes on income, ..social contributions (D5, D61)			Disposable income	Disposable income, with net taxes on production and imports (B6g; B12 part)
			Revenues	*less expenditures*	Net gain or loss (-)		
		16	17	18	19 =17+18	20 =16+19	20+a
S11	Non-financial corporations	27 594	2 196	-7 163	-4 967	22 627	22 627
S12	Financial corporations	4 027	1 877	-1 089	788	4 814	4 814
S13	General government	-39 979	55 378	-24	55 354	15 375	49 141
S14	Households	214 691	20	-52 039	-52 020	162 671	162 671
S15	NPISHs	4 667	366	-9	356	5 024	5 024
S1	All domestic sectors (total economy)	211 000	59 837	-60 326	-489	210 511	244 278
S2	Rest of the world	10 759	1 022	-533	489	11 248	9 734
	Total	221 759	60 859	-60 859	0	221 759	254 012

In our numerical example, all the domestic sectors, except households and non-financial corporations, are gainers, with the general government in first place, with revenues of 55378 (25693 of current taxes on income, wealth, etc. and 39685 of social contributions) and 24 of expenditures (in current taxes on income, wealth, etc.), allowing the transformation of a negative income before taxes of 39979 to a positive disposable income of 15375. In turn, the households, see their loss result from 20 of revenues and expenditures in the amount of 52039, corresponding to 17524 of current taxes on income, wealth, etc., and 34516 of social contributions less service charges. The later include the employers' social contributions, considered as income from employment in the measurement of the factor income originating and retained.

The result of the second round, represented in column 20, is the income available for spending in final consumption and saving, in the case of general government, households and NPISHs; and only for saving in the case of non-financial and financial corporations, who do not have final consumption expenditure. By adding the revenues of net taxes on production and imports (column a of Table 3.3) to that result, we obtain the balancing item of the national accounts with the same name (code B6g),

[Numerical example based on the national accounts for Portugal in 2022, in millions of euros, produced by *INE* and *Banco de Portugal*]

for domestic sectors, and the corresponding part of the current external balance (code B12), for the rest of the world.

Within the second round for domestic sectors, although not representing monetary flows between the involved institutional sectors, it would be possible to identify a so-called "sub-round" by considering the revenues of the households and the expenditures of the general government and the NPISHs, in social transfers in kind (code D63), which only changes disposable income of these sectors, that comes to be named as "adjusted"[10].

So far, to obtain the balancing items recorded by the national accounts, usually relevant macroeconomic aggregates for the total economy and domestic sectors, we saw that the net taxes on production and imports were considered with the factor income originated, by adding the corresponding expenditures of the institutional sectors and a *residual difference* to obtain the gross domestic product (code B1g); with the factor income retained, by adding the corresponding resources of the general government to obtain the gross national income (code B5g); and with the disposable income by also adding the corresponding resources of the general government (code B6g). In fact, although this (net) taxes integrate the costs of production and are collected by the general government from the producers, they allocate them to the prices of the products, paid by the purchasing sectors. Thus, with the restriction of a *residual difference*, the third round of redistributions consists in the final income formation, by adding the net gain or loss of institutional sectors relating to net taxes on production and imports, as represented in column c of Table 3.3, to the disposable income, as represented in column 21 of Table 3.9. In this round we identify the part of the final income that each institutional sector has for spending in transactions related to products and, according with the latest versions of the SNA, non-financial assets (produced and not produced), namely, in the form of final consumption, capital formation, and net acquisitions of (non-financial) non-produced assets. It would be the total final income if the *residual difference* did not exist.

Table 3.9. Chain of redistribution – third round.

		Disposable income	net taxes on production and imports (D2-D3)			Final Income
			Revenues	*less expenditures*	Net gain or loss (-)	
		20	a	b	c = a+b	21 =20+c
S11	Non-financial corporations	22 627		742	742	23 369
S12	Financial corporations	4 814		-537	-537	4 277
S13	General government	15 375	33 766	439	34 205	49 580
S14	Households	162 671		-315	-315	162 356
S15	NPISHs	5 024		349	349	5 372
	residual difference (D21-D31)			-32 929	-32 929	-32 929
S1	All domestic sectors (total economy)	210 511	33 766	-32 253	1 514	212 025
S2	Rest of the world	11 248	-1 514	0	-1 514	9 734
	Total	221 759	32 253	-32 253	0	221 759

[10] See Table 3.3-6 and the corresponding remarks in Santos (2024).

a.3) Use of income accounts (2025 SNA – Chap.10) are composed of use of disposable income account and use of disposable income adjusted for social transfers in kind account, record the distribution of disposable income between final consumption and savings. Table 3.10 represents the first, recording the adjustment for the change in pension and non-pension entitlements (code D8), which is not considered a distributive transaction in itself but needs to be considered since, on the one hand, it is an adjustment to the employers' social contributions (a component of remuneration of employees), which affected the transformation of the factor income originating into retained and the second round of redistributions and, on the other, it affects the net lending / net borrowing of the institutional sectors, included in the fourth round of the chain of redistribution. For the economy, the balancing item of this account is the saving (code B8). Regarding the transactions with the rest of the world, if there are any related to the adjustment for the change in pension entitlement, they are the last accounted for the current external balance (code B12), which accumulated total appears here.

Table 3.10. Use of disposable income account.

Total	S.2 **Rest of the world**	S.1 **Total economy**	S.15 **NPISHs**	S.14 **Households**	S.13 **General government**	S.12 **Financial corporations**	S.11 **Non-financial corporations**	Code	Transactions and balancing items
Expenditures									
								B6g	*Disposable income, gross*
197 672		197 672	3 898	151 318	42 456			P3	Final consumption expenditure
- 203	0	- 203	0		0	- 203	0	D8	Adjustment for the change in pension and non-pension entitlements
46 606		*46 606*	*1 126*	*11 151*	*6 685*	*5 017*	*22 627*	*B8g*	*Saving, gross*
5 536	*5 536*							*B12*	*Current external balance*

Code	Transactions and balancing items	S.11 **Non-financial corporations**	S.12 **Financial corporations**	S.13 **General government**	S.14 **Households**	S.15 **NPISHs**	S.1 **Total economy**	S.2 **Rest of the world**
B6g	*Disposable income, gross*	*22 627*	*4 814*	*49 141*	*162 671*	*5 024*	*244 278*	
P3	Final consumption expenditure							
D8	Adjustment for the change in pension and non-pension entitlements				- 203		- 203	0
B8g	*Saving, gross*							
B12	*Current external balance*							

b) Capital account (2025 SNA – Chap.11) within the scope of accumulation accounts, records: acquisitions and disposals of non-financial assets, produced and not produced; internal bookkeeping transactions linked to production (such as changes in inventories and acquisitions less disposals of valuable); and redistribution of wealth by means of capital transfers. Table 3.11 represents it, in which is recorded the last category of distributive transactions: capital transfers (code D9). The balancing item of this account, both for the economy (all domestic sectors) and for the rest of the world, is the net lending (+) / net borrowing (–) (code B9).

In this account, instead of expenditures and revenues, we have changes in assets and changes in liabilities and net worth. On the other hand, for reasons beyond the scope of this work, capital transfers

[Numerical example based on the national accounts for Portugal in 2022, in millions of euros, produced by *INE* and *Banco de Portugal*]

appear in the side of changes in liabilities and net worth with the distinction "receivable" and "payable", the latter of which has a negative sign. In our description of the distribution process, namely in fourth round of the chain of redistribution, we will treat "capital transfers payable" and "capital transfers receivable" in the same way as the expenditures and revenues, respectively, of the other eight categories of transactions.

Table 3.11. Capital account.

Total	S.2 Rest of the world	S.1 Total economy	S.15 NPISHs	S.14 Households	S.13 General government	S.12 Financial corporations	S.11 Non-financial corporations	Code	Transactions and balancing items
Changes in assets									
								B8g	*Saving, gross*
								B8n	*Saving, net*
								B12	*Current external balance*
								NF1,3 (P5,..)	Acquisitions less disposals of produced non-financial assets
50 190		50 190	731	9 181	5 807	455	34 016	NF11,31	Gross fixed capital formation
1 779		1 779	1	98	48	0	1 632	NF13,33	Changes in inventories
173		173	2	84	10	0	76	NF14	Acquisitions less disposals of valuables
0	- 247	247	- 26	- 249	- 8	- 209	740	NF2,34 (NP,..)	Acquisitions less disposals of non-produced non-financial assets
								D9r	Capital transfers, receivable
								D91r	Capital taxes, receivable
								D92r	Investment grants, receivable
								D93r	Debt forgiveness, receivable
								D99r	Other capital transfers, receivable
								D9p	Capital transfers, payable
								D91p	Capital taxes, payable
								D92p	Investment grants, payable
								D93p	Debt forgiveness, payable
								D99p	Other capital transfers, payable
0	*3 235*	*-3 235*	*790*	*2 266*	*- 757*	*5 229*	*-10 763*	*B9*	*Net lending (+) / net borrowing (–)*

Code	Transactions and balancing items	S.11 Non-financial corporations	S.12 Financial corporations	S.13 General government	S.14 Households	S.15 NPISHs	S.1 Total economy	S.2 Rest of the world	Total
									Changes in liabilities and net worth
B8g	*Saving, gross*	*22 627*	*5 017*	*6 685*	*11 151*	*1 126*	*46 606*		*46 606*
B8n	*Saving, net*	*- 685*	*3 840*	*92*	*-3 363*	*275*	*159*		*159*
B12	*Current external balance*							*5 536*	*5 536*
NF1,3 (P5,..)	Acquisitions less disposals of produced non-financial assets								
NF11,31	Gross fixed capital formation								
NF13,33	Changes in inventories								
NF14	Acquisitions less disposals of valuables								
NF2,34 (NP,..)	Acquisitions less disposals of non-produced non-financial assets								
D9r	Capital transfers, receivable	3 210	462	1 570	232	373	5 847	59	5 906
D91r	Capital taxes, receivable			0			0		0
D92r	Investment grants, receivable	1 274	4	1 446	229	358	3 311	4	3 314
D93r	Debt forgiveness, receivable	0	0	0	0	0	0	0	0
D99r	Other capital transfers, receivable	1 935	459	124	3	15	2 536	56	2 592
D9p	Capital transfers, payable	- 136	- 4	-3 155	- 3	- 1	-3 298	-2 608	-5 906
D91p	Capital taxes, payable	0	0	0	0	0	0	0	0
D92p	Investment grants, payable			- 734			- 734	-2 580	-3 314
D93p	Debt forgiveness, payable	0	0	0	0	0	0	0	0
D99p	Other capital transfers, payable	- 136	- 4	-2 421	- 3	- 1	-2 564	- 28	-2 592
B9	*Net lending (+) / net borrowing (–)*								

[Numerical example based on the national accounts for Portugal in 2022, in millions of euros, produced by *INE* and *Banco de Portugal*]

Thus, not forgetting the *residual difference,* as shown in Table 3.12, columns 22-29, the fourth, and last, round of redistributions will then measure the use of income in the mentioned transactions related to products and non-financial assets (produced and not produced), after considering the net gain or loss in last two groups of distributive transactions (codes D8 and D9), as well as the net lending or borrowing (code B9) of institutional sectors. Net lending or borrowing means that institutional sectors to meet these (net) transactions did not need to use all their income or needed more than their income.

Table 3.12. Chain of redistribution – fourth round.

		Final Income	Redistribution: adjustment .. in pension .. entitlements (D8)			Redistribution: capital transfers (D9)			Net lending (+) / net borrowing (–) (B9)	Use of Income
			Revenues	*less expenditures*	Net gain or loss (-)	Revenues	*less expenditures*	Net gain or loss (-)		
		21	22	23	24 =22+23	25	26	27 =25+26	28	29 =21+24+27+28
S11	Non-financial corporations	23 369		0	0	3 210	-136	3 074	-10 763	15 680
S12	Financial corporations	4 277		203	203	462	-4	459	5 229	10 168
S13	General government	49 580		0	0	1 570	-3 155	-1 585	-757	47 238
S14	Households	162 356	-203	0	-203	232	-3	229	2 266	164 649
S15	NPISHs	5 372		0	0	373	-1	372	790	6 534
	residual difference (D21-D31)	-32 929								-32 929
S1	All domestic sectors (total economy)	212 025	-203	203	0	5 847	-3 298	2 549	-3 235	211 339
S2	Rest of the world	9 734	0	0	0	59	-2 608	-2 549	3 235	10 420
	Total	221 759	-203	203	0	5 906	-5 906	0	0	221 759

For example, not considering the corresponding net gain of loss in net taxes on products, the non-financial corporations, with a final income of 23369, registered a net gain of 3074 in capital transfers (1274 of investment grants and 1935 of other capital transfers less 1366 of net other capital transfers), and a net borrowing of 10763. Therefore, because this institutional sector does not have final consumption, its use of income, in the amount of 15680 and the net borrowing should correspond to their spending or net transactions related with goods, services and non-financial produced and non-produced assets. However, because in national accounts these items include net taxes on production and imports, to identify the correspondence we have to "jump" the third round and instead of considering the final income, consider the disposable income with net taxes on production and imports, as shown in Table 3.13, for total economy. Thus, for example, the non-financial corporations cover their spending of 36464 (35724 of gross capital formation and 740 of net acquisitions of non-financial produced and non-produced assets), with their disposable income (22627), net gain in capital transfers (3074) and net borrowing (10763), that is a use of income of 14938.

The same exercise can be made for the other sectors.

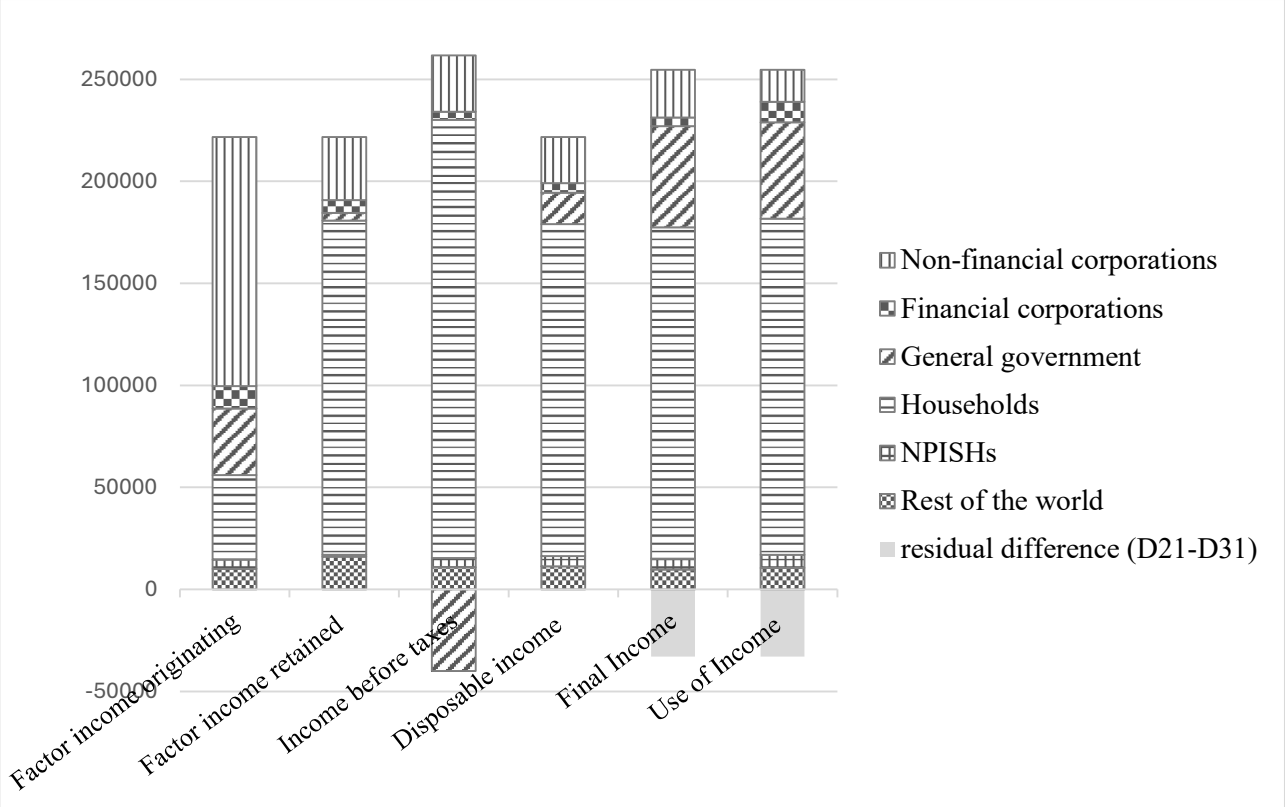
[Numerical example based on the national accounts for Portugal in 2022, in millions of euros, produced by *INE* and *Banco de Portugal*]

Table 3.13. Use of income of domestic sectors in net transactions related with goods and services and non-financial produced and non-produced assets.

		Disposable income, with net taxes on production and imports (B6g..)	Redistribution.. Net gain or loss (-)		Net lending (+) / net borrowing (–) (B9)	Use of income'	Net transactions related with goods, services and non-financial produced and non-produced assets			
			adjustment .. in pension .. entitlements (D8)	capital transfers (D9)			Final consumption (expenditure)	Gross capital formation	Non-financial non-produced assets	Total
		20+a	24	27	28	29'=20+a+24+27+28	30	31	32	33=30+31+32=20+a+24+27-28
S11	Non-financial corporations	22 627	0	3 074	-10 763	14 938		35 724	740	36 464
S12	Financial corporations	4 814	203	459	5 229	10 705		456	-209	247
S13	General government	49 141	0	-1 585	-757	46 799	42 456	5 865	-8	48 314
S14	Households	162 671	-203	229	2 266	164 964	151 318	9 363	-249	160 431
S15	NPISHs	5 024	0	372	790	6 186	3 898	734	-26	4 606
S1	All domestic sectors (total economy)	244 278	0	2 549	-3 235	243 592	197 672	52 142	247	250 061

The representation of institutional sectors in the main types of income identified in this interpretation of the distribution process (for the total of 221759) is summarized in Chart 3.1. and is quantified in the columns of "Structure - Total" in Tabes 4.6 and 4.7, except for the case of income before taxes and final income. It is worth highlighting the positions of non-financial corporations and households and the corresponding reversal throughout the process, especially from the factor income originating to factor income retained.

Chart 3.1. Summary of the representation of institutional sectors throughout the distribution process.



[Numerical example based on the national accounts for Portugal in 2022, in millions of euros, produced by *INE* and *Banco de Portugal*]

4. A SAM-based approach to distribution and redistribution of income

Starting from the national accounts - data and systems, the SAM-based approach presented bellow has been progressively conceived, adapted and experimented by the author, with the focus on the study of distribution and redistribution of income and the underlying institutional interrelations in distributive transactions. Among the various references that supported such development, the following must be highlighted: Stone (1986), Pyatt and Round (1985) and Pyatt (1988, 1991).

The SAM we are working with, independently of its level of disaggregation, is a square matrix, in which each column-row pair represents an account with the outflows represented in column and the inflows in row. In turn, reflecting the existence of equilibrium in the accounts, the sum of each column is equal to the sum of the corresponding row. In terms of SNA terminology for transactions, we say that the entries made in rows represent revenues (resources, receipts, inflows, incomings, incomes) and changes in liabilities and net worth, and that the entries made in columns represent expenditures (uses, outflows, outgoings, outlays) and changes in assets.

The SAM-based approach is used to measure and model the economic activity of a country. For that, empirical and theoretical descriptions of the activity are defined, respectively, through numerical and algebraic versions of the SAM. As explained below, each cell of the former is filled with numerical values, whereas of the latter is filled with algebraic expressions that, together with those of all the other cells, form a SAM-based model, the calibration of which involves a replication of the numerical version.

Without belittling the work of other authors, the formulation here presented has been used in the author's research work to study the effects of changes associated to distribution and redistribution of income. For that, from a specific reality (Portugal), portrayed by SAM numerical versions, constructed from the national accounts; and, by using the corresponding algebraic version, scenarios were constructed representing macroeconomic impacts of possible policy measures with incidence, among others, on: (other) net taxes on the production of real estate activities (Santos, 2022a); (other) current transfers from the government to the households and households' compensation of employees (Santos, 2018); factors income (labour and other) and current transactions of institutional sectors (Santos, 2018a); households unincorporated enterprises' factors income (gross mixed income) (Santos, 2016); social benefits in the form of households' retirement pensions (Santos, 2014) [11].

[11] Details on data and calculations in each of them, can be found in the following MPRA (Munich Personal RePEc Archive) Papers:

- No. 109488, August 2021*, Matrix representations of the national accounts' transaction values*, for Santos (2022a).
- No. 88611, August 2018, (with Utz Peter Reich) *Unconditional Basic Income: Who gets it? Who pays for it? A social Accounting Approach to Distribution*, for Santos (2018), with the approach applied to Portugal.
- No. 79742, June 2017, *An approach to the structural features of the socio-economic activity of a country based on a Social Accounting Matrix. Evidences and multiplier effects on distribution of income*, for Santos (2018a).
- No. 68364, December 2015, *The informal aspects of the activity of countries studied through Social Accounting and Socio-Demographic Matrices*, for Santos (2016).
- No. 53858, February 2014, *Studying the Socio-Economics of Ageing using Social Accounting and Socio-Demographic Matrices*, for Santos (2014).

Table 4.1. An aggregated social accounting matrix of transactions, with gross balancing items.

Expenditures/ Changes in assets / Revenues/ Changes in liabilities and net worth			**Economy**							**Rest of the world** account	Total
			Production accounts			Non-produced non-financial assets	Institutions accounts				
			Factors of production	Activities (industries)	Products (goods and services)		Current	Capital	Financial		
Economy	Production accounts	Factors of production	0	Gross added value (excluding net taxes on production and imports) = 211 704	0	0	0	0	0	Remuneration of employees (D1) + Property income (D4) = 10 055	Factor income (originating) = 221 759
		Activities (industries)	0	0	Output of goods and services = 473 336	0	0	0	0	0	Production value = 473 336
		Products (goods and services)	0	Intermediate consumption = 262 308	Distribution margins = 0	0	Final consumption = 197 672	Gross capital formation = 52 142	0	Exports = 120 714	Aggregate Demand = 632 836
	Non-produced non-financial assets		0	0	0	0	0	Net aquisitions … = 247	0	Net aquisitions … = -247	0
	Institutions accounts	Current	Gross national income (excluding net taxes on production and imports) = 205 783	Other taxes on production, net of subsidies (D29-D39) = 952	Taxes on products, net of subsidies (D21-D31) = 32 814	0	Current transactions (D5,D61, D62,D7, D8) = 118 289	0	0	Current transactions (D5,D61,D62,D7) = 11 760	369 598
		Capital	0	0	0	0	Gross saving = 46 606	Capital transfers (D9) = 3 239	0	Capital transfers (D9) = 2 608	52 453
		Financial	0	0	0	0	0	Net lending (+) / net borrowing (–) = -3 235	Net acquisitions of financial assets/Net incurrence of liabilities = -8 632	Net incurrence of liabilities (and statistical discrepancy)= 5 142	-6 725
Rest of the world account			Remuneration of employees (D1) + Property income (D4) = 15 976	Other taxes on production, net of subsidies (D29-D39) = -1 629	Taxes on products, net of subsidies (D21-D31) + Imports = 126 686	0	Current transactions (D5,D61,D62,D7) = 7 032	Capital transfers (D9) = 59	Net acquisitions of financial assets = 1 907		150 031
Total			Factor income (retained) = 221 759	Total costs = 473 336	Aggregate supply = 632 836	0	369 598	52 453	-6 725	150 031	

Note: The position of the distributive transactions is stressed with the corresponding SNA codes in parenthesis, except in the case of gross added value and gross national income, where the remuneration of employees (code D1) and property income (code D4) of institutional sectors are not explicit.

[Numerical example based on the national accounts for Portugal in 2022, in millions of euros, produced by *INE* and *Banco de Portugal*]

I. Numerical version

Chapter 3 showed the nine categories of distributive transactions properly positioned in the national accounts where they are recorded and a brief approach to their meaning, as well as position and role in the different parts of the so-called distribution process. For the first eight categories (SNA codes D1 to D8) we saw that national accounts provide information on the total expenditures and incomes of the various institutional sectors. For the last category (SNA code D9) we saw that national accounts provide information on the total payable and receivable by the various institutional sectors.

Table 4.1 presents an aggregated SAM numerical version and our starting point that position distributive transactions in a matrix representation of the system of national accounts, for the part related to the accounts that record the same. Representing the totals of transactions given in the sequence of national accounts, as shown in the Annex, this version can be considered as the grand totals of other levels of disaggregation.

These are totals to and from the total economy (all domestic institutional sector) and the rest of the world. However, for a possible disaggregation of institutions accounts by institutional sectors we only have totals, since information on the institutional interrelations in distributive transactions, within the economy and with the rest of the world, is not part of what is supposed to be available in the national accounts.

In fact, in transactions between institutional sectors, the revenues of some are the expenditures of others, or what some receive is paid by others. Thus, since one can be deduced from the other, the measurement of institutional interrelations will be possible both from information about the origin of the revenues (from-whom), or the part received, and from information about the destination of the expenditures (to-whom), or the part paid. This would allow the construction of the so called from-whom-to-whom matrices for distributive transactions, as was done with some detail in Santos (2022 and 2024).

Let us consider, for instance, the case of the “other current transfers” (D7) of our numerical example, without disaggregation, in Tables 3.6, or A.1. If the expenditures of each institutional sector were extended to destination institutional sectors, according with the estimate exemplified in Table 4.2, we would also have the institutional interrelations for this category of transactions, and it would be possible to fill in the corresponding from-whom-to-whom matrix, as represented in Table 4.3, with expenditures in columns and revenues in rows, as mentioned above, and the institutional sectors represented by the corresponding national accounts’ codes

In some cases, national accounts provide information at second and more levels of disaggregation of (total) transactions, which often allows the deduction institutional interrelations, avoiding the need to make estimates of the proposed extensions.

[Numerical example based on the national accounts for Portugal in 2022, in millions of euros, produced by *INE* and *Banco de Portugal*]

Table 4.2. Extension to destination institutional sectors of the total expenditures of other current transfers, in the income transfer other than transfers in kind account.

Total	S.2 **Rest of the world**	S.1 **Total economy**	S.15 **NPISHs**	S.14 **Households**	S.13 **General government**	S.12 **Financial corporations**	S.11 **Non-financial corporations**	Code	Transactions and balancing items
Expenditures									
28 262	8 079	20 184	189	6 181	6 497	4 699	2 618	D7	Other current transfers
1 387	599	788			301	487			S11 - Non-Financial Corporations
4 729	575	4 154	66	1 240	43	1 977	828		S12 - Financial Corporations
2 969	770	2 200	21	1 638	67	40	434		S13 - General Government
9 181	5 970	3 211	0	1 703	81	1 427	0		S14 - Households
4 269	165	4 104	45	691	3 049	99	220		S15 - NPISHs
5 728	0	5 728	57	909	2 957	668	1 136		S2 - Rest of the World

Table 4.3. From-whom-to-whom matrix of other current transfers.

	S11	**S12**	**S13**	**S14**	**S15**	S1	**S2**	S1+S2
S11	0	487	301	0	0	*788*	599	*1 387*
S12	828	1 977	43	1 240	66	*4 154*	575	*4 729*
S13	434	40	67	1 638	21	*2 200*	770	*2 969*
S14	0	1 427	81	1 703	0	*3 211*	5 970	*9 181*
S15	220	99	3 049	691	45	*4 104*	165	*4 269*
S1	*1 482*	*4 031*	*3 540*	*5 272*	*132*	*14 456*	*8 079*	*22 535*
S2	1 136	668	2 957	909	57	*5 728*		*5 728*
S1+S2	*2 618*	*4 699*	*6 497*	*6 181*	*189*	*20 184*	*8 079*	*28 262*

Note: The same construction could be made from the extension of the total revenues of other current transfers, in the income transfer other than transfers in kind account, by origin institutional sectors.

Thus, reading in column, we can know that the resident institutional units (S1) recorded a total of expenditures in the economy and in the rest of the world (S1+S2) in the amount of 20184. Because the revenues of the rest of the world (S2), which totalled 5728, are expenditures of the economy (S1), we can deduce the amount of transactions in the economy (S1), that is, the among the resident institutional units: 14456 = 20184 - 5728.

In the same way, reading in row, we have a total of revenues of the resident institutional units (S1), coming from the economy and the rest of the world (S1+S2) amounting to 22535. In turn, we have expenditures of the rest of the world (S2), which total 8079 that are revenues of the economy (S1), which allow us to deduce the amount of transactions in the economy (S1), that is, among the resident institutional units: 14456 = 22535 – 8079.

In turn, for instance, financial corporations (S12) registered expenditures in a total of 4699, of which 668 were to (whom!?) the rest of the world and the remaining 4031 to the domestic sectors (S1), distributed as follows: 487 to non-financial corporations (S11), 1977 to themselves (S12), 40 to general government (S13), 1427 to households (S14), 99 to NPISHs (S15). On the other hand, they registered revenues from (whom!?) the rest of the world (S2) in the amount of the 575 and from domestic sectors (S1) in the amount of 4154, distributed in the following way: 828 from non-financial corporations (S11), 1977 from themselves (S12), 43 from general government (S13), 1240 from

[Numerical example based on the national accounts for Portugal in 2022, in millions of euros, produced by *INE* and *Banco de Portugal*]

households (S14), 66 from NPISHs (S15). The same reading can be made for the other institutional sectors.

With such information provided by the national accounts it would become possible, within a consistent macroeconomic framework, to identify institutional interrelations, whose level of disaggregation could go as far as statistical secrecy, as well as sources and methods, would allow. This could be the starting point for deeper studies, using other sources of information, namely, monetary and financial statistics, public or government finance statistics, households' surveys, international accounts statistics. Although these other sources of information are gradually adapting to the SNA, there are still differences and the adjustment of national accounts totals would become easier and more accurate, especially if information on sources and methods were available.

Table 4.1 is an aggregated SAM numerical version that shows, within the system of economic transactions measured by the national accounts, how it is possible to work with the production process (income generator), and the distribution process (income distributor and user). Thus, with the disaggregation of the SAM accounts, networks of linkages associated to these processes, can be quantified to the extent that the availability of statistical information allows, according with various purposes of analysis.

Establishing the link between what was seen in Chapters 3, we can say that the SAM production accounts represent the production process, with "activities (industries)" covering the production national account, "products (goods and services)" covering the goods and services national account, and "factors of production" covering the generation and allocation of earned income national accounts. National accounts provide for the availability of statistical information capable of feeding, at least in part, the disaggregation of this group of accounts by institutional sectors, as shown, for example, in Tables A.1. Disaggregation by activities and products, not developed here, is also possible from the supply and use tables.

Linking production and distribution, the factors of production SAM accounts quantify the corresponding remuneration, as described in Chapter 3, allowing the identification of the factor income originating and retained and measuring the institutional sectors' contribution to the production of goods and services.

In turn, the institutions SAM accounts, namely the current and capital, register the (distributive) transactions that underly the chain of redistribution, as described in Chapter 3. The current SAM account covers the transfer and use of income national accounts (see Table A.1) and the capital SAM account covers the account with the same name (see Table A.2). As seen above, the national accounts do not provide for the availability of information on institutional interrelations in distributive transaction, a gap that we set out to fill in a simple way, as was then briefly illustrated. That would allow the fulfil of from-whom-to-whom matrices for distributive transactions, from which SAMs, in the version here purposed or other, could be constructed. Thus, with more or less detail, the revenues and expenditures of distributive transactions between institutional sectors, could be involved in this

[Numerical example based on the national accounts for Portugal in 2022, in millions of euros, produced by *INE* and *Banco de Portugal*]

empirical description, from which net gains or losses and levels of income associated to the various rounds of the distribution process, as presented above, could be calculated.

Our experiment, departing from Table 4.1, went until what is allowed by Tables A.1 and A.2 and some estimates made to from-whom-to-whom matrices, as mentioned above. The latter were constructed for (SNA codes in parentheses): current taxes on income, wealth, etc (D5); social contributions less service charges (D61); social benefits other than social transfers in kind (D62); other current transfers (D7); and capital transfers (D9).

With 17 rows and columns, a new version of the previous SAM was constructed with the factors of production disaggregated in labour (employees) and others (employers and own-account workers, capital) and the current and capital accounts disaggregated by the main domestic institutional sectors (SNA codes in parentheses) - non-financial corporations (S11), financial corporations (S12), general government (S13), households (S14) and NPISHs (S15). The financial and the rest of the world (S2) accounts remained completely aggregated.

II. Algebraic version

By adopting the systematization made in Santos (2022a), a possible theoretical description of a country's economic activity can be made through a so-called accounting multipliers model, adapted from the references mentioned at the beginning of this chapter and considering the empirical description made above, with uses corresponding to expenditures and resources to revenues.

"a) Four main assumptions:

a.1) structural features of the numerical version do not change;

a.2) resources' endowment is provided and there is no full employment;

a.3) production technology is provided;

a.4) relevant transactions are those that are measured by the national accounts, as defined by the underlying system.

b) Static analysis, at current prices.

c) SAM accounts and the corresponding transactions are organised into two main groups:

c.1) endogenous, if defined in the modelling process; and

c.2) exogenous, if defined outside the modelling process and if exerts an influence on the endogenous group.

d) Description and formalisation of the network of linkages between accounts.

To simplify: resources and changes in liabilities and net worth, represented in rows, are only mentioned as resources; uses and changes in assets, represented in columns, are only mentioned as uses.

Multiplications are identified by ".", if they are not at the end of a sentence.

d-1) Transactions within endogenous accounts: N = matrix; n = (column) vector of the corresponding row sums.

d-2) Transactions within exogenous accounts: R = matrix; r = (column) vector of the corresponding row sums.

d-3) Uses of exogenous in endogenous accounts, or injections into endogenous from exogenous accounts: X = matrix; x = (column) vector of the corresponding row sums.

d-4) Resources of exogenous from endogenous accounts, or leakages from endogenous into exogenous accounts: L= matrix; l = (column) vector of the corresponding row sums.

d-5) Total injections into endogenous accounts from exogenous accounts = total leakages from endogenous accounts into exogenous accounts:

$$i'.x = i'.l, \quad (1)$$

with i'= unitary (row) vector.

d-6) Total resources of the endogenous accounts: y_n = (column) vector of the corresponding row sums:

$$y_n = n + x. \quad (2)$$

Consequently, total uses of the endogenous accounts: y'_n = (row) vector of the corresponding column sums.

d-7) Total resources of the exogenous accounts: y_x = (column) vector of the corresponding row sums:

$$y_x = l + r. \quad (3)$$

Thus, total uses of the exogenous accounts: y'_x = (row) vector of the corresponding column sums.

d-8) Average use propensities of endogenous accounts:

- in endogenous accounts: $A_n = N.\hat{y}n^{-1}$; (4)

- in exogenous accounts: $Al = L.\hat{y}n^{-1}$; (5)

with $\hat{y}n^{-1}$ = inverse of the diagonal matrix of y_n. Thus, the structure of uses, or the initial direct effect of each additional monetary unit of the endogenous accounts' resources (with exogenous origin) is derived from the A_n and A_l matrices.

d-9) From d-1), d-4), and d-8) we can define:

$$N = A_n.\hat{y}n; \quad (6)$$

$$L = Al.\hat{y}n; \quad (7)$$

with $\hat{y}n$ = diagonal matrix of y_n.

d-10) From d-6), d-8), and d-9), it is possible the following development:

$$y_n = n + x = y_n = A_n.y_n + x = (I-A_n)^{-1}.x = M_a.\ x, \quad (8)$$

in the endogenous accounts' resources of each monetary unit of a change defined in d-3), with $M_a = (I-A_n)^{-1}$ = accounting multiplier matrix. This matrix represents the global effects with the assumptions described in a).

[Numerical example based on the national accounts for Portugal in 2022, in millions of euros, produced by *INE* and *Banco de Portugal*]

d-11) From d.4), d-9), and d-10), the following development is also possible:

$$l = A_l.y_n = A_l.\ (I-A_n)^{-1}.\ x = A_l.\ M_a.\ x. \quad (9)$$

Accounting multipliers can be decomposed in several different ways, as described and exemplified, for instance, in Santos (2004). On the other hand, instead of working with average propensities, it is possible to work with marginal propensities and obtain, rather than the accounting multipliers, the so-called fixed-price multipliers, as described and exemplified, for instance, in Santos (2007). The last reference is also illustrative of a work with transposed matrices, that is to say, exchanging uses by resources."

(Santos, 2022, pp. 33-34)

III. Scenarios of changes in institutional interrelations in distributive transactions

By applying the above-described accounting multiplier model to the mentioned disaggregated version of our numerical SAM, we constructed two scenarios involving changes in the institutional interrelations in distributive transactions. The results were taken from the recalculated SAMs with the multiplier effects of these changes, in which the expenditures of the exogenous accounts do not change, except the one that is the starting point of the scenario.

From the cells of the aggregated SAM – Table 4.1, the submatrices represented in Table 4.5 and 4.6, with the institutional sectors identified by the corresponding national accounts' codes, revenues in rows, and expenditures in column, resulted from de sum of the from-whom-to-whom matrices for the involved national accounts transactions, (wherever possible) disaggregated to the second level, estimated or deduced from what is supposed to be available from the national accounts, as seen above.

The following descriptions will consider what is provided by our SAM numerical version structure within the scope of what was seen above.

i) Scenario A, of changes in current transactions

As shown by Table 4.1, current transactions are part of our SAM's current account of institutions, representing amounts of: 118289 in the economy, or within domestic institutions, 7032 from domestic institutions to the rest of the world, and 11760 from the rest of the world to domestic institutions. They include current taxes on income, wealth, etc. (D5), social contributions less service charges (D61), social benefits other than social transfers in kind (D62), other current transfers (D7), and adjustment for the change in pension and non-pension entitlements (D8). Therefore, transactions involved in all the rounds identified in the chain of redistribution, in Chapter 3, are included here, although not all the fourth round. Table 4.4 represents the corresponding submatrices.

Table 4.4. Current transactions of institutional sectors.

	S11	**S12**	**S13**	**S14**	**S15**	S1	**S2**
S11	0	487	301	2 196	0	*2 984*	599
S12	828	1 977	43	3 117	66	*6 031*	575
S13	7 388	843	92	48 695	27	*57 044*	1 303
S14	2 196	3 398	40 095	1 743	328	*47 760*	9 117
S15	220	99	3 049	1 057	45	*4 470*	165
S1	*10 632*	*6 804*	*43 579*	*56 808*	*466*	*118 289*	*11 760*
S2	1 346	955	3 239	1 433	60	*7 032*	

Centring our attention in domestic institutional interrelations, let us consider a change in the cell with the higher amount - (S13, S14), corresponding to the revenues of the general government with origin in households, or the expenditures of the households with destination in general government, in the amount of 48695. From the (estimated) from-whom-to-whom matrices underlying its calculation, it is possible to identify the following decomposition: current taxes on income, wealth, etc., 17456; social contributions less service charges, 29601; other current transfers - miscellaneous current transfers, 1638.

Scenario A assumes an increase of 1000 in that amount, that is, 2% of the initial amount. To its construction, the following accounts were set as exogenous: households' current; institutions' financial; non-produced non-financial assets; and rest of the world.

ii) Scenario B, of changes in capital transfers

In Table 4.1 we can see that capital transfers (D9) are part of our SAM's capital account of institutions, representing amounts of: 3239 in the economy, or within domestic institutions, 59 from domestic institutions to the rest of the world, and 2608 from the rest of the world to domestic institutions. They include capital taxes (D91), investment grants (D92), other capital transfers (D93). Therefore, this time we are working at the end of the chain of redistribution, that is in the fourth round. Table 4.5 represents the corresponding submatrices.

Table 4.5. Capital transfers of institutional sectors.

	S11	**S12**	**S13**	**S14**	**S15**	S1	**S2**
S11	0	0	2 192	0	0	*2 192*	1 018
S12	0	0	461	0	0	*461*	1
S13	109	0	11	3	1	*124*	1 446
S14	0	3	43	0	0	*46*	186
S15	0	1	416	0	0	*416*	- 43
S1	*109*	*4*	*3 122*	*3*	*1*	*3 239*	*2 608*
S2	26	0	33	0	0	*59*	

Following an identical methodology to that used in scenario A, let us focus on the cell with higher amount of domestic institutional interrelations - (S11, S13), corresponding to the revenues of non-financial corporations with origin in the general government, or the expenditures of the general government with destination in non-financial corporations, in the amount of 2192. From the from-

whom-to-whom matrices underlying its calculation, it is possible to decompose that amount in 285 of investment grants, and 1907 of other capital transfers.

Scenario B assumes the same absolute increase of the previous, that is 1000 in that amount, now corresponding to 46% of the initial amount. To its construction, the following accounts were set as exogenous: general government's capital; institutions' financial; non-produced non-financial assets; and rest of the world.

iii) Results

With absolute increases of 1000, corresponding to relative increases of 2% in current transactions between households and general government, and of 46% in capital transfers between non-financial corporations and general government, scenarios A and B, reveal the results of the corresponding multiplier effects.

In both scenarios were set as exogenous: institutions' financial account; non-produced non-financial assets account; and rest of the world account. Were also set as exogenous: households' current account, in scenario A; and general government's capital account, in in scenario B.

Thus, with the focus in the various types of income identified throughout the distribution process, besides the corresponding structures of distribution by institutional sectors (assumed as unchangeable), Table 4.6 and 4.7, represent the percentual changes regarding the initial situation[12].

Table 4.6. Remuneration of production factors - structure and effects of scenarios (%).

		Factor income originating (Table 3.4, columns 3 and 3-b)						Factor income retained (Table 3.5, columns 12 and 12+a)					
		Structure		Scenario A		Scenario B		Structure		Scenario A		Scenario B	
		Total	GDP…	Total	GDP…	Total	GDP…	Total	GNI …	Total	GNI …	Total	GNI …
S11	Non-financial corporations	55,1	47,8	..	..	..	..	14,0	12,2	0,16	0,16	0,84	0,84
S12	Financial corporations	4,9	4,5	..	..	..	..	2,8	2,4	0,16	0,16	0,84	0,84
S13	General government	14,8	12,7	..	..	..	..	1,7	14,8	0,16	0,17	0,84	0,91
S14	Households	18,7	16,4	..	..	..	..	73,9	64,5	0,17	0,17	0,89	0,89
S15	NPISHs	2,0	1,6	..	..	..	..	0,4	0,4	0,16	0,16	0,84	0,84
	residual difference (D21-D31)		*13,0*		0,17		0,92						
S1	All domestic sectors (total economy)	95,5	96,0	0,17	0,17	0,92	0,92	92,8	94,3	0,16	0,16	0,88	0,88
S2	Rest of the world	4,5	4,0	0,00	0,00	0,00	0,00	7,2	5,7	0,16	0,16	0,84	0,84
	Total	100,0	100,0	0,17	0,17	0,87	0,88	100,0	100,0	0,16	0,16	0,87	0,88

Although without decomposition by domestic institutional sectors, the total factor income originating, or the generated income, to which non-financial corporations are the greater contributor, registered increases of 0,17% and 0,87-0,88% in scenarios A and B, respectively.

[12]In these tables and the corresponding description, the decimal places of the numbers are separated by "," because they are images of the spreadsheet worked on (excel files).

Indicative of the connection between the production and distribution processes, captured by our SAM-based approach, these results represent the totals that will remain until the end of the distribution chain in each scenario. In scenario B, total economy saw these increases added, respectively, by 0,04 percentual points, without and with net taxes on production and imports – gross domestic product (GDP), in this case.

The increases of 0,17% in scenario A and 0,92% in scenario B in the residual difference, corresponding to net taxes on products, were also verified in (total) net taxes on production and imports.

With the redistribution of the remuneration of production factors and a big change in the position of institutional sectors in the resulting structure, the factor income retained registered increases in the total economy, either without and with net taxes on production and imports – gross national income (GNI), in this case, identical to those for the total, once the rest of the world, although exogenous, registered revenues from endogenous accounts.

The relevant position of the households in the structure of the retained income, 73,9% (64,5%), only allowed them to feel slightly greater increases of 0,01 percentual points above the total economy, in both scenarios. In turn, the other institutional sectors registered increases of 0,04 percentual points below the total economy, except in the case of the GNI of the general government, 0,01 and 0,03 percentual points above the GNI of the total economy in scenarios A e B, respectively.

Therefore, scenario B reveals five times greater multiplier effects in factor income originating and retained, that is, in the generated income. That means that the multiplier effects of the change in capital transfers, from general government to non-financial corporations, are five times as large as the multiplier effects of the change in current transactions, from households to the general government.

Table 4.7. Redistribution of income - structure and effects of scenarios (%).

		First and second rounds - Disposable Income (Table 3.8, columns 20 and 20+a)						Third and fourth rounds - Use of Income (Table 3.13, column 29')		
		Structure		Scenario A (with D8)		Scenario B (with D8)		Structure	Scenarios	
		Total	DI …	Total	DI …	Total	DI …		A	B
S11	Non-financial corporations	10,2	8,9	0,15	0,15	0,83	0,83	5,9	0,21	4,60
S12	Financial corporations	2,2	1,9	0,11	0,11	0,80	0,80	4,2	0,18	0,73
S13	General government	6,9	19,3	3,21	1,12	0,72	0,85	18,4	1,10	-1,23
S14	Households	73,4	64,0	-0,16	-0,16	0,84	0,84	64,9	-0,16	0,84
S15	NPISHs	2,3	2,0	0,66	0,66	0,82	0,82	2,4	0,69	0,75
	residual difference (D21-D31)									
S1	All domestic sectors (total economy)	94,9	96,2	0,14	0,15	0,83	0,84	95,9	0,14	0,67
S2	Rest of the world	5,1	3,8	0,58	0,58	1,72	1,72	4,1	0,74	5,89
	Total	100,0	100,0	0,16	0,17	0,87	0,87	100,0	0,17	0,88

[Numerical example based on the national accounts for Portugal in 2022, in millions of euros, produced by *INE* and *Banco de Portugal*]

As shown in Table 4.7, in terms of the chain of redistribution, following the identification provided in Chapter 3, with the maintenance of the structures, the results of the effects of scenarios A and B were measured in terms of disposable income and use of income. With the adjustment for the change in pension and non-pension entitlements (D8) included in the disposable income, a "Total" is distinguished from a "DI", depending on the exclusion or inclusion, respectively, of the revenues of the general government in net taxes on production and imports. The use of income was, in turn, calculated from the latter.

In scenario A, the initial change of the current transactions from the households to the general government, the set of the households' current account (besides financial, rest of the world and non-produced non-financial assets accounts) as exogenous and the structure of distribution of the disposable income and the use of income, resulted in negative effect (-0,16%) felt by households in disposable income and in the use of income and the positive effects felt by the other sectors. It is worth mentioning the case of the general government, with a position in these structures of 6,9 % and 19,3% in disposable income, and 18,4% in the use of income, and effects quite above the other sectors.

As it could not be otherwise, the effects on total economy's disposable income and use of income of scenario B are significantly higher. With an initial change in the capital transfers from the general government to the non-financial corporations and the set of the general government's capital account (besides financial, rest of the world and non-produced non-financial assets accounts) as exogenous, it registered a certain harmony in the effects felt in disposable income, also revealing very little about the differences recorded by the structure of distribution. The same happens in terms of use of income, except in the case of the negative effect felt by the general government (-1,23%) and the quite positive effect felt by the non-financial corporations (4,6%).

In both scenarios the above-described effects felt in disposable income (DI) and use of income were reflected in an identical way in the net transactions related with goods, services and non-financial produced and non-produced assets, resulting in a total increase of 0,26% in scenario A and 1,37% in scenario B. To the latter, contributed the above mentioned quite positive effect (4,6%) also felt in gross capital formation and net transactions related with non-financial non-produced assets of the non-financial corporations.

Our SAM-based approach allowed us to measure income circularity through the link between production and distribution processes, involving: remuneration of production factors; current transactions; capital transfers; use of income; and net transactions with goods, services and non-financial produced and non-produced assets.

[Numerical example based on the national accounts for Portugal in 2022, in millions of euros, produced by *INE* and *Banco de Portugal*]

5. Summary and concluding remarks

About six decades ago, Richard Stone wrote:

> "An economic system could be described as a vast machine which operates through decisions. Millions of people sit at the controls. Every time one of them takes a decision, a switch is turned and something happens in the machine… The machine is a very complicated one, a maze of interdependence and feedback… if it is to work well an economic system needs a great deal of information on which to base the innumerable decisions that have to be taken the whole time" (Stone, 1965, p.136).

To deal with the direct and indirect consequences of these decisions, he proposed the setting up of

> "a computable model of the economy, that is to say a system of numerical relationships connecting the facts of economic life, and to use this model to examine a whole range of possible futures … two things are essential for such an undertaking: to combine a synoptic view of the system as a whole with specific knowledge about its parts; and to construct a working model which is so readily computable that it can be used to examine the consequences of a wide variety of assumptions and thus provide a sound framework for government and business decisions" (Stone, 1965, p.137).

Remaining valid and current, from the author's point of view, these two passages reinforce the importance and role of national accounts, system and data, in the study of the economic system "as a whole", "with specific knowledge about its parts". This paper was developed thinking in the part related to the distribution and redistribution of income and its positioning in the whole economic system, measured by the national accounts.

The conceptual framework, as well as the sources and methods underlying the national accounts, system and data, are not questioned here, although be present the notion of the existence of failures in the recognition of important issues in certain realities. This is the case of the defined boundaries, namely for production, that leave out the measurement of a part of the economic system, which significance can depend, for instance, on the geographical space to which they concern.

Thus, from the analysis of what is supposed to be made available by national accounts, it is possible to see that the value added of a country, measures the income generated by its production process in its economic territory, by residents and non-resident economic agents, or institutional units. Thus, under the control and responsibility of institutional sectors (groups of institutional units), the activities of production, or industries, use inputs of labour, capital, and goods and services to produce outputs of goods and services. Being the difference between the value of the latter, or output of goods and services, and the value of the inputs of goods and services, or the intermediate consumption, the value added, corresponds to the value of the inputs of labour and capital, or the remuneration of the factors of production, the so-called "factor income originating". After including the taxes on production and imports, net of subsidies, paid by institutional sectors, the value added, or factor income originating of domestic institutions is called "domestic product".

The measurement of income of a country cannot fail to exclude the income generated in it by non-resident economic agents, sending it to their countries of residence, on the one hand, and to include the income generated by resident economic agents in other countries, receiving it from the same, on the other. Thus, totalling the same amount as the "factor income originating", the so-called "factor income retained" is obtained. In turn, after including the taxes on production and imports, net of subsidies, received by institutional sectors, the factor income retained of domestic institutions is called "national income".

From then on, the chain of redistribution will develop in rounds in which the total factor income retained is redistributed through institutional sectors until the point in which is measured their use of income in transactions related to goods and services and non-financial assets (produced and not produced).

This summarizes what we called the distribution process, representative of the several steps of the distribution and redistribution of income and measured by the nine categories of distributive transactions of the national accounts, recorded in their current and capital accounts, involving all institutional sectors (domestic and rest of the world).

The unavailability of the part of the expenditures of the institutional sectors in taxes on products less subsidies leads to the consideration of a *residual difference* that is, in many aspects, limitative of the analysis of that process. Besides the importance of the availability of that information, also worth to highlight that the almost dilution of taxes on production and imports and subsidies throughout the distribution process should be avoided, to allow the easy identification of revenues and expenditures with and without them.

By adapting to the latest versions of the SNA, the methodology defined by Richard Stone to the first versions, it was possible to see that a better knowledge and understanding of the distribution process go through the consideration of all the institutional sectors in a total (without and with net taxes on production and imports) that does not change.

That knowledge can be improved with the specification of the underlying network of institutional interrelations in a matrix representation, such as a SAM-based approach. Thus, also adapted to the latest versions of the SNA, from the methodology defined by Graham Pyatt and his associates in a representation of the whole system of transactions recorded by the national accounts, the link between production and distribution processes is established, in the production SAM accounts - covering the upstream and downstream production process, with the factors of production account representing the factor income originating as row-total and the factor income retained as column-total. In turn, the current and capital SAM accounts, allowed some work with the distributive transactions involved in the chain of redistribution and the corresponding institutional interrelations between domestic sectors, or within domestic economy, and with the rest of the world.

To overcome the lack of knowledge on that network of institutional interrelations, the extension of the national accounts data on the distributive transactions of the institutional sectors to the institutional sectors of destination of their expenditures (to-whom) and/or of origin of their revenues

(from-whom) is proposed. Underlying the inclusion of such a proposal in the data to be published by the national accounts is the defence that data produced by national accounting statisticians, with access to a wider range of data from different sources of information and with in-depth knowledge of sampling and error handling methods, would avoid estimates made by the users to overcome their needs, with less appropriate methods.

Within the scope of the above mentioned SAM-based approach, the results of two scenarios, constructed with the accounting multiplier effects of equal absolute changes in institutional interrelations in current transactions (from households to general government) and capital transfers (from general government to non-financial corporations), allowed the identification of a greater impact of the latter in the production process, revealed through a five times greater increase in the generated income, with the corresponding reflexes in the corresponding distribution and redistribution.

The analysis of these results was made considering the maintenance of the institutional sectors' position in the structures of distribution of different types of income, identified from the empirical description made by the national accounts of our numerical example, or economic activity of a country. Except in the parts in which is revealed some connection between the production and the distribution processes, it was not possible to find some connection between that structure and the multiplier effects in our scenarios. On the other hand, through the link between the use of income and the net transactions with goods, services and non-financial produced and non-produced assets it was possible to establish the link between production and distribution processes, which began with the remuneration of production factors and ended with the use of income, and the income circularity. This shows the importance of working production and distribution processes together, in a framework as that provided by our SAM-based approach.

The assumptions to the adopted theoretical description, that is the accounting multipliers model, were also appointed as possible reasons for our results. Among these were the accounts set as exogenous, with more limited accounting of the multiplier effects, and the non-existence of full employment, allowing the response of the supply to the changes on the demand of goods and services.

More experiments and in greater detail need to be performed to substantiate the analysis of the network of linkages captured by the presented SAM-based approach, as well as others in the same scope. For that, a great contribution can be made by more and better estimates provided by the national accounts, namely regarding from-whom and/or to whom distributive transactions.

What was just presented can be seen as a macro-foundation for micro studies on distribution and redistribution of income, within or out the scope of the national accounts. Economic analysis and policy would certainly be better supported.

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Annex

Summary of the sequence of national accounts recording transactions, with gross balancing items, adapted to 2025 SNA (Annex 3), with the amended terminology of the 2008 SNA in parentheses.

Table A.1a. Current Accounts – expenditures.

		Total	Goods and services	S.2 Rest of the world	S.1 Total economy	S.15 NPISHs	S.14 Households	S.13 General government	S.12 Financial corporations	S.11 Non-financial corporations	Code	Transactions and balancing items
		Expenditures (Uses)										
Production account		126 571	126 571								P7	Imports of goods and services
		120 714		120 714							P6	Exports of goods and services
		473 336	473 336								P1	Output of goods and services
		262 308			262 308	2 804	11 062	13 156	6 943	228 342	P2	Intermediate consumption
		33 397	33 397								D21	Taxes on products
		- 467	- 467								D31	Subsidies on products (-)
		243 957			*243 957*	*4 097*	*41 747*	*32 339*	*11 368*	*121 477*	*B1g*	*Value added, gross / Gross domestic product*
Earned (distribution of) **income accounts**	**Generation of earned income account**										*B1g*	*Value added, gross / Gross domestic product*
		113 604			113 604	3 595	2 448	25 977	4 087	77 498	D1	Remuneration (compensation) of employees
		37 035			37 035						D2	Taxes on production and imports
		33 397			33 397						D21	Taxes on products
		3 639			3 639	9	1 075	0	542	2 012	D29	Other taxes on production
		-4 783			-4 783						D3	Subsidies
		- 467			- 467						D31	Subsidies on products
		-4 315			-4 315	- 358	- 760	- 439	- 5	-2 754	D39	Other subsidies on production
		72 727			*72 727*	*851*	*13 611*	*6 801*	*6 744*	*44 720*	*B2g*	*Operating surplus, gross*
		25 374			*25 374*		*25 374*				*B3g*	*Mixed income, gross*
	Allocation of earned (primary) income account										*B2g*	*Operating surplus, gross*
											B3g	*Mixed income, gross*
		1 544		1 544							D1	Remuneration (compensation) of employees
											D2	Taxes on production and imports
											D21	Taxes on products
											D29	Other taxes on production
		2 037		2 037							D3	Subsidies
		250		250							D31	Subsidies on products
		1 787		1 787							D39	Other subsidies on production
		51 035		8 511	42 524	3	1 004	4 610	12 997	23 911	D4	Property income
		239 550			*239 550*	*915*	*163 832*	*37 612*	*6 170*	*31 022*	*B5g*	*Balance of (primary) earned incomes, gross / National income, gross*
Transfer (redistribution) **of income accounts**	**Income transfers other than transfers in kind** (secondary distribution of income) **account**										*B5g*	*Balance of (primary) earned incomes, gross / National income, gross*
		26 259		449	25 810	9	17 524	24	1 089	7 163	D5	Current taxes on income, wealth, etc.
		25 559		449	25 109	7	16 945	21	1 048	7 088	D51	Taxes on income
		700			700	2	579	4	41	75	D59	Other current taxes
		34 600		84	34 516		34 516				D61	(Net) Social contributions less service charges
		48 162		3 147	45 014	328	20	40 296	2 174	2 196	D62	Social benefits other than social transfers in kind
		28 262		8 079	20 184	189	6 181	6 497	4 699	2 618	D7	Other current transfers
		3 805		70	3 735	66	1 240	37	1 367	1 024	D.71	(Net) Non-life insurance premiums less service charges
		3 671		655	3 016				3 016		D.72	Non-life insurance claims
		0		0	0			0			D.73	Current transfers within general government
		3 288		745	2 543			2 543			D.74	Current international cooperation
		17 499		6 609	10 890	123	4 941	3 916	316	1 594	D.75	Miscellaneous current transfers
		244 278			*244 278*	*5 024*	*162 671*	*49 141*	*4 814*	*22 627*	*B6g*	*Disposable income, gross*
Use of income accounts	**Use of disposable income account**										*B6g*	*Disposable income, gross*
		197 672			197 672	3 898	151 318	42 456			P3	Final consumption expenditure
		- 203		0	- 203				- 203		D8	Adjustment for the change in pension and non-pension entitlements
		46 606			*46 606*	*1 126*	*11 151*	*6 685*	*5 017*	*22 627*	*B8g*	*Saving, gross*
		5 536		*5 536*							*B12*	*Current external balance*

[Numerical example based on the national accounts for Portugal in 2022, in millions of euros, produced by *INE* and *Banco de Portugal*]

Table A.1b. Current Accounts – revenues.

Code	Transactions and balancing items	S.11 Non-financial corporations	S.12 Financial corporations	S.13 General government	S.14 Households	S.15 NPISHs	S.1 Total economy	S.2 Rest of the world	Goods and services	Total	
									Revenues (Resources)		
P7	Imports of goods and services							126 571		126 571	**Production account**
P6	Exports of goods and services								120 714	120 714	
P1	Output of goods and services	349 819	18 311	45 495	52 809	6 901	473 336			473 336	
P2	Intermediate consumption								262 308	262 308	
D21	Taxes on products						33 397			33 397	
D31	Subsidies on products (-)						- 467			- 467	
B1g	*Value added, gross / Gross domestic product*										
B1g	*Value added, gross / Gross domestic product*	*121 477*	*11 368*	*32 339*	*41 747*	*4 097*	*243 957*			*243 957*	**Generation of earned income account** — **Earned** (distribution of) **income accounts**
D1	Remuneration (compensation) of employees										
D2	Taxes on production and imports										
D21	Taxes on products										
D29	Other taxes on production										
D3	Subsidies										
D31	Subsidies on products										
D39	Other subsidies on production										
B2g	*Operating surplus, gross*										
B3g	*Mixed income, gross*										
B2g	*Operating surplus, gross*	*44 720*	*6 744*	*6 801*	*13 611*	*851*	*72 727*			*72 727*	**Allocation of earned** (primary) **income account**
B3g	*Mixed income, gross*				*25 374*		*25 374*			*25 374*	
D1	Remuneration (compensation) of employees				114 912		114 912	236		115 148	
D2	Taxes on production and imports			36 512			36 512	523		37 035	
D21	Taxes on products			33 031			33 031	365		33 397	
D29	Other taxes on production			3 481			3 481	158		3 639	
D3	Subsidies			-2 746			-2 746			-2 746	
D31	Subsidies on products			- 217			- 217			- 217	
D39	Other subsidies on production			-2 528			-2 528			-2 528	
D4	Property income	10 212	12 423	1 654	10 939	67	35 295	15 740		51 035	
B5g	*Balance of (primary) earned incomes, gross / National income, gross*										
B5g	*Balance of (primary) earned incomes, gross / National income, gross*	*31 022*	*6 170*	*37 612*	*163 832*	*915*	*239 550*			*239 550*	**Income transfers other than transfers in kind** (secondary distribution of income) **account** — **Transfer** (redistribution) **of income accounts**
D5	Current taxes on income, wealth, etc.			25 693			25 693	566		26 259	
D51	Taxes on income			24 993			24 993	566		25 559	
D59	Other current taxes			700			700	0		700	
D61	(Net) Social contributions less service charges	2 196	1 877	29 685	20	366	34 144	456		34 600	
D62	Social benefits other than social transfers in kind				47 880		47 880	282		48 162	
D7	Other current transfers	1 387	4 729	2 969	9 181	4 269	22 535	5 728		28 262	
D.71	(Net) Non-life insurance premiums less service charges		3 034				3 034	771		3 805	
D.72	Non-life insurance claims	767	1 289	32	1 427	58	3 574	97		3 671	
D.73	Current transfers within general government			0			0			0	
D.74	Current international cooperation			745			745	2 543		3 288	
D.75	Miscellaneous current transfers	620	406	2 193	7 753	4 211	15 182	2 317		17 499	
B6g	*Disposable income, gross*										
B6g	*Disposable income, gross*	*22 627*	*4 814*	*49 141*	*162 671*	*5 024*	*244 278*			*244 278*	**Use of disposable income account** — **Use of income accounts**
P3	Final consumption expenditure								197 672	197 672	
D8	Adjustment for the change in pension and non-pension entitlements				- 203		- 203	0		- 203	
B8g	*Saving, gross*										
B12	*Current external balance*										

[Numerical example based on the national accounts for Portugal in 2022, in millions of euros, produced by *INE* and *Banco de Portugal*]

Table A.2. Accumulation accounts.

	Total	Goods and services	S.2 Rest of the world	S.1 Total economy	S.15 NPISHs	S.14 Households	S.13 General government	S.12 Financial corporations	S.11 Non-financial corporations	Code	Transactions and balancing items
	Changes in assets										
Capital account										*B8g*	*Saving, gross*
										B8n	*Saving, net*
										B12	*Current external balance*
	50 190			50 190	731	9 181	5 807	455	34 016	NF11,31	Gross fixed capital formation
	1 779			1 779	1	98	48	0	1 632	NF13,33	Changes in inventories
	173			173	2	84	10	0	76	NF14	Acquisitions less disposals of valuables
	0		- 247	247	- 26	- 249	- 8	- 209	740	NF2,34 (NP,..)	Acquisitions less disposals of non-produced non-financial assets
										D9r	Capital transfers, receivable
										D91r	Capital taxes, receivable
										D92r	Investment grants, receivable
										D93r	Debt forgiveness, receivable
										D99r	Other capital transfers, receivable
										D9p	Capital transfers, payable
										D91p	Capital taxes, payable
										D92p	Investment grants, payable
										D93p	Debt forgiveness, payable
										D99p	Other capital transfers, payable
	0		*3 235*	*-3 235*	*790*	*2 266*	*- 757*	*5 229*	*-10 763*	*B9*	*Net lending (+) / net borrowing (–)*
Financial account										*B9 (F)*	*Net lending (+) / net borrowing (–)*
											Net incurrence of liabilities
	-2 206		*4 519*	*-6 725*							*Net acquisition of financial assets*
										B9(F)-B9	*Statistical discrepancy*

Code	Transactions and balancing items	S.11 Non-financial corporations	S.12 Financial corporations	S.13 General government	S.14 Households	S.15 NPISHs	S.1 Total economy	S.2 Rest of the world	Goods and services	**Total**	
										Changes in liabilities and net worth	
B8g	*Saving, gross*	*22 627*	*5 017*	*6 685*	*11 151*	*1 126*	*46 606*			*46 606*	Capital account
B8n	*Saving, net*	*- 685*	*3 840*	*92*	*-3 363*	*275*	*159*			*159*	
B12	*Current external balance*							*5 536*		*5 536*	
NF11,31	Gross fixed capital formation								50 190		
NF13,33	Changes in inventories								1 779		
NF14	Acquisitions less disposals of valuables								173		
NF2,34 (NP,..)	Acquisitions less disposals of non-produced non-financial assets							0			
D9r	Capital transfers, receivable	3 210	462	1 570	232	373	5 847	59		5 906	
D91r	Capital taxes, receivable			0			0			0	
D92r	Investment grants, receivable	1 274	4	1 446	229	358	3 311	4		3 314	
D93r	Debt forgiveness, receivable	0	0	0	0	0	0	0		0	
D99r	Other capital transfers, receivable	1 935	459	124	3	15	2 536	56		2 592	
D9p	Capital transfers, payable	- 136	- 4	-3 155	- 3	- 1	-3 298	-2 608		-5 906	
D91p	Capital taxes, payable	0	0	0	0	0	0	0		0	
D92p	Investment grants, payable			- 734			- 734	-2 580		-3 314	
D93p	Debt forgiveness, payable	0	0	0	0	0	0	0		0	
D99p	Other capital transfers, payable	- 136	- 4	-2 421	- 3	- 1	-2 564	- 28		-2 592	
B9	*Net lending (+) / net borrowing (–)*										
B9 (F)	*Net lending (+) / net borrowing (–)*						*-2 612*	*2 612*		*0*	Financial account
	Net incurrence of liabilities						*-4 113*	*1 907*		*-2 206*	
	Net acquisition of financial assets										
B9(F)-B9	*Statistical discrepancy*						*623*	*- 623*		*0*	