

IMF Multi-Analytical Regional Input-Output (IMF-MARIO) Database

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Paper presented at the
29th International Input-Output Association Conference
26 - 30 June 2023, Alghero, Italy

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Abstract

Input-output tables represent a unique source of information to understand the relationships between producers and consumers within an economy and their interconnection with: a) the environment through emissions of CO₂, other pollutants, the use of land and natural resources, b) energy and physical accounts; c) employment; d) tax gaps as well as fiscal policies related to climate change adaptation and mitigation; e) income distribution; f) trade in value added, and so on. The IMF has started developing a Multi-Analytical Regional Input-Output model (MARIO) to provide a powerful analytical tool and a source of harmonized granular data to better understand the inter-relationships between economies, their impact on climate change, and their economic and social development. Linking domestic input-output tables together in a consistent multi-regional model will help improve data consistency within and across economies.

MARIO's development will take advantage of already available data from different global input-output tables initiatives; statistical offices; and international organizations, including official source data collected by the IMF from its member countries. This will reduce the amount of missing data encountered in the estimation of multi-regional input-output models.

The IMF is in a unique position to develop a model with global geographic coverage while also improving cross-country and global data consistency. Through cooperation with other international organizations, such as the OECD, Eurostat, UNECLAC and the Asian Development Bank and its extensive technical assistance program, MARIO will cover the years from 1990 to 2022 and 209 economies, including all IMF members. The model will encompass 178 products and 144 industries, providing sufficient granularity to perform detailed analysis on themes related to climate change and the environment and will capture international spillovers providing the ability to analyze the energy transition, emissions, material flows, and other questions of strategic importance.

Introduction

Input-output tables represent a unique source of information to understand the sale and purchase relationships between producers and consumers within an economy and their interconnection, among others, with:

- a) Environment and climate change, like emissions of CO₂ and other pollutants, use of land, use of natural resources, energy transition.
- b) Employment and how it relates to gender, age, income group, qualification, green activities, etc..
- c) Tax gaps.
- d) Income distribution.
- e) Global Value Chains (GVCs) and Trade in Value Added (TiVA), and so on.

Over the past decade or so, different initiatives were conducted to estimate global MRIOs, with the main ones being the OECD Inter-Country Input-Output Tables (ICIO) (OECD, 2021), the University of Groningen World Input-Output Database (WIOD) (Timmer et al., 2015 and 2016), the IDE-JETRO's international input-output tables (Meng, Zhang & Inomata, 2013), the University of Sydney EORA (Lenzen et al., 2012 and 2013) and GLORIA (Lenzen et al., 2017 and 2022), the Eurostat FIGARO (Remond-Tiedrez and Rueda-Cantuche, 2019; Eurostat, 2021), the EXIOBASE (Bjelle et al., 2019; Stadler et al., 2018 and 2021), the University of Purdue GTAP-MRIO (Carrico et al, 2020), the Asian Development Bank ADB-MRIO (Asian Development Bank, 2022), the ECLAC MRIO (ECLAC, 2020), and the EMERGING (Huo et al., 2022).

Despite availability of these MRIOs, internal IMF discussions highlighted that the existing databases do not meet IMF needs in terms of coverage of economies and years, detail on commodities and industries, timeliness, flexibility of use, modeling, and analysis. On the modeling and analysis side, given the IMF's new priority areas for surveillance, including climate change and gender, as well as its traditional surveillance and policy formulation, extending domestic input-output tables to an IMF Multi-Regional Input-Output (MRIO) model would constitute a powerful analytical tool and source of harmonized granular data for IMF Departments, member economies, academia, and researches institutes, to better understand the inter-relationships between economies; their role in global value chains; the implications of their production, consumption, and investment activities for climate change; and their economic and social development. It would also help to improve the data and conceptual consistency across individual economies' input-output tables and could also be used to develop or improve Supply-Use Tables (SUTs) for those economies with limited use of the SUT framework in estimation of GDP by the production approach.

Key challenges include the lack of data and the necessity to standardize and harmonize concepts, classifications, and estimates across countries into a single statistical framework. The lack of SUTs or IOTs will require modeling tables for countries which do not produce them using macroeconomic aggregates combined with the structure of tables from countries with a similar economic profile. Although SUTs are frequently prepared for benchmarking purposes, they are not always disseminated. In addition, the availability of IOTs remains limited for various reasons including the conceptual complexities or dissemination issues related to data confidentiality. The IMF has frequent interactions with national statistical offices through its large program of technical assistance on national accounts which covers the production of SUTs and IOTs. Therefore, the IMF is in a unique position to collect official data supporting the compilation of estimates using modeling techniques. The absence of time series will also require extrapolation or interpolation of the tables for missing years.

The need for harmonization will also require significant work. The presentation of the tables and the classifications used by compilers vary significantly across countries because the supply or use of some products and industries are particularly relevant in each country. While the System of National Accounts prescribes statistical treatments in the SUTs and IOTs, statistical offices use different breakdowns of margins, taxes, or different approaches to implement the cost insurance freight/free-on-board adjustment for example. All these differences require time-consuming harmonization tasks which cannot always be automated.

To fulfill these needs, the IMF is developing the Multi-Analytical Regional Input-Output (MARIO) database, a new database which will take advantage of already available data from different global input-output tables initiatives; from statistical offices; and from international organizations, including official source data collected by the IMF from its member countries, which gives the IMF the advantage of early, and sometimes exclusive, access to a broader set of official statistics and which will reduce the amount of missing data encountered in the estimation of MRIOs.

The next section will present an overview of the proposed methodology to be used in MARIO's estimation, following by a discussion of its proposed structure and the main Global MRIOs which will be used as data sources for its estimation. The last section will make some final comments.

Estimation Methodology

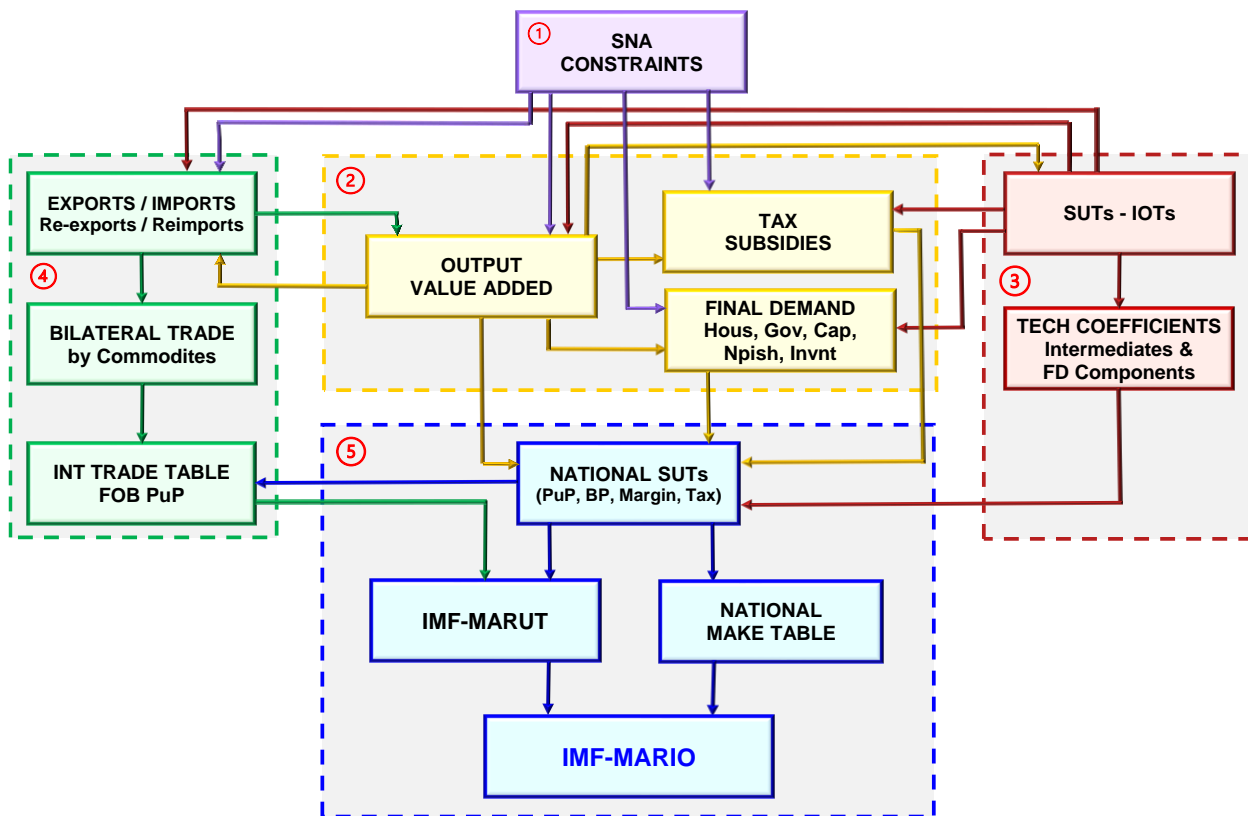
Given the complexity of estimation, the methodological solution proposed allows flexibility, and speed, by breaking down the MARIO's estimation process into 5 major blocks, as show in Figure 1.

1. SNA constraints for the economy.
2. Output, value added, tax, subsidies, and final demand components broken down by products and industries.
3. Technical coefficients for intermediate consumption and final demand.
4. International trade.
5. Estimation of the IMF-MARIO components based on data from the 4 previous blocks.

Despite the block's interdependence, the work is organized in such a way so that the data gathering and the work in each block can take place in parallel.

An overview of the estimation process in each block is presented in the following sub-sections.

Figure 1. Estimation methodology of IMF-MARIO



Source: Authors elaboration

Block 1 – SNA Constraints

The SNA constraints are the base for, and fundamental to, the estimation and to assure consistency in the final system. The estimation of these constraints is mainly based on aggregated data from the United Nations National Accounts Statistics, IMF, Eurostat, World Bank, OECD, and National Statistical Offices. One example of an SNA constraint will be the internationally agreed estimates of GDP by country. Other national accounts aggregates, such as household consumption will be included in these constraints. Due to vintages and adjustments made to meet various requirements it is expected that a full alignment of these constraints amongst participating international organizations will be difficult to achieve, but the best efforts will be made to reduce differences.

To assure consistency in the estimation, it is necessary to express the figures for all countries' SNA constraints in reference to the calendar year, as for some countries the national account figures refers to these countries' fiscal years. This approach will enable revising MARIO to incorporate the latest national accounts updates and maintain a contemporary database.

Block 2 – Output, value added, tax, subsidies, and final demand components

This block deals with the estimation of output, value added, tax, subsidies and final demand components at the product and industry levels. It assures the broader consistency of the estimated National Supply and Use Tables, the valuation process of going from purchasers' to basic price, and the structure of the final demand components.

The estimation of this block's components will interact with the estimation of exports to assure that exports are consistent with the output being produced. The interaction with the estimation of output and value added will help in the harmonization of the countries SUTs, and the countries SUTs values will be used in the estimation of this block's variables.

The results from this block will be used as constraints for the National SUTs, IMF-MARUT. And IMF-MARIO.

Block 3 – Technical coefficients for intermediate consumption and final demand

This block will work with the harmonization of the countries SUTs according to the definition of products and industries required for the estimation of MARIO. This block will fill the gaps for years where there is no information for countries' SUTs, including the estimation of SUTs for countries which don't produce them for which we will use coefficients from countries with similar economic profiles. The metadata will inform users about the data sources used to compile MARIO, including where non-official source data have been used.

The result will be technical coefficients matrices that will be used to estimate harmonized national SUTs in Block 5.

Block 4 – International trade table

Using SNA constraints and the information from the countries' SUTs will be possible to estimate the total exports and imports, FOB at purchasers' prices, by product, excluding reexports and reimports.

Based on bilateral trade information from various sources, and in particular from BACI¹, UN Comtrade², OECD-WTO Balanced Trade in Services (BaTIS)³, and OECD Bilateral Trade Database by Industry and End-Use (BTDIxE)⁴, it is possible to estimate for each product a matrix of bilateral trade among the countries. This information is then combined with information from BTDIxE and the National SUTs estimated in block 5, to estimate the International Trade Table containing the bilateral trade by end user of the exports, i.e., if exports are allocated to intermediate use for further processing or if it is a final good allocated to the final demand components.

¹ http://www.cepii.fr/CEPII/en/bdd_modele/bdd_modele_item.asp?id=37

² <https://comtradeplus.un.org/>

³ https://www.oecd-ilibrary.org/trade/data/oecd-statistics-on-international-trade-in-services/oecd-wto-balanced-international-trade-in-services-ebops-2010_08dba674-en

⁴ <https://www.oecd.org/sti/ind/bilateraltradeingoodsbyindustryandend-usecategory.htm>

Block 5 – IMF-MARIO

This first task performed in block 5 is to estimate harmonized National Supply Tables with valuation, Use Tables at purchasers' and basic prices, and the auxiliary tables on margins, tax, and subsidies—based on information from blocks 2 and 3.

The second task is to estimate the Multi-Analytical Regional Use Table (MARUT) based on information from the harmonized National Use Tables and the International Trade Table estimated in block 4. As explained in the next section, the estimation process, will be designed to ensure that the results: a) for EU countries are, as much as possible, the same as the ones presented in Eurostat's FIGARO; b) for the non-EU OECD countries, are in concordance with OECD's ICIO; c) for the Asian economies are in concordance with the ADB-MRIO; and d) for the Latin America economies are in concordance with the ECLAC-MRIO.

The final task in the estimation process is to obtain the IMF-MARIO, industry by industry symmetric square tables, using the information from the National Supply Tables and the IMF-MARUT. This is done by applying the assumption of fixed product sales structure, Eurostat model D (Eurostat, 2008, pp. 347-357), where the share of each industry in the sale of a given product is kept constant⁵.

MARIO Final Outputs

The resulting MARIO database will consist of harmonized national supply and use tables, and global multi-regional use tables and input-output tables.

Figures 2 to 5 show, in a schematic way, the structure of the tables which will constitute MARIO's database and refers to the national economy:

1. Supply table for the economy (Figure 2)
2. Use table in purchasers' prices – economy (Figure 3)
3. Use table at basic prices – economy (Figure 4)
4. Imports table – economy (Figure 5)
5. Wholesale and retail trade and repair services of motor vehicles – economy (Figure 5)
6. Trade margin wholesale trade, except motor vehicles – economy (Figure 5)
7. Trade margin retail trade, except motor vehicles – economy (Figure 5)
8. Transport margin land – economy (Figure 5)
9. Transport margin water – economy (Figure 5)
10. Transport margin air – economy (Figure 5)
11. Tax on products – economy (Figure 5)
12. Subsidies on products – economy (Figure 5)
13. Duty and tax on imports – economy (Figure 5)

⁵ See also Miller and Blair (2022), chapter 5, who refers to this estimation as being “industry-based” technology, industry by industry approach.

Figures 6 and 7 by its turn show the global systems:

1. IMF-MARUT at basic prices (Figure 6)
2. IMF-MARIO at basic prices (Figure 7)

In each one of these Tables, the cells are highlight with rectangles showing the block numbers which are sources of their values. In the case of Figure 2, the Supply Table, has: a) the row of totals for the valuation columns that come from Block 1 (B1); b) the columns of the valuation, values by product, are estimated in Block 2 (B2); c) the row of total output, by industry, estimated in Block 2 (B2); and d) the make matrix which shows the amount of products produced by each industry estimated based on information from Blocks 2 and 3 (B2 & B3). For Figures 3 to 7, the same logic showed for Figure 2 applies to understand which block is responsible for the estimation of the data shown in these tables.

Figure 2. Supply table for the economy

		Industry				Valuation				
		I1	I2	I3	I4	Total BP	Imports	Margins	Tax & Sub	Total PP
Commodity	P1	<i>B2 & B3</i>				<i>B2</i>	<i>B2</i>			<i>B2</i>
	P2									
	P3									
	P4									
Total		<i>B2</i>				<i>B1</i>				

Source: Authors elaboration

Figure 3. Use table in purchasers' prices for the economy

		Industry				Final Demand			Total
		I1	I2	I3	I4	FD1	FD2	FD3	
Commodity	P1	<i>B2 & B3</i>				<i>B2 & B3</i>			<i>B2</i>
	P2								
	P3								
	P4								
Value Added	Labor	<i>B2</i>							<i>B1</i>
	Capital								
	Tax & Sub Ind.								
Total		<i>B2</i>				<i>B1</i>			

Source: Authors elaboration

Figure 4. Use table at basic prices for the economy

		Industry				Final Demand			Total
		I1	I2	I3	I4	FD1	FD2	FD3	
Commodity	P1								B2
	P2								
	P3	B2 & B3				B2 & B3			
	P4								
	Imports								
Value Added	Tax & Sub Prod.								B1
	Labor								
	Capital	B2							
	Tax & Sub Ind.								
Total		B2				B1			

Source: Authors elaboration

Figure 5. Import, margin, tax and subsidy tables for the economy

		Industry				Final Demand			Total
		I1	I2	I3	I4	FD1	FD2	FD3	
Commodity	P1								B2
	P2								
	P3	B2 & B3				B2 & B3			
	P4								
	Total								

Source: Authors elaboration

In figure 6, the diagonal B5 shows the intermediate consumption of domestically produced inputs while the off diagonal shows the use of imported products. These tables are transformed by removing the net taxes on products and margins to derive basic price estimates.

Figure 6. IMF Multi-Analytical Regional Use Table (IMF-MARUT) at basic prices

		Industry				Final Demand				Total
		I_E1	I_E2	I_E3	I_E4	FD_E1	FD_E2	FD_E3	FD_E4	
Commodity	P_E1	B5			B4 & B5	B5			B4 & B5	B2
	P_E2		B5				B5			
	P_E3	B4 & B5		B5		B4 & B5		B5		
	P_E4				B5				B5	
Value Added	Tax & Sub Prod.	B4 & B5				B4 & B5				B1
	Labor									
	Capital	B2								
	Tax & Sub Ind.									
	Total	B2				B1				

Source: Authors elaboration

In the final tables, Figure 7, the products are allocated by industries to derive symmetric square tables, industry by industry, which are necessary for analytical purposes such as the derivation of the Leontief inverse.

Figure 7. IMF Multi-Analytical Regional Input-Output Table (IMF-MARIO) at basic prices

		Industry				Final Demand				Total
		I_E1	I_E2	I_E3	I_E4	FD_E1	FD_E2	FD_E3	FD_E4	
Industry	I_E1									B2
	I_E2									
	I_E3		B5				B5			
	I_E4									
Value Added	Tax & Sub Prod.									B1
	Labor									
	Capital	B2								
	Tax & Sub Ind.									
	Total	B2				B1				

Source: Authors elaboration

MARIO's Dimensions

An important step in the estimation process is the definition of countries, products, and industries that will be considered in the MARIO model, as these choices will impact the estimation, the results, and the future use of the model. Despite being possible to change the number of components of these 3 key variables, experience shows that changing their definition usually is not so straightforward, and it is highly demanding in time and resources.

Usually, a good strategy to follow is to consider a more granular definition of countries, products, and industries at the start of the estimation process, and after, to work with aggregated versions of the underlining database.

Advantages of working with a more granular version in the estimation is that the assembled system of estimation will be ready to work with more granular data when it becomes available, and the results obtained from the aggregated versions of the underlining system tend to be more consistent than the estimation based on a less granular version of data. The use of granular data also provides flexibility to examine additional products and industries that may become more important later.

Following these premises, the proposed list of countries will consider all the IMF member countries, select territories of member countries, key non-member economies, and the rest of the world (aggregation of the remaining economies). Through its large technical assistance program⁶ the IMF has frequent interactions with compilers of SUTs and IOTs. This is a unique opportunity to access data and metadata on SUTs/IOTs and contribute to methodological improvements. The IMF has collected 25 SUTs from national statistical offices either through direct data requests or downloads from published official statistics. In the future the IMF will strengthen its data collection program to support MARIO.

The choice of industries and products is based on data availability and the use of the MARIO to study questions related to economic structural analysis, trade, social and distributional aspects, and at the same time have enough granularity for products and industries which are critical to conduct studies and analysis associated with climate change, energy, and natural resources, which are crucial for the future of our lives and economies.

Annexes I to III present, respectively, the preliminary list of 209 economies, 144 industries, and 178 products which will be initially considered in MARIO's estimation. This choice of industries and products was based on current data availability, and the points raised above.

Another important aspect in the estimation process is the definition of the components that will be shown for value added (Table 1), final demand (Table 2), and used in the valuation from purchaser's prices to basic prices (Table 3). Table 2 shows value added components related to the use table at basic prices and purchasers' prices, while Table 3 shows final demand components relate to national and global tables.

⁶ The IMF has 15 regional capacity development centers delivering national accounts technical assistance missions and training. These are supplemented by assistance from the IMF's headquarters, totaling more than 250 missions per year.

Table 1. MARIO Value Added Components

A. Value added components, basic prices table

No	Code	Component
1	D21	Taxes on products
2	D31	Subsidies on products
3	D1	Compensation of employees
4	B2N	Net operating surplus
5	B3N	Net mixed income
6	K1	Consumption of fixed capital
7	D29_D39	Taxes less subsidies on production

B. Value added components, purchasers' price tables

No	Code	Component
1	D1	Compensation of employees
2	B2N	Net operating surplus
3	B3N	Net mixed income
4	K1	Consumption of fixed capital
5	D29_D39	Taxes less subsidies on production

Table 2. MARIO Final Demand Components

A. Final demand components, economy

No	Code	Component	SNA Code
1	HFCE	Households' final consumption	P3S14
2	NPISH	NPISH final consumption	P3S15
3	GGFC	Government final consumption	P3S13
4	GFCF	Gross fixed capita formation	P51
5	INVNT	Changes in inventories	P52_53
6	P34	Non-residents final consumption on the territory	P34
7	P6	Exports	P6

B. Final demand Components, MARUT and MARIO

No	Code	Component	SNA Code
1	HFCE	Households' final consumption	P3S14
2	NPISH	NPISH final consumption	P3S15
3	GGFC	Government final consumption	P3S13
4	GFCF	Gross fixed capita formation	P51G
5	INVNT	Changes in inventories	P52
6	P33	Residents' final consumption abroad	P33

Table 3. MARIO Valuation Components

Valuation components, supply table

No	Code	Component
1	P1	Output at basic prices
2	P7	Imports
3	P33	Direct purchases abroad by residents
4	TSBP	Total supply at basic prices
5	WMV	Trade margin wholesale and retail mv - economy
6	WST	Trade margin wholesale trade, except mv - economy
7	RTT	Trade margin retail trade, except mv - economy
8	LAND	Transport margin land - economy
9	WATER	Transport margin water - economy
10	AIR	Transport margin air - economy
11	D21	Tax on products - economy
12	D31	Subsidies on products - economy
13	DUTY	Duty and tax on imports
14	TSPP	Total supply at purchasers' prices

Global MRIOs as Data Sources

Since the 2010's, different initiatives were conducted to estimate world MRIOs, and as highlighted in the introduction, these include the OECD-ICIO, WIOD, IDE-JETRO, EORA, GLORIA, FIGARO, EXIOBASE, GTAP-MRIO, ADB-MRIO, ECLAC-MRIO, and EMERGING. Some of these MRIO databases use information from previous databases in their estimation, like ADB-MRIO uses information from WIOD, GLORIA uses information from EORA and OECD-ICIO, FIGARO uses information from OECD-ICIO, the OECD-ICIO uses information from ADB-MRIO, ECLAC-MRIO uses information from ADB-MRIO and OECD-ICIO, EMERGING uses information from ADB-MRIO and OECD-ICIO, and so on. In this way, different databases are sharing data in a way to improve estimation and to decrease estimation costs and time; this process may also lead to a better convergence of results from these different databases in the future.

Following this trend in the estimation of MRIOs, the quality of the data, the publicly available information, the goals of MARIO, including to optimize the use of time and resources, the estimation of MARIO will draw on information from selected MRIOs. As detailed in Table 4, the databases selected are FIGARO, ICIO, GLORIA, EXIOBASE, ADB-MRIO, and ECLAC-MRIO. Some of these databases show different levels of details according to their version and the years selected, which is the case for EXIOBASE, ADB-MRIO, and ECLAC-MRIO.

These databases will be used as inputs into the different blocks defined above; this will be done by splitting these MRIOs in parts to make an initial database which in the future could be updated as new or better information is made available. The idea is to build a system which can be constantly updated as new data and revisions are available, as well as used to nowcast and forecast the MARIO.

The databases estimated by international organization – FIGARO, ICIO, ADB-MRIO, ECLAC-MRIO – will also play a special role in the final balancing of MARIO. In such a way, MARIO estimation will respect FIGARO information for European Union (EU) countries, which will be used as constraints in MARIO's estimation; the same will be true for the non-EU OECD countries shown in the OECD-ICIO, for the Asian non-OECD countries shown in the ADB-MRIO, and for the Latin America non-OECD countries shown in the ECLAC-MRIO.

Table 4. Main Global MRIO Databases, publicly available data

Database	Release	Years	Economies	SUT	I-O	Products	Industries
FIGARO	2022	2010 to 2020	46	X	X	64	64
ICIO	2021	1995 to 2018	67		X		45
GLORIA	2023	1990 to 2027	164	X	X	120	120
EXIOBASE 3.8.2	2021	1995 to 2022	49	X	X	200	163
EXIOBASE 3rx	2019	1995 to 2015	214	X	X	200	163
ADB-MRIO-1	2022	2000, 2007-2021	63		X		35
ADB-MRIO-2	2022	2017-2021	73		X		35
ECLAC-ADB-1	2020	2007, 2011, 2017	73		X		20
ECLAC-ADB-2	2020	2011	73		X		38
ECLAC-ADB-3	2020	2011	79		X		25
ECLAC-ADB-4	2020	2011	79		X		18
ECLAC-LAC	2020	2014	55		X		40

Sources: Eurostat (2022), OECD (2021), Industrial Ecology Virtual Laboratory (2023), EXIOBASE (2021), Asian Development Bank (2022), ECLAC (2020).

Way Forward

The proposed framework for MARIO's estimation is expected to be flexible enough to make it possible to: a) replace the initial databases used in the estimation process by other better databases or source data as they become available; b) add new databases; c) nowcast and forecast the estimation based on IMF macroeconomic projections; and d) obtain yearly and quarterly estimation of this database. Initial results being expected by the second semester of 2024.

MARIO's estimation will also benefit from the recently formed group of International Organizations - OECD, European Commission / Eurostat, IMF, UN-ECLAC, and ADB – whose goal is to reduce the differences found in the results obtained by the different databases. To do so, the group will share data, methodologies, and information to improve the estimations made by each of these institutions.

As such, to meet the needs of IMF work, it is expected that the proposed MARIO design will allow for estimation flexibility, provide sufficient granularity, address the lack of coverage by country, year, industry, and products details from on existing MRIOs while taking advantage of the IMF ability to collect and improve official SUTs. Furthermore, it will be a powerful analytical tool allowing many applications to be conducted for the estimation of harmonized multidimensional indicators. It will be used for analysis and to measure the impacts of public and private policies on the economy, the environment, employment by gender, as well as social distribution effects, considering not only the implications of these policies on national economies, but also on their trading partners by incorporating interdependencies between economies involved in the global supply chain.

Annex I. Economies

Number	Economy	Code	IMF
1	Afghanistan	AFG	√
2	Albania	ALB	√
3	Algeria	DZA	√
4	Andorra	AND	√
5	Angola	AGO	√
6	Antigua and Barbuda	ATG	√
7	Argentina	ARG	√
8	Armenia	ARM	√
9	Australia	AUS	√
10	Austria	AUT	√
11	Azerbaijan	AZE	√
12	The Bahamas	BHS	√
13	Bahrain	BHR	√
14	Bangladesh	BGD	√
15	Barbados	BRB	√
16	Belarus	BLR	√
17	Belgium	BEL	√
18	Belize	BLZ	√
19	Benin	BEN	√
20	Bhutan	BTN	√
21	Bolivia	BOL	√
22	Bosnia and Herzegovina	BIH	√
23	Botswana	BWA	√
24	Brazil	BRA	√
25	Brunei Darussalam	BRN	√
26	Bulgaria	BGR	√
27	Burkina Faso	BFA	√
28	Burundi	BDI	√
29	Cabo Verde	CPV	√
30	Cambodia	KHM	√
31	Cameroon	CMR	√
32	Canada	CAN	√
33	Central African Republic	CAF	√
34	Chad	TCD	√
35	Chile	CHL	√
36	China	CHN	√
37	Colombia	COL	√
38	Comoros	COM	√
39	Democratic Republic of the Congo	COD	√
40	Republic of Congo	COG	√
41	Costa Rica	CRI	√
42	Côte d'Ivoire	CIV	√
43	Croatia	HRV	√
44	Cyprus	CYP	√
45	Czech Republic	CZE	√
46	Denmark	DNK	√
47	Djibouti	DJI	√
48	Dominica	DMA	√
49	Dominican Republic	DOM	√
50	Ecuador	ECU	√
51	Egypt	EGY	√
52	El Salvador	SLV	√
53	Equatorial Guinea	GNQ	√
54	Eritrea	ERI	√

Continue ...

Annex I continued

Number	Economy	Code	IMF
55	Estonia	EST	√
56	Eswatini	SWZ	√
57	Ethiopia	ETH	√
58	Fiji	FJI	√
59	Finland	FIN	√
60	France	FRA	√
61	Gabon	GAB	√
62	The Gambia	GMB	√
63	Georgia	GEO	√
64	Germany	DEU	√
65	Ghana	GHA	√
66	Greece	GRC	√
67	Grenada	GRD	√
68	Guatemala	GTM	√
69	Guinea	GIN	√
70	Guinea-Bissau	GNB	√
71	Guyana	GUY	√
72	Haiti	HTI	√
73	Honduras	HND	√
74	Hungary	HUN	√
75	Iceland	ISL	√
76	India	IND	√
77	Indonesia	IDN	√
78	Iran	IRN	√
79	Iraq	IRQ	√
80	Ireland	IRL	√
81	Israel	ISR	√
82	Italy	ITA	√
83	Jamaica	JAM	√
84	Japan	JPN	√
85	Jordan	JOR	√
86	Kazakhstan	KAZ	√
87	Kenya	KEN	√
88	Kiribati	KIR	√
89	Korea	KOR	√
90	Kosovo	KOS	√
91	Kuwait	KWT	√
92	Kyrgyz Republic	KGZ	√
93	Lao P.D.R.	LAO	√
94	Latvia	LVA	√
95	Lebanon	LBN	√
96	Lesotho	LSO	√
97	Liberia	LBR	√
98	Libya	LYB	√
99	Lithuania	LTU	√
100	Luxembourg	LUX	√
101	Madagascar	MDG	√
102	Malawi	MWI	√
103	Malaysia	MYS	√
104	Maldives	MDV	√
105	Mali	MLI	√
106	Malta	MLT	√
107	Marshall Islands	MHL	√
108	Mauritania	MRT	√
109	Mauritius	MUS	√
110	Mexico	MEX	√

Continue ...

Annex I continued

Number	Economy	Code	IMF
111	Micronesia	FSM	√
112	Moldova	MDA	√
113	Mongolia	MNG	√
114	Montenegro	MNE	√
115	Morocco	MAR	√
116	Mozambique	MOZ	√
117	Myanmar	MMR	√
118	Namibia	NAM	√
119	Nauru	NRU	√
120	Nepal	NPL	√
121	The Netherlands	NLD	√
122	New Zealand	NZL	√
123	Nicaragua	NIC	√
124	Niger	NER	√
125	Nigeria	NGA	√
126	North Macedonia	MKD	√
127	Norway	NOR	√
128	Oman	OMN	√
129	Pakistan	PAK	√
130	Palau	PLW	√
131	Panama	PAN	√
132	Papua New Guinea	PNG	√
133	Paraguay	PRY	√
134	Peru	PER	√
135	Philippines	PHL	√
136	Poland	POL	√
137	Portugal	PRT	√
138	Qatar	QAT	√
139	Romania	ROU	√
140	Russian Federation	RUS	√
141	Rwanda	RWA	√
142	Samoa	WSM	√
143	San Marino	SMR	√
144	São Tomé and Príncipe	STP	√
145	Saudi Arabia	SAU	√
146	Senegal	SEN	√
147	Serbia	SRB	√
148	Seychelles	SYC	√
149	Sierra Leone	SLE	√
150	Singapore	SGP	√
151	Slovak Republic	SVK	√
152	Slovenia	SVN	√
153	Solomon Islands	SLB	√
154	Somalia	SOM	√
155	South Africa	ZAF	√
156	South Sudan	SSD	√
157	Spain	ESP	√
158	Sri Lanka	LKA	√
159	St. Kitts and Nevis	KNA	√
160	St. Lucia	LCA	√
161	St. Vincent and the Grenadines	VCT	√
162	Sudan	SDN	√
163	Suriname	SUR	√
164	Sweden	SWE	√
165	Switzerland	CHE	√

Continue ...

Annex I continued

Number	Economy	Code	IMF
166	Syria	SYR	√
167	Tajikistan	TJK	√
168	Tanzania	TZA	√
169	Thailand	THA	√
170	Timor-Leste	TLS	√
171	Togo	TGO	√
172	Tonga	TON	√
173	Trinidad and Tobago	TTO	√
174	Tunisia	TUN	√
175	Türkiye	TUR	√
176	Turkmenistan	TKM	√
177	Tuvalu	TUV	√
178	Uganda	UGA	√
179	Ukraine	UKR	√
180	United Arab Emirates	ARE	√
181	United Kingdom	GBR	√
182	United States	USA	√
183	Uruguay	URY	√
184	Uzbekistan	UZB	√
185	Vanuatu	VUT	√
186	Venezuela	VEN	√
187	Vietnam	VNM	√
188	Yemen	YEM	√
189	Zambia	ZMB	√
190	Zimbabwe	ZWE	√
191	Hong Kong SAR	HKG	§
192	Macao SAR	MAC	§
193	French Polynesia	PYF	§
194	New Caledonia	NCL	§
195	Aruba	ABW	§
196	Curaçao	CUW	§
197	Sint Maarten	SXM	§
198	Anguilla	AIA	§
199	Bermuda	BMU	§
200	Cayman Islands	CYM	§
201	Montserrat	MSR	§
202	Turks and Caicos Islands	TCA	§
203	Puerto Rico	PRI	§
204	Cuba	CUB	‡
205	Liechtenstein	LIE	‡
206	Democratic People's Republic of Korea	PRK	‡
207	Taiwan Province of China	TWN	‡
208	West Bank and Gaza	WBG	‡
209	Rest of the World	ROW	&

Note:	
√	IMF member country
§	IMF member country territory
‡	Non-IMF member country
&	Rest of the World

Annex II. Industries

No.	Code	Industry	ISIC 4	Name
1	I01.a	Paddy rice production	A	Agriculture, forestry and fishing
2	I01.b	Oil seeds production		
3	I01.c	Sugar cane and sugar beet production		
4	I01.d	Other crops production		
5	I01.e	Cattle and sheep production		
6	I01.f	Others animal production and hunting		
7	I02.a	Silviculture		
8	I02.b	Extraction and gathering of forest products		
9	I03	Fishing and aquaculture		
10	I05	Mining of coal and lignite	B	Mining and quarrying
11	I06.a	Extraction of crude petroleum		
12	I06.b	Extraction of natural gas		
13	I07.a	Mining of uranium and thorium ores		
14	I07.b	Mining of iron ores		
15	I07.c	Mining of copper ores and concentrates		
16	I07.d	Mining of nickel ores and concentrates		
17	I07.e	Mining of aluminium ores and concentrates		
18	I07.f	Mining of precious metal ores and concentrates		
19	I07.g	Mining of lead, zinc and tin ores and concentrates		
20	I07.h	Mining of Lithium ores and concentrates		
21	I07.i	Mining of Cobalt ores and concentrates		
22	I07.j	Mining of Manganese ores and concentrates		
23	I07.k	Mining of Graphite ores and concentrates		
24	I07.l	Mining of Rare earth ores and concentrates		
25	I07.m	Mining of other non-ferrous metal ores and concentrates		
26	I08.a	Quarrying of stone, sand and clay		
27	I08.b	Mining of chemical and fertilizer minerals, production of salt, other mining and quarrying n.e.c.		
28	I09	Mining support service activities		
29	I10.a	Manufacture of vegetable oils and fats	C	Manufacturing
30	I10.b	Manufacture of food products n.e.c.		
31	I11	Manufacture of beverages		
32	I12	Manufacture of tobacco products		
33	I13	Manufacture of textiles		
34	I14	Manufacture of wearing apparel		
35	I15	Manufacture of leather and related products		
36	I16	Manufacture of wood and of products of wood and cork, etc.		
37	I17	Manufacture of paper and paper products		
38	I18	Printing and reproduction of recorded media		
39	I19.a	Manufacture of coke oven products		
40	I19.b	Manufacture of refined petroleum products		
41	I20.a	Manufacture of fuel elements for nuclear reactors		
42	I20.b	Manufacture of basic plastics		
43	I20.c	Manufacture of nitrogenous fertilizers		
44	I20.d	Manufacture of non-nitrogenous and mixed fertilizers		
45	I20.e	Manufacture of biofuels		
46	I20.f	Manufacture of hydrogen, green		
47	I20.g	Manufacture of hydrogen, non-green		
48	I20.h	Manufacture of other chemical products n.e.c.		
49	I21	Manufacture of basic pharmaceutical products and preparations		
50	I22	Manufacture of rubber and plastics products		

Continue ...

Annex II continued

No.	Code	Industry	ISIC 4	Name
51	I23.a	Manufacture of glass and glass products	C	Manufacturing
52	I23.b	Manufacture of clay building materials		
53	I23.c	Manufacture of cement, lime and plaster		
54	I23.d	Manufacture of other non-metallic mineral products		
55	I24.a	Manufacture of iron and steel - Electric Arc Furnace (EAF)		
56	I24.b	Manufacture of iron and steel - Basic Oxygen Furnace (BOF)		
57	I24.c	Manufacture of copper		
58	I24.d	Manufacture of nickel		
59	I24.e	Manufacture of aluminium		
60	I24.f	Manufacture of precious metal		
61	I24.g	Manufacture of lead, zinc and tin		
62	I24.h	Manufacture of Lithium		
63	I24.i	Manufacture of Cobalt		
64	I24.j	Manufacture of Manganese		
65	I24.k	Manufacture of Graphite		
66	I24.l	Manufacture of rare earth metal		
67	I24.m	Manufacture of other non-ferrous metal		
68	I25	Manufacture of fabricated metal products, except machinery & equipment		
69	I26.a	Manufacture of semiconductors		
70	I26.b	Manufacture of computer, electronic and optical products n.e.c.		
71	I27.a	Manufacture of batteries and accumulators		
72	I27.b	Manufacture of solar panels		
73	I27.c	Manufacture of electrical equipment n.e.c.		
74	I28.a	Manufacture of wind turbines		
75	I28.b	Manufacture of machinery and equipment n.e.c.		
76	I29.a	Manufacture of electric vehicles		
77	I29.b	Manufacture of hybrid electric vehicles		
78	I29.c	Manufacture of internal combustion engine vehicles		
79	I30	Manufacture of other transport equipment		
80	I31T32	Manufacture of furniture, other manufacturing		
81	I33	Repair and installation of machinery and equipment		
82	I35.a	Production of electricity by coal	D	Electricity, gas, steam and air conditioning supply
83	I35.b	Production of electricity by gas		
84	I35.c	Production of electricity by nuclear		
85	I35.d	Production of electricity by hydro		
86	I35.e	Production of electricity by wind		
87	I35.f	Production of electricity by petroleum and other oil derivatives		
88	I35.g	Production of electricity by biomass and waste		
89	I35.h	Production of electricity by solar photovoltaic		
90	I35.i	Production of electricity by solar thermal		
91	I35.j	Production of electricity by tide, wave, ocean		
92	I35.k	Production of electricity by Geothermal		
93	I35.l	Production of electricity nec		
94	I35.m	Transmission and distribution of electricity		
95	I35.n	Manufacture of gas; distribution of gaseous fuels through mains		
96	I35.o	Steam and air conditioning supply		
97	I36	Water collection, treatment and supply	E	Water supply, sewerage, waste management and remediation activities
98	I37	Sewerage		
99	I38.a	Recycling of waste		
100	I38.b	Incineration of waste		
101	I38.c	Treatment and disposal of waste nec		
102	I39	Remediation activities and other waste management services		

Continue ...

Annex II continued

No.	Code	Industry	ISIC 4	Name
103	I41T43	Construction	F	Construction
104	I45	Wholesale and retail trade and repair of motor vehicles and motorcycles	G	Wholesale and retail trade, repair of motor vehicles and motorcycles
105	I46	Wholesale trade, except of motor vehicles and motorcycles		
106	I47	Retail trade, except of motor vehicles and motorcycles		
107	I49.a	Land transport, passengers	H	Transportation and storage
108	I49.b	Land and pipelines transport, freight		
109	I50.a	Water transport, passengers		
110	I50.b	Water transport, freight		
111	I51.a	Air transport, passengers		
112	I51.b	Air transport, freight		
113	I52	Warehousing and support activities for transportation		
114	I53	Postal and courier activities		
115	I55	Accommodation	I	Accommodation and food service activities
116	I56	Food and beverage service activities		
117	I58	Publishing activities	J	Information and communication
118	I59T60	Audiovisual and broadcasting activities		
119	I61	Telecommunications		
120	I62T63	IT and other information services		
121	I64	Financial service activities, except insurance and pension funding	K	Financial and insurance activities
122	I65	Insurance, reinsurance and pension funding, except compulsory S.S.		
123	I66	Activities auxiliary to financial service and insurance activities		
124	I68.a	Imputed rents of owner-occupied dwellings	L	Real estate activities
125	I68.b	Real estate activities excluding imputed rents		
126	I69T70	Legal, accounting, head offices, management consultancy activities	M	Professional, scientific and technical activities
127	I71	Architectural and engineering activities, technical testing & analysis		
128	I72	Scientific research and development		
129	I73	Advertising and market research		
130	I74T75	Other professional, scientific and tech. activities, veterinary activ.		
131	I77	Rental and leasing activities	N	Administrative and support service activities
132	I78	Employment activities		
133	I79	Travel agency, tour operator, reservation service & related activities		
134	I80T82	Security, services to buildings and other business support activities		
135	I84	Public administration and defense, compulsory social security	O	Public administration and defense, compulsory social security
136	I85	Education	P	Education
137	I86	Human health activities	Q	Human health and social work activities
138	I87T88	Residential care and social work activities		
139	I90T92	Arts, cultural activities, gambling and betting activities	R	Arts, entertainment and recreation
140	I93	Sports activities and amusement and recreation activities		
141	I94	Activities of membership organizations	S	Other service activities
142	I95	Repair of computers and personal and household goods		
143	I96	Other personal service activities		
144	I97T98	Act. of HH as employers, undif. G&S-prod. activities of HH for own use	T	Act. of HH as employers, undif. G&S-prod. activities of HH for own use

Annex III. Products

No	Code	Product	ISIC 4	Name
1	P01.a	Paddy rice	A	Agriculture, forestry, and fishing
2	P01.b	Oil seeds		
3	P01.c	Sugar cane and sugar beet		
4	P01.d	Other crops		
5	P01.e	Cattle and sheep		
6	P01.f	Others animal production and hunting		
7	P02.a	Silviculture products		
8	P02.b	Extraction and gathering of forest products		
9	P03	Fishing products and aquaculture		
10	P05.a	Anthracite	B	Mining and quarrying
11	P05.b	Coking coal		
12	P05.c	Other bituminous coal		
13	P05.d	Sub-bituminous coal		
14	P05.e	Lignite		
15	P05.f	Peat		
16	P05.g	Other coal products nec		
17	P06.a	Crude petroleum		
18	P06.b	Natural gas		
19	P07.a	Uranium and thorium ores		
20	P07.b	Iron ores		
21	P07.c	Copper ores and concentrates		
22	P07.d	Nickel ores and concentrates		
23	P07.e	Aluminium ores and concentrates		
24	P07.f	Precious metal ores and concentrates		
25	P07.g	Lead, zinc and tin ores and concentrates		
26	P07.h	Lithium ores and concentrates		
27	P07.i	Cobalt ores and concentrates		
28	P07.j	Manganese ores and concentrates		
29	P07.k	Graphite ores and concentrates		
30	P07.l	Rare earth ores and concentrates		
31	P07.m	Other non-ferrous metal ores and concentrates		
32	P08.a	Stone, sand and clay		
33	P08.b	Chemical and fertilizer minerals, production of salt, other mining and quarrying n.e.c.		
34	P09	Mining support services		
35	P10.a	Vegetable oils and fats products	C	Manufacturing
36	P10.b	Food products n.e.c.		
37	P11	Beverages		
38	P12	Tobacco products		
39	P13	Textiles		
40	P14	Wearing apparel		
41	P15	Leather and related products		
42	P16	Wood & prod. of wood & cork, exc. furniture, of straw & plaiting mat.		
43	P17	Paper and paper products		
44	P18	Printing and recording services		
45	P19.a.1	Coke Oven Coke		
46	P19.a.2	Gas Coke		
47	P19.a.3	Coal Tar		
48	P19.b.1	Motor Gasoline		
49	P19.b.2	Aviation Gasoline		
50	P19.b.3	Gasoline Type Jet Fuel		

Continue ...

Annex III continued

No	Code	Product	ISIC 4	Name
51	P19.b.4	Kerosene Type Jet Fuel	C	Manufacturing
52	P19.b.5	Kerosene		
53	P19.b.6	Gas/Diesel Oil		
54	P19.b.7	Heavy Fuel Oil		
55	P19.b.8	Refinery Gas		
56	P19.b.9	Liquefied Petroleum Gases (LPG)		
57	P19.b.10	Refinery Feedstocks		
58	P19.b.11	Ethane		
59	P19.b.12	Naphtha		
60	P19.b.13	White Spirit & SBP		
61	P19.b.14	Lubricants		
62	P19.b.15	Bitumen		
63	P19.b.16	Paraffin Waxes		
64	P19.b.17	Petroleum Coke		
65	P19.b.18	Non-specified Petroleum Products		
66	P20.a	Nuclear fuel		
67	P20.b	Plastics, basic		
68	P20.c	Nitrogenous fertilizers		
69	P20.d	Non-nitrogenous and mixed fertilizers		
70	P20.e.1	Charcoal		
71	P20.e.2	Additives/Blending Components		
72	P20.e.3	Biogasoline		
73	P20.e.4	Biodiesels		
74	P20.e.5	Other Liquid Biofuels		
75	P20.f	Hydrogen, green		
76	P20.g	Hydrogen, non-green		
77	P20.h	Other chemical products nec		
78	P21	Basic pharmaceutical products and pharmaceutical preparations		
79	P22	Rubber and plastics products		
80	P23.a	Glass and glass products		
81	P23.b	Clay building materials		
82	P23.c	Cement, lime and plaster		
83	P23.d	Other non-metallic mineral products		
84	P24.a	Iron and steel - Electric Arc Furnace (EAF)		
85	P24.b	Iron and steel - Basic Oxygen Furnace (BOF)		
86	P24.c	Copper		
87	P24.d	Nickel		
88	P24.e	Aluminium		
89	P24.f	Precious metal		
90	P24.g	Lead, zinc and tin		
91	P24.h	Lithium		
92	P24.i	Cobalt		
93	P24.j	Manganese		
94	P24.k	Graphite		
95	P24.l	Rare earth metal		
96	P24.m	Other non-ferrous metal		
97	P25	Fabricated metal products, except machinery and equipment		
98	P26.a	Semiconductors		
99	P26.b	Computer, electronic and optical products n.e.c.		
100	P27.a	Batteries and accumulators		

Continue ...

Annex III continued

No	Code	Product	ISIC 4	Name
101	P27.b	Solar panels	C	Manufacturing
102	P27.c	Electrical equipment n.e.c.		
103	P28.a	Wind turbines		
104	P28.b	Machinery and equipment n.e.c.		
105	P29.a	Electric vehicles		
106	P29.b	Hybrid electric vehicles		
107	P29.c	Internal combustion engine vehicles		
108	P30	Other transport equipment		
109	P31T32	Furniture and other manufacturing		
110	P33	Repair and installation of machinery and equipment		
111	P35.a	Electricity by coal	D	Electricity, gas, steam and air conditioning supply
112	P35.b	Electricity by gas		
113	P35.c	Electricity by nuclear		
114	P35.d	Electricity by hydro		
115	P35.e	Electricity by wind		
116	P35.f	Electricity by petroleum and other oil derivatives		
117	P35.g	Electricity by biomass and waste		
118	P35.h	Electricity by solar photovoltaic		
119	P35.i	Electricity by solar thermal		
120	P35.j	Electricity by tide, wave, ocean		
121	P35.k	Electricity by Geothermal		
122	P35.l	Electricity nec		
123	P35.m	Transmission and distribution services of electricity		
124	P35.n.1	Coke oven gas		
125	P35.n.2	Blast Furnace Gas		
126	P35.n.3	Oxygen Steel Furnace Gas		
127	P35.n.4	Gas Works Gas		
128	P35.n.5	Biogas		
129	P35.n.6	Distribution services of gaseous fuels through mains		
130	P35.o	Steam and air conditioning supply		
131	P36	Natural water, water treatment and supply services	E	Water supply, sewerage, waste management and remediation activities
132	P37	Sewerage		
133	P38.a	Recycling of waste		
134	P38.b	Incineration of waste		
135	P38.c	Treatment and disposal of waste nec		
136	P39	Remediation activities and other waste management services		
137	P41T43	Constructions and construction works	F	Construction
138	P45	Wholesale and retail trade and repair serv. of motor vehicles & cycles	G	Wholesale and retail trade, repair of motor vehicles and motorcycles
139	P46	Wholesale trade services, except of motor vehicles and motorcycles		
140	P47	Retail trade services, except of motor vehicles and motorcycles		
141	P49.a	Land transport services, passengers	H	Transportation and storage
142	P49.b	Land and pipelines transport services, freight		
143	P50.a	Water transport services, passengers		
144	P50.b	Water transport services, freight		
145	P51.a	Air transport services, passengers		
146	P51.b	Air transport services, freight		
147	P52	Warehousing and support services for transportation		
148	P53	Postal and courier services		
149	P55	Accommodation services	I	Accommodation and food service activities
150	P56	Food and beverage serving services		

Continue ...

Annex III continued

No	Code	Product	ISIC 4	Name
151	P58	Publishing services	J	Information and communication
152	P59T60	Audiovisual and broadcasting services		
153	P61	Telecommunications services		
154	P62T63	Computer programming, consultancy and related serv., Information serv.		
155	P64	Financial services, except insurance and pension funding	K	Financial and insurance activities
156	P65	Insurance, reinsurance & pension funding services, exc. compulsory S.S.		
157	P66	Services auxiliary to financial services and insurance services		
158	P68.a	Imputed rents of owner-occupied dwellings	L	Real estate activities
159	P68.b	Real estate activities excluding imputed rents		
160	P69T70	Legal, accounting, head offices services, management consultancy serv.	M	Professional, scientific and technical activities
161	P71	Architectural, engineering, tech. testing and analysis services		
162	P72	Scientific research and development services		
163	P73	Advertising and market research services		
164	P74T75	Other professional, scientific, technical and veterinary services		
165	P77	Rental and leasing services	N	Administrative and support service activities
166	P78	Employment services		
167	P79	Travel agency, tour operator & other reservation services & related		
168	P80T82	Security & investigation serv., serv. to buildings & other bus. Support		
169	P84	Public administration and defense services, compulsory S.S. services	O	Public administration and defense, compulsory social security
170	P85	Education services	P	Education
171	P86	Human health services	Q	Human health and social work activities
172	P87T88	Residential care services, social work services without accommodation		
173	P90T92	Creative, arts, entmnt, library, museum, other cult. serv., gambling	R	Arts, entertainment and recreation
174	P93	Sporting services and amusement and recreation services		
175	P94	Services furnished by membership organisations		
176	P95	Repair services of computers and personal and household goods	S	Other service activities
177	P96	Other personal services		
178	P97T98	Services of HH as employers, undif. G&S prod. by HH for own use	T	Act. of HH as employers, undif. G&S-prod. activities of HH for own use

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