De La Salle University
AKI
Angelo King Institute
for Economic and Business Studies

DLSU-AKI Working Paper Series
2024-10-098

The ANIMO Econometric Model Database of De La Salle University: Variables and Technical Notes

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1. Introduction

This working paper provides a technical explanation of the gathering, treatment, and construction of the data used in the De La Salle University ANIMO Annual Econometric Model. The ANIMO Annual Econometric Model is an ongoing, improving development by the DLSU Carlos L. Tiu School of Economics (CLTSOE). As of the time of writing, the database comprises 990 indicators (annual data), of which 471 are used as inputs to the econometric model. The list of variables used in the model is listed in Appendix Table 1.

The sources of basic data for the database include, but is not limited to, the Philippine Statistics Authority (PSA), the Bangko Sentral ng Pilipinas (BSP), the International Monetary Fund (IMF), the Bureau of the Treasury (BoTr), and the World Bank. The fundamental source of data on the aggregate economic transactions of institutional sectors – households, firms, and the government – is the PSA's Philippine System of National Accounts (see Section 2). The database, and consequently the model, is **internally consistent** in that it aligns the data collected from other sources with the items recorded in the Philippine System of National Accounts. This is done through various approaches, which will be discussed in the text. One prominent approach to such alignment is the use of bridge equations. Bridge equations link series published by other organizations to their closest counterparts in the Philippine System of National Accounts. This allows the model to forecast variables from one or the other. A more detailed discussion is found in Section 15.

The paper is divided into 15 major sections. Section 2 to Section 4 discusses data on the Philippine System of National Accounts. Section 5 to Section 7 comprise the "labor and wages" block, discussing how we gathered data such as the labor force and labor force demographics, employment, and wages. Section 8 to Section 10 discusses the economic structure and prices. Section 11 discusses data on fiscal and monetary policy. Section 12 and Section 13 discusses data on indicators from the rest of the world and the Philippines' external transactions. Section 14 discusses the miscellaneous variables included in the database. Finally, Section 15 contains a discussion on the bridge equations.

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2. National Accounts: Demand-Side

To capture the various components of demand, the ANIMO model uses data from the Philippine System of National Accounts (PSNA), collected and published by the Philippine Statistics Authority (PSA), on an annual basis. Specifically, it uses data on the Expenditure-Approach to obtaining the Gross Domestic Product and Gross National Income.[1] Output from the demand-side is measured by GDP, which "is derived as the sum of all final expenditures, gross capital formation and exports of goods and services less imports of goods and services" (PSA, 2022c, p.6).

Data in both current and constant prices are used in the database and in the model. Implicit deflators are computed by dividing the value of an indicator in current prices by its value in constant prices from the PSNA (see Section 9). the Citing the PSA's Technical Notes, the single extrapolation method was used to arrive at the constant price estimates of GDP and its components (PSA, 2022c).[2] This entails deflating the value at current prices by an "output price index." The base year is 2018.

2.1. Household Final Consumption Expenditure

Based on the corresponding Technical Notes, Household Final Consumption is captured through the retail trade output, under the assumption that "retail trade is equal to the consumption of households", adjusted to "remove the expenditure of non-residents in the domestic area using inbound tourism expenditure". Aside from the adjusted retail trade output value, which measures the expenditure on goods, households' expenditure on various services is measured as the "gross output of various industries i.e., recreation, ownership of dwellings, electricity, water, etc." (PSA, 2022c, p.6)

2.1.1. Food and Non-Food Consumption

We split Household Final Consumption Expenditure into Food and Non-Food Consumption. Data on these two components are taken from the series Household Final Consumption Expenditure by Purpose. Household Food Consumption is the aggregate value of the consumption of (1) Food and Non-Alcoholic Beverages, and (2) Alcoholic Beverages and Tobacco.[3] [4] Household Non-Food Consumption is defined in the equation below:

$$CH_t = CHF_t + CHNF_t \Longrightarrow CHNF_t = CH_t - CHF_t \quad (1)$$

where CH_t is the value of Household Final Consumption found in the National Accounts, in both current and constant prices. CHF_t and $CHNF_t$ are Household Food and Non-Food Consumption,

[1] Data on Gross Domestic Product and Gross National Income at current prices are from PSA (2024i), and data at constant 2018 prices are from PSA (2024j)

[2] As per the technical notes, this method improves over the single-deflation used in the 2000-based PSNA series.

[3] Data for household consumption expenditure of food and non-alcoholic beverages at current prices are taken from PSA (2024ao) and data at constant 2018 prices are taken from PSA (2024ap)

[4] Data for household consumption expenditure of alcoholic beverages and tobacco at current prices are taken from PSA (2024aq) and data at constant 2018 prices are taken from PSA (2024ar)

respectively. $CHNF_t$ is defined as the residual value of Household Final Consumption after deducting Household Food Consumption. This process yields six series, three in current prices and three in constant prices, each for total household final consumption, household food consumption, and household non-food consumption.

2.2. Government Final Consumption Expenditure

As per the Technical Notes, Government Final Consumption Expenditure (CG_t) is "derived separately for national government, local government, social security schemes and non-profit institutions serving government.". These are then aggregated to arrive at the Government Final Consumption Expenditure value in the National Accounts.

2.3. Gross Capital Formation and its Components

The PSA (2024) defines Gross Capital Formation (GCF_t) as consisting of the sum of "fixed capital formation ($GFCF_t$), changes in inventories (INV_t) and valuables (VAL_t)", illustrated by the following equation:

$$GCF_t = GFCF_t + INV_t + VAL_t \tag{2}$$

According to the PSA (2024), the value for Changes in Inventories (INV_t) is either computed using the reported beginning and ending inventory levels, or estimated from selected indicators. Estimation of inventory varies for some goods or services. For example, the ending inventories for raw sugar is estimated through the commodity flow approach.[5] Estimating inventory flows also involves a valuation process that first records inventory in volume terms. The volumes of inventories are then matched with their corresponding prices and deflators to obtain their proper valuations.[6]

Meanwhile, Valuables (VAL_t) are estimated through two approaches: as "the summation of costs of valuables acquired by institutional units" from the demand-side, and as "the summation of costs of valuables locally- produced and acquired from the rest of the world" from the supply-side.

Lastly, Gross Fixed Capital Formation ($GFCF_t$) comprises expenditures for construction ($GFCCN_t$), durable equipment ($GFCEQ_t$), and other investment items ($GFCOI_t$), as seen below:

$$GFCF_t = GFCCN_t + GFCEQ_t + GFCOI_t \tag{3}$$

[5] While the PSA does not explicitly define the Commodity Flow Approach, the process behind it is described by the Bureau of Economic Analysis (BEA) as one that "begins with an estimate of the total supply of a commodity available for domestic uses; it then either attributes a fixed percentage of supply to an intermediate or final use, or it adjusts for intermediate purchases and attributes the residual to final uses." (BEA, n.d.)

[6] As per the Technical Notes, inventory levels in book values are transformed into volume terms. (PSA, 2022c)

Other investment items include the sum of expenditures on Breeding Stocks and Orchard Development, and Intellectual Property Products.[7] [8]

2.4. Exports and Imports of Goods and Services

In a separate Technical Note, the PSA (2024) defines export of goods as "all goods leaving the country, which are properly cleared through customs. A distinction, however, is made between exports of goods grown, mined, or manufactured in the Philippines (domestic exports) and exports of imported goods that do not undergo physical and/or chemical transformation in the Philippines (re-exports)". (PSA, 2024an, p.6)

Similarly, imports of goods are defined as "all articles, wares, goods, or merchandise of every kind or class entering the jurisdiction of the Philippines from any foreign port, either with intent to unload therein, or which, after such entering, are assumed therein, or incorporated in the general mass or property of the Philippines." (PSA, 2024an, p.6)

The values of exports and imports of goods in the annual National Accounts are aggregated from the monthly Foreign Trade Statistics (FTS) and are converted to Philippine peso (PHP) using the monthly average buying and selling rates of the Philippine peso to the US Dollar. Notably, the PSA adjusts these values to exclude replacement and returned goods, articles temporarily exported/imported, and goods on consignment basis. Meanwhile, the PSA's technical note states that data on the export and imports of services are aggregates derived from the Balance of Payments reported by the BSP.

The exports of goods and services, and the imports of goods and services, are used in bridge equations to reconcile them with their counterpart entries in the IMF's data on the balance of payments. This is covered more explicitly in Section 15, in equations B1 to B4.

2.4.1. Export Groups

We take annual export values in current and constant prices from the PSA for goods and for services ($EXGS_t$). The PSA reports exports of goods, classified into 13 product categories. We aggregate these into four major groups, detailed in Table 1: [9]

[7] As per the Technical Notes, the value of fixed capital expenditure on breeding stocks "is derived as the product of the number of animals (livestock and poultry) used as capital translated into live weight and relevant price". (PSA, 2022c, p. 7) Orchard development expenditures is in turn "based on the expenditure incurred in the areas to be planted and the cultivation of permanent crops until these become productive." (PSA, 2022c, p. 7)

[8] These include "capital expenditures on intangible fixed assets such as: a) research and development; b) mineral exploration; c) computer software and databases; and d) entertainment, literary or artistic original, and other intangibles" (PSA, 2022c, p. 7)

[9] Data for exports of goods by product at current prices are taken from PSA (2024c) and data at constant 2018 prices are taken from PSA (2024d)

Table 1. Export Groups

Export Group; Variable	Export Products
$EXGAPS_t$	Exports of Agricultural Products Exports of Fishery Products
$EXGEMT_t$	Exports of Electronic Products Exports of Ignition Wiring Sets Exports of Machinery and Transport Equipment
$EXGMCH_t$	Exports of Chemicals Exports of Cathodes and Sections of Cathodes, of Refined Copper Exports of Metal Components
$EXGOXS_t$	All other exports, namely: Exports of Articles of Apparel and Clothing Accessories Exports of Processed Food and Beverages Exports of Petroleum Products Exports of Woodcrafts and Furniture Other Exports of Goods

Note that the fourth major export group is computed as the residual value from total exports of goods after deducting the value of the three other groups:

$$EXGOXS_t = EXG_t - (EXGAPS_t + EXGEMT_t + EXGMCH_t) \quad (4)$$

Exports of services are split into two groups: (1) Exports of Travel ($EXSTRA_t$) and (2) Exports of Other Services ($EXSOXS_t$) which is computed by deducting the value of the exports of travel from the total value of exports of services reported in the National Accounts: [10]

$$EXSOXS_t = EXS_t - EXSTRA_t \quad (5)$$

[10] Data for exports of services at current prices are taken from PSA (2024e) and data at constant 2018 prices are taken from PSA (2024f)

2.4.2. Import Groups

Similar to export data, we also aggregate the value of imports of goods published by the PSA for 21 product categories into seven major groupings, enumerated in Table 2.[11]

[11] Data for imports of goods by product at current prices are taken from PSA (2024as) and data at constant 2018 prices are taken from PSA (2024at)

Table 2. Import Groups

Import Group; Variable	Import Products
$IMGAPS_t$	Imports of Cereal and Cereal Preparations Imports of Dairy Products Imports of Fruits and Vegetables Imports of Feeding Stuff
$IMGCHM_t$	Imports of Chemical and Chemical Products Imports of Medicinal and Pharmaceutical Products Imports of Plastics in Primary and Non-Primary Forms
$IMGEMG_t$	Imports of Electronic Products Imports of Telecommunication and Electrical Machinery Imports of Power-Generating and Specialized Machinery
$IMGIMT_t$	Imports of Industrial Machinery and Equipment Imports of Transport Equipment
$IMGMFU_t$	Imports of Mineral Fuels, Lubricants, and Related Materials
$IMGMTL_t$	Imports of Base Metals Imports of Metal Products Imports of Metalliferous Ores and Metal Scraps
$IMGOMS_t$	All other imports, namely: Imports of Articles of Apparel Imports of Textile Yarn, Fabrics, Made-Up Articles and Related Products Imports of Paper and Paper Products Imports of Professional Scientific Apparatus Other Imports of Goods

The last import group, $IMGOMS_t$ is computed as the residual value from total imports of goods after deducting the value of all other groups:

$$IMGOMS_t = IMG_t - (IMGAPS_t + IMGCHM_t + IMGEMG_t + IMGIMT_t + IMGMFU_t + IMGMTL_t) \quad (6)$$

Alternatively, we also group imports according to whether they are agricultural imports ($IMGAFF_t$) or industrial imports ($IMGIND_t$), such that:

$$IMGAFF_t = IMGAPS_t \tag{7}$$

$$IMGIND_t = IMGCHM_t + IMGEMG_t + IMGIMT_t + IMGMFU_t + IMGMTL_t + IMGOMS_t \tag{8}$$

These groupings are required in other parts of the model, specifically those pertaining to the Philippine Economic structure (Section 10). Imports of services are not disaggregated further.[12]

2.5. Gross Domestic Product and Gross National Income

By definition, Gross Domestic Product (GDP_t) both current and constant prices is computed as the sum of its components, such that:[13]

$$GDP_t = CH_t + CG_t + GCF_t + (EXGS_t - IMGS_t) \tag{9}$$

Gross National Income in current prices is accordingly computed by the PSA as the sum of GDP and Net Primary Income from the Rest of the World ($NPIRW_t$) such that:

$$GNI_t = GDP_t + NPIRW_t \tag{10}$$

We compute the GNI of the Philippines at constant prices by dividing GNI_t by the CPI (2023=100) (see Section 9.1).[14] Then we obtain the GNI per capita of the Philippines in US Dollars by dividing GNI_t (2023=100) by the total population (see Section 5.5); the result is then divided by the exchange rate between the Philippine Peso and the US Dollar in 2023 (see Section 12.3) to convert it into US Dollars:

$$GNIPC_t^{PHL} = \left(\frac{GNI_t}{POP_t}\right) \div XRUSA_t \tag{11}$$

[12] Note that the imports of goods and service ($IMGS_t$) is given by the sum of IMG_t and IMS_t

[13] Statistical discrepancies are recorded (SD_t) as a balancing value in case the left-hand and right-hand side of Equation (9) are not equal, but thus far SD_t as recorded by PSA has been zero.

[14] Note that the CPI used in Section 9.1 is given as 2018=100; we rebase this to 2023.

3. National Accounts: Supply-Side (Value-Added)

On the supply-side, the ANIMO model uses data on Gross Value-Added for sixteen industries, aligned with the 2009 Philippine Standard Industrial Classification (PSIC) System. In the Technical Notes, the PSA defines Gross Value-Added as "The value of output less the value of intermediate consumption" (PSA, 2022c, p.8). GVA is further defined to be "composed of compensation, depreciation, indirect taxes paid net of subsidies received and the operating surplus, which is the payment to the producer as entrepreneur" (PSA, 2022c, p.10).

The sixteen GVA industries and their corresponding definitions from the 2009 PSIC are enumerated in Table 3. All industry descriptions are taken verbatim from the PSIC Database (PSA, 2024bb).

Table 3. Gross Value-Added Industry Descriptions

Industry	PSIC Description
$\boldsymbol{GVAAFF_t}$ GVA in Agriculture, Forestry, & Fishing[15]	**PSIC Section A:** "This section includes the exploitation of vegetal and animal natural resources, comprising the activities of growing crops, raising and breeding of animals, harvesting of timber and other plants, animals or animal products from a farm or their natural habitats."
$\boldsymbol{GVAMAQ_t}$ GVA in Mining and Quarrying[16]	**PSIC Section B:** "This section includes the extraction of minerals occurring naturally as solids (coal and ores), liquids (petroleum) or gases (natural gas). Extraction can be achieved by different methods such as underground or surface mining, well operation, seabed mining, etc. This section also includes supplementary activities aimed at preparing the crude materials for marketing, for example, crushing, grinding, cleaning, drying, sorting, concentrating ores, liquefaction of natural gas and agglomeration of solid fuels."
$\boldsymbol{GVAMFG_t}$ GVA in Manufacturing[17]	**PSIC Section C:** "Manufacturing includes the physical or chemical transformation of materials, substances, or components into new products. The raw materials are products of agriculture, forestry, fishing, mining or quarrying as well as products of other manufacturing activities. Substantial alteration, renovation or reconstruction of goods is generally considered as manufacturing."
$\boldsymbol{GVAEWS_t}$ GVA in Electricity, Steam, Water and Waste Management[18]	**PSIC Section D:** "This section includes the activity of providing electric power, natural gas, steam, hot water and the like through a permanent infrastructure (network) of lines, mains and pipes. The dimension of the network is not decisive. Also included are the distribution of electricity, gas, steam, hot water and the like in

[15] Data at current prices are taken from PSA (2024k) and data at constant prices are taken from PSA (2024l)
[16] Data at current prices are taken from PSA (2024aa) and data at constant prices are taken from PSA (2024ab)
[17] Data at current prices are taken from PSA (2024y) and data at constant prices are taken from PSA (2024z)
[18] Data at current prices are taken from PSA (2024o) and data at constant prices are taken from PSA (2024p)

	industrial park or residential buildings. This section therefore includes the operation of electric and gas utilities, which generate, control and distribute electric power or gas. Also included is the provision of steam and air-conditioning supply. It excludes the operation of water and sewerage utilities, see 36, 37 and (typically long distance) transport of gas through pipelines" **PSIC Section E:** "This section includes activities related to the management of various forms of waste, such as solid or non-solid industrial or household waste, as well as contaminated sites. The output of the waste or sewage treatment process can either be disposed of or become an input into other production processes. Activities of water supply are also grouped in this section, since they are often carried out in connection with, or by units also engaged in, the treatment of sewage."
$\boldsymbol{GVACNS_t}$ GVA in Construction[19]	**PSIC Section F:** "This section includes general construction and specialized construction activities for buildings and civil engineering works. It includes new work, repair, additions and alterations, the erection of prefabricated buildings or structures on the site and also construction of a temporary nature."
$\boldsymbol{GVATRD_t}$ GVA in Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles[20]	**PSIC Section G:** "This section includes wholesale and retail sale (i.e. sale without transformation) of any type of goods and the rendering services incidental to the sale of these goods. Wholesaling and retailing are the final steps in the distribution of goods. Goods bought and sold are also referred to as merchandise. Also included in this section is the repair of motor vehicles and motorcycles."
$\boldsymbol{GVATAS_t}$ GVA in Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles[21]	**PSIC Section H:** "This section includes the provision of passenger or freight transport, whether scheduled or not, by rail, pipeline, road, water or air and associated activities such as terminal and parking facilities, cargo handling, storage etc. Also included in this section are the renting of transport equipment with driver or operator, and the postal and courier activities. This section excludes major repair or alteration of transport equipment, except motor vehicles, see division 3315; construction, maintenance and repair of roads, railroads, harbors, airfields, see 4210, 4290; maintenance and repair of motor vehicles, see 4520; renting of transport equipment without driver or operator, see 7710, 7730."

[19] Data at current prices are taken from PSA (2024g) and data at constant prices are taken from PSA (2024h)
[20] Data at current prices are taken from PSA (2024al) and data at constant prices are taken from PSA (2024am)
[21] Data at current prices are taken from PSA (2024aj) and data at constant prices are taken from PSA (2024ak)

$\boldsymbol{GVAAFS_t}$ GVA in Accommodation and Food Service Activities[22]	**PSIC Section I:** "This section includes the provision of short-stay accommodation for visitors and other travelers and the provision of complete meals and drinks fit for immediate consumption. The amount and type of supplementary services provided within this section can vary widely. This section excludes the provision of long-term accommodation as primary residences (Real estate activities, Section L), preparation of food or drinks that are either not fit for immediate consumption or that are sold through independent distribution channels, i.e. through wholesale and retail trade activities. The preparation of these foods is classified in Manufacturing."
$\boldsymbol{GVAIAC_t}$ GVA in Information and Communication[23]	**PSIC Section J:** "This section includes the production and distribution of information and cultural products, the provision of the means to transmit or distribute these products, as well as data or communications, information technology activities and the processing of data and other information service activities."
$\boldsymbol{GVAFIA_t}$ GVA in Financial and Insurance[24]	**PSIC Section K:** "This section includes financial service activities, including insurance, reinsurance and pension funding and activities to support financial services. This section also includes the activities of holding assets, such as activities of holding companies and the activities of trusts, funds and similar financial entities."
$\boldsymbol{GVAREO_t}$ GVA in Real Estate and Ownership of Dwellings[25]	**PSIC Section L:** "This section includes acting as lessors, agents and/or brokers in one or more of the following: selling or buying real estate, renting real estate, providing other estate services such as appraising real estate or acting as real estate escrow agents. Activities in this section may be carried out on own or leased property and may be done on a fee or contract basis. Also included is the building of structures, combined with maintaining ownership or leasing of such structures. This section includes real estate property managers."
$\boldsymbol{GVAPRO_t}$ GVA in Professional and Business Services[26]	**PSIC Section M:** "This section includes specialized professional, scientific and technical activities. These activities require a high degree of training, and make specialized knowledge and skills available to users" **PSIC Section N:** "This section includes a variety of activities that support general business operations. These activities differ from

[22] Data at current prices are taken from PSA (2024m) and data at constant prices are taken from PSA (2024n)
[23] Data at current prices are taken from PSA (2024w) and data at constant prices are taken from PSA (2024x)
[24] Data at current prices are taken from PSA (2024s) and data at constant prices are taken from PSA (2024t)
[25] Data at current prices are taken from PSA (2024ah) and data at constant prices are taken from PSA (2024ai)
[26] Data at current prices are taken from PSA (2024ac) and data at constant prices are taken from PSA (2024ad)

	those in Section M since their primary purpose is not the transfer of specialized knowledge."
$\boldsymbol{GVAPUB_t}$ GVA in Public Administration and Defense; Compulsory Social Security[27]	**PSIC Section O:** "This section includes activities of governmental nature, normally carried out by the public administration. This includes the enactment and judicial interpretation of laws and their pursuant regulation, as well as the administration of programs based on them, legislative activities, taxation, national defense, public order and safety, immigration services, foreign affairs and the administration of government programs. This section also includes compulsory social security activities. The legal or institutional status is not, in itself, the determining factor for an activity to belong in this section, rather than the activity being of a nature specified in the previous paragraph. This means that activities classified elsewhere in PSIC do not fall under this section, even if carried out by public entities. For example, administration of the school system (i.e. regulations, checks, curricula) falls under this section, but teaching itself does not (see Section P), and a prison or military hospital is classified to health (see Section Q). Similarly, some activities described in this section may be carried out by non-government units."
$\boldsymbol{GVAEDU_t}$ GVA in Education[28]	**PSIC Section P:** "This section includes education at any level or for any profession, oral or written as well as by radio and television or other means of communication. It includes education by the different institutions in the regular school system at its different levels as well as adult education, literacy programs, etc. Also included are military schools and academies, prison schools etc. at their respective levels. This section includes public as well as private education. Also includes instruction primarily concerned with sport and recreational activities and education support activities. Education can be provided in rooms, radio, television broadcast, Internet, correspondence or at home. For each level of initial education, the classes include special education for physically or mentally handicapped pupils."
$\boldsymbol{GVAHSW_t}$ GVA in Human Health and Social Work Activities[29]	**PSIC Section Q:** "This section includes the provision of health and social work activities, involving a wide range of activities, starting from health care provided by trained medical professionals in hospitals and other facilities, over residential care activities that still involve a degree of health care activities to social work activities without any involvement of health care professionals."
$\boldsymbol{GVAOTH_t}$	

[27] Data at current prices are taken from PSA (2024af) and data at constant prices are taken from PSA (2024ag)
[28] Data at current prices are taken from PSA (2024q) and data at constant prices are taken from PSA (2024r)
[29] Data at current prices are taken from PSA (2024u) and data at constant prices are taken from PSA (2024v)

GVA in Other Services	

Note that the PSA does not provide a "Total GVA" line item, under the assumption that the total GVA should amount to the total GDP derived from the expenditure approach, such that:

$$GVA_t = GDP_t \tag{12}$$

To avoid numerical inconsistencies due to rounding, we obtain the Gross Value-Added of Other Services ($GVAOTH_t$) residually, by deducting the GVA of all other industries from GDP such that:

$$GVAOTH_t = GDP_t - \sum_{i=1}^{15} GVA_t^{s_i} \tag{13}$$

where s_i denotes the fifteen industries excluding Other Services ($GVAOTH_t$) that are enumerated in Table 3.

4. National Accounts: Income & Outlay

The ANIMO model uses data from The Consolidated Accounts, and Income and Outlay (CAIO) Accounts, published by PSA. The data in the CAIO records the flow of transactions across economic agents, and with the rest of the world. At the aggregate level, kept in the Consolidated Accounts, this includes "transactions relating to production, consumption, disposable income, capital accumulation, and economic transactions with the rest of the world." (PSA, 2022c, p.1). At the level of the institutional sectors, the Income and Outlay accounts track the receipts and disbursements of income. All income and outlay data in the model are in current prices.

The ANIMO model uses PSA's income and outlay data at the aggregate (national) level as well as for three distinct institutional sectors: (1) Households including Non-profit institutions serving households (NPISHs), (2) General Government, and (3) Corporations. Data on the income and outlay of corporations are computed by summing the corresponding line items for Financial Corporations and Non-Financial Corporations, which are kept separate by the PSA (Section 4.3).

4.1. The Consolidated Accounts

The PSA's *Consolidated Accounts II: National Disposable Income and Its Use* contain data on the national sources of income and the outlay of this income.[30] The contents of this dataset may be summarized as follows:

[30] Data on the consolidated accounts for national disposable income and its use are taken from PSA (2024b)

$$GDI_t = NDI_t = (GOS_t + COEDOM_t) + NETPI_t + (COEFRW_t - COETRW_t) + (TRAFRW_t - TRATRW_t) + TAX_t - SUB_t \quad (14)$$

where Gross National Disposable Income (GDI_t) is identical to the Use of National Disposable Income (NDI_t). As per the PSA's technical notes, the sum of Gross Operating Surplus (GOS_t) and Compensation of Employees $(COEDOM_t)$ is the compensation earned by resident producers.[31] Gross Operating surplus is defined as "contribution of capital to production", representing the compensation toward owners of capital, while Compensation of Employees represents the aggregate annual income earned by workers for the period. Net Property Income $(NETPI_t)$ is computed as:

$$NETPI_t = PIFRW_t - PITRW_t \quad (15)$$

where $PIFRW_t$ is property income received from the rest of the world (ROW), while $PITRW_t$ is the property income paid to the rest of the world. As defined by the PSA, "[p]roperty income accrues when the owners of financial assets and natural resources (non-produced assets) put them at the disposal of other institutional units" (PSA, 2022d, p.8). Property income is the sum of investment income, which accrues from another's use of one's financial assets, and rent, which accrues from another's use of one's natural resources.

Net Compensation Inflow subtracts the compensation of employees to the rest of the world $(COETRW_t)$ from the compensation of employees received from the rest of the world $(COEFRW_t)$. Likewise, Net Transfers is the difference between transfers received from the rest of the world $(TRAFRW_t)$ and transfers to the rest of the world $(TRATRW_t)$. Transfers are defined by the PSA as "transactions in which one institutional unit provides a good, service or asset to another unit without receiving from the latter any good, service or asset in return as a direct counterpart" (PSA, 2022d, p.9).

It is worth noting that both $TRAFRW_t$ and $TRATRW_t$ may be disaggregated into their source institutions; that is, the composition of these transfers may be traced to the households (H), corporations (C), and general government (G) such that:[32]

$$TRAFRW_t = TRAFRW_t^H + TRAFRW_t^G + TRAFRW_t^C \quad (16)$$

$$TRATRW_t = TRATRW_t^H + TRATRW_t^G + TRATRW_t^C \quad (17)$$

[31] Both $COEDOM_t$ and $COEFRW_t$ appear as part of bridge equations (see Section 15, equations B6 and B10)

[32] Note that the PSA does not explicitly label non-households and non-government current transfers as "from corporations", but instead labels it as an aggregate of "Other Institutional Sectors" excluding households and the general government.

The last source of National Disposable Income is taxes (TAX_t) net of subsidies (SUB_t). As defined by PSA, "[t]axes are compulsory, unrequited payments, in cash or in kind, made by institutional units to government units" (PSA, 2022d, p.8). Conversely, subsidies are defined as "unrequited payments that government units, including non-resident government units, make to enterprises on the basis of the levels of their production activities or the quantities or values of the goods and services that they produce, sell or import" (PSA, 2022d, p.8)

Lastly, data on Gross Savings (SAV_t) is computed by PSA as the difference between Gross National Disposable Income (GDI_t) and Household Final Consumption Expenditure (CH_t) and Government Final Consumption Expenditure (CG_t) (see Section 2). This computation is given as:

$$SAV_t = GDI_t - (CH_t + CG_t) \tag{18}$$

4.2. Income and Outlay: Households including NPISHs

Data on the sources and uses of income of households are also from PSA.[33] In the technical notes, the PSA defines a household as "a group of persons who share the same living accommodation, who pool some or all of their income and wealth and who consume certain types of goods and services collectively" (PSA, 2022d, p.8). Meanwhile, the group of NPISHs "consists of non-market NPIs that are not controlled by the government. They provide goods and services to households free or at prices that are not economically significant" (PSA, 2022d, p.8) [34] The contents of this dataset may be summarized as follows:

$$NDI_t^H = GDI_t^H + TOTEXP_t^H \tag{19}$$

where Net Disposable Income for Households (NDI_t^H) is the difference between households' total Gross Disposable Income (GDI_t^H) and households' total expenses ($TOTEXP_t^H$).

In turn, GDI_t^H is the sum of all sources of income for households and NPISHs. This is given by:

$$GDI_t^H = GOS_t^H + COE_t^H + SB_t^H + OCTR_t^H \tag{20}$$

where GOS_t^H is the Gross Operating Surplus accruing to households and NPISHs and COE_t^H is the compensation of employees received by this institutional sector.[35] PI_H_t is the property income

[33] Data on the income and outlay of households and NPISHs are taken from PSA(2024au)
[34] Examples of NPISHs from the PSA include trade unions, charities, churches, etc.
[35] COE_t^H is modelled as a function of $COEDOM_t$ through a bridge equation (see Section 15, equation B10)

earned by households, SB_t^H is the value of Social Benefits (other than in kind), and $OCTR_t^H$ is the value of current transfers[36] received by the institutional sector.

Meanwhile, $TOTEXP\_H_t$ is the sum of all uses of income for households and NPISHs. This is given by:

$$TOTEXP_t^H = PX_t^H + TAXI_t^H + FEES_t^H + SC_t^H + OCTP_t^H \quad (21)$$

where PX_t^H is property expenses paid by households, $TAXI_t^H$ are taxes on income and wealth, $FEES_t^H$ are compulsory fees and fines, SC_t^H are social contributions, and $OCTP_t^H$ are the current transfers paid by households and NPISHs to other institutional sectors.[37]

Household and NPISH gross savings are obtained by deducting Household Final Consumption Expenditure (CH_t) from Households' net disposable income (NDI_t^H). This is represented as:

$$SAV_t^H = NDI_t^H - CH_t \quad (22)$$

4.3. Income and Outlay: Corporations

Data on the sources and uses for income for corporations are kept separately for financial corporations and non-financial corporations by PSA. In the PSA's technical notes, the two types of corporations are distinguished by the type of good or service provided. Financial corporations are described as "all resident corporations principally engaged in providing financial services, including insurance and pension funding services, to other institutional units." (PSA, 2022d, p.7)[38] non-financial corporations are those "principally engaged in the production of market goods and non-financial services." (PSA, 2022d, p.8) [39]

Both financial and non-financial corporations have the same income and outlay components. As such, we obtain income and outlay data for corporations by adding the values of each component across financial and non-financial corporations. The relationship between income and outlay components for corporations is:

$$SAV_t^C = GDI_t^C - TOTEXP_t^C \quad (23)$$

where Gross Saving for Corporations (SAV_t^C) is the difference between corporations' total Gross Disposable Income (GDI_t^C) and total expenses $(TOTEXP_t^C)$.

[36] Current transfers follow the same definition as "Transfers" from Section 4.1: The Consolidated Accounts.
[37] This implies payables by households and NPISHs to other institutional units for the use of financial assets and natural resources. It mirrors the description of Property Income from Section 4.1: The Consolidated Accounts
[38] Data on the income and outlay of financial corporations are taken from PSA (2024av)
[39] Data on the income and outlay of non-financial corporations are taken from PSA (2024aw)

In contrast to households, corporations' income comprises the institutional sector's gross operating surplus (GOS_t^C), property income (PI_t^C), and other current transfers received by corporations ($OCTR_t^C$). Mathematically:

$$GDI_t^C = GOS_t^C + PI_t^C + OCTR_t^C \tag{24}$$

The PSA's technical notes clarify that corporations' gross operating surplus is the "sum of consumption of fixed capital and net operating surplus" (PSA, 2022d, p.5). Property income for corporations is defined as "dividends received from shares of corporations, interest received from deposits and investments, rent on land and other natural assets, and reinvested earnings included under other property income" (PSA, 2022d, pp.5-6). For financial corporations specifically, other current transfers are described as "premiums less insurance service charges and claims less insurance charge" (PSA, 2022d, p.6).

Total expenses ($TOTEXP_t^C$) is the sum of corporations' property expenses (PX_t^C), current taxes on income and wealth ($TAXI_t^C$), compulsory fees and fines ($FEES_t^C$), and the current transfer paid by corporations to other institutional sectors ($OCTP_t^C$). This is shown below:

$$TOTEXP_t^C = PX_t^C + TAXI_t^C + FEES_t^C + OCTP_t^C \tag{25}$$

4.4. Income and Outlay: General Government

Data on the sources and outlays of income for the General Government are taken from the PSA.[40] The PSA defines General Government as comprising "institutional units that, in addition to fulfilling their political responsibilities and their role of economic regulation, produce services (and possibly goods) for individual or collective consumption mainly on a non-market basis and redistribute income and wealth" (PSA, 2022d, p.8). Central, state, and local government units, and their corresponding social security funds collectively fall under General Government. The sources and outlays of income for the General Government is summarized as follows:

$$NDI_t^G = GDI_t^G - TOTEXP_t^G \tag{26}$$

where Net Disposable Income for General Government (NDI_t^G) is the difference between the General Government's total Gross Disposable Income (GDI_t^G) and its total outlays ($TOTEXP_t^G$).

The General Government's gross disposable income (GDI_t^G) comprises its gross operating surplus (GOS_t^G), property income (PI_t^G), taxes on production and imports ($TAXOP_t^G$), taxes on income and wealth received from households and corporations ($TAXOI_t^G$), compulsory fees and fines received from the other institutional sectors ($FEES_t^G$), social contributions from households (SC_t^G), and other current transfers received ($OCTR_t^G$). This is given by:

[40] Data on the income and outlay of general government are taken from PSA (2024ax)

$$GDI_t^G = GOS_t^G + PI_t^G + TAXOP_t^G + TAXOI_t^G + FEES_t^G + SC_t^G + OCTR_t^G \quad (27)$$

The PSA defines taxes on production and imports as "taxes on goods and services that become payable as a result of the production, sale, transfer, leasing or delivery of those goods or services, or as a result of their use for own consumption or own capital formation" (PSA, 2022d, p.8). Accordingly, taxes on production and imports may be disaggregated into:

$$TAXOP_t^G = TAXP_t + TAXOTH_t \quad (28)$$

where $TAXOP_t^G$ are aggregate taxes on production and imports received by the government, $TAXP_t$ are taxes on products, while $TAXOTH_t$ are other taxes on production. $TAXP_t$ is further disaggregated into Value Added Tax (VAT) ($TAXVAT_t$), taxes and duties on imports excluding VAT ($TAXIMP_t$) and taxes on products, excluding vat, import and export taxes ($TAXPROD_t$). This disaggregation is given by:

$$TAXP_t = TAXVAT_t + TAXIMP_t + TAXPROD_t \quad (29)$$

The other income components enumerated in Equation (27) follow the same definitions as in previous sections.

In contrast, the General Government's uses of income ($TOTEXP\_G_t$) is the sum of its property expenses (PX_G_t), social benefits other than in kind (SB_G_t) disbursed to households, subsidies (SUB_G_t), and other current transfers paid by the General Government ($OCTP\_G_t$). This is given by:

$$TOTEXP\_G_t = PX\_G_t + SB\_G_t + SUB\_G_t + OCTP\_G_t \quad (30)$$

Lastly, similar to households, the gross savings of the General Government is obtained as the difference between its net disposable income (NDI_G_t) and its final consumption expenditure (CG_t):

$$SAV_t^G = NDI_t^G - CG_t \quad (31)$$

The variables GDI_t^G, $TOTEXP_t^G$, CG_t and PX_t^G are linked to the fiscal policy variables $PGOVREV_t$, $PGOVEXP_t$, and $INTPAY_t$ from Section 11.1 through bridge equations (see equations B7, B8, B9). Bridge equations are discussed in greater detail in Section 15.

4.5. Key Identities in Income and Outlay and the Flow of Funds

One key identity that arises from the previous sub-sections is that National Disposable Income (NDI_t) is used for household and government final consumption expenditures, with gross savings serving as a balancing item:

$$NDI_t = CH_t + CG_t - SAV_t \tag{32}$$

The Income and Outlay Accounts and the Demand-Side of the National Accounts are linked by the identity:

$$GCF_t = CTFRW_t + SAV_t - NLB_t \tag{33}$$

Following the PSA's (2022) Technical Notes on the CAIO, gross accumulation (GCF_t) is financed jointly by capital transfers from the rest of the world ($CTFRW_t$) and by gross savings (SAV_t), with net lending (+) or borrowing (-) (NLB_t) serving as the balancing item. That is, if inward capital transfers and savings falls short of the amount spent toward gross capital formation, then the shortfall is financed by borrowing. The converse also holds.

Note, however, that the gross capital formation, capital transfers, savings, and net lending and borrowing are the sum of these components across the different institutional sectors. That is, the following identities must hold:[41]

(i) Total gross capital formation must be equal to the sum of the gross capital formation of each institutional sector:

$$GCF_t = GCF_t^H + GCF_t^C + GCF_t^G \tag{34}$$

(ii) Total capital transfers from the rest of the world must be equal to the sum of inward capital transfers received by each institutional sector:

$$CTFRW_t = CTFRW_t^H + CTFRW_t^C + CTFRW_t^G \tag{35}$$

(iii) National gross savings must equal the sum of gross savings across all institutional sectors:

$$SAV_t = SAV_t^H + SAV_t^C + SAV_t^G \tag{36}$$

[41] Due to rounding and measurement errors by the PSA, some immaterial differences (less than PHP 10.00) may occur. As such, to avoid issues in model estimation, these small differences are closed or absorbed into other items.

(iv) Net lending or borrowing must equal the sum of net lending or borrowing across all institutional sectors:

$$NLB_t = NLB_t^H + NLB_t^C + NLB_t^G \tag{37}$$

Accordingly, the identity for the entire economy specified in Equation (33) must also hold for each institutional sector. That is, the gross capital formation for households, corporations, and the general government, is financed by each corresponding sector's gross savings and inward capital transfers, with their respective net lending or borrowing as a balancing item.

Of these, only gross savings (SAV_t) and gross savings per institutional sector $(SAV_t^H, SAV_t^C, SAV_t^G)$ are published by the PSA. To get the disaggregation of GCF_t, $CTFRW_t$, and NLB_t by institutional sector, we appeal to the Bangko Sentral ng Pilipinas' (BSP) Flow of Funds Matrix.[42] The BSP defines the Flow of Funds (FOF) matrix as "as an integrated matrix of the capital and financial accounts of each of the institutional sectors (i.e., non-financial corporations, financial corporations, general government, households, and ROW) and the whole economy, linking saving, capital accumulation, and the associated financial flows" (BSP, n.d.).

Note, however, that the values reported in the FOF differ from those published in PSA's CAIO. We reconcile these to obtain the values for the GCF_t, $CTFRW_t$ and NLB_t of each institutional sector to satisfy the identities listed in Equations (33) to (37).

4.5.1. General Government

To obtain GCF_t^G, we compute the share of the gross capital formation of general government in total gross capital formation from the FOF, and multiply it by national gross capital formation published by the PSA. This is given by:

$$GCF_t^G = \frac{GCF'^G_t}{GCF'_t} \cdot GCF_t \tag{38}$$

where GCF_t^G is the general government's gross capital formation consistent with GCF_t, the gross capital formation published by PSA (see Section 2.3). GCF'^G_t and GCF_t are their counterpart values in the BSP's FOF.

Then, set it such that the net lending or borrowing is equal to the value published in the FOF such that:

$$NLB_t^G = NLB'^G_t \tag{39}$$

[42] Data on the BSP's Flow of Funds Matrix are taken from BSP (2024c)

Finally, we compute the general government's capital transfers from the rest of the world residually, such that:

$$CTFRW_t^G = GCF_t^G + NLB_t^G - SAV_t^G \tag{40}$$

4.5.2. Households

We set it such that the capital transfers received by households is equal to that published in the FOF where:

$$CTFRW_t^H = CTFRW'^H_t \tag{41}$$

To compute the net lending or borrowing for households, we consider the discrepancy between the net lending and borrowing in the FOF and the balance of payments. To account for this discrepancy, we instead compute NLB_t^H as the difference between the current account balance (see Section 13.1), and the net lending or borrowing of the general government $\left(NLB'^G_t\right)$ and of corporations $\left(NLB'^C_t\right)$ published in the FOF such that:

$$NLB_t^H = CAB_t - NLB'^G_t - NLB'^C_t \tag{42}$$

where CAB_t is the current account balance, and NLB'^G_t and NLB'^C_t are the FOF values of net lending or borrowing for general government and for corporations respectively.

From here, we find the gross capital formation for households as:

$$GCF_t^H = CTFRW_t^H + SAV_t^H - NLB_t^H \tag{43}$$

4.5.3. Corporations

We find the gross capital formation of corporations residually, by deducting the gross capital formation of general government and of households from national gross capital formation such that:

$$GCF_t^C = GCF_t - (GCF_t^H + GCF_t^G) \tag{44}$$

We obtain inward capital transfers for corporations through a similar process:

$$CTFRW_t^C = CTFRW_t - (CTFRW_t^G + CTFRW_t^H) \quad (45)$$

Finally, we find net lending or borrowing for corporations as:

$$NLB_t^C = CTFRW_t^C + SAV_t^C - GCF_t^C \quad (46)$$

5. The Labor Force and Population

This section details how we obtain a demographic decomposition of the Philippine labor force by sex and age. The main objective of this decomposition is to reconcile data from three different sources such that the sum of the number of persons in the labor force in each sex and age bracket sum up to the total labor force figures published by the PSA.

5.1. Total Labor Force

We take data on the Total Labor Force (No. of persons) (LF_t) from multiple versions of the Philippine Statistical Yearbooks (PSY), from the PSA OpenStat, or from Press Releases published by the Philippine Statistics Authority. The objective is to obtain a complete data series from 1991 to 2023. As defined in the PSA's Technical Notes for the Labor Force Survey, persons in the labor force are those "15 years old and over, who are either employed or unemployed" (PSA, n.d.-a). In contrast, persons not in the labor force are defined as those "15 years old and over who are neither employed nor unemployed […] Those not in the labor force are persons who are not looking for work because of reasons such as housekeeping, schooling, and permanent disability" (PSA, n.d.-a).[43]

Accordingly, employed persons are defined as persons 15 years old and above who are either "at work, i.e., those who do any work even for one hour during the reference period for pay or profit, or work without pay on the farm or business enterprise operated by a member of the same household related by blood, marriage, or adoption" or those "with a job but not at work, i.e., those who have a job or business but are not at work because of temporary illness or injury, vacation, or other reasons. Likewise, persons who expect to report for work or to start operation of a farm or business enterprise within two weeks from the date of the enumerator's visit are considered employed" (PSA, n.d.-a).

[43] Examples enumerated by the PSA for Persons Not in the Labor Force include housewives, students, persons with disabilities, or retired persons.

In contrast, unemployed persons are defined as those 15 years of age and over who fit the following criteria: (1) Without work; (2) Currently available for work; (3) Seeking work; (4) Not seeking work for various reasons such as fatigue, or temporary illness.[44]

Data on the Total Labor Force for 1991-1994 are taken from Table 11.2 of the 2008 Philippine Statistical Yearbook (PSY). Data from 1995-2018 are taken from PSA OpenStat.[45] Data from 2019-2022 are taken from Table 11.3 of the 2023 PSY. Data on the Total Labor Force (No. of Persons) for 2023 are taken as a simple average from January to December of PSA's estimates, from "Table D - Key Employment Indicators by Sex with Measures of Precision, Philippines"; this table is in turn part of a Press Release, published February 7, 2024.

5.2. Labor Force by Sex and Age

We obtain a decomposition of the Total Labor Force by sex, and then by age for the following groups: 15-24, 25-54, 55-64, and 65 and above. Due to the discrepancies between data sources in the number of persons in the labor force, we use this decomposition process with the objective of internal consistency in the ANIMO model – that is, the sum of the number of persons across sex and age brackets remain consistent to the total labor force size published by the PSA LF_t. To obtain this decomposition, we first stratify the labor force by sex into male and female from 1995-2023 using the PSA official figures on the total labor force (LF_t) from the previous section, and the proportion of male and female labor force computed from data in PSA OpenStat, PSA Labor Force Survey (LFS) Estimates, and from the International Labour Organization (ILO).[46]

We first compute the proportion of male and female persons within the labor force using PSA OpenStat data from 1995-2018, from ILO data from 2019-2022, and from the 2023 PSA Estimates of the Labor Force Survey (see previous section). The proportion of each sex $\left(\theta_t^{G_i}\right)$ is obtained similarly across all data sources; we do this by dividing the number of male (M) or female (F) persons in the labor force by the total labor force:[47]

$$\theta_t^{G_i} = \frac{{LF'}_t^{G_i}}{{LF'}_t^{M} + {LF'}_t^{F}}$$
$$\text{where } \sum_{G_i} \theta_t^{G_i} = 1.00 \quad \text{and} \quad G_i \in (M, F) \tag{47}$$

[44] The reasons enumerated by the PSA for "Not Seeking Work" include (1) fatigue or the belief that no work is available, as is in the case of discouraged workers; (2) awaiting the results of previous job application, rehire, or job recall; (3) temporary illness or disability; and/or (4) bad weather

[45] See PSA (2024ay)

[46] See ILO (2024b)

[47] Note that the due to rounding errors, the "total labor force" in the computation pertains to the sum of male and female persons in the labor force.

where G_i refers to whether the proportion is calculated for male (M) or for female (F), and $LF'^{G_i}_t$ is the number of male or female persons in the labor force published in the PSA or ILO data sources.

We then multiply these proportions by the total labor force from PSA (LF_t) to obtain the two data series on the labor force by sex $\left(LF_t^{G_i}\right)$ used in the ANIMO model; one for the number of males (LF_t^M) and the number of females in the labor force (LF_t^F). Each data series is computed as:

$$LF_t^{G_i} = \theta_t^{G_i} \cdot LF_t \tag{48}$$

We then stratify each $LF_t^{G_i}$ into four age brackets. To do this, we refer to the data published by the ILO on the labor force by sex and age for the Philippines from 1985-2022.[48] Similar to how we stratify the labor force by sex, we compute for the share of male or female persons falling into each of the four age brackets. This proportion $\left(\varphi_t^{a_i}\right)$, shown in in Equation (49), is computed by dividing the number of persons in each age bracket by the total male labor force (LF_t^M) or total female labor force (LF_t^F) computed from Equation (48).

$$\varphi_t^{a_i} = \frac{LF'^{G_i,a_i}_t}{\sum_{a_i} LF'^{G_i,a_i}_t}$$
$$\text{where} \sum_{a_i} \varphi_t^{a_i} = 1.00 \quad \text{and} \tag{49}$$
$$a_i \in (\text{Age 15-24, Age 25-54, Age 55-64, Age 65 and above})$$

where a_i refers to whether the proportion was calculated for persons Age 15-24, Age 25-54, Age 55-64, or Age 65 and above. Meanwhile, LF'^{G_i,a_i}_t is the number of persons in labor force by sex (G_i) and age (a_i) published in the ILO database.

We multiply $\varphi_t^{a_i}$ by $LF_t^{G_i}$ from Equation (48) to obtain the labor force by sex and age $\left(LF_t^{G_i,a_i}\right)$ - eight data series whose sum is consistent with the total labor force for the economy published by PSA (LF_t). These series are computed as:

$$LF_t^{G_i,a_i} = \varphi_t^{a_i} \cdot LF_t^{G_i} \tag{50}$$

[48] As of the time of writing, the ILO has not yet released data on the Philippine Labor Force by Sex and Age for 2023. Hence, lacking any additional available data, we use the same distribution across age brackets in 2022 for 2023.

The internal consistency between these figures may be summarized as follows: First, the sum of the male and female labor force $\left(LF_t^{G_i}\right)$ is equal to the total labor force (LF_t) such that:

$$LF_t = \sum_{G_i} LF_t^{G_i} = LF_t^M + LF_t^F \tag{51}$$

Second, the total male or female labor force is the sum of the number of persons across all age brackets within each of them such that:

$$LF_t^{G_i} = \sum_{a_i} LF_t^{G_i,a_i} \tag{52}$$

Third, the number of persons in each age bracket is equal to the number of males and females within each age bracket:

$$LF_t^{a_i} = \sum_{G_i} LF_t^{G_i,a_i} = LF_t^{M,a_i} + LF_t^{F,a_i} \tag{53}$$

Lastly, the total labor force is the sum of the number of persons across both sexes and all age brackets, where:

$$LF_t = \sum_{G_i} \sum_{a_i} LF_t^{G_i,a_i} \tag{54}$$

5.3. The Working Age Population

Similar to the previous section, this section discusses the process of recovering the size of the working age population given the total labor force and total labor force participation rate, and also the stratification process of the working age population by sex and age. The main objective of this process is to obtain data series on the working population that are not only internally consistent, but that also allows the computation of labor force participation rates across demographic groups.

5.3.1. Total Labor Force Participation Rate and the Total Working Age Population

We source data on the total Labor Force Participation Rate $(LFPR_t)$ from the same sources as the data on the total labor force (see Section 5.1). These are the Table 11.2 of the 2008 PSY for years

1991-1994, PSA OpenStat for years 1995-2018, the 2023 PSY for years 2019-2022, and for the PSA Labor Force Survey estimates for the year 2023 in their February 7, 2024 Press Release. The labor force participation rate per year along with the annual total labor force (LF_t) data allows us to compute for the total working age population.[49] We do so by dividing the number of persons in the labor force by the labor force participation rate such that:

$$LFPR_t = \frac{LF_t}{WP_t} \Rightarrow WP_t = \frac{LF_t}{LFPR_t} \tag{55}$$

where $LFPR_t$ is the labor force participation rate, LF_t is the total labor force (see Section 5.1) and WP_t is the size of the total working age population.

5.3.2. Working Age Population by Sex and Age

We find the Working Population by Sex and Working Population by Sex and Age through a process similar to that followed for the Labor Force decomposition in Section 5.2. We first use data on the working age population by sex and age sourced from the PSA OpenStat from 1995-2018, and the ILO from 2019-2023.[50] [51] From this data, we compute the proportion of males (M) vis-à-vis females (F) in the working age population, $\phi_t^{G_i}$ through:

$$\phi_t^{G_i} = \frac{{WP'}_t^{G_i}}{WP_t'^{M} + WP_t'^{F}} \tag{56}$$

$$\text{where } \sum_{G_i} \theta_t^{G_i} = 1.00 \quad \text{and} \quad G_i \in (M, F)\ 0$$

where G_i refers to whether the proportion is calculated for male (M) or for female (F), and ${WP'}_t^{G_i}$ is the number of male or female persons in the labor force published in the PSA or ILO.

We then multiply each of these proportions by the total working age population derived from Equation (55) to obtain the total male working age population (WP_t^M), and total female working age population, WP_t^F as:

[49] In the Labor Force Survey and its corresponding Technical Notes, the Working Age Population (or Working Population) is referred to as the "Population 15 Years Old and Over" and is measured as the number of people 15 years of age and over. Note that the PSA excludes Overseas Filipino Workers (OFWs) from the Working Population, as they are also not considered to be part of the Philippine labor force.

[50] See ILO (2024d)

[51] As of the time of writing, the ILO has not yet released data on the Philippine Working Age Population by Sex and Age for 2023. Hence, lacking any additional available data, we use the same distribution across age brackets in 2022 for 2023.

$$WP_t^{G_i} = \phi_t^{G_i} \cdot WP_t \tag{57}$$

Once we obtain working population by sex $\left(WP_t^{G_i}\right)$, we then separate this into the working age population by sex and age $(WP_t^{G_i,a_i})$, for age brackets 15-24, 25-54, 55-64, and 65 and above. Similar to the process shown in Section 5.2, we use data from the ILO on the working age population by sex and age to compute for the share of each age bracket in the male or female working age population as:

$$\psi_t^{a_i} = \frac{{WP'}_t^{G_i,a_i}}{\sum_{a_i} {WP'}_t^{G_i,a_i}}$$
$$\text{where} \sum_{a_i} \psi_t^{a_i} = 1.00 \quad \text{and} \tag{58}$$
$$a_i \in (\text{Age 15-24, Age 25-54, Age 55-64, Age 65 and above})$$

where a_i denotes each age bracket, and ${WP'}_t^{G_i,a_i}$ is the number of persons in the working age population by sex (G_i) and age (a_i) published by the ILO. This proportion, $\psi_t^{a_i}$, is then multiplied by the total working age population by sex $\left(WP_t^{G_i}\right)$ to obtain eight data series that stratify the working population by sex and age:

$$WP_t^{G_i,a_i} = \psi_t^{a_i} \cdot WP_t^{G_i} \tag{59}$$

The data series on the working age population by sex age follows the same internal consistency as the labor force stratification by sex and age in Section 5.2.

5.4. Labor Force Participation Rates by Sex and Age

After estimating the number of persons in the labor force by sex and age $\left(LF_t^{G_i,a_i}\right)$ and the size of the working age population by sex and age $\left(WP_t^{G_i,a_i}\right)$, we compute the labor force participation rates by sex and age.[52] Following Equation (55), we obtain labor force participation rates for each demographic by dividing the number of persons in the labor force for each group (by sex and age) by the number of persons in the working age population in the corresponding group. This formula is written as:

[52] There is a special case for year 2004 where this process yields a labor force participation rate greater than 100% for males age 25-54; hence, to avoid further inconsistencies, all labor force by sex and age $\left(LF_t^{G_i,a_i}\right)$ and working age population by sex and age $\left(WP_t^{G_i,a_i}\right)$ data for 2004 is calculated as an average between the 2003 and 2005 values. The totals by sex and by indicator are adjusted accordingly as the sum across age brackets and across sexes.

$$PR_t^{G_i,a_i} = \frac{LF_t^{G_i,a_i}}{WP_t^{G_i,a_i}} \quad (60)$$

where $G_i \in$ (Male, Female)

$a_i \in$ (Age 15-24, Age 25-54, Age 55-64, Age 65 and above)

5.5. Population

Section 5.3 discussed the process by which we estimated the total working age population and the demographic groups that comprise the working age population. Note, however, that the working age population only consists of persons 15 years of age and older. Hence, this section discusses the process of reconciling Philippine census data on the total population and the PSA population projections to estimate an annual data series for total population (POP_t). We then compute for the population under 15 years old $(POPU15_t)$ residually, by deducting the working age population (WP_t) from the total population.

5.5.1. Total Population

We estimate the annual population size of the Philippines by referring to the PSA's Census of Population and Housing (CPH) Report for years 2000, 2010, 2015, and 2020. We take the CPH population size data as it was reported in Table 1.6 of the 2023 Philippine Statistical Yearbook for years 1995, 2000, 2010, 2015, and 2020.

We interpolate the missing years from 1995 to 2023 by using various versions of the PSA's population projections. To interpolate total population data for 1995-1999, we use Table 3 from the 1995 Census-Based Population Projections by the PSA, which was published on December 8, 2006. To interpolate data for years 2001-2009, we use population projections from Table 1.8 from the 2010 PSY. Likewise, we use population projections from Table 1.9 of the 2023 PSY to interpolate data for years 2011-2019. Lastly, we use Table 10 from the 2020 Census-Based Population Projections, published by the PSA on January 31, 2024, to interpolate data for years 2021-2023.

For the interpolation process, we impose the condition that the total male (M) and total female (F) population in the years between the census grow at the same rate annually as their counterpart in population projections, such that:

$$g_t^{POP,G_i} = g'^{POP,G_i}_t \quad (61)$$

where $G_i \in (M, F)$

where g_t^{POP,G_i} is the annual growth rate of the population of each sex, and g'^{POP,G_i}_t is the annual growth rate of the projected population size of each sex. In discrete time, the annual growth rates may be computed as follows:

$$g_t^{POP,G_i} = \frac{POP_t^{G_i} - POP_{t-1}^{G_i}}{POP_{t-1}^{G_i}} = \frac{{POP'}_t^{G_i} - {POP'}_{t-1}^{G_i}}{{POP'}_{t-1}^{G_i}} = {g'}_t^{POP,G_i}$$
$$\Rightarrow \frac{POP_t^{G_i}}{POP_{t-1}^{G_i}} - 1 = \frac{{POP'}_t^{G_i}}{{POP'}_{t-1}^{G_i}} - 1 \quad (62)$$

Rearranging Equation (62) yields:

$$POP_{t-1}^{G_i} = POP_t^{G_i} \div \left(\frac{{POP'}_t^{G_i}}{{POP'}_{t-1}^{G_i}}\right) \quad (63)$$

Equation (63) implies that the male or female population size for a previous period, $t-1$, may be obtained as long as population size per sex for period t, $POP_t^{G_i}$, and population projections for each sex (POP'^{G_i}) for period t and $t-1$ are known. Using the census data as initial values for each interval, we interpolate backwards using this process is repeated until we are able estimate the total population size for each sex from 1995-2023, resulting in two series, POP_t^M and POP_t^F.

We then obtain the total population size as:

$$POP_t = POP_t^M + POP_t^F \quad (64)$$

5.5.2. Population Under 15

The size of the male and female population below working age, or those under 15 years of age, are computed residually. This is done by deducting the estimated total working age population by sex (those age 15 and over) in Section 5.3.2 $\left(WP_t^{G_i}\right)$ from the estimated total population by sex $\left(POP_t^{G_i}\right)$ such that:

$$POPU15_t^{G_i} = POP_t^{G_i} - WP_t^{G_i}$$
$$\text{where } G_i \in (M, F) \quad (65)$$

where $POPU15_t^{G_i}$ is the male or female population under 15 years of age, ${POP_t^{G_i}}_t$ is the estimated population size by sex, and $WP_t^{G_i}$ is the estimated number of male or female persons in the working age population.

We then obtain the size of the total population below working age as:

$$POPU15_t = POPU15_t^M + POPU15_t^F \quad (66)$$

6. Employment

This section details the process of obtaining data on the number of workers at the aggregate and at the sectoral level. It also details the process of reconciling the sectoral employment data to match with the 16-sector classification followed by PSA in the Production (Value-Added) approach in the National Accounts (see Table 3, Section 3).

6.1. Total and Sectoral Employment

We refer to multiple statistical yearbooks published by the PSA for data on the total number of workers (EMP_t) and the number of workers employed in each sector (EMP_t^{Si}). As per the PSA's Technical Notes for the Labor Force Survey, these workers are defined as persons 15 years old and over who are either "at work, i.e., those who do any work even for one hour during the reference period for pay or profit, or work without pay on the farm or business enterprise operated by a member of the same household related by blood, marriage, or adoption" or those "with a job but not at work, i.e., those who have a job or business but are not at work because of temporary illness or injury, vacation, or other reasons. Likewise, persons who expect to report for work or to start operation of a farm or business enterprise within two weeks from the date of the enumerator's visit are considered employed" (PSA, n.d.-a).

Data on the total and sectoral employment from 1993-2000 are taken from Table 11.3A of the 2002 Philippine Statistical Yearbook (PSY). Data for years 2001-2003 are taken from Table 11.3 of the 2005 PSY. Meanwhile, data for years 2004-2014 are obtained from Table 11.5 of the 2015 PSY, and data for years 2015-2017 are obtained from Table 11.9 of the 2018 PSY. Likewise, data from 2018-2022 are taken from Table 11.6 of the 2023 Philippine Statistical Yearbook. Finally, data on the number of workers (total and per sector) for 2023 are obtained by taking a simple average of the PSA's monthly employment estimates from their Press Release titled "Unemployment Rate in December 2023 was Estimated at 3.1 Percent", published February 7, 2024.

The sectoral disaggregation of employment reported by the PSA changes across years, reflective of the adoption of revisions to the Philippine Standard Industrial Classifications (PSIC). Changes to the PSIC in turn influence the industry classifications used in the Labor Force Survey.[53] To enable us to calculate labor productivity per sector, and estimate indicators such as annual compensation per sector, the data on sectoral employment is treated to remain consistent with the

[53] Note 1 to Table 11.5 in the 2015 Statistical Yearbook, the 2009 PSIC was adopted only in the January 2012 onwards. Preceding years' industrial classifications were consistent with the 1994 PSIC.

sixteen GVA sectors in Section 3. The equivalence between sectors and the PSIC revisions is found in Table 4.

Table 4. Sector Equivalencies

s_i	s'_j		
Model Sectoral Classifications	**Pre-1994 PSIC (1990-2000)**	**1994 PSIC (2001-2011)**	**2009 PSIC (2012-2022)**
Agriculture, Forestry, and Fishing	Agriculture, Forestry, and Fishing	Agriculture, Hunting, and Forestry	Agriculture, Hunting, and Forestry
		Fishing	Fishing
Construction	Construction	Construction	Construction
Mining and Quarrying	Mining and Quarrying	Mining and Quarrying	Mining and Quarrying
Manufacturing	Manufacturing	Manufacturing	Manufacturing
Electricity, steam, waste and water Management	Electricity, Gas, and Water	Electricity, Gas, and Water	Electricity, gas, steam, and air conditioning supply
			Water supply; sewerage, waste management and remediation activities
Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	Wholesale and Retail Trade	Wholesale and Retail, Repair of Motor Vehicles	Wholesale and retail, repair of motor vehicles and motorcycles
		Motorcycles & Personal Household Goods	
Transportation and Storage	Transport, Storage, and Communication	Transport, Storage, and Communication	Transportation and Storage
Information and Communication			Information and Communication
Financial and Insurance Activities	Financing, Insurance, Real Estate and Business Services	Financial Intermediation	Financial and Insurance Activities
Real estate activities; ownership of dwellings		Real Estate, Renting and Business Activities	Real Estate Activities

Professional and Business Services			Professional, Scientific and Technical Activities
			Administrative and Support Service Activities
Accommodation and Food Service Activities	Community, Social, and Personal Services + Industry Not Adequately Defined	Hotel and Restaurants	Accommodation and Food Service Activities
Education		Education	Education
Human Health and Social Work Activities		Health and Social Work	Human Health and Social Work Activities
Public Administration and Defense; Compulsory Social Security		Public Administration and Defense; Compulsory Social Security	Public Administration and Defense; Compulsory Social Security
Other Services		Private Household with Employed Persons	Activities of Households as Employers; Undifferentiated Goods and Service-producing Activities of Households for Own Use
		Extraterritorial Organizations & Bodies	Activities of Extraterritorial Organizations and Bodies
		Other Community, Social & Personal Service Activities	Arts, Entertainment and Recreation
			Other Service Activities

Source: Authors

6.2. Aggregation Method

In the case where multiple PSIC sectors (s_j') correspond to only one of the ANIMO model's sixteen sectors (s_i), then a simple aggregation of the number of workers in each s_j' is taken, such that:

$$EMP_t^{s_i} = \sum_{s_j'} EMP_t^{s_j'} \tag{67}$$

where $EMP_t^{s_i}$ is the number of workers in sector s_i, consistent with the sixteen enumerated in Table *4*, and $EMP_t^{s_j'}$ is the number of workers in s_j', the corresponding PSIC sectors to be aggregated into s_i.

For example, the 2009 PSIC recognizes "Electricity, gas, steam, and air conditioning supply" and "Water supply; sewerage, waste management and remediation activities" as separate sectors. However, they both correspond to the desired industrial classification "Electricity, steam, waste and water management" (EWS). Hence:

$$EMP_t^{EWS} = EMP_t^{s_1'} + EMP_t^{s_2'} \tag{68}$$
$$t \geq 2012"$$

where s_1' is "Electricity, gas, steam, and air conditioning supply", and s_2' is "Water supply; sewerage, waste management, remediation activities".

A similar process is followed to get the total number of workers for (1) Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles (2001-2011), (2) Professional and Business Services (2012 onwards), (3) Other Services.

6.3. Decomposition Method

In cases where one PSIC sector (s_j') corresponds to more than one sector from the ANIMO Model (s_i), then $EMP_t^{s_j'}$ is multiplied by a sectoral weight $(\partial_t^{s_i})$ that is averaged across the **three succeeding years** for which data for $EMP_t^{s_i}$ is available, such that:

$$EMP_t^{s_i} = \overline{\partial^{s_i}} \cdot EMP_t^{s_j'} \tag{69}$$

The sectoral weight $\partial_t^{s_i}$ is computed as:

$$\partial_{t'+v}^{s_i} = \frac{EMP_{t'+v}^{s_i}}{\sum_{i=1}^{I} EMP_{t'+v}^{s_i}} \tag{70}$$

where:

$$t' = \begin{cases} 2001 & \text{if } t \in (1993,2000) \\ 2012 & \text{if } t \in (2001,2011) \end{cases}$$

$$v = 0, 1, 2$$

Consequently:

$$\overline{\partial^{s_i}} = \frac{\sum_{j=0}^{2} \partial_{t'+v}^{s_i}}{3} \tag{71}$$

For example, this is used in separating the number of workers in the sectors "Transportation and Storage" (TAS) and "Information and Communication" (IAC). Data on the employment of these two sectors were combined into "Transport, Storage, and Communication" from 1990-2011. Following the decomposition method, the sectoral weight for Transport and Storage, ∂_t^{TAS}, is computed as:

$$\partial_{t'+v}^{TAS} = \frac{EMP_{t'+v}^{TAS}}{EMP_{t'+v}^{TAS} + EMP_{t'+v}^{IAC}} \tag{72}$$

where:

$$t' = \begin{cases} 2012 & \text{if } t \in (2001,2011) \\ 2001 & \text{if } t \in (1990,2000) \end{cases}$$

$$v = 0, 1, 2$$

This is also used to separate the sector "Real Estate, Renting and Business Activities" in 2001-2011 into the sectors: "Real Estate Activities; Ownership of Dwellings", and "Professional and Business Services".

It is again used on data prior to 2001, when the sector "Financing, Insurance, Real Estate and Business Services" needs to be separated into "Financial and Insurance Activities (FIA)", "Real Estate Activities; Ownership of Dwellings (REO)", and "Professional and Business Services (PRO)"; and when the sectors "Community, Social, and Personal Services"/ "Industry Not Adequately Defined" needs to be separated into four other sectors to remain consistent with the model.

6.4. Special Case – Agriculture, Forestry, and Fishing

Due to rounding, the sum of sectoral employment does not always equal the total employment figure published by the PSA. To remedy this, we close the slight discrepancies by computing for

the employment in Agriculture, Forestry, and Fishing (AFF) as the difference between the total employment published by PSA (EMP_t), and the sum of employment in non-AFF sectors:

$$EMP_t^{AFF} = EMP_t - \sum_{s_j}^{S-1} EMP_t^{s_j}, \qquad s_j \neq AFF \tag{73}$$

6.5. Employment Structure

The employment structure of the economy is characterized by the share of each sector in total employment. We obtain a profile of the employment structure of the Philippines across years by calculating the employment shares as follows:

$$EMPSHARE_t^{s_i} = \frac{EMP_t^{s_j}}{EMP_t} \tag{74}$$

6.6. Rates of Employment, Unemployment, and Underemployment

6.6.1. Employment Rate

We calculate the Employment Rate as the total number of workers divided by the size of the labor force. This is written as:

$$EMPR_t = \frac{EMP_t}{LF_t} \tag{75}$$

6.6.2. Unemployment Rate

We calculate the Unemployment Rate as the number of unemployed persons, $UEMP_t = (LF_t - EMP_t)$ divided by the size of the labor force (LF_t)

$$UEMPR_t = \frac{(LF_t - EMP_t)}{LF_t} \tag{76}$$

6.6.3. Underemployment Rate

We source data on the underemployment rate from the PSA. In their Technical Notes for the Labor Force Survey, the PSA defines the Underemployed as including "all employed persons who express the desire to have additional hours of work in their present job, or an additional job, or to have a new job with longer working hours." Hence, the underemployment rate is the proportion of

employed persons who fit this description, relative to total employment. Data on the underemployment rate from 1993-2000 are taken from Table 11.1 of the 2006 PSY. Data for years 2001-2004 are sourced from Table 11.1 of the 2010 PSY. Meanwhile data from 2005-2023 is sourced from the PSA OpenStat.[54]

We further separate underemployment into visible underemployment and invisible underemployment. In the Technical Notes, those who are visibly underemployed, are defined as: "underemployed persons are those who work for less than 40 hours during the reference period and want additional hours of work.", while invisibly underemployed persons are those who are underemployed, but work at least 40 hours a week. We obtain data on visible underemployment for years 1993 to 2004 from Table 11.1 of the 2006 PSY, and data for 2005-2023 is sourced from PSA OpenStat.

The invisible underemployment rate $(UNDEMPI_t)$ is computed residually by deducting the visible underemployment rate $(UNDEMPV_t)$ from the underemployment rate $(UNDEMP_t)$ satisfying the identity:

$$UNDEMP_t = UNDEMPV_t + UNDEMPI_t \tag{77}$$

6.7. Productivity: Real Value-Added per Worker

After obtaining total employment (EMP_t) and sectoral employment $\left(EMP_t^{s_i}\right)$, we define labor productivity as real (constant price) value-added per worker in each sector. Given this definition, we compute productivity per sector such that:

$$PRD_t^{s_i} = \frac{GVA_t^{s_i}}{EMP_t^{s_i}} \tag{78}$$

where $PRD_t^{s_i}$ is the productivity per sector s_i, $GVA_t^{s_i}$ is the gross value-added (in constant prices) of sector s_i, and $EMP_t^{s_i}$ is the number of workers in sector s_i.

Similarly, productivity at the national level is computed as the ratio of total gross value-added in constant 2018 prices to total employment.

$$PRD_t = \frac{GVA_t}{EMP_t} \tag{79}$$

[54] See PSA (2024az)

7. Wages (Annual Compensation of Employees per Sector)

This section details the process of obtaining data series for the total annual compensation of employees per sector (referred to as the "sectoral wage bill") and the average compensation of employees per sector (referred to as the "wage rate"). This process entails interpolating values for years wherein no compensation data is reported, and reconciling the sectoral monthly earnings reported by the ILO with the total wage bill for the Philippines published by the PSA. This includes matching the wage data with the 16-sector classification followed by PSA in the Production (Value-Added) approach in the National Accounts (see Table 3, Section 3).

7.1. National and Sectoral Wage Bills

We refer to the line item in the PSA's *Consolidated Accounts II: National Disposable Income and Its Use,* labelled "Compensation of Employees from Resident Producers." [55] As per the PSA's Technical Notes, the compensation of employees "represents the income accruing to individuals in return for their labor input into production processes" (PSA, 2022d, p.7). [56] Limiting this to "resident producers" yields the total earnings of all workers, in all sectors, employed in the Philippines during a given year – by definition, this is the national wage bill: $COEDOM_t$. To obtain the average compensation of employees for the Philippines, we divide the wage bill by the total number of employed workers (EMP_t) (see Section 6.1) in the corresponding year:

$$ACOEDOM_t = \frac{COEDOM_t}{EMP_t} \tag{80}$$

We refer to the ILO's database, ILOSTAT, for data on the Average Monthly Earnings by Economic Activity. [57] The ILO defines earnings as "…the gross remuneration in cash and in kind paid to employees, as a rule at regular intervals, for time worked or work done together with remuneration for time not worked, such as annual vacation, other type of paid leave or holidays."[58] This data is presented in local currency (PHP) and in current prices.

It is important to note that there are some key differences in the PSA's definition of compensation and the ILO's definition of earnings. The national wage bill, or the compensation of employees (resident producers) published by the PSA ($COEDOM_t$) "includes salaries and wages, separation/retirement/terminal pay, gratuities, and payments made by the employer in behalf of the employees such as contribution to SSS/GSIS, ECC, PhilHealth, Pag-Ibig, etc." (PSA, 2020, April 7)

Meanwhile, the ILO's definition of earnings is defined as the "gross remuneration in cash and in kind paid to employees, as a rule at regular intervals, for time worked or work done together

[55] Data on the compensation of employees of resident producers are taken from PSA (2024b)
[56] Philippine Statistics Authority. (2024). *Technical Notes on the Consolidated Accounts, and Income and Outlay Accounts*. https://www.psa.gov.ph/content/consolidated-accounts-and-income-and-outlay-accounts
[57] See ILO (2024a)
[58] This excludes employer contributions for social security, pension, and benefits, as well as compensation for severance and termination.

with remuneration for time not worked, such as annual vacation, or other type of paid leave or holidays." In contrast to the PSA's definition, the ILO's concept of earnings excludes social security and pension schemes, as well as severance and termination pay. This difference explains the difference between the ILO data available on their database, and PSA data on wage statistics from the Labor Force Survey (LFS), the Occupational Wages Survey (OWS), and the Compensation of Employees line item on the Consolidated Accounts, and Income and Outlay (CAIO) Accounts.

Obtaining the sectoral wage bill and wage rates consistent with the PSA wage bill and wage rates requires a multi-stage process, detailed in Section 7.1.1 to 7.1.5.

7.1.1. Rescaling Earnings Statistics

Due to the difference definition behind wages and compensation by the PSA and earnings by the ILO, we reconcile this through the computation of a scaling coefficient. To obtain the scaling coefficient, we use data on the Median Monthly Basic Pay and Monthly Allowances of Time-Rate Workers on Full-Time Basis by Industry from the Occupational Wages Survey (OWS) for the years 2014, 2016, 2018, 2020, and 2022. We match the published median wage – computed as the sum of median basic pay and median allowances per sector – of each year, to the corresponding average monthly earnings of each year and sector published by the ILO. We obtain the scaling coefficient per sector s_i (ς^{s_i}) as the average of the ratio between the OWS median wage data per sector $\left(w_t^{s_i}\right)$ and ILO average earnings data per sector $\left(w'^{s_i}_t\right)$ across these five years That is:

$$\varsigma^{s_i} = \frac{\sum_t^5 \frac{w_t^{s_i}}{w'^{s_i}_t}}{5} \tag{81}$$

For sectors with coefficients with a significant difference from 1.00, we use ς^{s_i} to scale the ILO earnings data; for sectors with coefficients without a significant difference from 1.00, we use the ILO earnings data as published. The sectors to which we applied a scaling coefficient are: Agriculture, Forestry, and Fishing; Electricity, gas, steam, and airconditioning supply; Water supply, sewerage, waste management and remediation; Construction; Wholesale and Retail Trade; Information and Communication; Administrative and Support Service Activities; and Human Health and Social Work Activities. We apply the scaling coefficient by multiplying it with the ILO earnings data per industry, published for 2012-2022 such that:

$$w^{*s_i}_t = w'^{s_i}_t \cdot \varsigma^{s_i} \tag{82}$$

This process yields a re-scaled dataset on monthly wages per sector for the years 2012-2022.

7.1.2. Sectoral Consolidation

Similar to the case of sectoral employment in Section 6.1, we establish consistency between the sub-sectors used by the ILO and the 16-sectors used in the model (see Table *4*). We do so by taking the weighted average of each sub-sector's monthly earnings rate $\left(w^{*}{}_{t}^{s_j}\right)$, obtained in Section 7.1.1, where the employment share of each subsector relative to the total employment across subsectors functions as its weight. That is:

$$w^{*}{}_{t}^{s_i} = \sum_{j=1}^{I} \left(w^{*}{}_{t}^{s_j} \cdot \frac{EMP_t^{s_j}}{\sum_{j=1}^{I} EMP_t^{s_j}} \right) \tag{83}$$

We use this process to consolidate the following sub-sectors: (1) The subsectors "Electricity, gas, steam, and airconditioning supply" and "Water supply, sewerage, waste management and remediation" are consolidated into "Electricity, Steam, Water, and Waste Management"; (2) The subsectors "Professional, scientific, and technical activities" and "Administrative and support service activities" are consolidated into "Professional and Business Services"; (3) Lastly, the sub-sectors "Arts, entertainment and recreation", "Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use", "Activities of extraterritorial organizations and bodies" and "Other service activities" are consolidated into "Other Services"

7.1.3. Backcasting Earnings Data from 2000-2011

The data on average earnings per sector published by the ILO is only consistent from 2012 onwards; prior to that, earnings data is intermittently reported, with no discernible trend. To recover data from 2000 to 2011, we first run a simple linear regression model of the average earnings per sector on its time trend, such that:

$$\widehat{w}^{*}{}_{t}^{s_i} = \beta_0^{s_i} + \beta_1^{s_i} time + u_t^{s_i} \tag{84}$$

where $\beta_1^{s_i}$ captures the average growth rate in the average monthly earnings of sector s_i. Assuming a constant annual growth rate in earnings captured by $\beta_1^{s_i}$, we find earnings data by working back from 2011 with the formula:

$$w^{*}{}_{t}^{s_i} = \frac{w^{*}{}_{t+1}^{s_i}}{\left(1 + \beta_1^{s_i}\right)} \tag{85}$$
$$t \in [2000, 2011]$$

7.1.4. Deriving the Monthly Wage Rates (PSA) from Monthly Earnings Rates (ILO)

After obtaining a complete series on monthly earnings from 2000-2022, we then use the ratio between the sectoral earnings rates and the average total earnings rate across industries to derive the monthly wage rate. Note that we have the annual national wage rate ($ACOEDOM_t$) from Equation (80); dividing this by 12 yields the national wage rate per month ($MCOEDOM_t$). Hence, we can find the monthly wage rate per sector as follows:

$$MCOEDOM_t^{s_i} = MCOEDOM_t \cdot \frac{{w^*}_t^{s_i}}{w_t^*} \tag{86}$$

where $MCOEDOM_t^{s_i}$ is the monthly wage rate per sector s_i, $MCOEDOM_t$ is the monthly national wage rate, ${w^*}_t^{s_i}$ is the monthly average earnings of each sector constructed from Sections 7.1.1 to 7.1.3, and w_t^* is the monthly average earnings across all sectors published by the ILO.[59]

7.1.5. Reconciling the Monthly Wage Rates to the Annual Wage Bill

From the monthly sectoral wage rates derived from equation (86), we proceed to compute an annual wage bill for each sector $\left(W_t^{s_i}\right)$ by multiplying $MCOEDOM_t^{s_i}$ by 12, and multiplying it by the number of workers employed in each sector $\left(EMP_t^{s_i}\right)$. That is:

$$W_t^{s_i} = \left(MCOEDOM_t^{s_i} \cdot 12\right) EMP_t^{s_i} \tag{87}$$

However, the sum of sectoral wage bills must match that of the annual wage bill published by the PSA ($COEDOM_t$). To ensure this internal consistency in the data, the annual sectoral wage bill of each sector is divided by a correction rate. This correction rate, ϵ, is computed as:

$$\epsilon_t = \frac{\sum_{s_i} W_t^{s_i}}{COEDOM_t} \tag{88}$$

We use this correction rate to obtain sectoral wage bills that are internally consistent with the national wage bill, denoted by $COEDOM_t^{s_i}$ as follows:

$$COEDOM_t^{s_i} = \frac{W_t^{s_i}}{\epsilon_t} \tag{89}$$

[59] Note that this has been backcasted to obtain data for years 2000-2011, using the same process detailed in Section 7.1.3.

This internal consistency between the compensation of employees per sector, and the total compensation of employees is then written as:

$$COEDOM_t = \sum_{s_i} COEDOM_t^{s_i} \tag{90}$$

7.2. Sectoral Wage Rates

After obtaining the annual sectoral wage bills $\left(COEDOM_t^{s_i}\right)$ that is internally consistent with the national wage bill $(COEDOM_t)$, we can also obtain the internally consistent sectoral wage rates by dividing each sector's wage bill by the number of workers in that sector such that:

$$ACOEDOM_t^{s_i} = \frac{COEDOM_t^{s_i}}{EMP_t^{s_i}} \tag{91}$$

7.3. Minimum Wage Rates

We obtain the data on minimum wage for non-agriculture, for each region, from the National Wages and Productivity Commission (NWPC) under the Department of Labor and Employment (DOLE). The document provided by the NWPC and DOLE (2024) lists the wage orders and the effectivity date for when the minimum wage rates take effect. From this document, we compile the non-agriculture minimum wage rates in each region as of the end of each year, using the upper-bound of the total amount mandated by each wage order. For example, if a minimum wage hike in NCR took effect on July 2023, mandating an increase such that the prevailing minimum wage falls within PHP 608.00-PHP 645.00, then – provided no other wage hikes take effect in that year, the value of $MWAGE_{2023}^{NCR}$ would be PHP 645.00.

Meanwhile, the data on the minimum nominal wage from 1978-2019 for agriculture is sourced from the PSA OpenStat.[60] We take the reported wage across all farm workers for each region.[61]

8. Factor Shares

This section details the process of obtaining data on the factor shares of capital, labor, and net taxes in each sectors' output. Each sector's output may be measured by the Gross Value-Added (GVA)

[60] Data on agricultural wage rates are taken from PSA (2024a)

[61] Due to regional restructuring, we adopt the prevailing minimum wage for the overall region in cases where regions were separated. For example, the "Southern Tagalog" region was separated into Region IV-A (CALABARZON) and Region IV-B (MIMAROPA) starting 2001; for all years preceding 2001, the same minimum wage rate taken from "Southern Tagalog" is recorded for Region IV-A and Region IV-B.

of each sector. As defined in the PSA's Technical Notes, GVA is determined by the "compensation, depreciation, indirect taxes paid net of subsidies received and the operating surplus" (PSA, 2022c, p.10).[62] This is illustrated by:

$$GVA_t^{s_i} = GOS_t^{s_i} + COEDOM_t^{s_i} + NTX_t^{s_i} \tag{92}$$

Dividing Equation (92) by $GVA_t^{s_i}$ yields:

$$1 = \frac{GOS_t^{s_i}}{GVA_t^{s_i}} + \frac{COEDOM_t^{s_i}}{GVA_t^{s_i}} + \frac{NTX_t^{s_i}}{GVA_t^{s_i}} \tag{93}$$

This may be re-written as:

$$1 = SHCAPITAL_t^{s_i} + SHLABOR_t^{s_i} + SHNTX_t^{s_i} \tag{94}$$

Hence, the share of labor in the output of each sector $\left(SHLABOR_t^{s_i}\right)$ is obtained by dividing each sector's wage bill $\left(COEDOM_t^{s_i}\right)$ by the sector's GVA $\left(GVA_t^{s_i}\right)$.

We obtain the share of net taxes (indirect taxes less subsidies) by referring to the 16-Sector 2018 Input-Output Tables, published by the PSA on December 9, 2021. We then set $NTX_t^{s_i}$ as the value of transactions for "Taxes less subsidies on production and imports" for each sector. Lastly, we obtain $SHNTX_t^{s_i}$ by dividing $NTX_t^{s_i}$ by each sector's GVA. Note that we only refer to the 2018 Input-Output tables for the values of $NTX_t^{s_i}$, and consequently of $SHNTX_t^{s_i}$. This means that the values for both are time-invariant; that is, the share of net taxes remains the same across all years such that:

$$NTX_t^{s_i} = NTX^{s_i}\ \forall\ t \Longrightarrow SHNTX_t^{s_i} = SHNTX^{s_i}\ \forall\ t \tag{69}$$

Once we have $SHLABOR_t^{s_i}$ and $SHNTX^{s_i}$, we can compute $SHCAPITAL_t^{s_i}$ residually such that:

$$SHCAPITAL_t^{s_i} = 1 - \left(SHLABOR_t^{s_i} + SHNTX^{s_i}\right) \tag{70}$$

[62] Note that GVA in constant prices is used. Accordingly, all the components in Equation (92)**Error! Reference source not found.** are in constant 2018 prices as well. $COEDOM_t^{s_i}$ is expressed in constant 2018 prices by deflating it by the Consumer Price Index (2018=100)

9. Deflators

This section contains information on movements in prices. Some data series are directly taken from the reporting agencies such as BSP and PSA, while others are computed or imputed.

9.1. The Consumer Price Index and Inflation

We source data on the annual average Consumer Price Index (CPI) from the Bangko Sentral ng Pilipinas (BSP).[63] Inflation is computed as the growth of CPI, such that:

$$INF_t = \frac{CPI_t - CPI_{t-1}}{CPI_{t-1}} \tag{95}$$

CPI_t is modelled as a function of PCH_t from the succeeding section through a bridge equation. This is explained in greater depth in Section 15.

9.2. Implicit Deflators

Recall from Sections 2 and 3 that we obtained data on the demand-side (expenditure) approach and the value-added (production) approach to arrive at GDP. As discussed in those sections, we obtain data in both **current and constant prices** for each of the final demand components (Consumption, Government Spending, Gross Capital Formation), the exports and imports of various product groups, and the gross value-added (GVA) of each sector. This enables us to compute for the **implicit deflator** of these items. The implicit deflator measures the change in prices specific to each component. The formula for computing each implicit deflator is given below:

$$P_t^x = \frac{x_t^{\text{nominal}}}{x_t^{\text{real}}} \times 100 \tag{96}$$

where P_t^x is the implicit deflator for item x. Here, x is any component of final demand, exports or imports of each product group, or the value-added of each sector. Hence, x_t^{nominal} and x_t^{real} is the value of each x in current and constant 2018 prices, respectively.

For example, the implicit deflator of the value-added for Agriculture, Forestry, and Fishing is computed as:

$$P_t^{GVAAFF} = \frac{GVAAFF_t^{\text{nominal}}}{GVAAFF_t^{\text{real}}} \times 100 \tag{97}$$

[63] See BSP (2024b)

Since our base year is set at 2018, the value of each implicit price deflator in 2018 is equal to 100.

The implicit deflators for the final demand components are enumerated in Table *5*, while the implicit deflators for the exports and imports of various product groups are found in Table *6*. Technical details on the measurement of the items corresponding to each deflator can be found in Section 2.

Table 5. Implicit Deflators – Final Demand Components

Variable Name	Description
P_t^{CH}	GDP Deflator
P_t^{CH}	Implicit Deflator for **Household Final Consumption Expenditure**
P_t^{CHF}	Implicit Deflator for **Household Final Consumption Food Expenditure**
P_t^{CHNF}	Implicit Deflator for **Household Final Consumption Non-Food Expenditure**
P_t^{CG}	Implicit Deflator for **Government Final Consumption Expenditure**
P_t^{GCF}	Implicit Deflator for **Gross Capital Formation**
P_t^{GFCF}	Implicit Deflator for **Gross Fixed Capital Formation**, which is a sub-component of **Gross Capital Formation**
P_t^{INV}	Implicit Deflator for **Changes in Inventories**, which is a sub-component of **Gross Capital Formation**
P_t^{VAL}	Implicit Deflator for **Valuables**, which is a sub-component of **Gross Capital Formation**
P_t^{GFCCN}	Implicit Deflator for **Gross Capital Expenditures in Construction**, which is a sub-component of **Gross Fixed Capital Formation**
P_t^{GFCEQ}	Implicit Deflator for **Gross Capital Expenditures in Construction**, which is a sub-component of **Gross Fixed Capital Formation**
P_t^{GFCOI}	Implicit Deflator for **Gross Capital Expenditures in Construction**, which is a sub-component of **Gross Fixed Capital Formation**
P_t^{EXGS}	Implicit Deflator for the **Exports of Goods and Services**

P_t^{EXG}	Implicit Deflator for the **Exports of Goods**
P_t^{EXS}	Implicit Deflator for the **Exports of Services**
P_t^{IMGS}	Implicit Deflator for the **Imports of Goods and Services**
P_t^{IMG}	Implicit Deflator for the **Imports of Goods**
P_t^{IMS}	Implicit Deflator for the **Imports of Services**

Source: Authors

Table 6. Implicit Deflators – Exports and Imports by Product Group

Variable Name	**Description**
P_t^{EXGAPS}	Implicit Deflator for the **Exports of Agricultural Products**, and of **Fishery Products**
P_t^{EXGEMT}	Implicit Deflator for the **Exports of Electronic Products**, of **Ignition Wiring Sets**, and of **Machinery and Transport Equipment**
P_t^{EXGMCH}	Implicit Deflator for the **Exports of Chemicals**, of **Cathodes and Sections of Cathodes and Refined Copper**, and of **Metal Components**
P_t^{EXGOXS}	Implicit Deflator for **All Other Exports** not in $EXGAPS$, $EXGEMT$, $EXGMCH$, and $EXGOXS$
P_t^{EXSTRA}	Implicit Deflator for the **Exports of Travel Services**
P_t^{EXSOXS}	Implicit Deflator for the **Exports of Non-Travel Services**
P_t^{IMGAPS}	Implicit Deflator for **Imports of Cereal and Cereal Preparations,** of **Dairy Products,** of **Fruits and Vegetables,** and of **Feeding Stuff**
P_t^{IMGCHM}	Implicit Deflator for **Imports of Chemical and Chemical Products**, of **Medicinal and Pharmaceutical Products**, and of **Plastics in Primary and Non-Primary Forms**
P_t^{IMGEMG}	Implicit Deflator of **Imports of Electronic Products**, of **Telecommunication and Electrical Machinery**, and of **Power-Generating and Specialized Machinery**
P_t^{IMGIMT}	Implicit Deflator of **Imports of Industrial Machinery and Equipment**, and of **Transport Equipment**
P_t^{IMGMFU}	Implicit Deflator for the **Imports of Mineral Fuels, Lubricants, and Related Materials**

P_t^{IMGMTL}	Implicit Deflator for the **Imports of Base Metals**, of **Metal Products**, and of **Metalliferous Ores and Metal Scraps**
P_t^{IMGOMS}	Implicit Deflator for **All Other Imports**

Source: Authors

In addition to the Implicit Deflators enumerated above, we also compute for the Implicit Deflators based on the Gross Value-Added of each sector. These are enumerated in Table 7, with the corresponding descriptions of each sector found in Section 2.

Table 7. Implicit Deflators – Sectoral Gross Value-Added Deflators

Variable Name	Description
P_t^{GVA}	GVA Deflator (equivalent to the GDP deflator, as by definition, total GVA and GDP are equal)
P_t^{GVAAFF}	Implicit Deflator for the **Gross Value-Added of Agriculture, Forestry, and Fishing**
P_t^{GVAMAQ}	Implicit Deflator for the **Gross Value-Added of Mining and Quarrying**
P_t^{GVAMFG}	Implicit Deflator for the **Gross Value-Added of Manufacturing**
P_t^{GVAEWS}	Implicit Deflator for the **Gross Value-Added of Electricity, Steam, Water and Waste Management**
P_t^{GVACNS}	Implicit Deflator for the **Gross Value-Added of Construction**
P_t^{GVATRD}	Implicit Deflator for the **Gross Value-Added of Wholesale and Retail Trade; and the Repair of Motor Vehicles and Motorcycles**
P_t^{GVATAS}	Implicit Deflator for the **Gross Value-Added of Transport and Storage**
P_t^{GVAAFS}	Implicit Deflator for the **Gross Value-Added of Accommodation and Food Service Activities**
P_t^{GVAIAC}	Implicit Deflator for the **Gross Value-Added of Information and Communication**
P_t^{GVAFIA}	Implicit Deflator for the **Gross Value-Added of Financial and Insurance Activities**
P_t^{GVAREO}	Implicit Deflator for the **Gross Value-Added of Real Estate and Ownership of Dwellings**
P_t^{GVAPRO}	Implicit Deflator for the **Gross Value-Added of Professional and Business Services**

P_t^{GVAPUB}	Implicit Deflator for the **Gross Value-Added of Public Administration and Defense; Compulsory Social Security**
P_t^{GVAEDU}	Implicit Deflator for the **Gross Value-Added of Education**
P_t^{GVAHSW}	Implicit Deflator for the **Gross Value-Added of Human Health and Social Work Activities**
P_t^{GVAOTH}	Implicit Deflator for the **Gross Value-Added of Other Services**

Source: Authors

10. The Economic Structure

This section discusses the construction of series in the database that are concerned with the productive structure of the Philippine economy, as reflected in the Input-Output tables. These series are grouped into three major blocks:

(1) **Sectoral Output Prices:** these are the average output prices of each of the 16 sectors, weighted by the production cost structures implicit in the flow of primary and intermediate inputs found in the Input-Output tables.

(2) **Theoretical Final Demand Prices:** these are the average output prices of the final demand components, weighted by their purchases from each of the 16 sectors as reflected in the Input-Output tables.

(3) **Value-Added Volume Indices:** these are Gross Value-Added indices, constructed to reflect the market structures of each of the 16 sectors, implicit in the rows of the intermediate demand and final demand faced by each sector.

At end of this process, we obtain a set of domestic sectoral output prices and "theoretical" gross value-added for each of the 16 sectors listed in Section 2, together with a set of theoretical final demand prices for household and government final consumption expenditure, the components and sub-components of Gross Capital Formation and the six export groups.

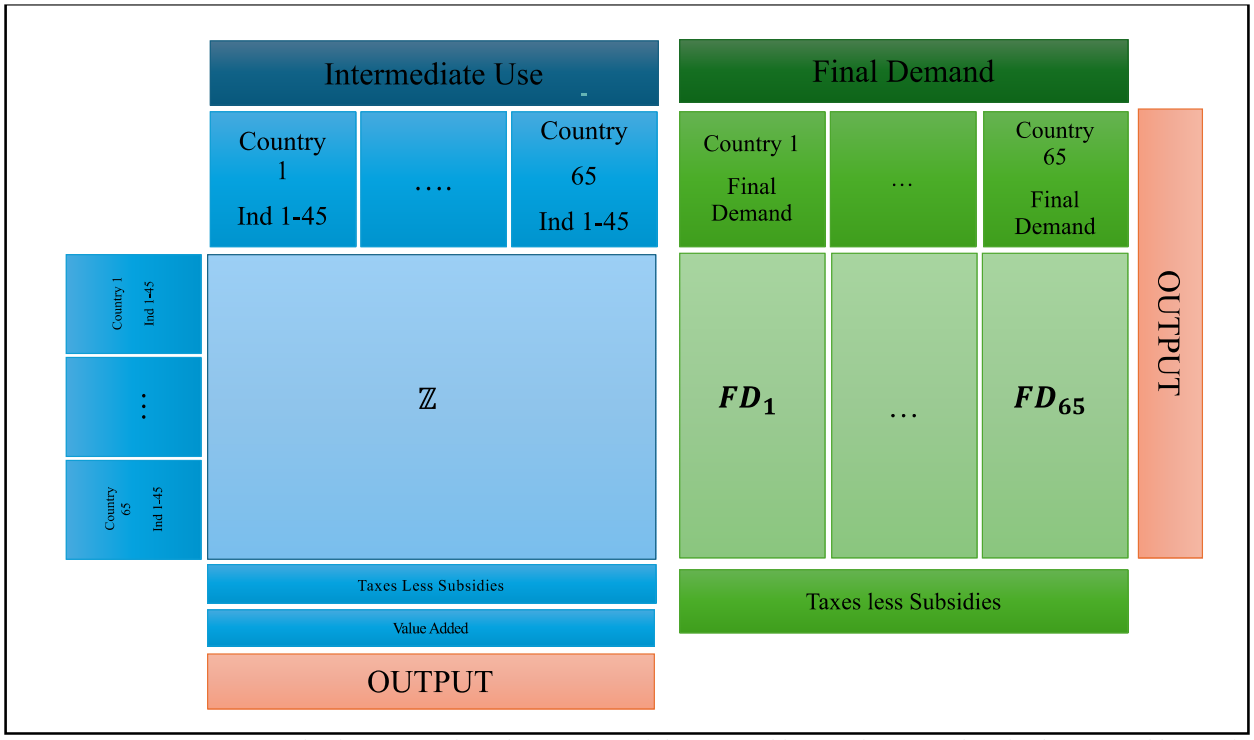
Although the Philippine Statistical Authority (PSA) offers a detailed set of input-output tables updated every six years from 2000 to 2018, these tables are elaborated in total terms; that is, they do not differentiate the geographical origins of these transactions. Consequently, the PSA I-O tables do not allow differentiation between domestic and imported transactions. Given that the methodological approach developed requires the differentiation of these transactions according to their origin (domestic or foreign), we have chosen to use the structures implicit in the OECD's Inter-Country Input-Output Tables (ICIO) as of 2021 for the year 2018. [64]

[64] Organization for Economic Co-operation and Development

10.1. The Inter-Country Input-Output Tables

We use the OECD ICIO table for the year 2018. One limitation of this analysis is that we only use the 2018 economic structure as a reference for the economic structure that holds across all years. As of 2021, the ICIO tables contain information on the intermediate supply chain and final demand components of 67 economies, across 45 industries (Guilhoto, 2021, November 2-5). In their documentation, the OECD illustrates the structure of the ICIO as follows:

Figure 1. ICIO Tables Original Structure

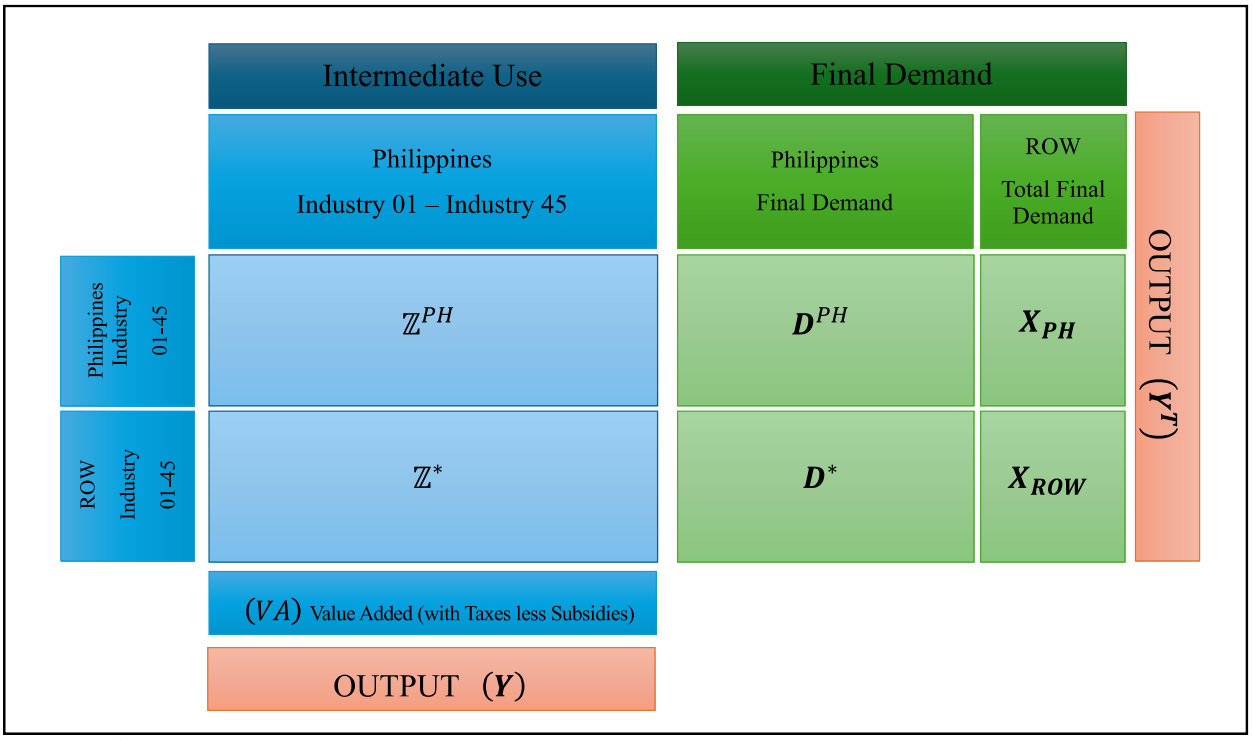


Source: OECD (2023). Reproduction summarizes the structure of the ICIO tables as of 2021. Values in the ICIO tables are in current million USD for each year.

The ICIO tables therefore provide a matrix of the flow of intermediate goods $\mathbb{Z}$, from Country r, industry i to Country s, industry j. Additionally, the $\boldsymbol{d}$ matrices also track the value of goods and services supplied by industry i in Country r, to meet the final demand in Country s.

From the ICIO tables, we isolate the portions of the data for the Philippines (PHL) and aggregate the data of all other countries. We treat these aggregated values as the "rest of the world" (ROW). This reduces the ICIO table as a set of input and output flows within the Philippine domestic economy and with the ROW. The structure of the compressed ICIO is presented in Figure 2. The dimensions and description of each matrix in Figure 2 is summarized in Table 8.

Figure 2. ICIO Tables Compressed Structure



Source: Authors.
Note : Values for the export matrices for the Philippines (X_{PH}) and the ROW (X_{ROW}) are computed as the value of Total Output, less the value of Philippine Intermediate and Final Demand.

Table 8. ICIO Compressed Structure Descriptions

Matrix	**Dimensions** $(\boldsymbol{m} \times \boldsymbol{n})$	**Description**
$\mathbb{Z}^{PH}$	(45×45)	**Intermediate Consumption Matrix (Philippines)**. Each element z_{mn}^{PH} is the value of the flow of goods from Industry m to Industry n. All transactions in this matrix are **domestic** transactions.
$\mathbb{Z}^*$	(45×45)	**Intermediate Consumption Matrix (Imports)**. Each element z_{mn}^{*} is the value of the flow of goods from suppliers abroad from Industry m to consumers domestically from Industry n. These transactions are intermediate inputs **imported** from the rest of the world.
$\boldsymbol{D}^{PH}$	(45×4)	**Final Demand Matrix (Philippines).** Each element d_{mn}^{PH} represents the final demand of the Philippines for goods and services produced by Industry m. These represent domestic final consumption of goods and services, and are separated into the following:

		• Household and NPISH Final Consumption Expenditure[65] • Government Final Consumption • Gross Fixed Capital Formation • Changes in Inventories
$\boldsymbol{D}^*$	(45×4)	**Final Demand Matrix (Imports).** Each element d^*_{mn} represents the final demand of the Philippines for goods and services produced by suppliers abroad from Industry m. These are **imports** and are separated into the same final demand categories as $\boldsymbol{d}^{PH}$.
X_{PH}	(45×1)	**Export Demand Vector.** Each element x^{PH}_m represents the value of exports from Philippine Industry m to the Rest of the World.
X_{ROW}	(45×1)	**Export Demand Vector.** Each element x^*_m represents the aggregate value of exports from external producers from Industry m to the Rest of the World.
$\boldsymbol{VA}$	(1×45)	**Value-Added**. Represents Value-Added at basic prices, inclusive of taxes less subsidies.
$\boldsymbol{Y}, \boldsymbol{Y^T}$	(1×45), (45×1)	**Output.** Each element y^*_m represents the gross output of Industry m.

Source: Authors

To construct domestic price indices, "theoretical" final demand prices, and "theoretical" gross value-added, we need to compress the ICIO tables further such that the 45 industries used in the ICIO tables match the 16 industries used in the model. To do this, we construct a 16×45 binary matrix, $\boldsymbol{B}$, wherein:

$$b_{ij} = \begin{cases} 1 & \text{ICIO industry } j \text{ falls under PSA industry } i \\ 0 & \text{otherwise} \end{cases} \tag{98}$$

For example, ICIO industry D01T02 represents Agriculture, Forestry, and Hunting. This falls under the sector: Agriculture, Forestry, and Fishing. Hence, $b_{11} = 1$ while $b_{i1} = 0$ for all other i. The equivalencies between ICIO Industries and the 16 sectors in the model are given in Table *9*.

[65] This is taken as the sum of final demand from: Household Consumption, Consumption from Non-Profit Institutions Serving Households (NPISH), and Direct Purchases from Residents Abroad.

Table 9. ICIO Industry and Model Sector Equivalencies

Model Sector Description	ICIO Industry Code and Description
(AFF) Agriculture, Forestry, and Fishing	(D01T02) Agriculture, hunting, forestry
	(D03) Fishing and aquaculture
(MAQ) Mining and Quarrying	(D05T06) Mining and quarrying, energy producing products
	(D07T08) Mining and quarrying, non-energy producing products
	(D09) Mining support service activities
(MFG) Manufacturing	(D10T12) Food products, beverages and tobacco
	(D13T15) Textiles, textile products, leather and footwear
	(D16) Wood and products of wood and cork
	(D17T18) Paper products and printing
	(D19) Coke and refined petroleum products
	(D20) Chemical and chemical products
	(D21) Pharmaceuticals, medicinal chemical and botanical products
	(D22) Rubber and plastics products
	(D23) Other non-metallic mineral products
	(D24) Basic metals
	(D25) Fabricated metal products
	(D26) Computer, electronic and optical equipment
	(D27) Electrical equipment
	(D28) Machinery and equipment, nec
	(D29) Motor vehicles, trailers and semi-trailers
	(D30) Other transport equipment

	(D31T33) Manufacturing nec; repair and installation of machinery and equipment
(EWS) Electricity, Steam, Water and Waste Management	(D35) Electricity, gas, steam and air conditioning supply
	(D36T39) Water supply; sewerage, waste management and remediation activities
(CNS) Construction	(D41T43) Construction
(TRD) Wholesale and retail trade; repair of motor vehicles	(D45T47) Wholesale and retail trade; repair of motor vehicles
(TAS) Transportation and Storage	(D49) Land transport and transport via pipelines
	(D50) Water transport
	(D51) Air transport
	(D52) Warehousing and support activities for transportation
	(D53) Postal and courier activities
(AFS) Accommodation and Food Service Activities	(D55T56) Accommodation and food service activities
(IAC) Information and Communication	(D58T60) Publishing, audiovisual and broadcasting activities
	(D61) Telecommunications
	(D62T63) IT and other information services
(FIA) Financial and Insurance Activities	(D64T66) Financial and insurance activities
(REO) Real Estate Activities and Ownership of Dwellings	(D68) Real estate activities
(PRO) Professional and Business Services	(D69T75) Professional, scientific and technical activities
	(D77T82) Administrative and support services

(PUB) Public administration and defence; compulsory social security	(D84) Public administration and defence; compulsory social security
(EDU) Education	(D85) Education
(HWS) Human Health and Social Work Activities	(D86T88) Human health and social work activities
(OTH) Other Services	(D90T93) Arts, entertainment and recreation
	(D94T96) Other service activities
	(D97T98) Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use

Source: Authors

We then use the binary matrix $\boldsymbol{B}$ to transform the (45×45) intermediate consumption matrices $(\mathbb{Z})$ to (16×16) intermediate consumption matrices $(\boldsymbol{z})$. This process is detailed in Equation (99) and Equation (100).

$$\boldsymbol{z^{PH}} = (\boldsymbol{B}\mathbb{Z}^{PH})\boldsymbol{B^T} \tag{99}$$

$$\boldsymbol{z}^{*} = (\boldsymbol{B}\mathbb{Z}^{*})\boldsymbol{B^T} \tag{100}$$

where each element z_{ij}^{PH} in matrix $\boldsymbol{z^{PH}}$ represents the domestic flow of goods from sector s_i to sector s_j in the Philippines, and each element z_{ij}^{*} in matrix $\boldsymbol{z}^{*}$ represents the imports of goods from suppliers abroad in sector s_i to sector s_j in the Philippines.

Similarly, the matrix of final demand components is pre-multiplied by the binary matrix $\boldsymbol{B}$ to compress it into an (16×4) matrix, as in Equations (101) and (102):

$$\boldsymbol{d^{PH}} = \boldsymbol{BD^{PH}} \tag{101}$$

$$\boldsymbol{d}^{*} = \boldsymbol{BD}^{*} \tag{102}$$

where each element d_{ij}^{PH} represents the goods and services supplied by sector i in the Philippines to households, government, and others. Similarly, d_{ij}^{*} are goods and services under sector i, supplied by producers abroad to domestic residents.

This same process is repeated to compress the exports matrices, the value-added matrix, and output to remain consistent with the 16 sectors in the model.

10.2. Domestic Output Price Indices

Since no statistical data is available on the overall output prices of each sector, we estimate the output prices for each of the 16 sectors using a simultaneous equations model. The simultaneous equations model comprises 16 equations, one for each of the sector's output price $\left(PCI_t^{s_j}\right)$. Each equation models each sectors' output price as a linear combination of its own price (to account for intra-industry transactions), other sectors' output prices $\left(PCI_t^{s_j}\right)$, the prices of agricultural, industrial, and services imports $\left(PIM_t^k\right)$, and the sectors' own value-added $\left(PGVA_t^{s_j}\right)$. This is presented in Equation (103):

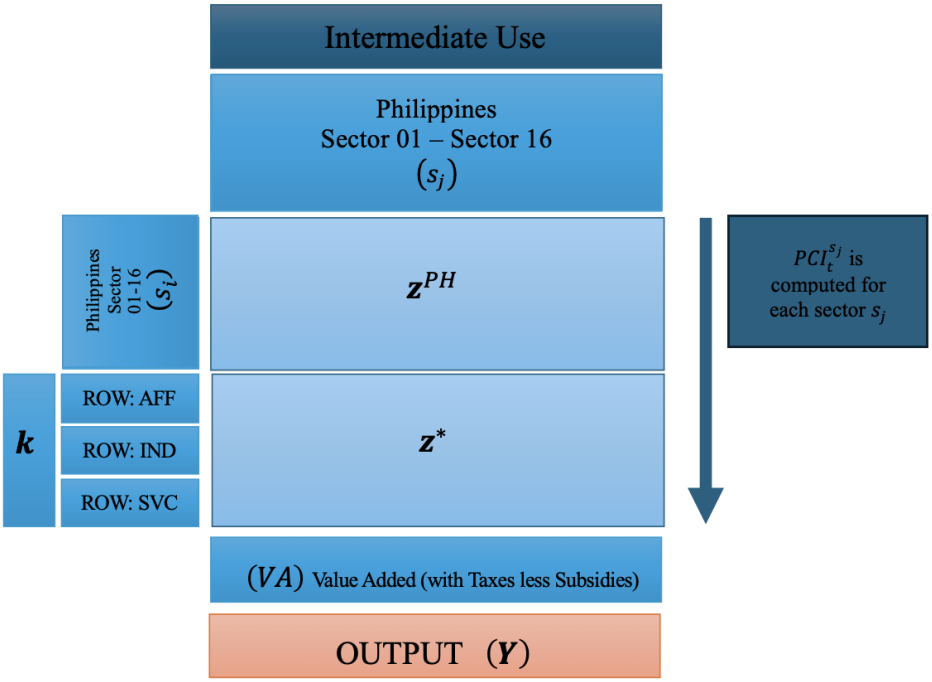
$$PCI_t^{s_j} = \alpha_{s_j} PCI_t^{s_j} + \sum_{s_i} \alpha_{s_i,s_j} PCI_t^{s_i} + \sum_k \beta_{k,s_j} PIM_t^k + \gamma_{s_j} PGVA_t^{s_j} \tag{103}$$

Rearranging Equation (103) to isolate $PCI_t^{s_j}$ yields:

$$PCI_t^{s_j} = \frac{1}{1-\alpha_{s_j}} \left(\sum_{s_i} \alpha_{s_i,s_j} PCI_t^{s_i} + \sum_k \beta_{k,s_j} PIM_t^k + \gamma_{s_j} PGVA_t^{s_j} \right) \tag{104}$$

The coefficients α_{s_j}, α_{s_i,s_j}, β_{k,s_j}, and γ_{s_j} may be computed from a further compressed version of the ICIO tables. A visualization for this may be found in Figure 3. The compression happens primarily in the Intermediate Consumption matrix $\mathbb{Z}^*$. In Figure 2Figure 3, it shows that the ROW still accounts for all sectors; however, in Figure 3, we compress $\mathbb{Z}^*$ into a 3×16 matrix. Each z_{kj}^* represents the imports of Philippine sector j from suppliers abroad of agricultural products $(k = 1)$, industrial products $(k = 2)$, or services $(k = 3)$. We compress the original 16×16 matrix into a 3×16 matrix by taking the sum of rows within the matrix; that is, we sum up all sectors which belong to agriculture, industry, and services. The mapping per sector to these categories are given in Table 10.

Figure 3. ICIO Tables Visualization for Sectoral Output Price Coefficients



Source: Authors

Table 10. ICIO Sector and Category Mapping

Import Classifications	Sectors
AFF: Agriculture, Forestry, and Fishing	(AFF) Agriculture, Forestry, and Fishing
IND: Industry	(MAQ) Mining and Quarrying
	(MFG) Manufacturing
	(EWS) Electricity, Steam, Water and Waste Management
	(CNS) Construction
SVC: Services	(TRD) Wholesale and retail trade; repair of motor vehicles
	(TAS) Transportation and Storage
	(AFS) Accommodation and Food Service Activities
	(IAC) Information and Communication
	(FIA) Financial and Insurance Activities
	(REO) Real Estate Activities and Ownership of Dwellings

	(PRO) Professional and Business Services
	(PUB) Public administration and defence; compulsory social security
	(EDU) Education
	(HWS) Human Health and Social Work Activities
	(OTH) Other Services

Source: Authors

The coefficient calculations are provided in Equations (105), (106), and (107). Since we are using the economic structure presented as of the 2018 Input-Output tables, all coefficients are time-invariant. Each coefficient effectively represents a **weight**, a measure of relative importance of each sector s_i, and each import group k, in the output (and thus, pricing) of sector s_j.[66]

$$\alpha_{s_i,s_j} = \frac{z_{ij}^{PH}}{Y_{s_j}^{PH}} \tag{105}$$

Equation (105) shows the computation for the α_{s_i,s_j} coefficients, which functions as weights to each sectors' output prices $\left(PCI_t^{s_i}\right)$. Note that α_{s_j}, the coefficient for the sector's own output price $\left(PCI_t^{s_j}\right)$ is $\alpha_{s_j} = \alpha_{s_i,s_j}$ when $s_i = s_j$. The element z_{ij}^{PH} is the flow of goods supplied by sector s_i to s_j, and $Y_{s_j}^{PH}$ is the gross output of sector s_j.

$$\beta_{k,s_j} = \frac{z_{k,s_j}^{*}}{Y_{s_j}^{PH}} \tag{106}$$

Following the same logic, β_{k,s_j} is the coefficient corresponding to each import category. The element z_{k,s_j}^{*} is the value of either agricultural, industrial, or services imports of sector s_j from the rest of the world. Dividing this by sector's gross output $\left(Y_{s_i}^{PH}\right)$ yields β_{k,s_j}.

$$\gamma_{s_j} = \frac{VA_{s_j}}{Y_{s_j}^{PH}} \tag{107}$$

The coefficient γ_{s_i} is obtained by dividing sector j's value-added by its gross output.

[66] These are simply the technical coefficients attributable to each sector

An example of one sector's (say, AFF) output price equation in the simultaneous equations model is given by Equation (108).

$$PCI_t^{AFF} = \left(\frac{1}{1-\alpha_{AFF}}\right)\left[\alpha_{MAQ,AFF}PCI_t^{MAQ} + \cdots + \alpha_{OTH,AFF}PCI_t^{OTH} + \beta_{AFF,AFF}PIM_t^{AFF} + \beta_{IND,AFF}PIM_t^{IND} + \beta_{SVC,AFF}PIM_t^{SVC} + \gamma_{AFF}PGVA_t^{AFF}\right] \quad (108)$$

Here, the output price of the sector, Agriculture, Forestry and Fishing (PCI_t^{AFF}) is modelled as a function of its own-sector price coefficient α_{AFF}, the prices of all other sectors, from Mining and Quarrying $\left(PCI_t^{MAQ}\right)$ to Other Services (PCI_t^{OTH}), the import prices PIM_t^{AFF}, PIM_t^{IND}, and PIM_t^{SVC}, and the sector's own gross value-added ($PGVA_t^{AFF}$).

Each of the other sectors' output prices are modelled similarly. The computation for implicit deflators for value-added and import prices are found in Section 9.2. Solving the simultaneous equations model yields 16 sectoral output prices, which we then convert to an index such that each $PCI_t^{s_j}$ value is equal to 100 in 2018.

10.3. Theoretical Final Demand Prices

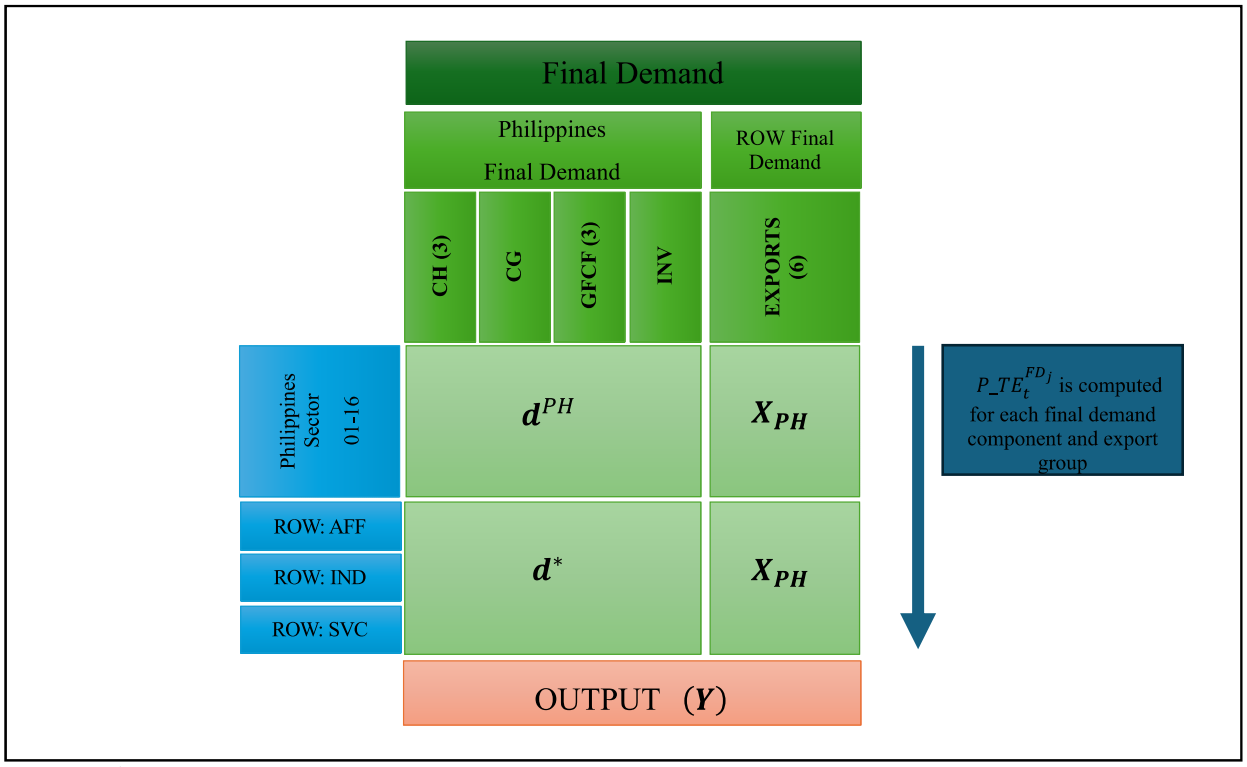
Obtaining the sectoral output prices from Section 14.2 enables us to compute Theoretical Final Demand Prices as a weighted average of all sectoral output prices $PCI_t^{s_i}$ and import prices PIM_t^k. This no longer requires a simultaneous equations model, as each final demand component is simply modelled as function of domestic output prices computed previously and import prices and are determined independently from other theoretical final demand prices. Note that "final demand prices" also includes the prices of the exports of goods and services, as these are functionally the final demand of consumers abroad.

The formula for theoretical final demand prices is presented in the equation below:

$$P\_TE_t^{FD_j} = \sum_{s_i} \delta_{s_i,FD_j} PCI_t^{s_i} + \sum_k \eta_{k,FD_j} PIM_t^k \quad (109)$$

Similar to the calculation of the sectoral output prices, the coefficients δ_{s_i,FD_j} and η_{k,FD_j} function as weights, and represent the relative importance of the price movements of each sector and import group in each final demand component and in exports. These are computed from a restructured ICIO table, which is visualized in Figure 4. We restructure the final demand matrices $\boldsymbol{d^{PH}}$ and $\boldsymbol{d}^*$ to be consistent with the final demand components accounted for in the model; these components FD_j are enumerated in Table *11*. Accordingly, we compute a theoretical final demand price for each FD_j.

Figure 4. ICIO Tables Visualization for Sectoral Output Price Coefficients



Source: Authors

Table 11. Final Demand Components

Group	Final Demand Component (FD_j)	
Households	CH	Total Household Final Consumption[67]
	CHF	Household Food Consumption
	$CHNF$	Household Non-Food Consumption
Government	CG	General Government Final Consumption
Gross Capital Formation	$GFCCN$	Gross Fixed Capital Formation – Construction
	$GFCEQ$	Gross Fixed Capital Formation – Equipment
	$GFCOI$	Gross Fixed Capital Formation – Other Investments
	INV	Changes in Inventories
Exports	$EXGAPS$	Exports of Agricultural Products and Fishery Products
	$EXGEMT$	Exports of Electronic Products, of Ignition Wiring Sets, and of Machinery and Transport Equipment

[67] Note that $CH = CHF + CHNF$

	$EXGMCH$	Exports of Chemicals, of Cathodes and Sections of Cathodes and Refined Copper, and of Metal Components
	$EXGOXS$	All Other Exports not in $EXGAPS$, $EXGEMT$, $EXGMCH$, and $EXGOXS$
	$EXSTRA$	Exports of Travel Services
	$EXSOXS$	Exports of Non-Travel Services

Source: Authors

Given that the original table only includes the aggregates of total private consumption, gross fixed capital formation and total exports, it was necessary to first disaggregate the corresponding columns to differentiate each of the categories of consumption, investment and exports detailed in Table 11.

10.3.1. Public Final Consumption Expenditure

The coefficients $\delta_{s_i,CG}$ and $\eta_{k,CG}$ is simply computed in the same manner as the technical coefficients corresponding to each of the 16 domestic sectors, and 3 import groups, as seen in Equations (110) and (111). That is, to obtain the coefficients needed to construct P_TE_t for government final consumption expenditure, we divide the value of transactions supplied by each domestic sector to households, and the value of each product group imported by the government.

$$\delta_{s_i,CG} = \frac{d^{PH}_{i,CG}}{CG} \tag{110}$$

$$\eta_{k,CG} = \frac{d^{*}_{k,CG}}{CG} \tag{111}$$

10.3.2. Private Consumption: Total, Food, and Non-Food

Each $\delta_{s_i,CH}$ and $\eta_{k,CH}$ for total household consumption is simply computed similar to $\delta_{s_i,CG}$ and $\eta_{k,CG}$.

Meanwhile, the totals of Food Consumption (CHF) and Non-Food Consumption $(CHNF)$ are derived by multiplying the total value of household consumption, CH by the share of food consumption and non-food consumption from the 2018 National Accounts (see Section 2). This effectively apportions the I-O total value for Household Consumption among the two sub-components. The sectoral coefficients δ and η for CHF and $CHNF$ are then computed by first apportioning domestic and foreign transactions, respectively, from each sector to either food consumption, non-food consumption, or both, before dividing them by CHF or $CHNF$.

For the sectoral coefficients corresponding to food consumption, we consider the total purchases from the Agriculture, Forestry, and Fishing sector, along with a proportion of overall

household purchases from the following sectors: Manufacturing, Wholesale and Retail Trade, Transport and Storage, and Accommodation and Food Service Activities. The proportion from these sectors are in turn the same proportion used to disaggregate CH into CHF and $CHNF$. Due to this apportioning, the coefficients δ for CHF from the sectors not mentioned above is equal to zero.

The total purchases from all other sectors are in-turn apportioned to non-food consumption, as well as the remainder of the purchases from Manufacturing, Wholesale and Retail Trade, Transport and Storage, and Accommodation and Food Service Activities. This initial distribution is subsequently corrected in all shared sectors, except agriculture, to match the previously estimated total.

10.3.3. Gross Fixed Capital Formation

The breakdown of gross fixed capital formation is carried out in two stages. In the first stage, a direct allocation of sectors to investment components is made according to the nature of products and services. For example, purchases of products supplied by Agriculture, Forestry, and Fishing would be allocated to "Other Investments" $(GFCOI)$ as this includes investments in Breeding Stocks and Orchard Development. Meanwhile, purchases of products supplied by the Mining and Quarrying sector would be allocated to "Construction" $(GFCCN)$. [68]

In the second stage, we conduct a proportional allocation of services supplied by some sectors across all investment components. For example, proportional allocation is done since all types of investments would have a demand for services supplied by Transport and Storage, or services supplied by Financial and Insurance activities. The proportional allocation is done by multiplying the total value supplied by a sector to Gross Fixed Capital Formation (all components), to the relative size of each investment components' demand excluding the transactions supplied by the shared sectors.

For example, to obtain $d^{PH}_{TAS,GFCCN}$, which is the value of services supplied by the domestic Transportation and Storage (TAS) sector for the Gross Fixed Capital Formation for Construction $(GFCCN)$, we have:

$$d^{PH}_{TAS,GFCCN} = d^{PH}_{TAS,GFCF} \times \frac{\sum_{s_i}^{S-s_i'} d^{PH}_{s_i,GFCCN}}{\sum_j \sum_{s_i} d^{PH}_{s_i,GFC_j}} \tag{112}$$

where $d^{PH}_{TAS,GFCF}$ is the total value of services supplied by TAS for Gross Fixed Capital Formation, $\sum_{s_i}^{S-s_i'} d^{PH}_{s_i,GFCCN}$ is the value of services apportioned for $GFCCN$, **excluding any transactions from shared sectors like TAS,** and $\sum_j \sum_{s_i} d^{PH}_{s_i,GFC_j}$ is the sum of the value of services (excluding shared sectors) across all investment components. The rightmost term in Equation (112) is effectively the

[68] Note that "Other Investments" include Breeding Stocks and Orchard Development, and Intellectual Property Products

demand of Construction for services of the non-shared sectors, relative to the demand of all other investment components.

The summary of sectoral allocation across gross fixed capital formation types is given in Table *12*. Note that "1" denotes that the **total** supply from the sector is apportioned to an investment component, while "–" denotes none of the total supply from the sector is apportioned to an investment component. Finally, "Proportional Allocation" means the total purchases from that sectors are divided across investment components.

Table 12. Sectoral Distribution of Gross Fixed Capital Formation (Investment)

Sector	**Construction** ($\boldsymbol{GFCCN}$)	**Durable Equipment** ($\boldsymbol{GFCEQ}$)	**Other Investments** ($\boldsymbol{GFCOI}$)
Agriculture, forestry, and fishing	-	-	1
Mining and quarrying	1	-	-
Manufacturing	-	1	-
Electricity, steam, water and waste management	-	-	-
Construction	1	-	-
Wholesale and retail trade; repair of motor vehicles and motorcycles	Proportional Allocation		
Transportation and storage			
Accommodation and food service activities			
Information and communication	-	-	1
Financial and insurance activities	Proportional Allocation		
Real estate and ownership of dwellings	1	-	-
Professional and business services	-	-	1
Public Administration and Defense; Compulsory social security	-	-	-
Education	-	-	1
Human health and social work activities	-	-	1
Other services	-	-	1

Source: Authors

Once the value of goods and services supplied by each sector has been allocated across investment components, we can simply derive δ and η in a similar process as in Equation (110) and Equation (111). That is, we divide the value of goods or services supplied by each sector s_i or imported from industry k, by the total final demand of each investment component.

10.3.4. Exports of Goods and Services

We follow a similar procedure detailed in Section 14.3.3 for the disaggregation of exports. The sectoral allocation across the six export groups is summarized in Table 13. Sectoral Distribution of Exports. For sectors that produce several categories of exported goods, a strictly proportional reallocation has been made among them. This proportion is indicated in the cells below.

Table 13. Sectoral Distribution of Exports

	EXGAPS	*EXGEMT*	*EXGMCH*	*EXGOXS*	*EXSTRA*	*EXSOXS*
Agriculture, forestry, and fishing	1	-	-	-	-	-
Mining and quarrying	-	-	-	1	-	-
Manufacturing	-	0.3	0.3	0.4	-	-
Electricity, steam, water and waste management	-	-	-	-	-	-
Construction	-	-	-	-	-	-
Wholesale and retail trade; repair of motor vehicles and motorcycles	Proportional Allocation				-	-
Transportation and storage					-	-
Accommodation and food service activities	-	-	-	-	1	-
Information and communication	-	-	-	-	-	1
Financial and insurance activities	Proportional Allocation					
Real estate and ownership of dwellings	-	-	-	-	-	1
Professional and business services	-	-	-	-	-	1
Public Administration and Defense; Compulsory social security	-	-	-	-	-	-
Education	-	-	-	-	-	1
Human health and social work activities	-	-	-	-	-	1
Other services	-	-	-	-	-	1

Source: Authors

10.4. Theoretical Gross Value-Added

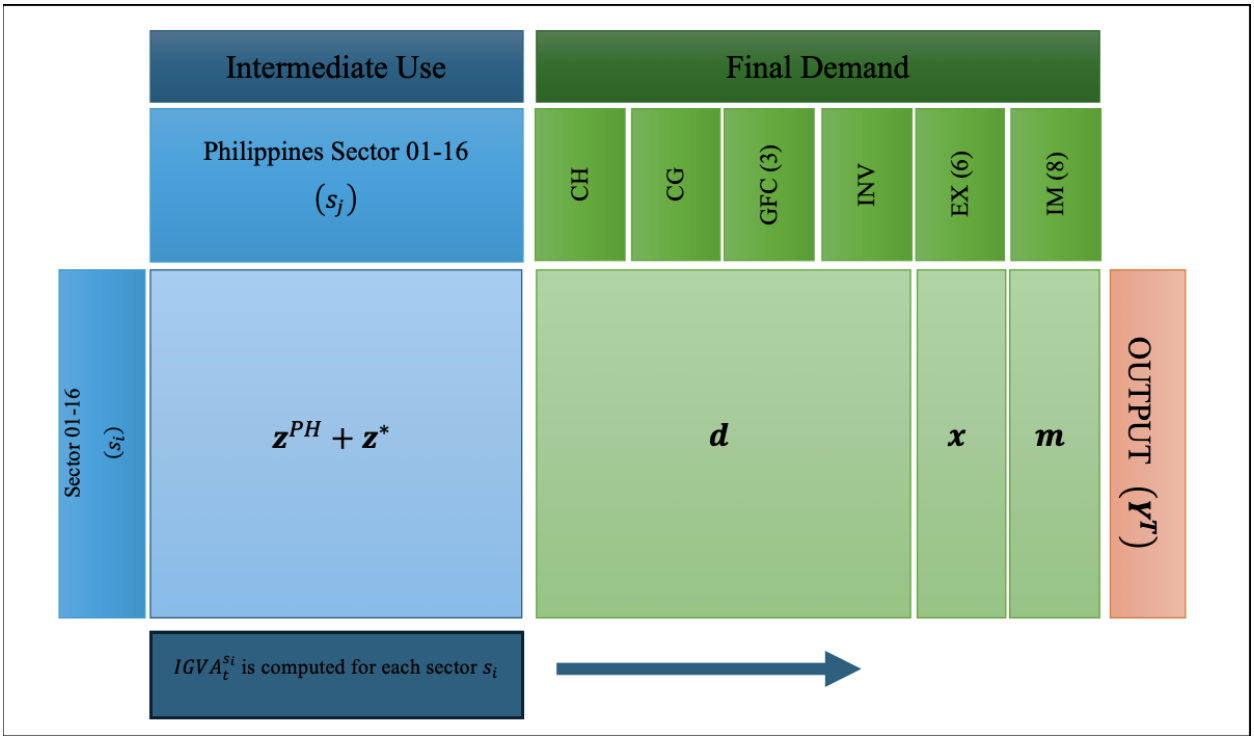
The main objective of this third group of calculations is to obtain indices of value-added derived from the Input-Output tables, both in the domestic sectors and in the different components of final demand, while also considering the demand covered by foreign suppliers (imports). This way, the evolution of each of 16 sectors is conditioned by the rest of the activities, which are demand for intermediate consumption and the different components of final demand. We need to subtract the part of this demand, both intermediate and final, covered by imports.

As in the preceding cases, to proceed, it is necessary to distribute the imports of each of the productive branches, among the 8 import categories contemplated in the PSA national accounts.

To compute these indices, we once again have to restructure the ICIO tables, as visualized in Figure 5. We restructure the intermediate consumption matrices by adding $\boldsymbol{z}^{PH}$ and $\boldsymbol{z}^{*}$. This results in one matrix, where each element z_{s_i,s_j} is the value of input supplied – by domestic or

foreign producers – of sector s_i to each Philippine sector s_j, and to each final demand component, each export group, and each import group.

Figure 5. ICIO Tables Visualization for Theoretical Gross Value-Added Coefficients



Source: Authors

Note that aside from the Final Demand components and Export Groups (see Table 11), the import groups in the restructured ICIO are enumerated in

Table 14. Import Groups for ICIO Restructuring

Group	**Import Group (m)**	
Imports	$IMAPS$	Imports of Cereal and Cereal Preparations, of Dairy Products, of Fruits and Vegetables, and of Feeding Stuff
	$IMGCHM$	Imports of Chemical and Chemical Products, of Medicinal and Pharmaceutical Products, and of Plastics in Primary and Non-Primary Forms
	$IMGEMG$	Imports of Electronic Products, of Telecommunication and Electrical Machinery, and of Power-Generating and Specialized Machinery
	$IMGIMT$	Imports of Industrial Machinery and Equipment, and of Transport Equipment

	IMGMFU	Imports of Mineral Fuels, Lubricants, and Related Materials
	IMGMTL	Imports of Base Metals, of Metal Products, and of Metalliferous Ores and Metal Scraps
	IMGOMS	All other imports of goods not mentioned above
	IMS	Imports of Services

Source: Authors

In the process of restructuring, we use a similar method of apportioning the value supplied by each sector s_i across the three components of Gross Fixed Capital Formation, the six export groups, and the eight import groups. The allocation of value across import groups is summarized in Table 15.

Table 15. Sectoral distribution of imports

	IMGAPS	*IMGCHM*	*IMGEMG*	*IMGIMT*	*IMGMFU*	*IMGMTL*	*IMGOMS*	*IMS*
Agriculture, forestry, and fishing	0.5	-	-	-	-	-	-	-
Mining and quarrying	-	-	-	-	0.5	-	-	-
Manufacturing	0.5	1	1	1	0.5	1	0.9	-
Electricity, steam, water and waste management	-	-	-	-	-	-	0.5	-
Construction	-	-	-	-	-	-	0.5	-
Wholesale and retail trade; repair of motor vehicles and motorcycles	Proportional Allocation							
Transportation and storage								
Accommodation and food service activities	-	-	-	-	-	-	-	1
Information and communication	-	-	-	-	-	-	-	1
Financial and insurance activities	-	-	-	-	-	-	-	1
Real estate and ownership of dwellings	-	-	-	-	-	-	-	1
Professional and business services	-	-	-	-	-	-	-	1
Public Administration and Defense; Compulsory social security	-	-	-	-	-	-	-	1
Education	-	-	-	-	-	-	-	1
Human health and social work activities	-	-	-	-	-	-	-	1

Other services	-	-	-	-	-	-	-	1

Source: Authors

Once the sectoral imports have been distributed into the different final demand components and import categories, we can use this to compute for coefficients needed for the Theoretical GVA indictors.

However, alongside the coefficients derived from the restructured ICIO, computing the Theoretical GVA first requires computing an index, where 2018=100, for each sectoral gross value-added, each final demand component, each export group, and each import group. Collectively, these indices are called GVA Indices. To compute each index, we take the value of each of these series at constant 2018 prices, divide it by the value of the series in 2018, and multiply the series by 100. This is illustrated in Equations (113) to (116). The GVA index corresponding to each sectoral gross value-added s_i is computed as:

$$I_t^{GVA^{s_j}} = \frac{GVA_t^{s_j}}{GVA_{2018}^{s_i}} \times 100 \tag{113}$$

Meanwhile, the indices corresponding to household consumption, government consumption, fixed capital formation, and inventories are computed as:

$$I_t^{FD^j} = \frac{FD_t^j}{FD_{2018}^j} \times 100 \tag{114}$$

where: $FD^j = \{CH, CG, GFCCN, GFCEQ, GFCOI, INV\}$

Lastly, the index for each group of exports and imports are computed as:

$$I_t^{EX^{x_j}} = \frac{EX_t^{x_j}}{EX_{2018}^{x_j}} \times 100 \tag{115}$$

where: $x_j = \{EXGAPS, EXGEMT, EXGMCH, EXGOXS, EXSTRA, EXSOXS\}$

$$I_t^{IM^{m_j}} = \frac{IM_t^{m_j}}{IM_{2018}^{m_j}} \times 100 \tag{116}$$

where: m_j
$= \{IMGAPS, IMGCHM, IMGEMG, IMGIMT, IMGMFU, IMGMTL, IMGOMS, IMS\}$

We can then compute the Theoretical GVA of each sector s_i as a weighted average of these indices such that: [69]

$$IGVA_t^{s_i} = \sum_{s_j} \rho_{s_i,s_j} I_t^{GVA^{s_j}} + \sum_{FD^j} \rho_{s_i,FD^j} I_t^{FD^j} + \sum_{x_j} \rho_{s_i,x_j} I_t^{EX^{x_j}} + \sum_{m_j} \rho_{s_i,m_j} I_t^{IM^{m_j}} \quad (117)$$

The coefficients ρ_{s_i,s_j}, ρ_{s_i,FD^j}, ρ_{s_i,x_j}, ρ_{s_i,m_j} are computed as the value of transactions of the goods and services supplied by each sector s_i to each sector s_j, to final demand, to exports, and to imports respectively, relative to its total output $Y_{s_i}^{PH}$.

11. Fiscal and Monetary Variables

This section discusses data series that capture trends in policy decisions of the National Government and the Bangko Sentral ng Pilipinas. Section 11.1 discusses key indicators in the Philippines' fiscal space, while Section 11.2 details key indicators of monetary policy, relevant interest rates, and other key indicators from the banking sector.

11.1. Fiscal Variables

Data on fiscal revenues, expenditures, and debt are sourced from the Philippines' Bureau of the Treasury (BoTr). We source data on Government Revenues ($PGOVREV_t$) and Government Expenses ($PGOVEXP_t$) from the BoTr's Annual Cash Operations Report.[70] Government Revenues include tax revenue, non-tax revenue, and grants. Tax revenue comes from domestic and travel tax collected by the Bureau of Internal Revenue (BIR), taxes collected by the Bureau of Customs (BOC), and miscellaneous taxes collected by other government offices. Government Expenses include allotment to local government units (LGUs), interest payments, tax expenditures, subsidies, equity, net lending, and other National Government Disbursements.

The difference between Government Revenues and Expenditures results in the Fiscal Balance ($PFISCBAL_t$); that is:

$$PFISCBAL_t = PGOVREV_t - PGOVEXP_t \quad (118)$$

[69] Note the coefficients linked to imports ρ_{s_i,m_j}, are all negative

[70] See Republic of the Philippines: BoTr (2024b)

Both $PGOVREV_t$ and $PGOVEXP_t$ are modelled in bridge equations, as functions of GDI_t^G and of the sum of $TOTEXP_t^G$ and CG_t (see Section 4.4) respectively. These bridge equations are explained in Section 15.

We obtain data on key variables relating to the Philippines' debt position from the BoTr's report on the National Government Outstanding Debt Stock.[71]

As summarized in Equation (119), the total stock of outstanding debt ($DEBTST_t$) is the sum of debt owed by the National Government to domestic creditors ($DEBTD_t$) and international creditors ($DEBTF_t$). All these values appear in the BoTr's report.

$$DEBTST_t = DEBTD_t + DEBTF_t \tag{119}$$

We also obtain data on the Philippines' debt service from the BoTr's report on National Government Debt Indicators.[72] From here, we use data on interest payments ($INTPAY_t$)[73] and principal payments ($PRPAY_t$) made by the National Government on outstanding debt,[74] From these indicators we compute other indicators on the Philippine debt position.

First, we compute new debt issued ($DEBTNEW_t$) as the change in the debt stock ($DEBTST_t$), then add back the principal payments made during the period ($PRPAY_t$).

$$DEBTNEW_t = (DEBTST_t - DEBTST_{t-1}) + PRPAY_t \tag{120}$$

Second, we compute residually the Change in Financial Assets ($CHANGEFA_t$) as the difference between Government Expenditures ($PGOVEXP_t$), Government Revenue ($PGOVREV_t$), and the change in the debt stock ($DEBTST_t$), such that:

$$CHANGEFA_t = (PGOVEXP_t - PGOVREV_t) - (DEBTST_t - DEBTST_{t-1}) \tag{121}$$

Finally, we compute the Implicit Interest Rate on debt as the interest payment made in one period, divided by the average debt stock of the current and previous periods:

$$IMPINTRDEBT_t = INTPAY_t - \frac{(DEBTST_t - DEBTST_{t-1})}{2} \tag{122}$$

[71] See Republic of the Philippines: BoTr (2024c)
[72] See Republic of the Philippines: BoTr (2024d)
[73] Note that $INTPAY_t$ is used to model PX_t^G (see Section 4.4) in a bridge equation (see Section 15).
[74] For years 2000-2016, we use the BoTr's "Debt Service version 1" data series, while for years 2017 onward we use the BoTr's "Debt Service version 2" data series. While the data on interest payments remain the same throughout both versions, there is considerable variation in the data on principal payments between both versions. We choose to use the versions as detailed to ensure a complete data series on debt servicing starting 2000 to 2023.

Aside from the fiscal balance and the debt position, a key indicator linked to fiscal policy would be the average value of social benefits disbursed by the government. We compute the total number of retirees ($RETIREES_t$) as the sum of the working age population $\left(WP_t^{a_i}\right)$ aged 55-64 and those above age 65. Accordingly, we compute the average social benefits disbursed by the government (ASB_G_t) as:

$$ASB\_G_t = \frac{SB\_G_t}{RETIREES_t} \tag{123}$$

11.2. Monetary Variables

To capture movements in the financial markets, the model uses data on key domestic interest rates. Driving those key domestic interest rates is the BSP's Target Overnight Repurchase Rate (RRP) – effectively the policy rate. As per the BSP, setting the policy rate also sets the Overnight Lending Rate (ceiling rate) and the Term Deposit Rate (floor rate), which form the Interest Rate Corridor (IRC) system.[75] [76] This system, in turn, is meant to ensure that short-term market rates remain reasonably close to the BSP's policy rate (BSP, 2016).

The policy rate and some key domestic interest rates are listed in Table 16. The source of the key Philippine interest rates is the BSP, except for the data on annual rate on 10 Year-Government Bond Rates, which is sourced from the Bureau of Treasury (BoTr).[77] [78]

Table 16. Key Philippine Interest Rates

Interest Rate	Description
$\boldsymbol{BSPRATE\_AVE_t}$ / $\boldsymbol{BSPRATE\_END_t}$ Policy Rate – Bangko Sentral ng Pilipinas	Refers to the Target Overnight Repurchase Rate. This policy rate captures the BSP's monetary policy stance. $BSPRATE\_AVE_t$ refers to the simple average of the BSP's target RRP rate at the end of each month throughout the year. $BSPRATE\_END_t$ refers to the target RRP rate as of the end of each year.
$\boldsymbol{TBANK_t}$ Bank Average Lending Rate	As per the BSP's notes, this refers to the interest rate based on reporting [Universal and Commercial

[75] Rate of lending from BSP to the banks
[76] Rate at which BSP takes deposits from banks
[77] See BSP (2024i)
[78] See Republic of the Philippines: BoTr (2024a)

	Banks'] interest income and outstanding peso-denominated loans
$\boldsymbol{TBCL_t}$ Interbank Call Rate	
$\boldsymbol{TBR3M_t}$ 91-Day Treasury Bill Rate	"Monthly treasury bill (T-bill) rates […] computed based on the auction date by Bangko Sentral ng Pilipinas (BSP) staff, which differs from the monthly T-bill rates based on the issue date as computed by the Bureau of the Treasury (BoTr)." (BSP, 2024)
$\boldsymbol{TB10Y_t}$ 10-Year Government Bond Rate	Refers to the annual average yield rate of 10-Year Government Bonds (T-Bonds)[79]

Source: Authors

Alongside these interest rates the BSP's monetary policy stance, and their designated Reserve Requirement Ratio (RRR), greatly influences how much banks are willing to lend in the form of loans. The ANIMO database sources data on the Philippine Banking Systems' (PBS) outstanding loans as of the end the year, as reported by the BSP.[80] Outstanding Loans ($LOAN_t$) are divided into loans to residents ($LOAN_t^R$) and to non-residents ($LOAN_t^{NR}$) such that:

$$LOAN_t = LOAN_t^R + LOAN_t^{NR} \tag{124}$$

Loans to residents is comprised of production loans ($LOAN_t^{PROD}$), consumer loans ($LOAN_t^{CONS}$) and those under BSP Reverse Repurchase Agreements. Production loans are categorized based on the economic activity, while consumption loans comprise credit card loans, motor vehicle loans, salary loans, and other loans.

12. External Variables

This section discusses the process of obtaining information on the Rest of the World which might affect the Philippines. As a small open economy, the Philippines is vulnerable to changes in the international environment. Changes in world income affect the external demand for Philippine exports of goods and services. Fluctuations in world prices and key trading partners' export prices also affect the demand and prices of goods within the economy. As such, we collect and process data on external income, international interest rates, exchange rates, external commodity price indices, export price movements of key trading partners, and external labor force participation rates.

[79] Since no auctions were held in 2014 and 2015, the yield rates were imputed.
[80] See BSP (2024d) and BSP (2024e)

12.1. External Income

We refer to the International Monetary Fund's (2024c) World Economic Outlook (WEO) Database for data on World GDP growth. We take data on the World's Gross Domestic Product at constant prices; this data is in terms of the year-on-year percent changes. We then convert this into an index, with the base year in 2018 through a simple process.

First, we set the index such that 2018=100. Second, we set it such that the growth in the index in each period is equal to the year-on-year growth in World GDP:

$$g_t^{IGDPW} = g_t^{GDPW} \tag{125}$$

where g_t represents the year-on-year growth rates in the World GDP Index ($IGDPW$) and in World GDP ($GDPW$). Expanding Equation (125) yields:

$$\frac{IGDPW_t - IGDPW_{t-1}}{IGDPW_{t-1}} = g_t^{GDPW} \Rightarrow \frac{IGDPW_t}{IGDPW_{t-1}} - 1 = g_t^{GDPW} \tag{126}$$

Rearranging Equation (126) allows us a method to obtain values of $IGDPW$ for years prior to 2018 as:

$$IGDPW_{t-1} = IGDPW_t \div (g_t^{GDPW} + 1) \tag{127}$$

Alternatively, rearranging Equation (126) for the lead period also allows us a method to obtain values of $IGDPW$ for years after 2018 as:

$$IGDPW_{t+1} = IGDPW_t \cdot (g_{t+1}^{GDPW} + 1) \tag{128}$$

Using Equation (127) and Equation (128) allows us to construct $IGDPW_t$, an index for changes in the World GDP from 1985-2023.

Aside from movements in the overall World GDP, we also keep measures for the GDP, Gross National Income per Capita, and GDP per capita of key countries in our database. We obtain data on GDP at current and constant prices from the World Bank World Development Indicators (WDI) Database. This data is defined by the World Bank (2024) as the "sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products" (World Bank, 2024e). These are in US dollars, converted by the World Bank from domestic currencies using single year official exchange rates.

Similarly, we use the WDI database to source data on the Gross National Income per Capita and GDP per capita in current and constant prices. GNI per capita is defined by the World Bank as "Gross national income, converted to U.S. dollars using the World Bank Atlas method, divided by the midyear population" (World Bank, 2024g). Likewise, the World Bank computes GDP per capita as the ratio between countries' GDP and their midyear population. We obtained these data series for key economies, namely the United States of America, Canada, Japan, Singapore, Hong Kong, Saudi Arabia, and the United Arab Emirates.

Since the World Bank's data on GDP and GDP per capita at constant prices is in constant 2015 prices, we convert these values to constant 2018 prices. To convert data from constant 2015 prices to constant 2018 prices, we first compute the implicit deflator at 2015=100 ($DEF_t^{2015=100}$), by dividing the value of GDP at current prices ($NGDP_t$) by its corresponding value at constant 2015 prices ($RGDP_t$):

$$DEF_t^{2015=100} = \frac{NGDP_t}{RGDP_t^{2015}} \tag{129}$$

We then convert this to base year 2018 by dividing the implicit deflator by its 2018 value across the whole series such that:

$$DEF_t^{2018=100} = \frac{DEF_t^{2015=100}}{DEF_{2018}^{2015=100}} \tag{130}$$

We then divide the nominal GDP ($NGDP_t$) by the new deflator (DEF_t^{2018}) to obtain GDP at constant 2018 prices. We use this same process to obtain GDP per capita at constant 2018 prices.

12.2. International Interest Rates

They key international interest rates incorporated into the ANIMO model are listed in Table 17. All data on key international interest rates are sourced from the International Monetary Fund's (IMF), International Financial Statistics Database, except for the data on the Federal Reserve policy rate (CBPR), sourced from the Bank of International Settlements (BIS).[81]

Table 17. Key International Interest Rates

Interest Rate	Description
$\boldsymbol{FEDRATE\_AVE_t}$ / $\boldsymbol{FEDRATE\_END_t}$	Refers to the "mid-point mid-point of the Federal Reserve target rate" (BIS, 2024, June 6)

[81] See BIS (2024b)

Policy Rate – Federal Reserve System of the United States	$FEDRATE\_AVE_t$ refers to the simple average at the end of each month throughout the year. $FEDRATE\_END_t$ refers to the rate as of the end of each year.
Government Bond Rates for: • Euro Area • Japan • United States of America	As per the IMF's Introductory Notes, the series on Government Bonds Rates "refers to one or more series representing yields to maturity of government bonds or other bonds that would indicate longer term rates" (2024, June 6) Quoting from the IMF Country Notes, these rates specifically refer to: • **Euro Area**: Euro area yield for 10-year government bonds calculated on the basis of harmonized national government bond yields weighted by GDP. • **Japan**: Arithmetic average yield on newly issued government bonds with ten-year maturity. • **USA**: Yield on actively traded treasury issues adjusted to constant maturities.
Money Market Rates for: • Euro Area • Japan • United States of America	The IMF defines Money Market Rates as the "rate on short-term lending between financial institutions". From the Country Notes, these specifically refer to: • **Japan**: Rate for collateral and overnight loans in the Tokyo Call Money Market. • **USA**: The effective federal funds rate, which is the volume-weighted median of transaction-level data collected from depository institutions in the Report on Selected Money Market Rates (FR 2420).
$\boldsymbol{IRLTCHN_t}$ Lending Rate for China	As defined by the IMF: "Lending Rate is the other depository corporations' rate that usually meets the short- and medium-term financing needs of the private sector. This rate is normally differentiated according to creditworthiness of borrowers and objectives of financing.

	Prior to 1989, rate on working capital loans to state industrial enterprises. Thereafter, rate on working capital loans of one-year maturity.
$IRSTCHN_t$ Discount Rate for China	As defined by the IMF: "Discount Rate is the interest rate at which the central bank lends to commercial banks to meet their liquidity needs." For China, specifically, this is defined as the "rate charged by the PBC on 20-day loans to financial institutions."
US_TBILLR_t Treasury Bill Rate for the United States	As defined by the IMF, the treasury-bill rate is the "rate at which short-term government debt securities are issued or traded in the market." For the United States, specifically, this is defined as the "Weighted average yield on multiple-price auctions of 13-week treasury bills. Monthly averages are computed on an issue-date basis."

Source: Authors

12.3. Exchange Rates

The ANIMO model considers the movements of the bilateral exchange rates of various currencies against the US Dollar. We source data on exchange rates from the Bank of International Settlements.[82] These bilateral exchange rate(s) "contain long time series on US dollar nominal exchange rates. They record the nominal value of one US dollar (USD) relative to a given currency. A decrease (increase) indicates an appreciation (depreciation) of the currency against the USD" (BIS, n.d.) We take the average of bilateral exchange rates over a given year. We collect bilateral exchange rate data on the following currencies vis-à-vis the US Dollar:

- PHP: Philippine Peso
- CHN: Chinese Yuan
- JPY: Japanese Yen
- KRW: Korean Won
- EUR: Euro
- IDR: Indonesian Rupiah
- MYR: Malaysian Ringgit
- SGD: Singaporean Dollar
- THB: Thai Baht

[82] See BIS (2024a)

- VND: Vietnamese Dong

12.4. World Commodity Price Indices

Key commodity prices in the world market may have a significant influence over domestic commodity prices. For example, the Philippines is import-dependent on oil, and as such, domestic prices are vulnerable to shocks which impact the price of oil in the world market. To isolate price movements and ensure comparability of prices across commodities, we convert world commodity prices into world commodity price indices.

We first obtain the price per barrel of crude oil (Dated Brent) to represent oil price movements, and commodity price indices (2016=100) for food, cereals (including rice), vegetable oils, and metals from the IMF's World Economic Outlook Database.

The data on crude oil prices are given as US$ per barrel. We convert this to a commodity price index for oil ($PWOIL_t$) by setting the year-to-year growth of the index equal to the growth in oil prices by:

$$g_t^{PWOIL} = g_t^{PBRE} \tag{131}$$

where g_t represents the year-on-year growth rates in the Oil Commodity Price Index ($PWOIL$) and in crude oil prices in US$ per barrel ($PBRE$). Expanding Equation (131) yields:

$$\frac{PWOIL_t - PWOIL_{t-1}}{PWOIL_{t-1}} = \frac{PBRE_t - PBRE_{t-1}}{PBRE_{t-1}} \tag{132}$$
$$\Rightarrow \frac{PWOIL_t}{PWOIL_{t-1}} - 1 = \frac{PBRE_t}{PBRE_{t-1}} - 1$$

We then set the index such that its value in 2018 is equal to 100, giving us an initial value. Rearranging Equation (133) allows us a method to obtain values of $PWOIL$ for years prior to 2018 as:

$$PWOIL_{t-1} = PWOIL_t \div \left(\frac{PBRE_t}{PBRE_{t-1}}\right) \tag{133}$$

Likewise, from Equation (132) we can retrieve a method to obtain values for $PWOIL$ for years following 2018 as:

$$PWOIL_{t+1} = PWOIL_t \cdot \left(\frac{PBRE_{t+1}}{PBRE_t}\right) \tag{134}$$

For the other commodity price indices, since these are already price indices provided by the IMF at 2016=100, we convert these to commodity price indices where 2018=100 by dividing each series by the 2018 value and multiplying it by 100. This yields commodity price indices at 2018=100 for food ($PWFOOD_t$), cereals ($PWCER_t$), vegetable oils ($PWVEG_t$), and metals ($PWMET_t$).

12.5. International Import Price Indices

As a small, open economy, the Philippines' import prices is significantly influenced by international export prices – especially of larger economies and its neighboring countries from which it sources most of its imports. However, export price indices at its aggregate is difficult to compute; to complicate matters further, to model Philippine imports and import prices within the ANIMO Model, we require a series of indicators that capture the export prices of the Philippines' key trading partners for each import group considered in the ANIMO Model (see Section 2.4.2). To develop indicators for the international price movements which influence Philippine import prices, we consider the movement of export prices of nine of the Philippines' key trading partners, as well as their relative importance in the world economy. The process of constructing these indicators are discussed in the succeeding sections.

12.5.1. Export Price Indices of Key Countries

The movement of export prices of some key Philippines trading partners and competitors may be tracked through their respective export price indices. To compute for these, we first extract data on the Merchandise Export Value Index (VL_t), and Merchandise Export Volume Index (VM_t) from the World Trade Organization (WTO) Statistics Database for the following countries: ASEAN-5 (Indonesia, Malaysia, Singapore, Thailand, Viet Nam), China, Japan, South Korea, and the United States of America. As per the WTO's Technical Notes, these indices are a measure of the value (in current US$) and volume of merchandise exports relative to the base period (2015=100). The statistics on merchandise export value "reflect changes in prices and in quantities of exported […] goods" (WTO, 2024c, p.5) while merchandise export volume statistics "reflect changes in the quantity only of [exported] goods" (WTO, 2024c, p.6).[83]

Since initially, the base period of VL_t and VM_t is 2015 (that is, the value of both indices in 2015 is equal to 100), we adjust the base period to 2018 to align with the rest of the data used in the model. We do so through Equation (135) and Equation (136):

$$VL_t^{2018=100} = \frac{VL_t^{2015=100}}{VL_{2018}^{2015=100}} \tag{135}$$

[83] Data on the merchandise exports value index are taken from WTO (2024a) and data on the merchandise exports volume index are taken from WTO (2024b)

$$VM_t^{2018=100} = \frac{VM_t^{2015=100}}{VM_{2018}^{2015=100}} \tag{136}$$

After this process, both the Value Index and Volume Index have a value of 100 at year 2018.

The export price indices of each country are then derived as the ratio between the value index $\left(VL_t^k\right)$, and volume index $\left(VM_t^k\right)$ for each country k such that:

$$PX_t^k = \frac{VL_t^k}{VM_t^k} \times 100 \tag{137}$$

where PX_t^k is the export price index for country k. The value of PX_t^k is 100 at the year 2018.

Intuitively, what Equation (137) does is isolate the export price movements by dividing a measure of price and quantity (the value index) by a measure of quantity only (volume index).

12.5.2. International Import Shares

To calculate the import prices faced by the Philippines for each product group, we compute the share of each country from where the Philippines imports by product group, in total Philippine imports. Then we apply these shares (weights) to the import prices faced by the Philippines for each product. To do this, we first extract data on the value of imports of each key trading partner to the world at the product level from the ITC Trade Map. This data is in current US$, at the HS[84] 2-digit level. We then obtain the value of each country's imports of each product group $\left(M_i^k\right)$ as the aggregate value of their imports falling within each product group. The import product group equivalencies to the ones used in the model is presented in the table below:

Table 18. Import Product Group and HS-02 Equivalencies

Import Group Code	Product Group Definitions	Corresponding HS-02 Product Codes
$IMGAPS_t$	Imports of Cereal and Cereal Preparations Imports of Dairy Products Imports of Fruits and Vegetables Imports of Feeding Stuff	'04; '06; '07; '08; '10; '12; '13; '14; '19; '23

[84] The HS or "Harmonized System" is an international system of classification of goods

$IMGCHM_t$	Imports of Chemical and Chemical Products Imports of Medicinal and Pharmaceutical Products Imports of Plastics in Primary and Non-Primary Forms	'28; '29; '30; '31; '32; '33; '34; '35; '36; '37; '38; '39
$IMGEMG_t$	Imports of Electronic Products Imports of Telecommunication and Electrical Machinery Imports of Power-Generating and Specialized Machinery	'85
$IMGIMT_t$	Imports of Industrial Machinery and Equipment Imports of Transport Equipment	'84; '86; '87; '88; '89
$IMGMTL_t$	Imports of Base Metals	'72; '73; '74; '75; '76; '78; '79; '80; '81; '82; '83; '26
$IMGMFU_t$	Imports of Mineral Fuels, Lubricants, and Related Materials	'27
$IMGOMS_t$	All other imports	'01; '02; '03; '05; '09; '11; '15; '16; '17; '18; '20; '21; '22; '24; '25; '40; '41; '42; '43; '44; '45; '46; '47; '48; '49; '50; '51; '52; '53; '54; '55; '56; '57; '58; '59; '60; '61; '62; '63; '64; '65; '66; '67; '68; '69; '70; '71; '90; '91; '92; '93; '94; '95; '96; '97; '99

Source: Authors

The share of each country for each export (import) group is obtained by dividing the import value of each country for each product group by the total import value of each product across countries. Mathematically, import shares are computed as:

$$m_i^k = \frac{M_i^k}{\sum_{k=1}^{9} M_i^k} \tag{138}$$

where m_i^k refers to the import share (weight) of country k in product group i. M_i^k refers to the total imports of country k of product group i from the world. The denominator considers nine countries ($k = 9$) which are most likely to be key trading partners for Philippines when it comes to imports: Indonesia, Malaysia, Singapore, Thailand, Viet Nam, China, Japan, South Korea, and the United States. Note that we only compute these weights for year 2018.

12.5.3. International Import Prices per Product Group

We obtain a proxy for the international prices faced by the Philippines on its imports, by taking a weighted average of the Philippines' key trading partners' export price indices, PX_t^k (see Section 12.5.1). The weights are, in turn, the import shares corresponding to each country for a given product group, m_i^k (see Section 12.5.2). The weighted international import price indices per product group is computed as is:

$$PW_{i,t} = \sum_{k=1}^{9} m_i^k \cdot PX_t^k \tag{139}$$

where i indexes the product group, and k indexes the country. These indices take the value of 100 at 2018.

12.6. External Labor Force Participation Rates

Data on the Labor Force Participation Rates (LFPR) by sex and age are taken directly from the ILOSTAT Database.[85] We keep data on the LFPR in developed countries as a way to benchmark the LFPR in the Philippines, both at the aggregate and granular levels. Parallel to the data on Philippine Labor Force Participation Rates, data for the other countries are kept for the total labor force, male labor force, and female labor force. Participation rates for age brackets 15-24, 25-54, 55-64, and over 65 years of age are kept for the male and female labor force. Countries (economies) included in the database are: The United States of America, Germany, Belgium, Japan, the Republic of Korea, Spain, Singapore, and Hong Kong.

12.7. Foreign Direct Investment

We keep data on the total Foreign Direct Investment Credits and Debits from the International Monetary Fund's (IMF) Balance of Payments Analytic Presentation.[86] We use the line items under the Financial Account: (1) *Direct investment, assets*, and (2) *Direct investment, liabilities.* These represent the Net Acquisition of Assets (Debit) and Net Incurrence of Liabilities (Credit). Since the data provided by the IMF is in US Dollars, we multiply this by the average annual exchange rate between the Philippine Peso and US Dollar. We also obtain data on the Net Foreign Direct Investment Flows by Sector from the BSP for each of the 16 sectors used in the model, from 2010 to present.[87] [88] These data are in US Dollars.

[85] See ILO (2024c)
[86] See IMF (2024b)
[87] See BSP (2024f)
[88] Data on Net Foreign Direct Investment Flows for some sectors are also available as early as 1999; however, due to the shift from BPM5 and BPM6 in how the Balance of Payments report is compiled, and the shift from the 2009 PSIC from the 1994 PSIC in how the sectors are classified, FDI data on sectors such as Accommodation and Food Service Activities (AFS), Education (EDU), Human Health and Social Work (HSW), Information and Communication (IAC), Professional and Business Activities (PRO), Public Administration and Defense (PUB), Transportation and Storage (TAS), and Other Service Activities (OTH).

13. The Balance of Payments

This section discusses the process of obtaining information on the Philippines' Balance of Payments; specifically, the value of its Current Account Balance in Philippine Peso – as opposed to the available data which has the Philippines' Current Account Balance in US Dollar. From the Balance of Payments, we also identify the components pertaining to remittances of Overseas Filipinos Workers (OFWs) by reconciling it with the Balance of Payments data provided by the Bangko Sentral ng Pilipinas (BSP).

13.1. The Current Account Balance

We source data on the Balance of Payments from the International Financial Statistics (IFS) database, made available by the IMF. The items obtained are listed in Table *19*, along with their variable names in the database, and the description from the IMF. Note that all credit items in the Philippines' Balance of Payments represent income accruing to the Philippines from the rest of the world, while debit items represent payments from the Philippines to creditors abroad. All items are presented based on the "sixth edition of the Balance of Payments and International Investment Position Manual (BPM6)". As per the IMF's Technical Notes, while the BPM6 presentation was implemented in 2009 for IMF publications, as of 2015, the IMF rearranged previous publications (presented under the BPM5) to be consistent with the BPM6. This allowed for a consistent series on each country's Balance of Payments across time from 1985 to present.

Table 19. IFS Balance of Payments

Variable Name	IFS Item Name	Description
$BPGC_t$	**Exports of Goods:** Current Account, Goods and Services, Goods, Credit [BPM6], US Dollar	As per the IMF, these are "measured on the "free-on-board" (f.o.b.) basis—that is, by the value of the goods at the border of the exporting economy. For imports, this excludes the cost of freight and insurance incurred beyond the border of the exporting economy. The goods item covers general merchandise, net exports of goods under merchanting, and nonmonetary gold."
$BPGD_t$	**Imports of Goods:** Current Account, Goods and Services, Goods, Debit [BPM6], US Dollar	
$BPSC_t$	**Exports of Services:** Current Account, Goods and Services, Services, Credit [BPM6], US Dollar	These "comprise manufacturing services on physical inputs owned by others; maintenance and repair services n.i.e.; transport; travel; construction; insurance and pension services; financial services;

$BPSD_t$	**Imports of Services:** Current Account, Goods and Services, Services, Debit [BPM6], US Dollar	charges for the use of intellectual property n.i.e.; telecommunications, computer, and information services; other business services; personal, cultural, and recreational services; and government goods and services n.i.e."
$BPPIC_t$	Current Account, Primary Income, Credit [BPM6], US Dollar	As per the IMF, Primary Incomes comprise the following: "(1) compensation of employees; (2) investment income (consisting of direct investment income, portfolio investment income, other investment income, and investment income on reserve assets); and (3) other primary income"
$BPPID_t$	Current Account, Primary Income, Debit [BPM6], US Dollar	
$BPSIC_t$	Analytic Presentation, Current Account, Net (excluding exceptional financing), Secondary Income, Credit (excluding exceptional financing) [BPM6], US Dollar	Secondary Income credit comprise: "all current transfers received by the reporting economy, except those received by the economy to finance the balance of payments needs."
$BPSID_t$	Current Account, Secondary Income, Debit [BPM6], US Dollar	The IMF defines this as "all current transfers paid by the reporting economy"

Source: Authors

To convert these data into Philippine Peso, we multiply the IMF's data by the average exchange rate between the Philippine Peso and the US Dollar, for each year. We then compute the Current Account Balance as:

$$CABALANCE_t = (BPGC_t - BPGD_t) + (BPSC_t - BPSD_t) + NETBP_t \quad (140)$$

where: $CABALANCE_t$ is the Current Account Balance, $(BPGC_t - BPGD_t)$ is the Trade Balance in Goods, $(BPSC_t - BPSD_t)$ is the Trade Balance in Services, and $NETBP_t$ is the sum of Primary and Secondary income credits, less the sum of Primary and Secondary Income debits.

From the $CABALANCE_t$, we are then able to obtain the share of the Current Account Balance to GDP as:

$$CASHARE_t = \frac{CABALANCE_t}{GDP_t} \quad (141)$$

Note that both the Current Account Balance and GDP in Equation (141) are in Philippine Peso and in current prices.

After converting the IMF data to Philippine Peso, the variables $BPGC_t$, $BPGD_t$, $BPSC_t$, and $BPSD_t$ are modelled as functions of their counterparts in the Philippine System of National Accounts (see equations B1 to B4). Meanwhile, and $NETBP_t$ is linked to $REMITS_t$, which is discussed in the next sub-section (see equation B5). These bridge equations are explained more thoroughly in Section 15.

13.2. Remittances and Overseas Filipino Workers

We refer to the BSP's Balance of Payments data to identify the proportion of Net Primary Income and Net Secondary Income attributable to remittances from 2005-2023. For the same proportions for 1999-2004, we refer to the BSP's presentation of the Balance of Payments under the BPM5 concept.[89]

We focus on two items that capture remittances: under Primary Income, we use item *"A.1.C.3. Compensation of Employees."* This refers to the net compensation of employees, the difference between receipts and payments. Meanwhile, under Secondary Income, we use item "*A.1.D.4.3.3. [Personal Transfers] Of which: Workers' remittance"*; similarly, this refers to the difference between receipts and payments from workers' remittances.[90] From this, we compute the share of remittances in Net Primary Income ($SHPRINREM_t$) and the share of remittances in Net Secondary Income ($SHSEINREM_t$) by dividing the value of these line items by the value of Net Primary Income and Secondary Income respectively. Using the Balance of Payments data in Section 13.1, we compute the value of remittances in Net Primary Income as:

$$DPRINREM_t = (BPPIC_t - BPPID_t) \times SHPRINREM_t \tag{142}$$

And the value of remittances in Net Secondary Income as:

$$DSEINREM_t = (BPPIC_t - BPPID_t) \times SHSEINREM_t \tag{143}$$

The total value of remittances is then calculated as:

$$REMITS_t = DPRINREM_t + DSEINREM_t \tag{144}$$

[89] Data on primary incomes for 2005-2023 are taken from BSP (2024g) while data on secondary incomes for 2005-2023 are taken from BSP (2024h). Data on both items for 1999-2004 are taken from BSP (2024a)

[90] The BPM5 Concept has line items specifically pertaining to "Migrants' Transfers" in the Capital Account; we treat this as part of "Secondary Income", which was named "Current Transfers" under the BPM5 presentation of the Balance of Payments. Hence, we add it to the "Current Transfers of Workers' Remittances (Net)"

Similar to the Balance of Payments data, we obtain the value of remittances in Philippine Peso by multiplying $DPRINREM_t$ and $DSEINREM_t$ by the average exchange rate between the Philippine Peso and US Dollar per year.

$REMITS_t$ is used in two bridge equations, as an input to model $NETBP_t$ in equation B5, and $COEFRW_t$ (see Section 4.1) in equation B6. More details on this is found in Section 15.

Lastly, the total number of OFW workers is collected from the PSA's Openstat Database for the years 2000-2015[91]. We collect data on OFWs from Table 11.28 of the 2020 Philippine Statistical Yearbook for the years 2016-2019. We use Table 1 of the Final Results of the 2021 Survey of Overseas Filipino Workers for the years 2020-2021, published on December 2, 2022. Finally, we source data from Table 1 of the Final Results of the 2022 Survey of Overseas Filipino Workers for data on the year 2022, published on October 11, 2023.

14. Other Variables

This section discusses the retrieval and processing of other variables not found in other sections or blocks of the model.

14.1. Poverty Incidence

While the Philippines' records official statistics of Poverty Incidence among families and across individuals. We use the incidence of poverty across individuals as our metric for poverty, and this is defined by the PSA in their Technical Notes as: "the weighted total number of […] individuals with annual per capita income less than the annual per capita poverty threshold/line […] divided by the weighted total number of […] individuals" (PSA, n.d.-b).

For the years for which the poverty incidence is reported, we take the figure directly from PSA. We then interpolate the years in-between for which data are not available. The available years with reported poverty incidence data are 1994, 1997, and 2000, which we source from Table 2.10 of the 2002 Philippine Statistical Yearbook (PSY). Data in 2003 is sourced from Table 2.10b of the 2010 PSY. We source poverty incidence data for years 2006, 2009, and 2010 from Table 2.10b of the 2016 PSY. The data for years 2015, 2018, and 2021 are from Table 2.9 of the 2023 PSY. Finally, 2023 data was reported by the PSA through a press release titled *"Percentage of Filipino Families Classified as Poor Declined to 10.9 percent in 2023",* published July 22, 2024.

We estimate the poverty incidence for the years for which no data are available as follows:

$$POVERTY_t = POVERTY_{t-1}\left(1 + \frac{g_T}{T}\right) \tag{145}$$

where $POVERTY_{t-1}$ is the poverty incidence reported or interpolated for the previous year, and g_T is the cumulative growth between two years for which poverty data is reported, and T is the number of years between the two years for which poverty data is available.

[91] See PSA (2024ba)

14.2. Climate Conditions

The database keeps a subset of indicators related to weather and climate, as agricultural yields and productivity can be influenced by these conditions. We source data on Average Annual Rainfall, measured in millimeters ($RAIN_t$) from the World Food Programme.[92] As per the attached metadata, rainfall data is estimated through satellite observations and rain gauge data. We take the average of all observations recorded within the year to obtain an annual average.

We also keep data on the average mean surface air temperature for the Philippines ($TEMP_t$). While the historical data is produced by the Climate Research Unit (CRU) of the University of East Anglia, we source our data from the World Bank Climate Change Knowledge Portal.[93]

15. Bridge Equations

The primary data reference for the ANIMO Annual Econometric Model is the PSA's System of National Accounts, expressed through the expenditure shares, and through income and outlay, which are discussed in Section 2 and Section 4. However, several key variables reported by the PSA in the National Accounts are also reported by other organizations such as the IMF and the BoTr. However, the exact values reported across organizations may vary, due to differences in their methods, and the economic activities they choose to include or exclude in each item reported. Moreover, in the case of the discrepancy between the PSA and the IMF's reporting of the trade flows of goods and services, some discrepancy may also be attributable to the exchange rate used to convert IMF data. Despite these issues, the model aims to be able to forecast and describe all these variables, as they are relevant economic indicators published by reputable source organizations and may provide useful insights for policy decisions.

The bridge equations allow the ANIMO Annual Econometric Model to resolve these discrepancies, and to describe and model counterpart economic indicators reported by different organizations. Each bridge equation is an error-correction model (ECM) that models some transformation of the dependent variable, usually the log-difference, as a function of some transformation of the independent variable, and the lagged values of both variables. All equations are estimated through Ordinary Least Squares (OLS) regression.

The presence of a stable and sensible relationship between variables allows the model to describe and forecast the dependent variables, using the results of the behavioral equations associated with the independent variables. For example, the model structure contains behavioral equations to describe EXG_t from the National Accounts; the bridge equation shows that a stable relationship exists between EXG_t and $BPGC_t$, thereby allowing us to describe and forecast $BPGC_t$, an item in the balance of payments, from what the model reveals about EXG_t.

[92] See WFP (2024)
[93] See World Bank (2024f)

Table *20* summarizes the variables linked with a bridge equation, and the relationship between variables modelled by each bridge equation.

Table 20. List of Relationships with a Bridge Equation

Dependent Variable		**Independent Variable**		**No.**
$\boldsymbol{BPGC_t}$: Balance of Payments, Current Account, Goods, Credit, Pesos	International Monetary Fund, Authors' Calculations	$\boldsymbol{EXG_t}$: Exports of Goods	Philippine Statistics Authority	B1
$\boldsymbol{BPGD_t}$: Balance of Payments, Current Account, Goods, Debit, Pesos	International Monetary Fund, Authors' Calculations	$\boldsymbol{IMG_t}$: Imports of Goods	Philippine Statistics Authority	B2
$\boldsymbol{BPSC_t}$ **:** Balance of Payments, Current Account, Services, Credit, Pesos	International Monetary Fund, Authors' Calculations	$\boldsymbol{EXS_t}$: Exports of Services	Philippine Statistics Authority	B3
$\boldsymbol{BPSD_t}$ **:** Balance of Payments, Current Account, Services, Debit, Pesos	International Monetary Fund, Authors' Calculations	$\boldsymbol{IMS_t}$: Imports of Services	Philippine Statistics Authority	B4
$\boldsymbol{NETBP_t}$ **:** Net Primary Incomes and Secondary Incomes	International Monetary Fund, Authors' Calculations	$\boldsymbol{REMITS_t}$ **:** Remittances	International Monetary Fund, Authors' Calculations	B5
$\boldsymbol{COEFRW_t}$ **:** Compensation of Employees from the Rest of the World (ROW)	Philippine Statistics Authority	$\boldsymbol{REMITS_t}$ **:** Remittances	International Monetary Fund, Authors' Calculations	B6
		Year dummies for 2021 & 2023		
$\boldsymbol{PGOVREV_t}$: National Government Revenues	Bureau of the Treasury	$\boldsymbol{GDI_t^G}$ **:** General Government: Total Income	Philippine Statistics Authority	B7
$\boldsymbol{PGOVEXP_t}$: National Government Expenses	Bureau of the Treasury	$\left(\boldsymbol{TOTEXP_t^G} + \boldsymbol{CG_t}\right)$ **:** General Government: Total Expenses, General Government Final Consumption Expenditure	Philippine Statistics Authority	B8

PX_t^G : General Government: Property Expenses	Philippine Statistics Authority	$INTPAY_t$: Interest Payments	Bureau of the Treasury	B9
COE_t^H : Households: Compensation of Employees	Philippine Statistics Authority	$COEDOM_t$: Compensation of Employees from Resident Producers	Philippine Statistics Authority	B10
CPI_t : Consumer Price Index, Philippines, 2018=100	Philippine Statistics Authority	PCH_t: Implicit Deflator for Household Final Consumption Expenditure	Philippine Statistics Authority, Authors' Calculations	B11

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APPENDIX: ANIMO Model Variables

The table below lists the variables used as an input to the ANIMO Annual Econometric Model. It summarizes the variable name, the description of the variable, and the section in this paper where each variable is discussed. The sources of basic data for each variable are also listed, with "Authors' Calculations" indicating that we processed the basic data further to obtain a complete and internally consistent series for 2000-2023.

As of the time of writing, there are 471 variables used in the model, excluding dummy variables for specific years. Most variables listed below are endogenous; that is, they are determined within the structure of the model and are part of a series of equations estimated and solved simultaneously. Exogenous variables are highlighted.

Appendix Table 1. ANIMO Model Variables

Variable	Variable Description	Section	Sources
CH	Household Final Consumption Expenditure	Section 2.1	Philippine Statistics Authority
CHF	Household Final Consumption Expenditure: Food & Beverages	Section 2.1.1	Philippine Statistics Authority, Authors' Calculations
$CHNF$	Household Final Consumption Expenditure: Non-Food	Section 2.1.1	Philippine Statistics Authority, Authors' Calculations
CG	Government Final Consumption Expenditure	Section 2.2	Philippine Statistics Authority
GCF	Gross Capital Formation	Section 2.3	Philippine Statistics Authority
$GFCF$	Gross Fixed Capital Formation	Section 2.3	Philippine Statistics Authority, Authors' Calculations
$GFCCN$	Gross Fixed Capital Formation: Construction	Section 2.3	Philippine Statistics Authority, Authors' Calculations
$GFCEQ$	Gross Fixed Capital Formation: Durable Equipment	Section 2.3	Philippine Statistics Authority
INV	Gross Fixed Capital Formation: Changes in Inventories	Section 2.3	Philippine Statistics Authority
$GFCOI$	Gross Fixed Capital Formation: Other Investments	Section 2.3	Philippine Statistics Authority, Authors' Calculations
VAL	Gross Fixed Capital Formation: Valuables	Section 2.3	Philippine Statistics Authority
$EXGS$	Exports of Goods and Services	Section 2.4	Philippine Statistics Authority
$IMGS$	Imports of Goods and Services	Section 2.4	Philippine Statistics Authority
EXG	Exports of Goods	Section 2.4	Philippine Statistics Authority

IMG	Imports of Goods	Section 2.4	Philippine Statistics Authority
EXS	Exports of Services	Section 2.4	Philippine Statistics Authority
IMS	Imports of Services	Section 2.4	Philippine Statistics Authority
EXGAPS	Exports of Goods: Agricultural Products; Fishery Products	Section 2.4.1	Philippine Statistics Authority, Authors' Calculations
EXGMCH	Exports of Goods: Chemicals; Cathodes and Sections of Cathodes; Refined Copper; Metal Components	Section 2.4.1	Philippine Statistics Authority, Authors' Calculations
EXGEMT	Exports of Goods: Electronic Products; Ignition Wiring Sets; Machinery and Transport Equipment	Section 2.4.1	Philippine Statistics Authority, Authors' Calculations
EXGOXS	Exports of Goods: Others	Section 2.4.1	Philippine Statistics Authority, Authors' Calculations
EXSTRA	Exports of Travel	Section 2.4.1	Philippine Statistics Authority
EXSOXS	Exports of Other Services	Section 2.4.1	Philippine Statistics Authority, Authors' Calculations
IMGAFF	Imports: Agriculture	Section 2.4.2	Philippine Statistics Authority, Authors' Calculations
IMGMTL	Imports of Goods: Base Metals; Metal Products; Metalliferous Ores and Metal Scraps	Section 2.4.2	Philippine Statistics Authority, Authors' Calculations
IMGAPS	Imports of Goods: Cereal and Cereal Preparations; Dairy Products; Fruits and Vegetables; Feeding Stuff	Section 2.4.2	Philippine Statistics Authority, Authors' Calculations
IMGCHM	Imports of Goods: Chemical and Chemical Products; Medicinal and Pharmaceutical Products; Plastics in Primary and Non-Primary Forms	Section 2.4.2	Philippine Statistics Authority, Authors' Calculations

$IMGEMG$	Imports of Goods: Electronic Products; Telecommunication and Electrical Machinery; Power-Generating and Specialized Machinery	Section 2.4.2	Philippine Statistics Authority, Authors' Calculations
$IMGIMT$	Imports of Goods: Industrial Machinery and Equipment; Transport Equipment	Section 2.4.2	Philippine Statistics Authority, Authors' Calculations
$IMGIND$	Imports: Industrial Products	Section 2.4.2	Philippine Statistics Authority, Authors' Calculations
$IMGMFU$	Imports of Goods: Mineral Fuels, Lubricants and Related Materials	Section 2.4.2	Philippine Statistics Authority
$IMGOMS$	Imports of Goods: Others	Section 2.4.2	Philippine Statistics Authority, Authors' Calculations
GDP	Gross Domestic Product	Section 2.5	Philippine Statistics Authority
GNI	Gross National Income	Section 2.5	Philippine Statistics Authority
$GNIPCPH$	GNI per Capita of The Philippines in USD	Section 2.5	Philippine Statistics Authority, Authors' Calculations
GVA	Gross Value Added (Total)	Section 3	Philippine Statistics Authority
GVA^{s_i}	Gross Value Added per Sector s_i (16 sectors)	Section 3	Philippine Statistics Authority
GOS	Gross Operating Surplus From Resident Producers	Section 4.1	Philippine Statistics Authority, Authors' Calculations
$COEDOM$	Compensation of Employees From Resident Producers	Section 4.1, Section 7	Philippine Statistics Authority
$NETPI$	Net Property Income	Section 4.1	Philippine Statistics Authority, Authors' Calculations
$COETOT$	Compensation of Employees: Net Inflow from ROW	Section 4.1	Philippine Statistics Authority
$COEFRW$	Compensation of Employees: From ROW	Section 4.1	Philippine Statistics Authority
$COETRW$	Compensation of Employees: To ROW	Section 4.1	Philippine Statistics Authority

SAV	Gross Saving	Section 4.1	Philippine Statistics Authority, Authors' Calculations
NDI	Use of National Disposable Income	Section 4.1	Philippine Statistics Authority
GOS^H	Households: Gross Operating Surplus	Section 4.2	Philippine Statistics Authority
COE^H	Households: Compensation of Employees	Section 4.2	Philippine Statistics Authority
SB^H	Households: Social Benefits Other Than in Kind	Section 4.2	Philippine Statistics Authority
$TAXI^H$	Households: Taxes On Income and Wealth	Section 4.2	Philippine Statistics Authority
SC^H	Households: Social Contributions	Section 4.2	Philippine Statistics Authority
SAV^H	Households: Gross Saving	Section 4.2	Philippine Statistics Authority, Authors' Calculations
$OTHEXP^H$	Households: Other Expenses	Section 4.2	Philippine Statistics Authority, Authors' Calculations
$TOTEXP^H$	Households: Total Expenses	Section 4.2	Philippine Statistics Authority, Authors' Calculations
$OTHINC^H$	Households: Other Income	Section 4.2	Philippine Statistics Authority, Authors' Calculations
GDI^H	Households: Total Income	Section 4.2	Philippine Statistics Authority
NDI^H	Households: Net Disposable Income	Section 4.2	Philippine Statistics Authority, Authors' Calculations
GOS^C	Corporations: Gross Operating Surplus	Section 4.3	Philippine Statistics Authority
$TAXI^C$	Corporations: Current Taxes On Income and Wealth, etc.	Section 4.3	Philippine Statistics Authority
SAV^C	Corporations: Gross Saving	Section 4.3	Philippine Statistics Authority
$OTHEXP^C$	Corporations: Other Expenses	Section 4.3	Philippine Statistics Authority, Authors' Calculations
$TOTEXP^C$	Corporations: Total Expenses	Section 4.3	Philippine Statistics Authority, Authors' Calculations

$OTHINC^C$	Corporations: Other Income	Section 4.3	Philippine Statistics Authority, Authors' Calculations
GDI^C	Corporations: Total Income	Section 4.3	Philippine Statistics Authority, Authors' Calculations
GOS^G	General Government: Gross Operating Surplus	Section 4.4	Philippine Statistics Authority
$TAXOP^G$	General Government: Taxes On Production and On Imports	Section 4.4	Philippine Statistics Authority
$TAXOI^G$	General Government: Current Taxes On Income and Wealth, etc.	Section 4.4	Philippine Statistics Authority
SC^G	General Government: Social Contributions	Section 4.4	Philippine Statistics Authority
PX^G	General Government: Property Expense	Section 4.4	Philippine Statistics Authority
SB^G	General Government: Social Benefits Other Than in Kind	Section 4.4	Philippine Statistics Authority
SUB^G	General Government: Subsidies	Section 4.4	Philippine Statistics Authority
$OCTP^G$	General Government: Other Current Transfers (Use of Income)	Section 4.4	Philippine Statistics Authority
SAV^G	General Government: Gross Saving	Section 4.4	Philippine Statistics Authority, Authors' Calculations
$TOTEXP^G$	Government: Total Expenses	Section 4.4	Philippine Statistics Authority, Authors' Calculations
$OTHINC^G$	Government: Other Income	Section 4.4	Philippine Statistics Authority, Authors' Calculations
NDI^G	General Government: Net Disposable Income	Section 4.4	Philippine Statistics Authority, Authors' Calculations
GDI^G	General Government: Total Income	Section 4.4	Philippine Statistics Authority
GCF^G	General Government Gross Capital Formation	Section 4.5.1	Philippine Statistics Authority, Bangko Sentral ng Pilipinas, Authors' Calculations
$LFTOT$	Labor Force: Total	Section 5.1	Philippine Statistics Authority

LF^{G_i,a_i}	Labor Force by Sex (G_i) and Age (a_i) (G_i : Male, Female ; a_i : 15-24, 25-54, 55-64, 65+)	Section 5.2	Philippine Statistics Authority, International Labour Organization, Authors' Calculations
WP^{G_i,a_i}	Working Age Population by Sex (G_i) and Age (a_i) (G_i : Male, Female ; a_i : 15-24, 25-54, 55-64, 65+)	Section 5.3.2	Philippine Statistics Authority, International Labour Organization, Authors' Calculations
$PR_t^{G_i,a_i}$	Labor Force Participation Rate by Sex (G_i) and Age (a_i) (Male, Female ; 15-24, 25-54, 55-64, 65+)	Section 5.4	Philippine Statistics Authority, International Labour Organization, Authors' Calculations
$POPTOT$	Population: Total	Section 5.5.1	Philippine Statistics Authority, International Labour Organization, Authors' Calculations
EMP	Employees: Total	Section 6.1	Philippine Statistics Authority, Authors' Calculations
EMP^{s_i}	Employees by Sector s_i (16 sectors)	Section 6.2-Section 6.4	Philippine Statistics Authority, Authors' Calculations
$EMPSHARE^{s_i}$	Share in Employment by Sector s_i (16 sectors)	Section 6.5	Philippine Statistics Authority, Authors' Calculations
$UEMPR$	Unemployment Rate	Section 6.6.2	Philippine Statistics Authority, Authors' Calculations
$UNDEMP$	Underemployment Rate	Section 6.6.3	Philippine Statistics Authority, Authors' Calculations
$UNDEMPV$	Underemployment Rate: Visible	Section 6.6.3	Philippine Statistics Authority
PRD^{s_i}	Productivity by Sector s_i (16 sectors)	Section 6.7	Philippine Statistics Authority, Authors' Calculations
$COEDOM^{s_i}$	Annual Compensation of Employees by Sector s_i (Sectoral Wage Bills) (16 sectors)	Section 7.1	Philippine Statistics Authority, International Labour Organization, Authors' Calculations
$ACOEDOM^{s_i}$	Average Annual Compensation of Employees by Sector s_i (Sectoral Wage Rates) (16 sectors)	Section 7.2	Philippine Statistics Authority, International Labour Organization, Authors' Calculations

$SHCAPITAL^{s_i}$	Capital Share by Sector s_i (16 sectors)	Section 8	Philippine Statistics Authority, Authors' Calculations
$SHLABOR^{s_i}$	Labor Share by Sector s_i (16 sectors)	Section 8	Philippine Statistics Authority, Authors' Calculations
CPI	Consumer Price Index, Philippines 2018=100	Section 9.1	Philippine Statistics Authority
INF	Inflation Rate	Section 9.1	Philippine Statistics Authority, Authors' Calculations
P_t^x	Implicit Deflators for Final Demand, Exports, Imports, and GVA	Section 9.2	Philippine Statistics Authority, Authors' Calculations
P^{IMGAFF}	Import Deflators: AFF	Section 10.2	Philippine Statistics Authority, Authors' Calculations
P^{IMGIND}	Import Deflators: IND	Section 10.2	Philippine Statistics Authority, Authors' Calculations
PCI^{s_i}	Domestic Output Price Index of each sector s_i (16 sectors)	Section 10.2	The Organization for Economic Cooperation and Development, Philippine Statistics Authority, Authors' Calculations
$P\_TE^{FD_j}$	Theoretical Final Demand Prices for all Final Demand Components FD_j	Section 10.3	The Organization for Economic Cooperation and Development, Philippine Statistics Authority, Authors' Calculations
$I^{GVA^{s_j}}$	Theoretical Gross Value Added for each sector s_j (16 sectors)	Section 10.4	The Organization for Economic Cooperation and Development, Philippine Statistics Authority, Authors' Calculations
$DEBTST$	Debt Stock	Section 11.1	Bureau of the Treasury
$IMPINTRDEBT$	Implicit Interest Rate on Debt	Section 11.1	Bureau of the Treasury, Authors' Calculations
$INTPAY$	Interest Payments	Section 11.1	Bureau of the Treasury
$CHANGEFA$	Change in Financial Assets	Section 11.1	Bureau of the Treasury, Authors' Calculations
$PGOVEXP$	Government Expenditures	Section 11.1	Bureau of the Treasury
$PGOVREV$	Government Revenues	Section 11.1	Bureau of the Treasury

ASB^G	Average Social Benefits From The Government	Section 11.1	Philippine Statistics' Authority, International Labour Organization, Authors' Calculations
$RETIREES$	Estimated Number of Retirees	Section 11.1	Philippine Statistics' Authority, International Labour Organization, Authors' Calculations
$BSPRATE\_AVE$	Central Bank Policy Rate (Philippines), Annual Average	Section 11.2	Bangko Sentral ng Pilipinas, Authors' Calculations
$TBANK$	Bank Average Lending Rate	Section 11.2	Bangko Sentral ng Pilipinas
$TB10Y$	BoTr 10 Year Government Bonds	Section 11.2	Bangko Sentral ng Pilipinas
$GNIPCSAU$	GNI per Capita of Saudi Arabia in USD	Section 12.1	World Bank
$IGDPW$	World GDP Index (Based on % Change, Constant Prices)	Section 12.1	International Monetary Fund, Authors' Calculations
$FEDRATE\_AVE$	Central Bank Policy Rate: USA, Annual Average	Section 12.2	Bank of International Settlements, Authors' Calculations
$XRUSA$	Exchange Rate: PHP/USD	Section 12.3	Bank of International Settlements
$PWOIL$	Commodity Price Index: Crude Oil (Petroleum), Dated Brent, Light Blend 38 Api (Us$ Per Barrel)	Section 12.4	International Monetary Fund, Authors' Calculations
PX_t^k	Export Price Indices US$ for each country k (9 countries)	Section 12.5.1	World Trade Organization, Authors' Calculations
$PW_{i,t}$	Weighted International Import Price Indices for each Product Group i	Section 12.5.3	World Trade Organization, International Trade Center, Authors' Calculations
$BPGD$	Balance of Payments, Current Account, Goods , Debit, Pesos	Section 13.1	International Monetary Fund, Authors' Calculations
$BPGC$	Balance of Payments, Current Account, Goods, Credit, Pesos	Section 13.1	International Monetary Fund, Authors' Calculations
$BPSC$	Balance of Payments, Current Account, Services, Credit, Pesos	Section 13.1	International Monetary Fund, Authors' Calculations
$BPSD$	Balance of Payments, Current Account, Services, Debit, Pesos	Section 13.1	International Monetary Fund, Authors' Calculations

$CABALANCE$	Current Account Balance	Section 13.1	International Monetary Fund, Authors' Calculations
$CASHARE$	Current Account Balance (Share of GDP %)	Section 13.1	International Monetary Fund, Authors' Calculations
$NETBP$	Net Primary Incomes and Secondary Incomes	Section 13.1	International Monetary Fund, Authors' Calculations
$REMITS$	Remittances	Section 13.2	International Monetary Fund, Authors' Calculations
OFW	Number of Overseas Filipino Workers (From PSA)	Section 13.2	Philippine Statistics Authority
$POVERTY$	Poverty Incidence	Section 14.1	Philippine Statistics Authority, Authors' Calculations

Source: Authors
Notes: Variables treated as **exogenous** by the model are highlighted in green