

# **Behind GDP**

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# Preface

This short guide is intended as a basic reference to understand the basics of National Accounts Main Aggregates (NAMA) and Supply and Use Tables (SUT) and the close interrelationships between the two from a practical point of view. We will omit some technical details and will provide just a practical overview. Both set of accounts describe the production, expenditure and income flows of an economy in a consistent way but using a different approach. We will not deal here with other parts of the National Accounts (sector accounts, financial accounts) although some reference to concepts like sectors and institutional units will need to be made. On the other hand, we will talk about classifications, codes and other practical aspects of the ESA 2010 transmission programme that are necessary for understanding the context and the practical use of the tables.

It is mainly intended with people with some familiarity with National Accounts that want to have a general understanding of the main variables and concepts used in both areas and how they relate to each other.

# 1 Introduction

## 1.1 Basic National Accounts equations

Most books about National Accounts start with the famous three approaches to GDP:

Output: Production ( $P1$ ) *minus* Intermediate consumption ( $P2$ ) *plus* Taxes less subsidies on products ( $D21X31$ ).

$$B1GQ = P1 - P2 + D21X31 = B1G + D21X31 \quad (1.1)$$

Expenditure: Final consumption ( $P3$ ), usually differentiated between private and government consumption, *plus* Investment ( $P5$ ) *plus* Exports ( $P6$ ) *minus* Imports ( $P7$ ).

$$B1GQ = P3 + P5 + P6 - P7 \quad (1.2)$$

Income: Compensation of employees ( $D1$ ) *plus* Gross operating surplus and mixed income ( $B2A3G$ ) *plus* Taxes less subsidies ( $D2X3$ ).

$$B1GQ = D1 + B2A3G + D2X3 \quad (1.3)$$

I will deviate from that approach, which I find slightly confusing, and will start by two different equations.

Equation 1.4 simply states that the total supply of goods and services in an economy are either produced domestically ( $P1$ ) or imported ( $P7$ ).

$$TS = P1 + P7 \quad (1.4)$$

Equation 1.5 shows what we do with the total supply of goods and services. They can be used as intermediate consumption ( $P2$ ) in the production process of other goods and services, consumed ( $P3$ ), used as investment ( $P5$ ) or exported ( $P6$ ).

$$TU = P2 + P3 + P5 + P6 \quad (1.5)$$

Obviously, the total supply has to be equal to the total uses ( $TS = TU$ ) and rearranging then we arrive to something close to a combination of Equation 1.1 and Equation 1.2.

$$P1 - P2 = P3 + P5 + P6 - P7 \quad (1.6)$$

This equation is valid for data measured at *basic prices*. Basic prices exclude Taxes less subsidies on products and trade margins and transport costs. But GDP is measured at *market prices*. All transactions except *P1* are measured at market prices in the equation <sup>1</sup> but *P1* is measured at basic prices, which is the money received by the producer. When I buy a baguette for which I pay 1 euro, we would record a *P3* of 1 euro. The boulangerie would record a production of approximately 0.9 euros. It will not record the VAT as revenue because 0.1 euros will be paid to government as taxes. However, it will record all non-deductible taxes on products<sup>2</sup> as costs (*P2*). That's why we need to add *D21X31* to *P1*, to get an equation consistent with GDP at market prices, in which buyers and sellers prices are on the same valuation.

It is important to note, because many people are confused about this, that *P7* can be used for *P3*, *P5* or *P2*. So please do not make the assumption that a decrease of imports increases GDP. Only in the case that imports are substituted by domestic production, a decrease of imports would increase GDP. In all other cases, it would lead to a decrease in intermediate consumption (which should imply a decrease in production), final consumption or investment and be neutral for GDP.

$$P1 + D21X31 - P2 = B1G + D21X31 = P3 + P5 + P6 + P7 \quad (1.7)$$

We have seen now the origin of Equation 1.1 and Equation 1.2. Now we will look at Equation 1.3. We can start by expanding the value added in Equation 1.1:

$$B1GQ = B1G + D21X31 = (D1 + B2A3G + D29X39) + D21X31 = D1 + B2A3G + D2X3 \quad (1.8)$$

Value added is distributed between labour (*D.1*), capital (*B2A3G*) and taxes less subsidies on production (*D29X39*). We could break down the variables more precisely, especially *B2A3G* to distinguish the cost of capital *P51C* from an (imperfect<sup>3</sup>) proxy of profits (*B2A3N*) but also *D1* into wages and salaries (*D11*) and Social contributions (*D12*).

We could use these equations to look at a production approach that combines the output and income approaches:

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<sup>1</sup>But they can be converted with some effort to basic prices.

<sup>2</sup>In this simplified example I assumed 0.5 euros value added per baguette and a 20% VAT rate. The other 0.1 euros of VAT have been charged to the suppliers of inputs to the boulangerie.

<sup>3</sup>Net operating surplus and mixed income (*B2A3N*) includes the labour remuneration of self-employed and the imputed rents of owner-occupied dwellings.

$$P1 = P2 + D1 + B2A3N + P51C + D29X39$$

Now time to practice these equations with Table 1.1

Table 1.1: Spain 2022, National Accounts aggregates

label	sto	value
Output	P1	2 617 983
Intermediate consumption	P2	1 392 351
Value added, gross	B1G	1 225 632
Gross domestic product at market prices	B1GQ	1 346 377
Taxes less subsidies on products	D21X31	120 745
Compensation of employees	D1	643 047
Wages and salaries	D11	497 275
Social contributions	D12	145 772
Operating surplus and mixed income, gross	B2A3G	571 410
Consumption of fixed capital	P51C	226 116
Operating surplus and mixed income, net	B2A3N	345 294
Other taxes less other subsidies on production	D29X39	11 175
Taxes less subsidies	D2X3	131 920
Final consumption expenditure	P3	1 040 844
Gross capital formation	P5	289 220
Exports of goods and services	P6	550 319
Imports of goods and services	P7	534 006

## 1.2 Codes

In order to work with national accounts we need to invest some time in understanding the coding system. There will be codes starting by *P*, *D* or *B*. *P* will refer to the goods and services transactions, *D* to distributive transactions and *B* to balancing items. A transaction, like *P6*, could be further detailed adding codes (*P61*, *P62*). This can go, specially in distributive transactions, up to the third/fourth digit (*D4432*). Luckily for us, in the goods and services accounts we will only have to learn a few codes up to two digits.

In some occasions, especially for dissemination purposes, the sector is added to the transaction. So *P3\_S13* means final consumption (*P3*) of the government sector (*S13*) when it would make sense to group a particular transaction by sector (*P3* in our case) but it could be done for many more transactions. The sector can also refer to a geographical area (EU, euro area) so we will find codes like *P6\_S212* or in some cases the geographical code is used directly and we will find *P6\_B0*.

## 1.3 Classifications

The NACE (industrial classification of economic activities within the European Union) would be the classification we will use more. There are specific aggregations in National Accounts 10, 21, 38, 64 and 88.

The symmetric classification for products is the CPA (Classification of Products by Activity) and the most common aggregation is 64. I called them symmetric because the NACE and CPA are related. Industries in a particular NACE ( $B$ ) will produce mainly, but not only, products of the counterpart CPA classification ( $CPA\_B$ ). We will see those classifications consistently applied in SUTS but not in NAMA. A particular classification (COICOP) would be used for Household and another one (AN) for GFCF. There are other ones we will not have to use (COFOG, COPNI) but it is recommended to be aware of their existence.

## 1.4 Valuations

Production would be expressed at basic prices, which is the price relevant to the producer. Almost all other transactions will be expressed in purchaser prices, which includes taxes less subsidies on products and trade and transport margins. Exports and imports would be expressed at FOB (Free on Board<sup>4</sup>) in NAMA, which can be assumed to be purchaser prices, as they are the values provided by BOP (Balance of Payments). In SUT imports are expressed at CIF (Cost Insurance Freight<sup>5</sup>) as they are needed by product and therefore provided by FTS (Foreign Trade Statistics<sup>6</sup>). In SUT, several valuation matrix would be needed to put in basic prices the Use table. This step is needed to compile Input Output tables.

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<sup>4</sup><https://www.incotermsexplained.com/the-incoterms-rules/the-eleven-rules-in-brief/free-board/>

<sup>5</sup><https://www.incotermsexplained.com/the-incoterms-rules/the-eleven-rules-in-brief/cost-insurance-freight/>

<sup>6</sup><https://ec.europa.eu/eurostat/documents/3859598/16099239/KS-GQ-22-001-EN-N.pdf/96ccbe2a-a05b-0660-356b-02072c2ada8a?t=1676298298316&download=true>

## 2 Output approach

### 2.1 Production (P1)

Production will be the first transaction we will look into and will be used to illustrate some general characteristics of the NA system.

In NAMA we will compile P1 by economic activity and in the supply table we will compile it additionally by product.

<b>Production</b>				
<b>NACE activities</b>				
<b>CPA products</b>	<b>A01</b>	<b>...</b>	<b>U</b>	<b>TOTAL</b>
<b>CPA_A01</b>				
<b>...</b>				
<b>CPA_U</b>				
<b>TOTAL</b>				

Figure 2.1: Production

NAMA is the bottom row with the industry totals. In SUT, we will have all the cells. However for some industries there will be only values in the diagonal while in others we will find values outside the diagonal. For example, the main output of a vineyard would be wine but they could also offer accommodation services, wine courses, etc.

We will find also in SUT a disaggregation of  $P1$  by economic activity into market output ( $P11$ ), output produced for own final use ( $P12$ ) and non-market output ( $P.13$ ). The relevance will be different depending on the activity.  $P12$  would be important for NACE activities  $L68A$  (*Imputed rents of owner-occupied dwellings*) and  $T$  (*Activities of households as employers*), because they are produced and consumed by households and activity  $M72$  (*Scientific research and development*) because includes own accounts capital formation on R&D.  $P13$  would be most output of NACE  $O$ ,  $P$  and  $Q$ . Additionally it would provide an idea of the amount of output that is calculated as sum of costs in the economy and the importance of the government sectors in different economic activities.



<b>Production</b>				
<b>NACE activities</b>				
<b>CPA products</b>	<b>F</b>	<b>M72</b>	<b>P</b>	<b>TOTAL</b>
<b>CPA_A01</b>				
<b>...</b>				
<b>CPA_U</b>				
<b>TOTAL</b>				
<b>P11</b>				
<b>P12</b>				
<b>P13</b>				

Figure 2.2: Types of Production

## 2.2 Transport and trade margins

Something that we omitted in {#introduction} were transport and trade margins because they do not appear in NAMA. Production in NAMA and the supply table are measured in basic prices. That is the price received by the producer. That would be the price a seller in let's say Amazon receives. That price does not include taxes paid or received for the sale of the product, the cost of sending the product and the margin Amazon gets from the transaction. As later on, we want to put together supply and use we need to find a common valuation. This is easier done transforming basic prices in production to purchaser prices. It can be done transforming purchaser prices in the use table to basic prices but it is much more complex. In the first case, we would only need to add some extra columns while in the second case, complete valuation matrices will be needed.

Negative adjustments will be made in CPAs *G* and *H* (and *D* in a few cases) and positive or null in the other CPA products. But the overall adjustment, the sum of all individual adjustment will be zero and therefore will not have an effect on NAMA.

<b>Production</b>					
<b>NACE activities</b>					
<b>CPA products</b>	<b>A01</b>	<b>...</b>	<b>U</b>	<b>TOTAL</b>	<b>TTM</b>
<b>CPA_A01</b>					$\geq 0$
<b>...</b>					$< 0$
<b>CPA_U</b>					$\geq 0$
<b>TOTAL</b>					0

Figure 2.3: Trade and transport margins

## 2.3 Taxes less subsidies on products (D21X31)

Taxes less subsidies will allow us to evaluate production at market prices and it is only compiled by product and that's why there is no a NACE activity *B1GQ* and appears as a single aggregate in NAMA. Also add21Xing it to *B1G* will give us *B1GQ*. D31 will generally be positive, and quite important for more taxed products (cigarettes, tobacco, petrol) and can be negative for products that are heavily subsidised.

CPA products	Production					
	NACE activities					
	A01	...	U	TOTAL	TTM	D21X3
CPA_A01						
...						
CPA_U						
TOTAL					0	

Figure 2.4: Taxes less subsidies on products