

Lecture 02

2. Measuring Economic Activity and Economic Variables

2.1. Measurement of GDP and its components

Bibliography:

Frank & Bernanke (2011), Chapter 4

Amaral et al. (2007), Cap.1.

Louçã & Caldas (2009), sections 3.1 and 3.2

Learning Goals

After this lecture you should be able to:

- Understand the concepts of Product and Value Added**
- Understand the concepts of Expenditure and Income**
- Relate the three methods for measuring GDP**
- Understand the concepts of investment, national and foreign saving, and the current account**

2. MEASURING ECONOMIC ACTIVITY AND ECONOMIC VARIABLES

2.1.1. Measurement of GDP

- What is the **G**ross **D**omestic **P**roduct (**GDP**)?

The market value of the final goods and services produced in a country during a given period

- Using market values of different goods and services...

...allows economists to aggregate the quantities of many different goods and services.



John Maynard Keynes (1883-1946)

“John Maynard Keynes
& Lydia Lopokova”,
Painting by William
Roberts (1895 – 1980),
National Portrait Gallery,
London



Richard Stone (1913-1991)

Also known as the
“father of national
accounts”

Nobel in Economics
1984

The prices used for the aggregation raise some some problems:

Some services do not have a market price, it is necessary to "create" a price based on production costs.

Examples:

- Imputed rents for owner-occupied housing
- the unpaid part of a medical appointment in a public hospital
- Some public services (like policy, national protection) are not traded in the market so do not have a market value
- The price of a good or service relevant to a buyer can not be the same as for another buyer or for the seller ...

Because there is the effect of indirect taxation.

Related Examples

- Value Added Tax VAT [*in Portuguese: IVA*] is deductible for a firm, but not for a family
- The price of gasoline is higher for buyers than for sellers ISP -Tax on Petroleum Products and Energy [*ISP - Imposto Sobre os Produtos Petrolíferos e energéticos*] ISP -Tax on Petroleum Products and Energy.
- The price ... of transport service can be higher for sellers than for buyers (if there is a subsidy, a subvention).

Net Indirect Taxes

Net Indirect Taxes are the result of the difference between components which are

- Positive (+) the taxes (themselves)
- Negative (-) the subsidies

The total taxes net of subsidies (**TIT**) include 2 types of taxes:

- **net indirect taxes on products (TIP)**
 - VAT (+), ISP (+), transport subsidies (-), etc.
- **net indirect taxes on production (TILP)**
 - IUC (Road Tax) [*Imposto Único de Circulação*] (+), exploration licenses (+), interest subsidy (-), etc.

$$TIT = TIP + TILP$$

The valuation of the aggregates can be made according to three perspectives on indirect taxation:

- the **factor costs** (cf) - considers only the compensation of private factors;
- at **basic prices** (pb) - considers the influence of **indirect taxes and subsidies** that act as fixed costs or revenues **for the producer** ($TILP$);
- at **market prices** (pm) - considers the relevant prices for the end user and includes **indirect taxes and subsidies on products** (TIP).

Final Goods or Final Services

Intermediate Goods or Intermediate Services

Final goods or services:

- Goods or services used by the ultimate user
- They are the end products of the production process
- They are counted as GDP

Intermediate Goods or Intermediate Services:

- Goods or services used up in the production of final goods and services,
- They are **not counted** as part of GDP
- ...(so they are not counted twice) Including the market value of intermediate products would mean '**double counting**'.

Final good



Intermediate
goods

“Many goods and services are subjected to production processes. Example: To make a loaf of bread,

- the farmer grows **wheat** and sells it to the miller for \$0.50,
- the miller grinds the wheat into **flour** and sells to the baker for \$1.20 and
- the baker makes the flour into **bread** and sells it for \$2.00.

The **final good** is the good that is consumed by the consumer: the ‘bread’.

The wheat and flour are ‘**intermediate goods**’, which are goods used in the production of the bread.”

Value-added method for bread



TABLE 1.1 Value added in bread production

COMPANY	REVENUES	–	COST OF PURCHASED INPUTS	=	VALUE ADDED
ABC Grain	\$0.50		\$0.00		\$0.50
General Flour	\$1.20		\$0.50		\$0.70
Hot 'n' Fresh	\$2.00		\$1.20		\$0.80
Total					\$2.00

Source: http://highered.mcgraw-hill.com/sites/0070281580/student_view0/powerpoint_presentations.html

- **Value-added method for GDP**

- Does it for all products/firms: Summing up the value added by each firm in the production process.

Value Added

- Netting out intermediate goods and services is hard to apply practically.
 - Hence, economists determine the market value indirectly
- Added Value [**VAB**] of an productive entity is:
 - The value of production (**Prod**) of that entity deducted from the value of raw materials and intermediate products purchased from other entities (**CI**).
- GDP of a country = sum of the Gross Value Added of all production entities located in the **territory** of that country:

$$GDP_{pm} = \underbrace{Prod - CI}_{VAB_{pb}} + TIP$$

Value Added at basic prices

Produced within a given country:

GDP = Gross **Domestic** Product

- Measures economic activity within a given country
- Example: all value added taking place within Portuguese borders, even if produced in a foreign-owned plant.

During a given period (“flow” variable):

- Normally a year or a quarter.

- **GDP** measures the value of final goods and final services *produced* within an economy
- **GDP** also measures the value of the final goods and final services **used** (purchased) in that economy.

4 types of final users of goods and services

- *Households*
- *Firms*
- *Government*
- *External Sector [Rest of the World]*

What **current** GDP does **not** measure

- Pollution
- Broader Well-being?
- What else?

And how about the purchase of an already constructed house?



Other issues with GDP measurement

- How about activities that do not have a market value?

E.g. housewife/husband work not counted as part of GDP

- How about quality improvements?

“These days it seems that a growing fraction of innovation is not measured at all. In a world where houses are Airbnb hotels and private cars are Uber taxis, where a free software upgrade renews old computers, and Facebook and YouTube bring hours of daily entertainment to hundreds of millions at no price at all, many suspect GDP is becoming an ever more misleading measure.”

(The Economist, April 30th, 2016)

Circular Flow of Income (Households and Firms)

Households supply factors of production to firms



Source: http://highered.mcgraw-hill.com/sites/0070281580/student_view0/powerpoint_presentations.html

CIRCULAR FLOW (dynamic) <http://www.j-bradford-delong.net/multimedia/circular3.html>

Expanded Circular Flow Diagram

Source: Krugman & Wells (2013)

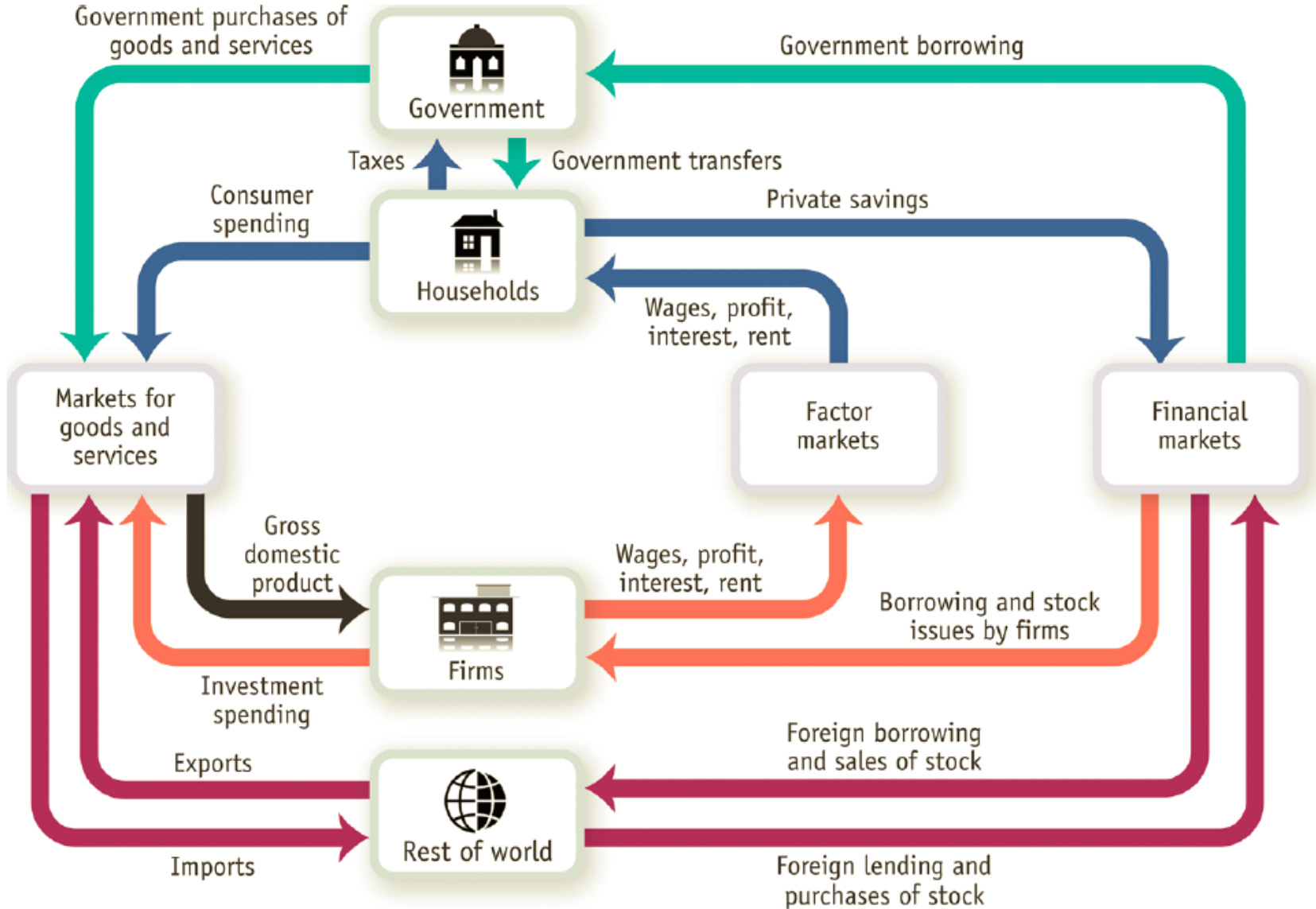


Figure 7.1 An Expanded Circular-Flow Diagram: The Flows of Money Through the Economy
Krugman and Wells: Macroeconomics, Third Edition

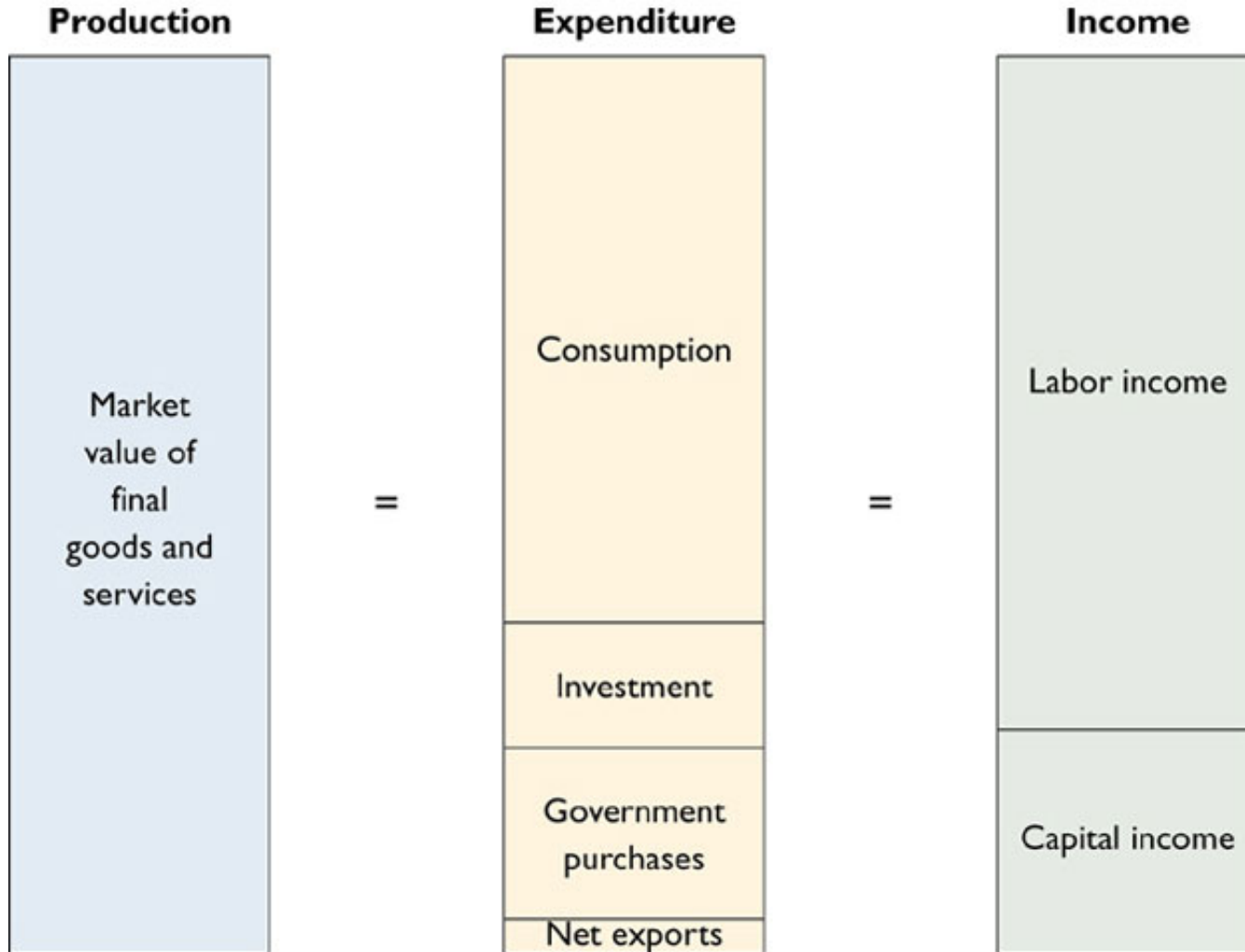
NOTE: Presentation slides do not substitute the BIBLIOGRAPHY

GDP Measuring Equivalently:

- GDP can be measured by 3 ways
- **Method 1: Expenditure approach**
 - Adding up the total amount spent by each of the four groups (final goods and services) in the territory.
- **Method 2: Production approach**
 - Adding up the added values created in the territory.
- **Method 3: Income approach**
 - Adding up the incomes generated by the productive factors or inputs in the territory.

The Three Faces of GDP

Production=Expenditure= Income



2. Aggregate spending on domestically produced final goods and services = \$21,500

2. expenditure

	American Ore, Inc.	American Steel, Inc.	American Motors, Inc.	Total factor income
Value of sales	\$4,200 (ore)	\$9,000 (steel)	\$21,500 (car)	
Intermediate goods	0	4,200 (iron ore)	9,000 (steel)	
Wages	2,000	3,700	10,000	\$15,700
Interest payments	1,000	600	1,000	2,600
Rent	200	300	500	1,000
Profit	1,000	200	1,000	2,200
Total expenditure by firm	4,200	9,000	21,500	
Value added per firm = Value of sales – Cost of intermediate goods	4,200	4,800	12,500	

3. Total payments to factors = \$21,500

3. income

1. Value of production of final goods and services, sum of value added = \$21,500

1. production



Method 1 - Expenditure Approach

Adding up the total amount spent by each of the four groups (final goods and services) and subtracting spending on imports

$$\begin{aligned} \text{GDP} = Y &= \text{Private Consumption ("C")} + \\ &\text{Investment ("I")} + \text{Public Consumption ("G")} + \\ &\text{Exports (X)} - \text{Imports (M)} \\ &= \text{Absorption ("A")} + X - M \end{aligned}$$

Where $A = C+G+I$

Careful: Sometimes C is denoted as Total Consumption (private + public), i.e. C+G!

Private Consumption (C)

Value of goods and services used to satisfy the individual needs of household members (e.g. food, clothing, entertainment)

- Consumption of **durables goods**: cars, furniture, etc.
- Consumption of **non durables goods**: food, clothing, etc.
- Consumption of **services**: haircuts, legal services, education, etc.

Gross Fixed Capital Formation

- **Gross Fixed Capital Formation GFCF** [*FBCF Formação Bruta de Capital Fixo*]

Spending on (new)capital equipment and (new)own housing:

- Gross Fixed Capital Formation of firms:
 - New machinery and new factories.
- Residential Investment:
 - New homes and new apartment buildings
- Gross Fixed Capital Formation of Government
 - Infrastructures, machines and equipment

() Note: some differences from F& B (2009). Reason: US Accounts are different from Portuguese Accounts*

“Investment” **(it isn’t INVESTMENT)**

- In Economics (Macroeconomics)
 - Purchases of stocks or bonds are called ***“financial investments”***, ***which*** does *not* normally mean the creation of new physical capital!

Question: why are investment goods treated the same as final consumer goods for the purposes of counting toward GDP?

Public Consumption ("G" or sometimes also denoted as "CG")

- **Government purchases**

Purchases by state and local governments of final goods and services (excluding equipment)

- Does not include transfer payments (Payments made by the government in return for which no current goods or services are received)
- Does not include interest payments on government debt

Net Exports ($NX = X - M$)

- Net Exports ($X - M$)
 - Equal exports minus imports
- Exports (“X” or “Ex”)
 - Domestically produced goods and services that are sold abroad, whatever its use.
- Imports (“M” or “Im”)
 - Purchases by domestic buyers of goods and services that were produced abroad.

Resources

The Resources (or sources) of the value of goods and services used in the national territory can result from:

- domestic production (*Prod*);
- imported production (*Im*);
- indirect taxes net of subsidies on the two previous (*TIP*);
- *raw materials and finished goods in stock (STi) ...But ... these were already included in VE.*

USES	RESOURCES
<i>IC</i>	<i>Prod</i>
<i>C + G</i>	<i>Im</i>
<i>FBCF(GFCF)</i>	<i>TIP</i>
<i>VE</i>	
<i>ACOV</i>	
<i>Ex</i>	

- From Resources and Uses balance

$$CI + C + G + FBCF + VE + ACOV + Ex = Prod + Im + TIP$$

$$C + G + (FBCF + VE + ACOV) + Ex - Im = Prod - CI + TIP$$

$$\hat{U} \quad C + G + (FBCF + VE + ACOV) + Ex - Im = PIBpm$$

$$C + G + I + Ex - Im = PIBpm$$

Inventory Investment or changes in inventories

VE [*Variação de Existências*]

Inventory Investment (VE) is :

- Difference between the inventory at the end of the period (ST_f) and the beginning of the period (St_i)
- **VE** = $ST_f - ST_i$
- VE is not a *real use / allocation*. St_i is)

ACOV (*Acquisitions by households of valuables (antiques, art objects etc.) excluding concessions are recorded as gross fixed capital formation. ACOV are part of Investment.*)

Investment (I) is: $I = FBCF + VE + ACOV$

Portugal Expenditure Growth (2008-2012)

Table 5.1

GDP AND MAIN EXPENDITURE COMPONENTS		REAL GROWTH RATE, IN PERCENTAGE				
	share of GDP in 2012 (%)	2008	2009	2010	2011	2012
GDP	100	0.0	-2.9	1.9	-1.6	-3.2
Domestic demand	101	0.8	-3.3	1.8	-5.8	-6.8
Private consumption	66	1.3	-2.3	2.5	-3.8	-5.6
Government consumption	18	0.3	4.7	0.1	-4.3	-4.4
Investment	16	-0.1	-13.3	1.4	-13.8	-13.7
GFCF	16	-0.3	-8.6	-3.1	-10.7	-14.5
Stockbuilding ^(a)		0.0	-1.1	0.9	-0.7	0.2
Exports	39	-0.1	-10.9	10.2	7.2	3.3
Imports	39	2.3	-10.0	8.0	-5.9	-6.9
Domestic demand contribution ^(a)		0.9	-3.6	2.0	-6.3	-7.0
Net exports contribution ^(a)		-1.0	0.6	-0.1	4.7	3.9

Source: INE.

Note: (a) Contribute to real GDP growth, in percentage points.

Source: Banco de Portugal (2012) Annual Report, p. 105.)

Link:

<https://www.bportugal.pt/en-US/PublicacoesIntervencoes/Banco/RelatConselhoAdministracao/Pages/default.aspx>

Method 2 – Production Approach

Uses	Resources
<i>IC</i>	<i>Prod</i>
<i>VABbp</i>	

VAB at factor costs (*VABfc*) is the value resultant from the use of productive factors (inputs) in production :

$$VABfc = Prod - IC - TILP$$

without any influence of direct taxation

VAB at base prices (*VABbp*):

$$VABbp = VABfc + TILP = Prod - IC$$

GDP at market prices (*PIBmp*):

$$GDPmp = VABbp + TIP = VABfc + TIT = Prod - IC + TIP$$

Method 3 – Income Approach

USES	RESOURCES
R_p	$VABbp$
$TILP$	
RM	
EE	

R_p = Wages paid by producers for the use of wage labor.

Mixed Income = RM (self-employment). (*Rendimentos Mistos*)

EE = Gross Operating Surplus. (*Excedente Bruto de Exploração*)

$$VABbp = Rp + TILP + RM + EE$$

$$PIBmp = VABbp + TIP = Rp + RM + EE + (TILP + TIP)$$

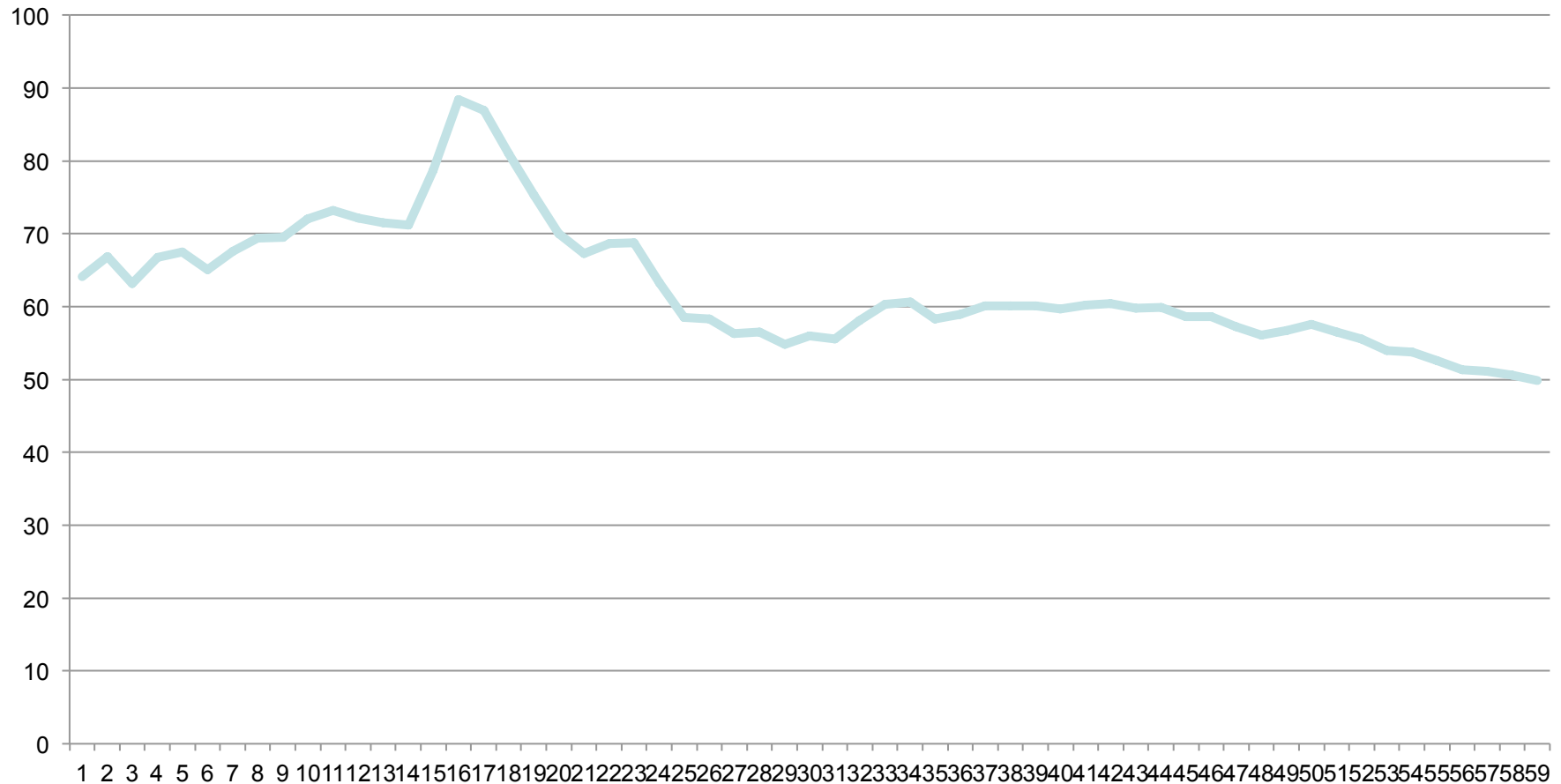
The Gross Domestic Income (GDI) *Rendimento Interno Bruto (RIB)* is given by:

$$GDI[RIB] = Rp + RM + EE + TIT = GDPmp$$

Part of wages in GDP at current prices

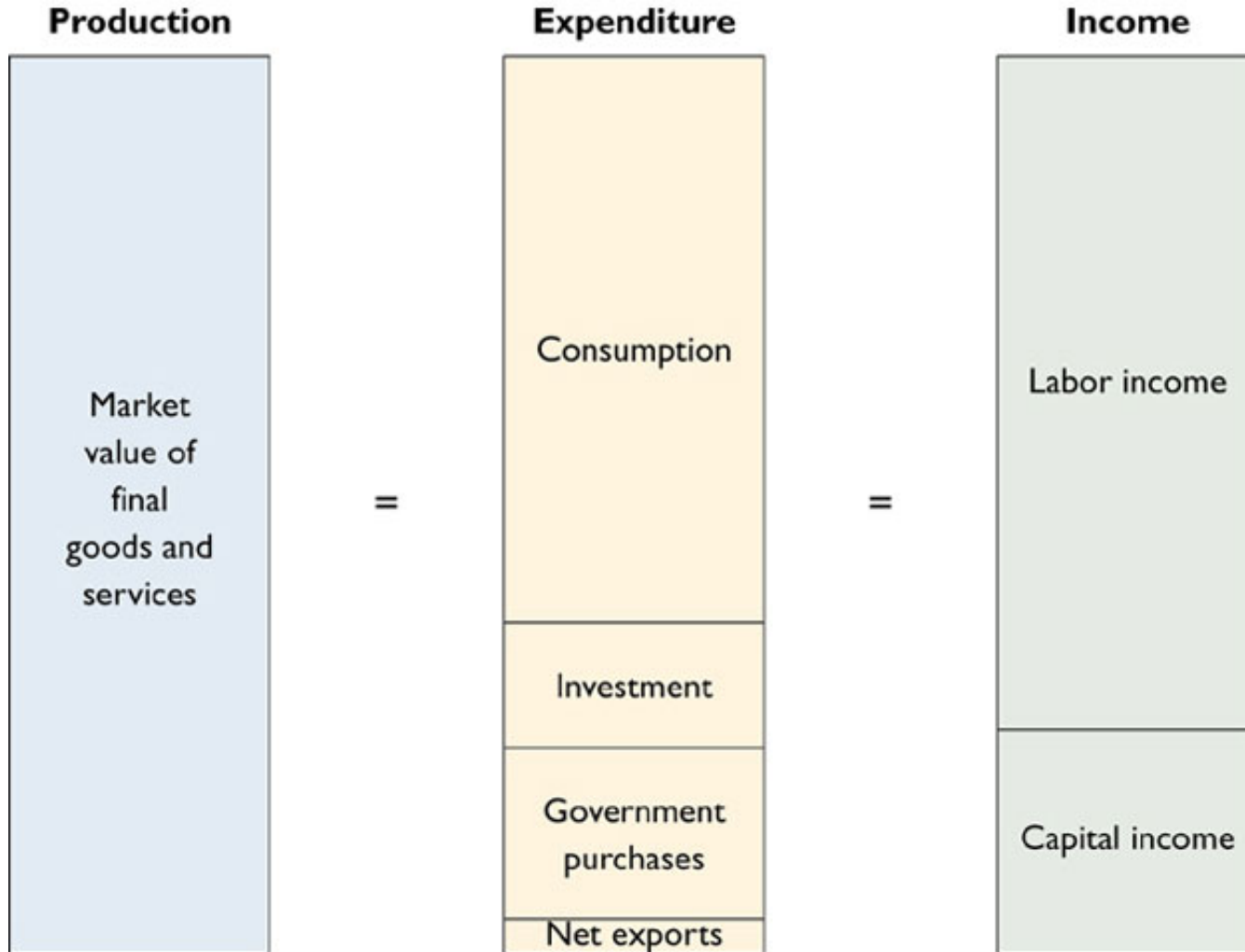


Portugal (1960-2017)



National Accounts Main Identities

$$\text{GNP}_{pm}(\text{Production}) = \text{DI} (\text{Expenditure}) = \text{RIB} (\text{Income})$$



Source: Frank & Bernanke (2011), p.108

Algebraically:

- **Production Approach:** $GDP = \Sigma VA$
- **Expenditure Approach:** $GDP = C + G + I + X - M$
- **Income Approach:** GDP (at market prices) = GDP (at factor cost) + TSP (or $TILP$) = $W + OS + TSP$

W = aggregate wages and other remuneration of employees;

OS = operating surpluses of producing units (includes rent, interest, depreciation and profits); and

TSP or TILP = taxes less subsidies on products (that is, sales taxes and other business taxes paid by enterprises to government, less transfers received by enterprises from government)

Net & Gross Aggregates

An aggregate net (e.g. product) is given by the gross value *minus* Consumption of Fixed Capital (CFC ;Depreciation):

$$NDP_{mp} = GDP_{mp} - CFC$$

Consumption of fixed capital (CFC) is the economic value assigned to equipment depreciation (amortization).

- This is an economic value and not an accounting.
- As it is difficult to obtain reliable statistics of depreciation, ...

the **gross** macroeconomic magnitudes are usually disseminated and used.

Territory or Residence Perspective

Resident economic agent: performs economic activities in the economic territory for an extended period (6 months or more).

Domestic Product: economic value added **within economic territory** by residents and non residents.

National Product: added value in the economic territory and in the rest of the world by resident economic agents.

Rest of the World (ROW)

$RPrrm$ = primary income (compensation of productive factors) received from the rest of the world (received from abroad).

$RPprm$ = primary income (compensation of productive factors) sent to the rest of the world.

$TITrm$ = indirect taxes sent to the rest of the world (EU institutions) net of subsidies received from the rest of the world (EU institutions).

The Gross National Income (GNI) of the residents, is:

$$GNI = GNPmp = GDPmp + \underbrace{(RPrrm - RPprm) - TITrm}$$

Net factor income from abroad (“Yf”)

Rest of the World (cont.)

Net Current **Transfers** (“ TR_f ” or “TL”) from ROW

- Transfer = payment for which nothing is exchanged or due. Include **current (TCL)** and **capital (TKL)** transfers

E.g.: Repatriation of savings by nationals employed as guest workers in foreign countries (a positive inflow for the home country), gifts, remittances of emigrants, relief funds provided by charitable organizations, and economic assistance from foreign governments

Gross National Disposable Income (“GNDI” or “renda nacional disponivel (RND)” in Portuguese)

$$\mathbf{GNDI = GNI + TLC_f}$$

GDP Accounting: Overview

Production	Income	Expenditure ¹
Value added by: Agriculture Industry Services Government Services = GDP (at basic prices) + Taxes less subsidies on products (TSP)	Compensation of employees (W) + Operating surplus of enterprises (OS) (including depreciation) = GDP (at basic prices) + Taxes less subsidies on products (TSP)	Private consumption + General government consumption (CG) + Gross investment (I) + Exports of goods and nonfactor services (X) – Imports of goods and nonfactor services (M) ²
Gross domestic product = GDP (at market prices)	= GDP (at market prices) + Net factor income from abroad (Y_f) = Gross national income (GNI) (at market prices) + Net current transfers (TR_f) = Gross national disposable income (GNDI) at market prices – Depreciation (D) = Net national disposable income (NNDI) (at market prices)	= GDP (at market prices) + Net factor from abroad (Y_f) = GNI (at market prices) + Net current transfers (Tr_f) = GNDI (at market prices) – Depreciation (D) = NNDI (at market prices)

Saving-Investment Balance, the Current Account, and External Financing Capacity

Gross National Saving (“poupanca nacional bruta”):

$$\text{SB} = \text{gross disposable income} - \text{total final consumption} = \text{GNDI} - \underbrace{(\text{C} + \text{G})}_{\text{Total Final Consumption}}$$

Often only denoted as “S”

The Country's Current Account

- Widely used concept in international macro:

$$CA = GNDI - \underbrace{A}_{\text{“absorption” or “domestic demand”}}$$

Recalling that $A = C+G+I$, this yields

$$\begin{aligned} CA &= \overbrace{GNDI - C - G}^S - I = S - I \\ &= X - M + TR_f + Y_f = \Delta NFA \end{aligned}$$

where NFA = Net foreign assets (ignoring valuation changes)⁴⁷

Net External Financing Capacity

- Also important concept in international macro:

$$NCF = - CA + \underline{TKL}$$

“Net (“liquidas”) capital transfers

- If $NCF > 0$ then the country has net financing needs;
- If $NCF < 0$ then the country helps finance ROW
- In particular: if $CA < 0$, the country is a net capital importer

Current Account Balances in the Eurozone (percent of GDP)

