

# Aggregation: The Concept

Lecture 21: From Individual Transactions to the Economy as a Whole

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# Recap: The Macro Panorama

Last lecture we identified the **six big macroeconomic issues**:

 Economic growth & living standards

 Unemployment

 Productivity

 Inflation

 Recessions & expansions

 International interdependence

To study all of these, we need one fundamental tool:

 **Aggregation** — summing up millions of individual decisions into a single economy-wide picture.

# Part I: What is Aggregation?

# The Problem of Scale

In microeconomics, we studied **one consumer, one firm, one market**.

But Portugal has:



~10 million consumers



~1.3 million registered firms



Billions of transactions per year



~8,000 hotels and similar accommodations

We cannot track every transaction. We need a way to **compress** all of this information into a manageable set of numbers.

 That is exactly what **aggregation** does.

# What is Aggregation?

## AGGREGATION

is the process of **summing individual economic variables** — the spending decisions of millions of households, the output of thousands of firms — to obtain **totals for the economy as a whole**.

### Examples:

Individual variable	Aggregate variable
Ana spends €80/month on restaurant meals	Household consumption
Pestana Hotels invests in a new resort	Business investment
Portuguese government builds a new highway	Government expenditure
A Lisbon hotel sells rooms to German tourists	Exports of services

# Why Does Aggregation Work? 🤔

Aggregation works because — even though individuals differ — their **combined behaviour** follows **predictable patterns**.

Think of a **thermometer** 🌡️

You cannot track every molecule of air in this room individually. But the **average kinetic energy** of all molecules gives you a reliable, useful number: **temperature**.

Similarly, we cannot track every euro spent in Portugal. But the **sum of all spending** gives us a reliable number: **GDP**.

💡 **Key insight:**

Individual details get “averaged out”. What remains is the **systematic, predictable** part of economic behaviour — which is exactly what policy needs to respond to.

⚠️ **The cost:** Aggregation hides **distribution** — who gets what.

# The Trade-off of Aggregation

## ✓ What aggregation gives us:

- A manageable picture of the whole economy
- Comparisons across time and countries
- Targets for economic policy
- Early warning indicators (recessions, inflation)

## ⚠ What aggregation hides:

- Inequality: who earns the income?
- Regional differences: Lisbon vs interior Portugal
- Sectoral differences: tourism booming while manufacturing shrinks
- Quality of jobs: full-time vs precarious seasonal work

👉 A country's GDP can grow while most workers see their wages **fall** — if growth is concentrated at the top. Aggregation alone does not tell us this.

# Part II: The Circular Flow of Income

# Economies as a Flow

The best way to understand aggregation is through the **circular flow of income** model.

The

## **CIRCULAR FLOW MODEL**

shows how money, goods, and services continuously flow between the main economic agents — households, firms, the government, and the rest of the world.

We will build it up **step by step**, starting simple and adding complexity.

# Step 1: Two Agents – Households & Firms

In the simplest economy:

## Households

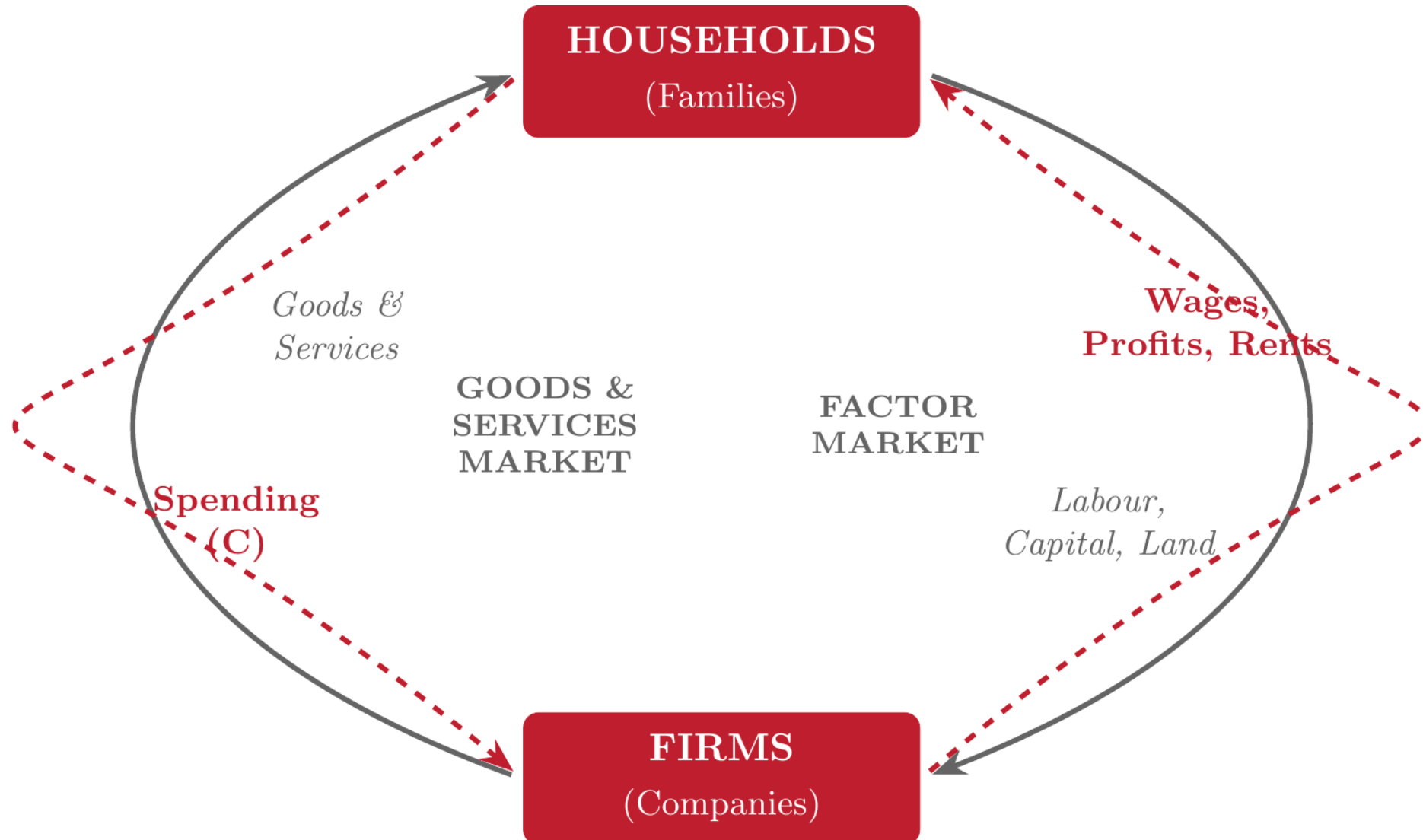
- Own the factors of production (labour, capital, land)
- Sell them to firms → earn **income**
- Spend that income on goods and services → **consumption**

## Firms

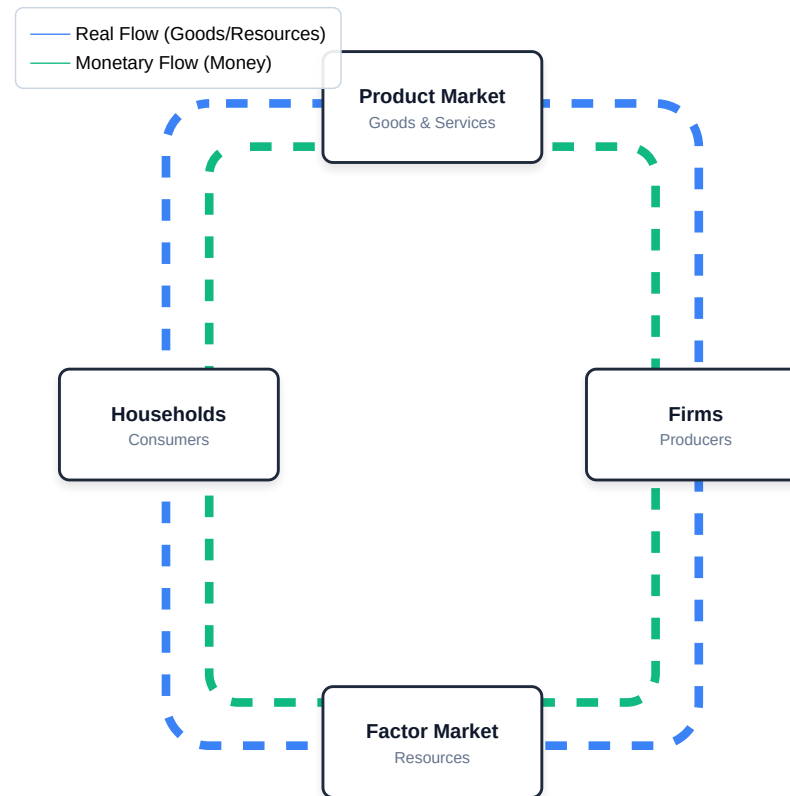
- Buy factors of production → pay **wages, rents, profits**
- Produce goods and services → earn **revenue**

👉 Money flows in a **circle**: from firms to households (as income), and back from households to firms (as spending).

# Step 1: Two Agents – Households & Firms




# The Circular Flow of Income



## Step 2: Adding the Government


In a real economy, the **government** plays a major role:

### Government collects:

 **Taxes** — from households (income tax) and firms (corporate tax)

### Government spends:

 Public services — education, health, infrastructure

 **Transfer payments** — pensions, unemployment benefits (money back to households without a service in return)

### Key implication:

Not all household income is spent on consumption. Some leaks out as **taxes**.

Not all firm revenue stays in the private sector. Government **injects** spending back in.

 The flow is still circular, but the government acts as a **redistribution node**.

## Step 3: Adding the Rest of the World

Real economies also trade with the outside world:

### Exports

Foreigners buy Portuguese goods and services

👉 Money **flows in** to Portugal

For tourism: foreign visitors spending in Portuguese hotels, restaurants, attractions = **export of services**

### Imports

Portuguese households and firms buy foreign goods

👉 Money **flows out** of Portugal

### NET EXPORTS (NX)

$$NX = \text{Exports} - \text{Imports}$$

If  $NX > 0$ : more money flowing **in** than out (trade surplus)

If  $NX < 0$ : more money flowing **out** than in (trade deficit)

Portugal typically runs a **services surplus** (tourism!) but a **goods deficit**.

# The Full Circular Flow

The complete model has **four agents** and **four types of spending**:

Agent	Type of spending	Symbol
Households	Consumption	C
Firms	Investment	I
Government	Government expenditure	G
Rest of world	Net exports	NX

**The fundamental identity:**

$$Y = C + I + G + NX$$

👉 Every euro of output produced in Portugal must be **purchased** by someone — this equation always holds, by definition. This is the **expenditure approach** to GDP (next lecture).

**Leakages vs Injections**

Leakages 	Injections 
Savings (S)	Investment (I)
Taxes (T)	Government spending (G)
Imports (M)	Exports (X)

In equilibrium:

$$S + T + M = I + G + X$$

💡 What leaks out of the circular flow must be matched by injections back in.

# Part III: Aggregating Output — What Counts?

# The Value-Added Principle

When we aggregate output, we face a problem: **double counting**.

**Example — a tourist breakfast in Porto:**

Stage	Seller	Revenue	Cost of inputs	
Wheat farm	Farmer	€0.50	€0	<b>€0.50</b>
Flour mill	Miller	€1.20	€0.50	<b>€0.70</b>
Bakery	Baker	€2.00	€1.20	<b>€0.80</b>
<b>Total GDP contribution</b>				<b>€2.00</b>


👉 We **do not** add  $€0.50 + €1.20 + €2.00 = €3.70$  (that would count the bread three times).

We add only the **value added** at each stage:  $€0.50 + €0.70 + €0.80 = €2.00$ .

# What Gets Included in Aggregation?


## Included:

- Final goods and services (sold to end users)
- Government services (at cost)
- New housing construction
- Changes in business inventories
- Exports of goods and services

 *A German tourist staying at a Lisbon hotel: the room rate is included as an **export of services**.*

## Not included:

- Intermediate goods (used to produce other goods)
- Sales of existing assets (second-hand house sales)
- Financial transactions (buying shares)
- Transfer payments (pensions, subsidies)
- Unpaid work (home cooking, volunteering)

 *Why not second-hand houses? The house was already counted when it was first built.*

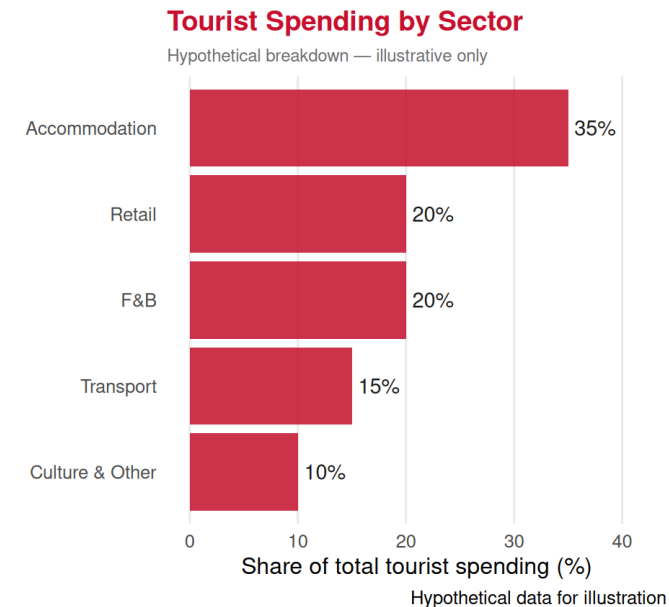
# The Tourism Aggregation Problem

Tourism is a **cross-cutting industry** — it does not have a single production line. This makes aggregation tricky.

When a British tourist spends €1,000 in Portugal:

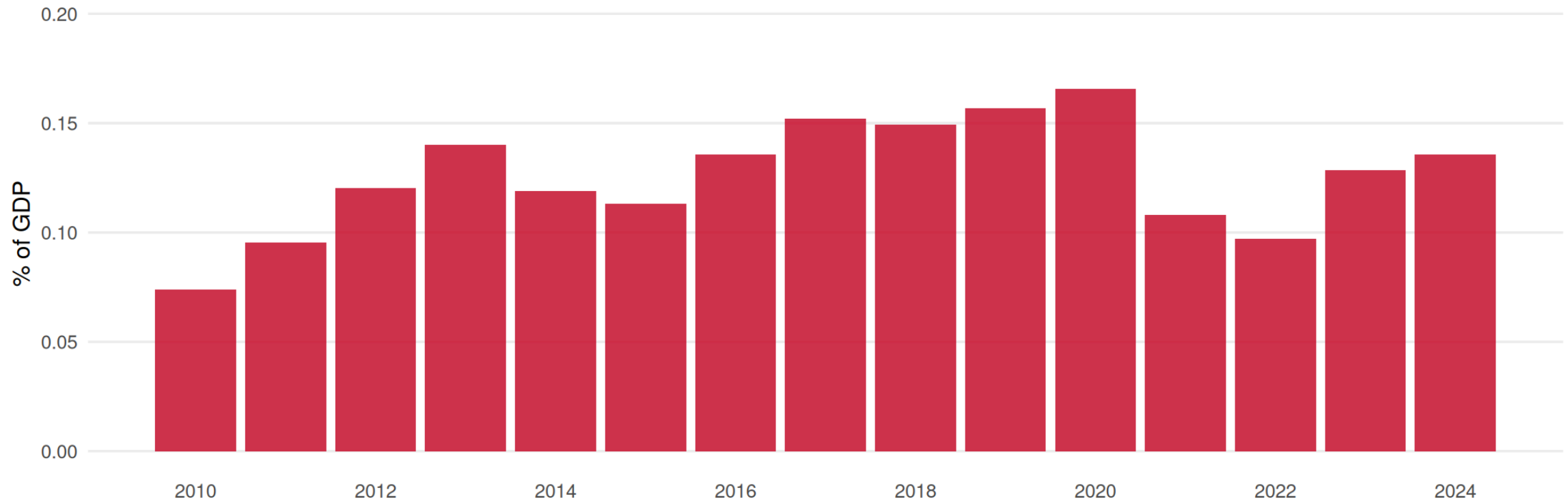
- €350 at hotels 🏠 → counted under **accommodation services**
- €200 at restaurants 🍴 → counted under **food & beverage**
- €150 on transport 🚌 → counted under **transport services**
- €200 on retail 🛒 → counted under **retail trade**
- €100 on cultural attractions 🎨 → counted under **arts & entertainment**

👉 That €1,000 is **spread across multiple sectors** in the national accounts. There is no single “tourism line” in GDP — it must be reconstructed using **Tourism Satellite Accounts (TSA)**.



# Tourism's Share in the Portuguese Economy

## Tourism Receipts as % of GDP — Portugal



Source: Eurostat (bop\_its6\_det, nama\_10\_gdp). Travel receipts from non-EU partners.

👉 Tourism represents a **significant and growing share** of Portugal's GDP — making macroeconomic performance especially important for this industry.

# Part IV: Aggregate Demand and Aggregate Supply

# From Individual to Aggregate Curves

In microeconomics we drew **individual demand** and **supply curves** for single markets.

In macroeconomics we aggregate these into:

## **Aggregate Demand (AD)**

The total demand for all goods and services in an economy at each **price level**.

$$AD = C + I + G + NX$$

Downward sloping: when prices rise, real purchasing power falls, real wealth falls, and exports become less competitive.

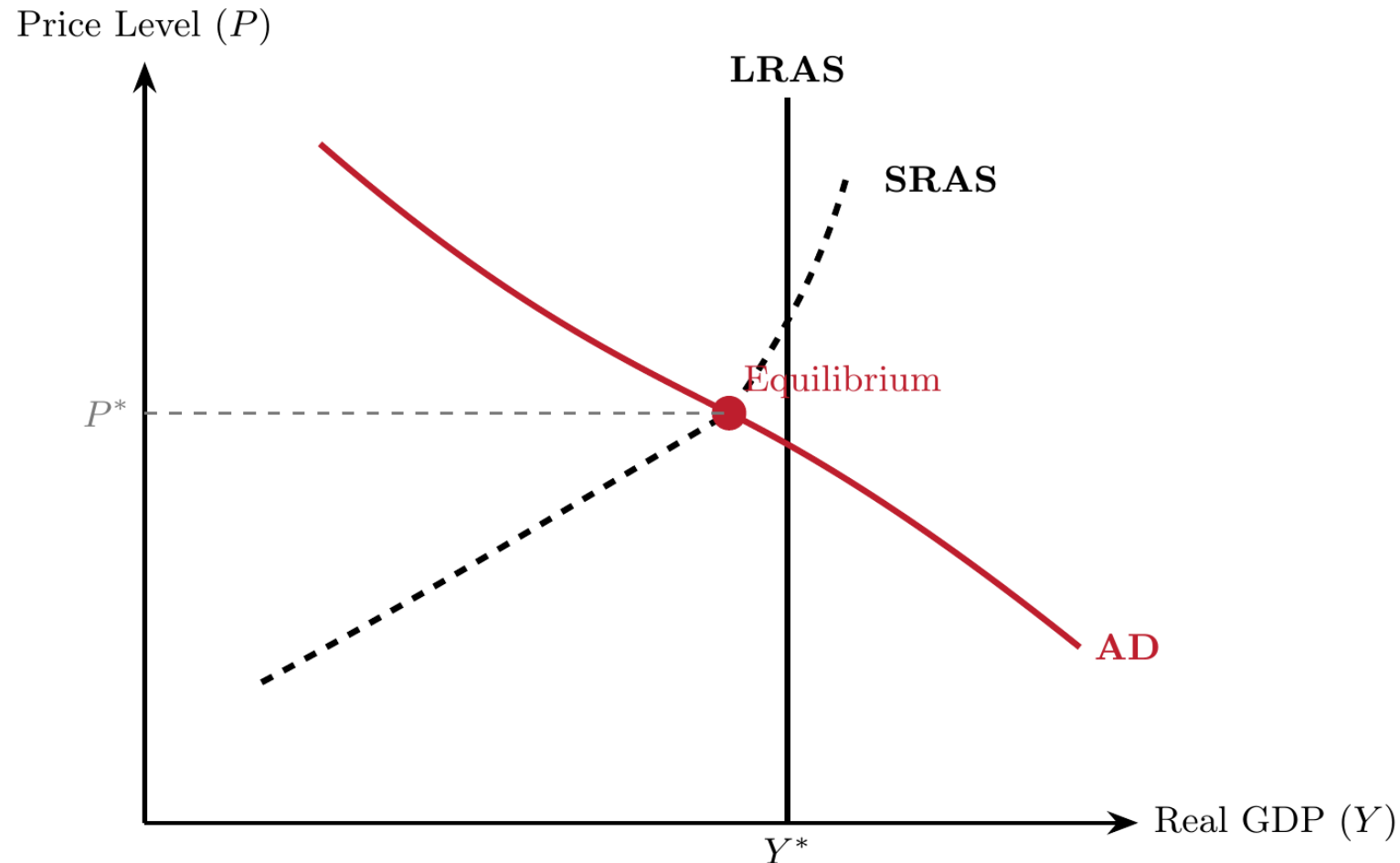
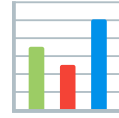
## **Aggregate Supply (AS)**

The total output all firms in an economy are willing to produce at each **price level**.

Upward sloping in the **short run**: higher prices make production more profitable.

Vertical in the **long run**: output is determined by real factors (technology, labour, capital), not prices.

# The AD-AS Model (Preview)



👉 This model gives us the macroeconomic equivalent of the supply-demand diagram we used in microeconomics. We will use it throughout the macro block.

# The Three Approaches to Measuring Aggregate Output

Any economy can be measured from **three equivalent angles** — they always give the same answer:



## Expenditure approach

Add up all **spending** on final goods and services

$$Y = C + I + G + NX$$

*Who buys the output?*



## Income approach

Add up all **incomes** earned in production

$$Y = W + R + \Pi + \text{taxes}$$

*(Wages + Rents + Profits)*

*Who earns from production?*



## Production (value-added) approach

Add up **value added** at each stage of production

$$Y = \sum \text{Value Added}$$

*What is produced?*

 All three approaches measure the **same thing** — total economic activity — just from different perspectives. Next lecture we focus on the expenditure approach: **GDP**.

# Exercises



## Exercise 1 — Multiple Choice

A local tour operator in the Algarve buys sunscreen bottles from a wholesaler for €4 each, and sells them to tourists for €7 each. What is the value added by the tour operator, and how much does this contribute to GDP?

- (A) €7 — the full selling price is GDP
- (B) €4 — only intermediate costs count
- (C) €3 — only the value added by the tour operator counts
- (D) €11 — the sum of all transactions counts

Correct answer: (C).

The tour operator's value added = €7 – €4 = **€3**. GDP counts only value added at each stage to avoid double-counting. The €4 paid to the wholesaler was already (or will be) counted as the wholesaler's value added. Option A double-counts the wholesale stage; D triple-counts it.



## Exercise 2 — Multiple Choice

Which of the following transactions would NOT be included in Portugal's GDP?

- (A) A German tourist pays €150 to stay in a Porto hotel
- (B) The Portuguese government pays €2,000/month in pensions to a retired teacher
- (C) A new Airbus A320 is purchased by TAP Air Portugal for its fleet
- (D) A Portuguese construction company builds 10 new apartments

Correct answer: (B).

Transfer payments (pensions, unemployment benefits) are not included in GDP — they redistribute existing income but do not correspond to new production of goods or services. Option A is an export of services (counted). Option C is investment (counted). Option D is investment in new construction (counted).



## Exercise 3 — Open Question

Consider a simplified tourism economy with three firms:

- **Quinta do Algarve** (wine producer): sells wine to a restaurant for **€60**. Inputs from outside the economy cost **€10**.
- **Restaurante Praia** (restaurant): buys wine for €60 and other ingredients for €20, and sells meals to tourists for **€160**.
- **Hotel Maré** (hotel): builds a new outdoor terrace at a cost of **€500** (inputs purchased from local suppliers for **€300**, rest is labour).

(a) Calculate the **value added** by each firm.

(b) What is the **total contribution to GDP** of these three firms?

(c) To which component of GDP (C, I, G, or NX) does each transaction belong? Justify briefly.

(d) If the meals at Restaurante Praia were purchased exclusively by **foreign tourists**, how would your classification in (c) change?

## Solution:

(a) - Quinta do Algarve:  $€60 - €10 = €50$  - Restaurante Praia:  $€160 - €60 - €20 = €80$  - Hotel Maré:  $€500 - €300 = €200$  (value of new terrace less purchased inputs)

(b) Total GDP contribution =  $€50 + €80 + €200 = €330$

(c) Restaurant meals sold to domestic consumers → **C** (consumption). Hotel terrace construction → **I** (investment, as it is a new capital asset). Wine sold to the restaurant is an intermediate good → **not counted directly** (captured via value added).


(d) If meals are purchased by foreign tourists, they represent an **export of services** → classified under **NX** (net exports), not C. The money flows **into** Portugal from abroad.

# Summary

## Today we covered:

- ✓ **Aggregation** — summing individual variables into economy-wide totals
- ✓ The **circular flow of income** — households, firms, government, and the rest of the world
- ✓ **Leakages** (savings, taxes, imports) and **injections** (investment, government spending, exports)
- ✓ The **value-added principle** — how to avoid double counting
- ✓ What is and is not **included** in aggregate output
- ✓ The **three approaches** to measuring output (expenditure, income, production)

## Next lecture (Lecture 22):

 GDP in depth — the expenditure approach, nominal vs real GDP, and what GDP tells us (and doesn't tell us) about well-being.

**Thank You!** 🙌

**Questions?**

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*Next class: Friday, May 8th, 2026*