

Intermediate Macro [2]

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measurement

• calculating nominal GDP

↳ there are 3 ways to do so:

1st product approach

↳ value of all final goods and services produced

2nd Expenditure approach

↳ spending on all final goods

3rd Income approach

↳ income of all those involved in the production of goods

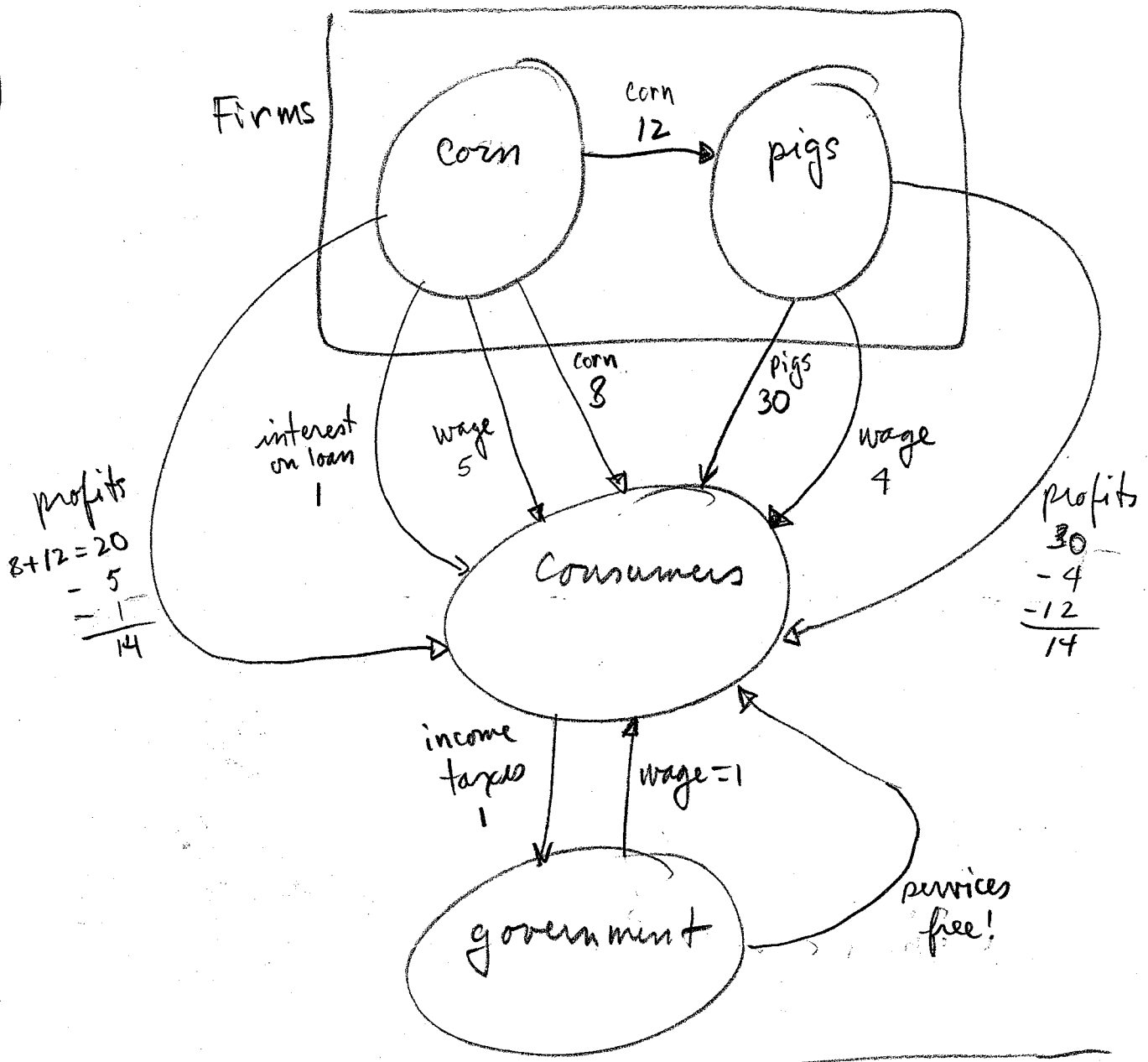
• we will illustrate those approaches through a simple example

→ suppose we have an economy with

• Firms → pig farmer (who consume corn)
→ corn farmer

• Consumers → eat corn and pig
→ work

• government → collect income taxes
→ provide services
(hire workers to do so)



101 product approach

↳ need to use a value-added measure because some goods produced in the economy are used to produce other goods [they are intermediate goods] Those cannot be counted because they are part of the value of final goods [they would be counted twice]

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Value-added GDP = value of all final goods (service)
 - value of all intermediate goods

ex: corn producer \rightarrow no intermediate goods

$$\therefore \text{value} = \text{value-added} = 8 + 12 = 20$$

$$\text{pig farmer} \rightarrow 30 - 12 = 18$$

\uparrow cost of corn

government services \rightarrow free but valued
 at cost by convention
 (i.e. wage = 1)

$$= 1$$

$$\therefore (\text{nominal}) \text{GDP} = 20 + 18 + 1 = 39$$

2^o Expenditure approach

E = total spending on all final goods

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

\downarrow consumption \downarrow investment \rightarrow government spending \rightarrow net export
 $X - M$

\uparrow export \uparrow import

$$\text{here: } \left. \begin{array}{l} I=0 \\ NX=0 \end{array} \right\} \rightarrow \text{GDP} = C + G$$

$$C = 30 + 8 = 38$$

pig corn

$$G = 1$$

$$\therefore E = 39$$

Note: 1^o and 2^o give the same answer.
 why? 1^o is supply, 2^o is demand, and $D = S$

3° Income approach

Y = income of all agents involved in
(national income) production

$$Y = \text{wage} + \text{interest income} + \text{profits}$$
$$Y = W + R + \pi$$

here: $\text{wage} = 5 + 4 + 1 = 10$

$\text{interest} = 1$

$\text{profits} = 14 + 14 = 28$

39 = GDP in 1°

why is national income = GDP?

$\text{profits} = \text{sales} - \text{cost}$

$\pi = \text{GDP} - W - R$

$$\therefore \text{GDP} = \underbrace{\pi + W + R}_{= Y}$$

Summary: 1° GDP = value-added = supply

2° $C + I + G + NX = \text{demand}$

3° $Y = \text{GDP}$

supply = demand \Rightarrow

$$\text{3°} \Rightarrow \boxed{Y = C + I + G + NX}$$

\hookrightarrow ie GDP is also a measure of income

Real GDP

↳ we saw that nominal GDP is the value of all goods produced

ex: economy that produces apples and orange.

	P_t^A	q_t^A	P_t^O	q_t^O
2006	0.5	4	1	3
2007	0.75	4	2	3
2008	0.8	5	1.5	4

$$\begin{aligned} \text{nominal GDP}_{2006} &= P_{2006}^A \cdot q_{2006}^A + P_{2006}^O \cdot q_{2006}^O \\ &= 0.5 \cdot 4 + 1 \cdot 3 = 5 \end{aligned}$$

only P in prices! ↓

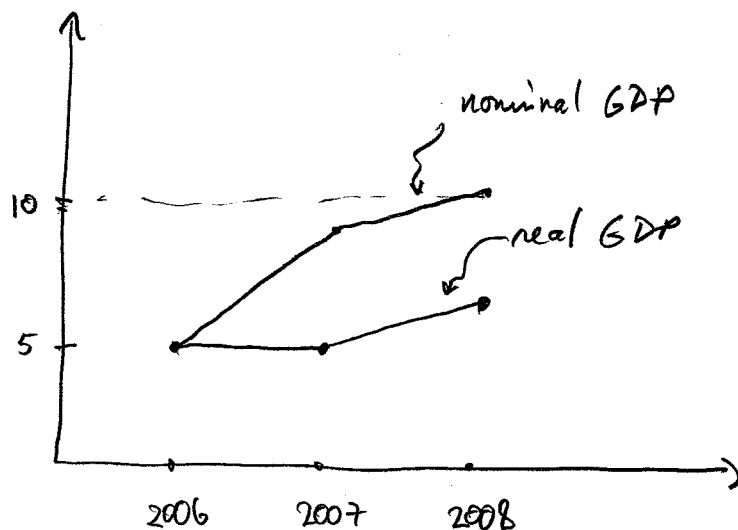
	GDP	Real GDP at 2006 prices
2006	5	5
2007	9	5
2008	10	6.5

called GDP at constant prices

To calculate real GDP, we can choose a base year (say 2006) and use the prices of that year to calculate the GDP of all other years. This way, we have removed the impact of the variation in prices over time (ie: measure of quantity, not value anymore)

ex: real GDP₂₀₀₇ (base year = 2006)

$$\begin{aligned} &= P_{2006}^A \cdot q_{2007}^A + P_{2006}^O \cdot q_{2007}^O \\ &= 0.5 \cdot 4 + 1 \cdot 3 = 5 \end{aligned}$$



(GDP deflator) (implicit)

recall: $\text{real GDP}_t = \frac{\text{nominal GDP}_t}{\text{Price}_t}$ (when there is only one good,

now, we have a measure of real GDP and nominal GDP so we can infer (implicitly) the price level (average) that corresponds to these two [ie: we get a price index]

$$\text{Price}_t = \frac{\text{nominal GDP}_t}{\text{real GDP}_t} \leftarrow \text{this is called the GDP deflator}$$

	nominal GDP	real GDP	implicit GDP deflator
2006	5	5	1
2007	9	5	1.8
2008	10	6.5	~ 1.5

\leftarrow always the case for base year

$\hat{=}$ often multiplied by 100

ie:

100
180
150

GDP vs GNP

ex: GDP = goods produced by firms within Canada

GNP = goods produced by firms owned by
↳ national Canadians [these firms might operate
in the U.S.]

Cost of living

↳ production of firms owned by
U.S. citizens not included

↳ inflation: ↑ in overall level of prices

$$\pi_t = \frac{P_t - P_{t-1}}{P_{t-1}} \times 100 \quad \leftarrow \text{inflation rate}$$

↳ inflation rate: growth rate of prices
(where P_t is a price index)

ex: $P_t = \text{GDP deflator}_t$

$$\therefore \pi_{2007} = \frac{180 - 100}{100} \times 100 = 80\%$$

$$\pi_{2008} = \frac{150 - 180}{100} \times 100 = -30\%$$

↓
deflation

an alternative to using the GDP deflator, as
a measure of overall (average) price, is
the Consumer Price index (CPI)

CPI

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↳ rather than being based on GDP (production) the CPI is based on the typical basket of goods an average consumer usually consumes.

keep quantity fixed over time rather than price (like for real GDP)

The CPI is calculated by comparing the price of a basket of goods to that of the base year.

ex: suppose that a typical consumer consumes 5 apples and 2 oranges (typical basket)

Cost of basket in 2006 $\rightarrow C_{2006}^B = 0.5 \cdot 5 + 1 \cdot 2 = 4.5$

$\nwarrow P_{2006}^A$ $\nwarrow P_{2006}^O$

$$C_{2007}^B = 0.75 \cdot 5 + 2 \cdot 2 = 7.75$$

$$C_{2008}^B = 0.8 \cdot 5 + 1.5 \cdot 2 = 7$$

$$CPI_{2007} = \frac{C_{2007}^B}{C_{2006}^B} = \frac{7.75}{4.5}$$

	CPI
2006	1.0
2007	1.72
2008	1.55

→ gives a different inflation rate than the GDP deflator

Differences with GDP deflator

- based on consumption rather than production
- includes price of imports rather than only domestic
- keeps quantity fixed, not prices