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## 1.1 Measurement of the Economy at the Macro Level

*References:*  
Williamson, Chs. 2.

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## Outline

1. Measurement of GDP
2. Savings, wealth and capital
3. Nominal and real GDP and price indices
4. Labor market measurement

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## Measuring GDP: National Income and Product Accounting (NIPA)

Three (complementary) approaches:

1. Product (or "value-added") approach.
2. Expenditure approach.
3. Income approach.

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## Example

- Fictional Island Economy
- Three types of “economic agents”:
  - Businesses (Coconut Producer, Restaurant)
  - Consumers
  - Government

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## Coconut producer

- Owns all of the trees, hires workers to harvest coconuts
- Current year:
  - 10 MM coconuts sold for \$2 each
  - Paid wages \$5 MM to workers
  - Paid \$0.5 MM interest on loan from consumers
  - Paid \$1.5 MM in taxes

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## Restaurant (Chez Crusoe)

- Buys coconuts, hires workers to prepare meals
- Current year:
  - Revenue of \$30 MM
  - Purchased 6 MM coconuts for \$2 each (*intermediate goods*)
  - Paid \$4 MM to workers
  - Paid \$3 MM in taxes.

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## Government

- Collects taxes, hires workers to provide defense
- Current year:
  - Tax revenue \$5.5 MM
  - Paid wages \$5.5 MM

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## Consumers (worker)

- Supply labor to coconut producer and restaurant, earn interest on loan to the former
- Also *owns* coconut producer and restaurant, and thus receives profit distributions
- Current year:
  - Total wage income \$14.5 MM
  - Total Interest income \$0.5 MM
  - Paid taxes \$1 MM
  - Total profit distributions \$24 MM

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## Product (or “Value-Added”) Approach to Measurement of GDP

- GDP = sum of value-added of each domestic producer.
- Value added is value of output minus value of intermediate inputs.

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## Expenditure Approach to Measurement of GDP

- GDP = sum of spending on final domestic goods and services by economic agents
- Each expenditure is classified as
  - Consumption (C)
  - Investment (I)
  - Government spending (G)
  - Net exports (NX=exports-imports=X-M)
- “Economic agents” include households, businesses, government, and foreigners.

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## Income Approach to Measurement of GDP

- GDP = GDI = sum of income of economic agents earned from domestic production
- “Economic agents” are households, businesses, government, and foreigners.

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## Components of NIPA Income:

- Compensation of employees (wage, salary, benefits)
- Proprietors' income
- Rental income
- Corporate profits
- Net interest income
- Income taxes (“government income”)
- Indirect business taxes
- Depreciation (“consumption of fixed capital”)
- Other taxes subtracted from items above (income taxes)

*The last two items are basically accounting “fixes”; they are subtracted from corporate profits (explicitly or implicitly), so they needed to be added back in!*

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### Details (req'd to do the NIP accounting for a more complex economy)

- Inventories:
  - assigned a market value and
  - Included as product under product approach
  - Included as investment under expenditure approach
  - Counted as if sold in computing firms' profit under income approach
- International trade (export and imports)
- Depreciation

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### Suppose the information about our Coconut producer is changed:

- Owns all of the trees, hires workers to harvest coconuts
- Current year:
  - Produced 13 MM coconuts
  - Sold 10 MM coconuts sold for \$2 each
  - Holds 3 MM coconuts in inventory at the end of the year
  - Paid wages \$5 MM to workers
  - Paid \$0.5 MM interest on loan from consumers
  - Paid \$1.5 MM in taxes

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### GDP in 2005

Component of GDP	\$Billions	% of GDP
GDP	12,455.8	100.0
Consumption	8,742.4	70.2
Durables	1,033.1	8.3
Nondurables	2,539.3	20.4
Services	5,170.0	41.5
Investment	2,057.4	16.5
Fixed Investment	2,036.2	16.3
Nonresidential	1,265.7	10.2
Residential	770.4	6.2
Inventory Investment	21.3	0.2
Net Exports	-613.2	-4.9
Exports	1,303.1	10.5
Imports	2,019.9	16.2
Government Expenditures	2,372.8	19.1
Federal Defense	589.3	4.7
Federal Nondefense	289.0	2.3
State and Local	1,494.4	12.0

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## GNP = GDP + NFP

- NFP = net factor payments from the rest of the world  
(I.e., payments made by foreign producers for labor and capital supplied by domestic residents)
- Sometimes income is more naturally measured as GNP = GNI...
- But (of course) NFP is not income earned *from domestic production*.

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## Savings, Wealth, and Capital

- Flows:  
GDP, GNP, income, saving, consumption, surplus, deficit, ...
- Stocks:  
Wealth, capital, debt, ...
- Investment increases the domestic capital stock (means of production).
- Saving increases wealth.

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## Savings, Wealth, and Capital

- *Investment* is allocation of *production* to increase the domestic capital stock.
  - Increases capacity for production in the future.
- *Saving* is allocation of *income* to increase wealth.

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### Private Disposable Income ( $Y^d$ ) and Private Saving ( $S^p$ )

- "What the private sector has available to spend":  

$$Y^d = Y + NFP + TR + INT - T$$

where

- TR is transfers from the gov't
- INT is interest payments from the gov't
- T is taxes paid.

- $Y^d$  is allocated to (private) consumption and private saving:  

$$Y^d = S^p + C$$

or

$$S^p = Y^d - C$$


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### Government Income and Government Saving ( $S^g$ )

- Income of the government is allocated to *government saving* and government spending:  

$$T - TR - INT = S^g + G$$

or

$$S^g = T - TR - INT - G$$

- This is just the gov't surplus or negative of the *deficit*.  

$$D = -S^g$$

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### National Saving ( $S$ )

- National saving is GNP minus consumption minus gov't spending  

$$S = S^p + S^g$$

$$= Y + NFP - C - G$$
- Using  $Y = C + I + G + NX$ , we have '  

$$S = I + NX + NFP$$
- Defining the current account surplus:  

$$S = I + CA$$

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## Measuring Real GDP

- Allows us to compare GDP in two different years (correcting for price changes)
- *Two approaches* to calculation:
  1. Use prices in some base year.
  2. Use a chain-weighting scheme.

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## Measuring Real GDP: Base year approach:

Compare GDP *quantities* in each year evaluated at a fixed set of prices (from some base year).

	Apples	Oranges
Quantity in Year 1	$Q_1^A = 50$	$Q_1^O = 100$
Price in Year 1	$P_1^A = \$1.00$	$P_1^O = \$0.80$
Quantity in Year 2	$Q_2^A = 80$	$Q_2^O = 120$
Price in Year 2	$P_2^A = \$1.25$	$P_2^O = \$1.60$

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## Measuring Real GDP: Chain-weighting approach

- For two adjacent periods, measure real GDP growth factor both ways and use the geometric average.

	Apples	Oranges
Quantity in Year 1	$Q_1^A = 50$	$Q_1^O = 100$
Price in Year 1	$P_1^A = \$1.00$	$P_1^O = \$0.80$
Quantity in Year 2	$Q_2^A = 80$	$Q_2^O = 120$
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## Measurement of the Price Level

Two approaches:

1. Implicit price deflator  
(Construct the index implied by measure of RGDP)
2. Explicit price index;  
e.g., Consumer Price Index (CPI).  
(based on a fixed basket of goods)

*Note that P is generally normalized to = 100 in some "base-year".*

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## Two Measures of the Price Level

Source: The U.S. Department of Commerce and the Bureau of Labor Statistics.

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## Measurement in the Labor Market

- Everyone is
  1. Employed;
  2. Unemployed (but seeking work); or
  3. Not in the labor force.
- Unemployment rate:
 
$$U = \frac{\text{\#unemp}}{\text{labor force}}$$

$$= \frac{\text{\#unemp}}{(\text{\#emp} + \text{\#unemp})}$$
- Participation rate:
 
$$PR = \frac{\text{labor force}}{\text{Working age population}}$$

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