Week 4: Output, Business Cycles, Growth & Employment

Md. Nazmul Ahsan

Department of Economics
Concordia University

mdnazmul.ahsan@concordia.ca

Economics 203: Introduction to Macroeconomics

This Chapter explains:

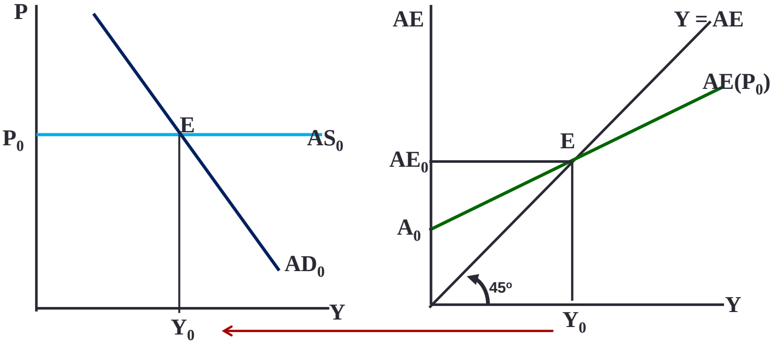
1. Short run aggregate demand & output (real GDP)
2. Aggregate expenditure
3. Aggregate expenditure & equilibrium real GDP
4. The multiplier
5. Equilibrium output (real GDP) & aggregate demand

Short run Aggregate Demand and Output

Assume:

- No government sector
- All prices & wages are fixed
- Business produces output demanded
- Labour accepts opportunities to work
- Money supply, interest rates & foreign exchange rates are fixed

AE, AD, & Output with Constant Prices



The equality Y = AE determines the ***position of the AD*** curve to give planned expenditure = output at $\mathbf{P_0Y_0}$

At **E** current output $\mathbf{Y_0}$ is equal to **planned expenditure $\mathbf{AE_0}$= output**

Aggregate Expenditure (AE)

AE is ***planned* aggregate expenditure**

Components of AE:

- From National Accounts (without govt):

$$\mathbf{AE \equiv C + I + X - IM}$$

- **With P constant:**

$$(\mathbf{Y = AE}) \rightarrow \text{equilibrium real GDP}$$

Aggregate Expenditure (AE)

- **Two key components of aggregate expenditure:**
  - **Induced expenditure**
  - **Autonomous expenditure**

- **Induced Expenditure ≡** *planned expenditure* determined by current income (Y)
  - **AE = F(Y,…..)**, AE is a function of Y
  - **ΔAE/ΔY:** a change in Y ***causes*** a change in AE

Induced Expenditures

1. Part of **household consumption expenditure (C)**

   $\Delta C/\Delta Y \equiv$ marginal propensity to consume (**mpc = c**)

$$\mathbf{0 < \Delta C/\Delta Y < 1}$$

2. Part of **household expenditure on imports (IM)**

   $\Delta IM/\Delta Y \equiv$ marginal propensity to import (**mpm = m**)

$$\mathbf{0 < \Delta IM/\Delta Y < 1}$$

Induced Expenditures:

Relationship between GDP, Consumption, Imports & Expenditure

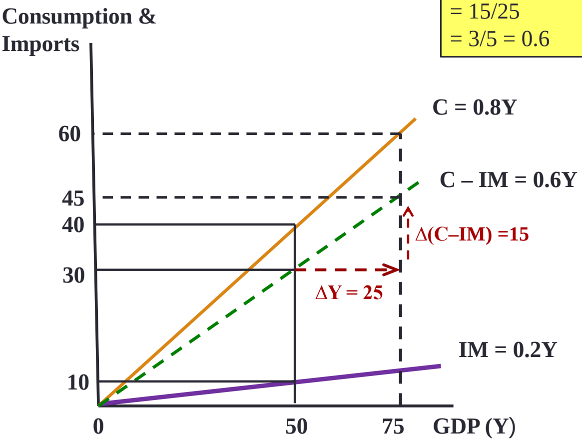
Assume C = 0.8Y, IM = 0.2Y

Y	Induced C $= \Delta C / \Delta Y$	Induced IM $= \Delta IM / \Delta Y$	Induced Expenditure $= (\Delta C - \Delta IM) / \Delta Y$
0	0	0	0
50	40	10	30
100	80	20	60
75	60	15	45

- Changes in Y ***induce*** changes in expenditure in the same direction but of smaller size

Induced Expenditures

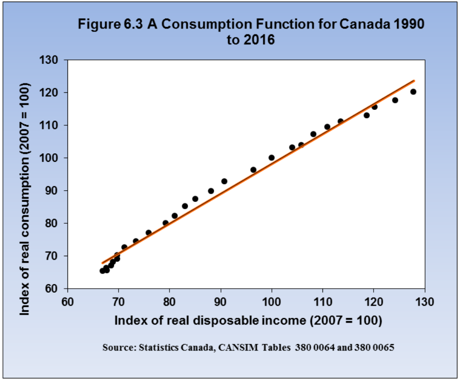
Slope (C – IM)
= Δ(C-IM)/ΔY
= 15/25
= 3/5 = 0.6



The numerical example illustrated in a diagram

Induced Expenditures

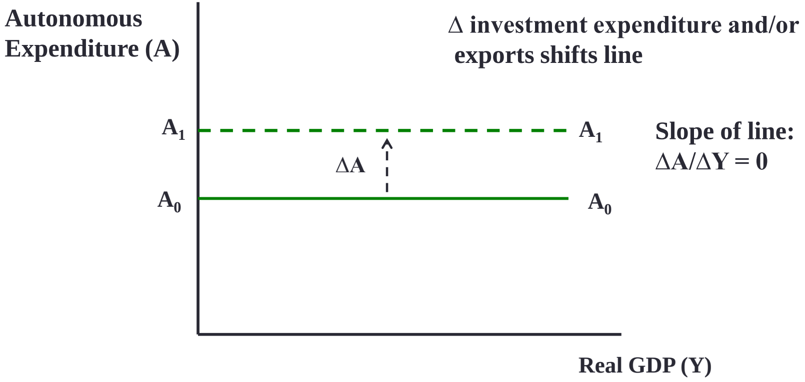
- Consumption expenditure is the largest and most stable part of induced expenditure
- Consumption vs Income in Canada



Slope = ΔC/ΔYD =0.9

Autonomous Expenditures

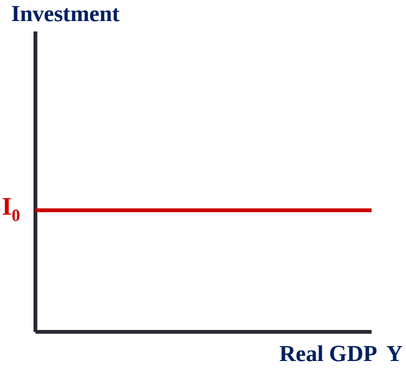
Autonomous Expenditure (A) ≡ *planned expenditure* **NOT** determined by current income (Y)



Autonomous Expenditures

Investment Expenditure

- Investment (**I**) ≡ *planned* business spending on plant, equipment & inventories
- Investment is ***autonomous***,
- Based on business expectations of demand for output & profit
- Δi &/or ΔExpectations → shift **I** function vertically.

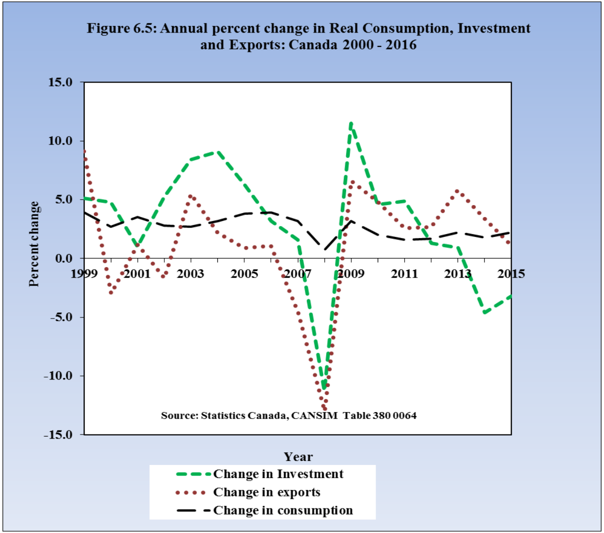


Autonomous Expenditures

Exports expenditure

- Exports ≡ spending by residents of foreign countries on domestic output
- Exports are autonomous expenditure: $\mathbf{X = X_0}$
- **X depends on: foreign Y,**
  domestic & foreign P
  foreign exchange rates
  tastes and preferences
  etc.

Volatility of AE Components



- Consumption is the largest & most stable part of AE
- Investment & exports are volatile parts of AE

The Aggregate Expenditure Function

Aggregate expenditure (AE) ≡ the sum of *planned autonomous* & *planned induced* expenditure

Planned autonomous expenditure = A_0

Planned induced expenditure = $(c - m)Y$

Then $\mathbf{AE = A_0 + (c - m)Y}$

Suppose: $\mathbf{A_0 = 100}$ **and** $\mathbf{(c - m)Y = 0.5Y}$

$$\mathbf{AE = 100 + 0.5Y}$$

The Aggregate Expenditure Function

A numerical example: AE = 100 + 0.5Y

GDP (Y)	Autonomous Expenditure (A_0 = 100)	Induced Expenditure (c – m)Y = 0.5Y	Aggregate Expenditure (AE) = 100 +0.5Y
0	100	0	100
50	100	25	125
100	100	50	150
175	100	87.5	187.5
200	100	100	200
150	100	75	175

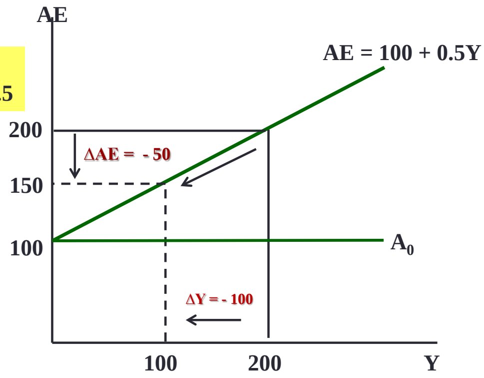
The Aggregate Expenditure Function

The numerical example in a diagram:

$$AE = 100 + 0.5Y$$

$\Delta Y \rightarrow \Delta AE$

Slope of AE:
$\Delta AE/\Delta Y = -50/-100 = 0.5$



Aggregate Expenditure and Equilibrium Output

Short-run equilibrium output:

- Aggregate expenditure current output are equal (Y = AE).
- **$Y = AE = A_0 + (c - m)Y$**
- Current output = ***planned*** expenditure on current output
- Business revenues cover costs & expected profit
- **No unplanned Δ inventories**

Equilibrium Output: the 45º Diagram

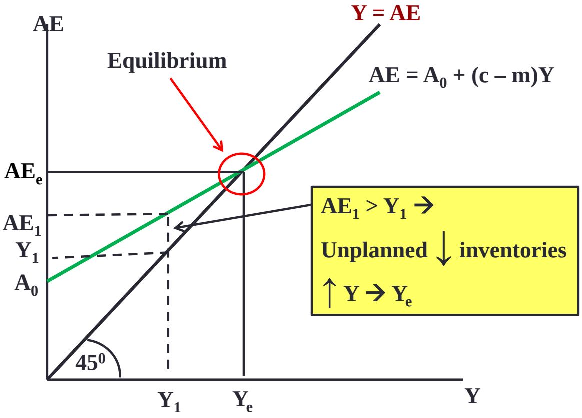
Equil: Y = AE

45^0 line plots all
Y = AE

$AE = A_0 + (c - m)Y$

At intersection
AE & 45^0 line
Y = AE

$Y \neq Y_e$ → unwanted
Δ inventories → ΔY



Equilibrium Output: a numerical example

GDP (Y) (1)	Autonomous Expenditure ($A_0 = 100$) (2)	Induced Expenditure $(c - m)Y = 0.5Y$ (3)	Aggregate Expenditure (AE) = 100 + 0.5Y (4)	Unplanned Δ Inventory (Y – AE) (5)
0	100	0	100	– 100
50	100	25	125	– 75
100	100	50	150	– 50
175	100	87.5	187.5	– 12.5
200	100	100	200	0
250	100	125	225	+ 25
300	100	150	250	+ 50

- **Equilibrium Y =200. Business sector output is just equal to aggregate expenditure.**
- **At Y = 200 business sector just recovers costs of production including expected profit. There is no *unplanned* change in inventories.**

Equilibrium Output:

Adjusting to short-run dis-equilibrium Y:

Suppose $Y \neq AE$ → *Unplanned Δ inventories*

- **Y > AE** → unplanned increase in inventories → ↓**Y** → Y_e
- **Y < AE** → unplanned decrease inventories →↑ **Y** → Y_e

- **ΔY → equilibrium with $Y_e = AE$**

Equilibrium Output and Employment

- **In equilibrium Y_e = AE**

- **However if:**
- **($Y_e < Y_P$)** ≡ ***Recessionary gap*** & **high** unemployment

- **($Y_e > Y_P$)** ≡ ***Inflationary gap*** & **low** unemployment

- **($Y_e = Y_P$)** ≡ ***'full employment'***

- ***Fluctuations in Y cause fluctuations in employment and unemployment rates***

The Multiplier

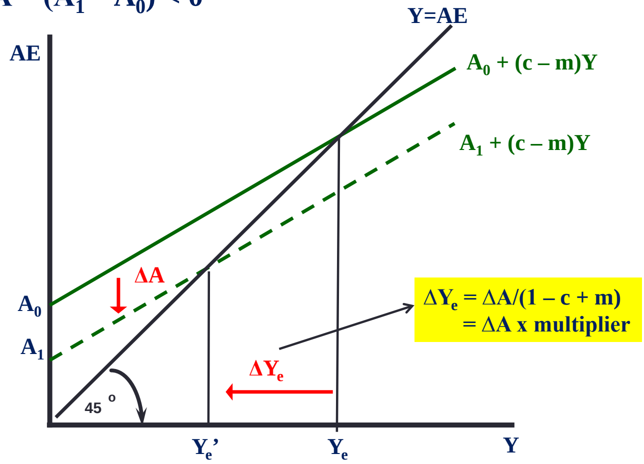
Changes in Y_e are caused by ΔA

The Multiplier is a number ≡ *ΔY_e/(ΔA that caused it)*

- $\Delta A \rightarrow$ parallel *vertical* ***shift*** **in AE**
- $\Delta A \rightarrow \Delta Y \rightarrow$ ***induced*** $\Delta AE = (c - m)\Delta Y$
- $\Delta Y = \Delta A + (c - m)\Delta Y$
- **Multiplier** $\Delta Y/\Delta A = \dfrac{1}{1-(c-m)} = \dfrac{1}{1-(\text{slope of AE})}$

The Multiplier: $\Delta Y_e / \Delta A$

Example $\Delta A = (A_1 - A_0) < 0$



The Multiplier:

A Numerical example:

Base Case:

- **Autonomous expenditure: $A_0 = 100$**
- **Induced expenditure: $(c - m)Y = 0.75Y$**

Then numerically AE at different levels of Y is:

Y	$A_0 = 100$	$0.75Y$	$AE_0 = 100 + 0.75Y$
100	100	75	175
200	100	150	250
400	100	300	400

Equilibrium $Y_0 = AE_0 = 400$

continued……

The Multiplier:

The Numerical example continued:

Case 2: Oil producers cut investment spending by 25 as oil price falls:

$\Delta A = -25$

- **Autonomous expenditure:** $A_1 = \ = 75$
- **Induced expenditure:** $(c - m)Y = 0.75Y$

Then numerically AE at different levels of Y is:

Y	$A_1 = 75$	0.75Y	$AE_1 = 75 + 0.75Y$
100	75	75	150
200	75	150	225
300	75	225	300
400	75	300	375

Equilibrium $Y_1 = AE_1 = 300$

The Multiplier:

The Numerical example summarized:

Base case A_0 = 100, Induced expend = 0.75Y
Equil Y_0 = 400

Then $\Delta A = \Delta I = -25 \rightarrow A_1 = 75$
Equil Y_1 = 300

Multiplier = $\Delta Y / \Delta A$
= -100/-25
= 4

Multiplier = 1/(1-slope AE)
= 1/(1 – 0.75)
= 1/0.25
= 4

Multiplier as a forecasting tool predicts effect of ΔA on Y_e

The Multiplier

In basic algebra: Effect of a $\Delta A > 0$ on Y_e

Base case

$A_0 = 90$

Induced expenditure = 0.6Y

Equilibrium:
$$Y = A_0 + 0.6Y$$
$$Y = 90 + 0.6Y$$
$$Y = 90/(1 - 0.6)$$
$$Y = 90 \times 2.5$$
$$Y_e = 225$$

Case 2: $\Delta A = \Delta I = 20$

$A_1 = 110$

$\Delta AE/\Delta Y = 0.6$

$$Y = A_1 + 0.6Y$$
$$Y = 110 + 0.6Y$$
$$Y = 110/(1 - 0.6)$$
$$Y = 110 \times 2.5$$
$$Y_e = 275$$

Multiplier defined as the predictor of $\Delta Y/\Delta A$

$$\Delta Y/\Delta A = 50/20 = 2.5 = 1/(1 - 0.6) = 1/(1 - \text{slope AE})$$

Equilibrium Output & Aggregate Demand

Key model concepts:

Autonomous expenditure:

- *Independent of current income*

Induced expenditure:

- *Spending decisions based on current income*
- MPC & MPM → **$(c - m)Y$, $0 < (\Delta AE/\Delta Y) < 1$**

Equilibrium Output & Aggregate Demand

Key model concepts:

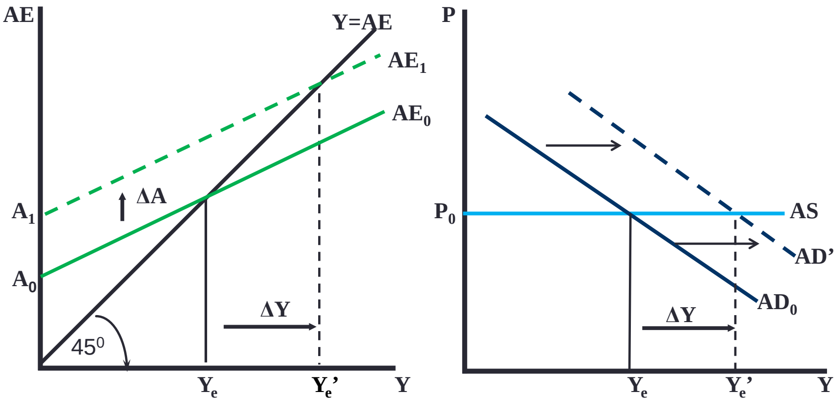
- **Equilibrium Y** = A_0 x multiplier
- **Induced expenditure** → multiplier
- **ΔA x multiplier** → ΔY > ΔA
- **Volatility in A** → Business cycles in Y

Equilibrium Output & Aggregate Demand

The AD function:

- Y_e from Y = AE *positions* the AD curve
- $\Delta A \rightarrow \Delta Y_e \rightarrow$ *horizontal shift in AD* = ΔA x multiplier
- Fluctuations in AD from fluctuations in A $\rightarrow$
  business cycles in Y_e
- A diagram to illustrate

Aggregate Expenditure, Equilibrium Output & Aggregate Demand



- $\Delta A \rightarrow \Delta Y = \Delta A$ x multiplier $\rightarrow$ shift AD = ΔA x multiplier

Chapter Summary

- ***Aggregate demand*** determines Y at constant P
- Equilibrium ***Y = AE positions*** **AD**
- ***AE ≡ planned aggregate expenditure***
- **AE** = ***autonomous*** expenditure + ***induced*** expenditure
- **Autonomous** expenditure is independent of current Y:
  $$\Delta A/\Delta Y = 0$$
- **Induced** expenditure (c – m)Y is determined by Y:
  $$0 < (c - m) < 1$$

Chapter Summary

- **Equilibrium Y = AE**
- **AE > Y** → ***unplanned fall*** *in inventories* → ↑ Y
- **AE < Y** → ***unplanned rise*** *in inventories* → ↓ Y
- The **multiplier** $\equiv \Delta Y_e/\Delta A = 1/(1 - \text{slope } AE)$
- ***ΔA → ΔY → shift AD*** → ΔY_e in AD/AS
- ΔA → ΔAD → ***business cycles*** in Y

Copyright