Chapter 22

Adding Government and Trade to the Simple Macro Model

Introducing Government

Government is and important variable in the economy.

Fiscal Policy:

- government expenditures or purchases
- taxation

Government Spending

- G is part of desired AE

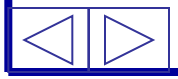
Transfer payments: e.g. pensions

- **not** government purchases
- only a flow of funds from gov't to HH
- affects disposable income and HH spending

Tax Revenues

Net taxes, T:

- total tax revenue minus total transfer payments



Tax rates are autonomous policy variables,
but revenues vary with GDP:

$$T = tY$$

where **t = marginal propensity to tax.**

Note: t includes all taxes,
so when Y rises by $1, tax revenues rise by
t x $1.

The Budget Balance: [T – G]

G is autonomous

Tax rates are induced

- **[T – G]** revenue minus expenditures

If **T > G** - **budget surplus**

If **T < G** - **budget deficit**

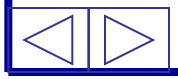
As **Y** increases, **T** rises

- tax revenues rise
- transfers payments fall

Provincial and Municipal Governments

• **G** includes all levels of government in desired AE in public saving

[In Canada – combined purchases of provincial and municipal governments is **larger** than federal government.]



The Net Export Function

Exports: X

- autonomous wrt **Canadian** national income.

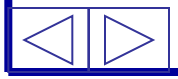
Imports: IM = mY

- rise as national income increases
  - not autonomous
  - **induced** or depends on GDP

Marginal propensity to import :

- change in imports caused by a $1 change in GDP
- **$\Delta m / \Delta Y$**

- **MPM = m** = 20/100 = 0.2



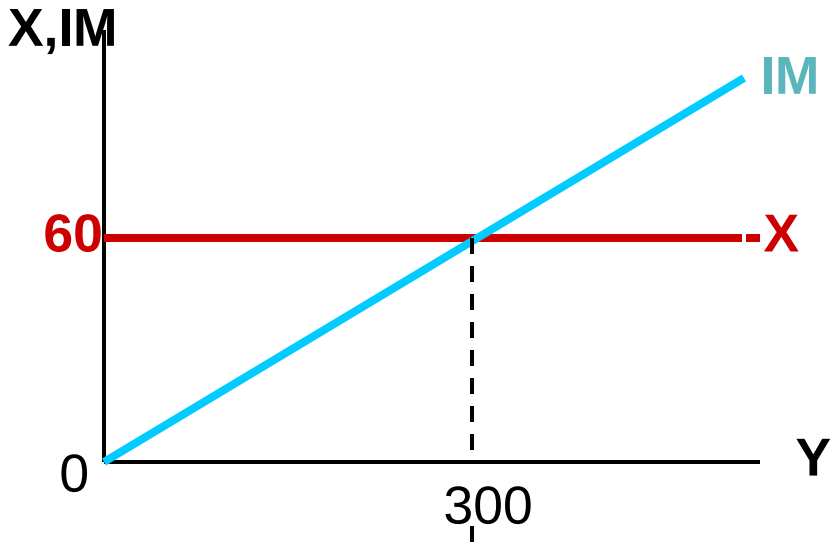
Net export function: NX = X – IM

- Falls as national income rises
- **X** constant
- **IM** increase as GDP [**Y**] increases

If **X > IM :**

- Foreigners buy more C$
- To buy exports
- Canada accumulates more foreign currency
- Uses foreign currency to buy foreign income-earning assets
- Similar to investment (**I**)
- Produces future income for Canadians

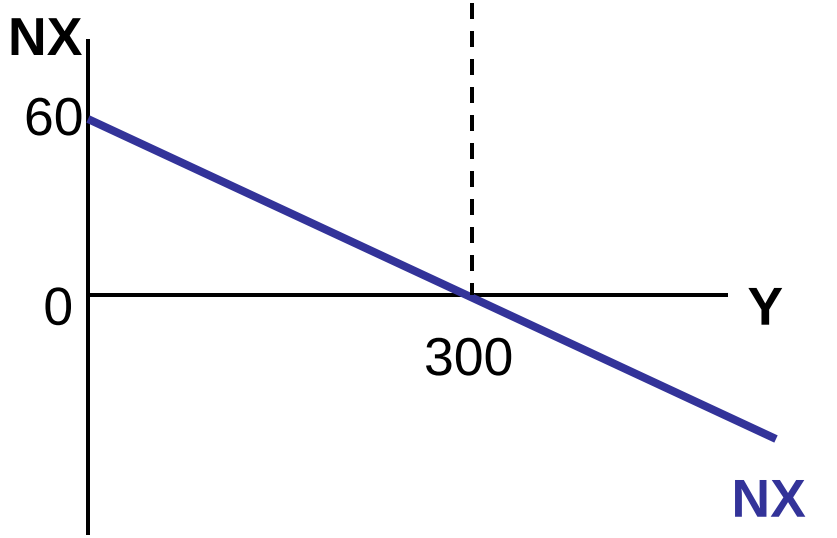
Y	X	IM	X - IM
0	60	0	60
100	60	20	40
200	60	40	20
300	60	60	0
400	60	80	-20



NX function holds constant:

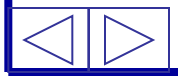
- foreign national income
- domestic and foreign prices
- exchange rate

If any of these change, NX changes:



If IM > X:

- Canadians sell more C$
- Buy more imports than foreigners
- Canada's trading partners accumulate C$
- C$ used to buy Canadian assets
- Liability for Canada
- Income will flow **to** foreigners

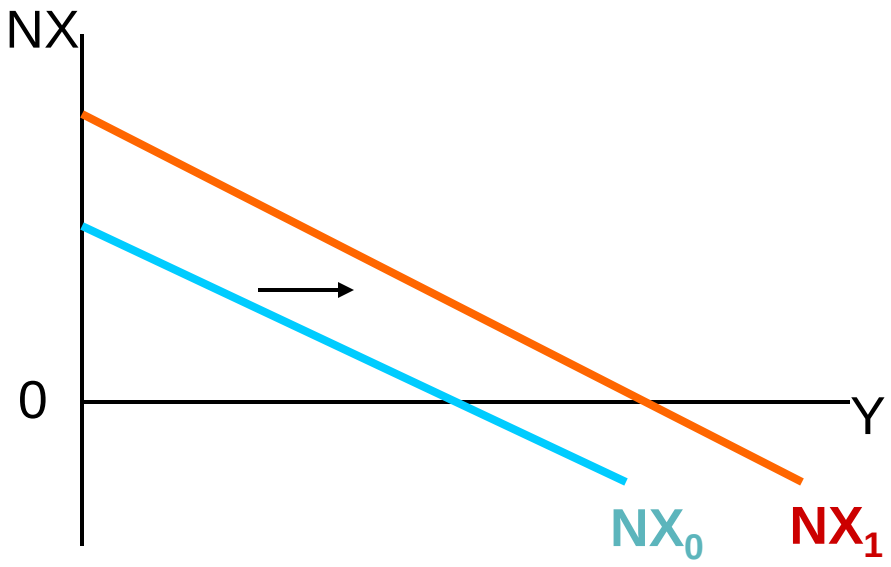


Shifts in the Net Export Function

Foreign income:

If foreign incomes increase

- ceteris paribus, Canadian exports [**X**] increase
- shifts up **NX** function



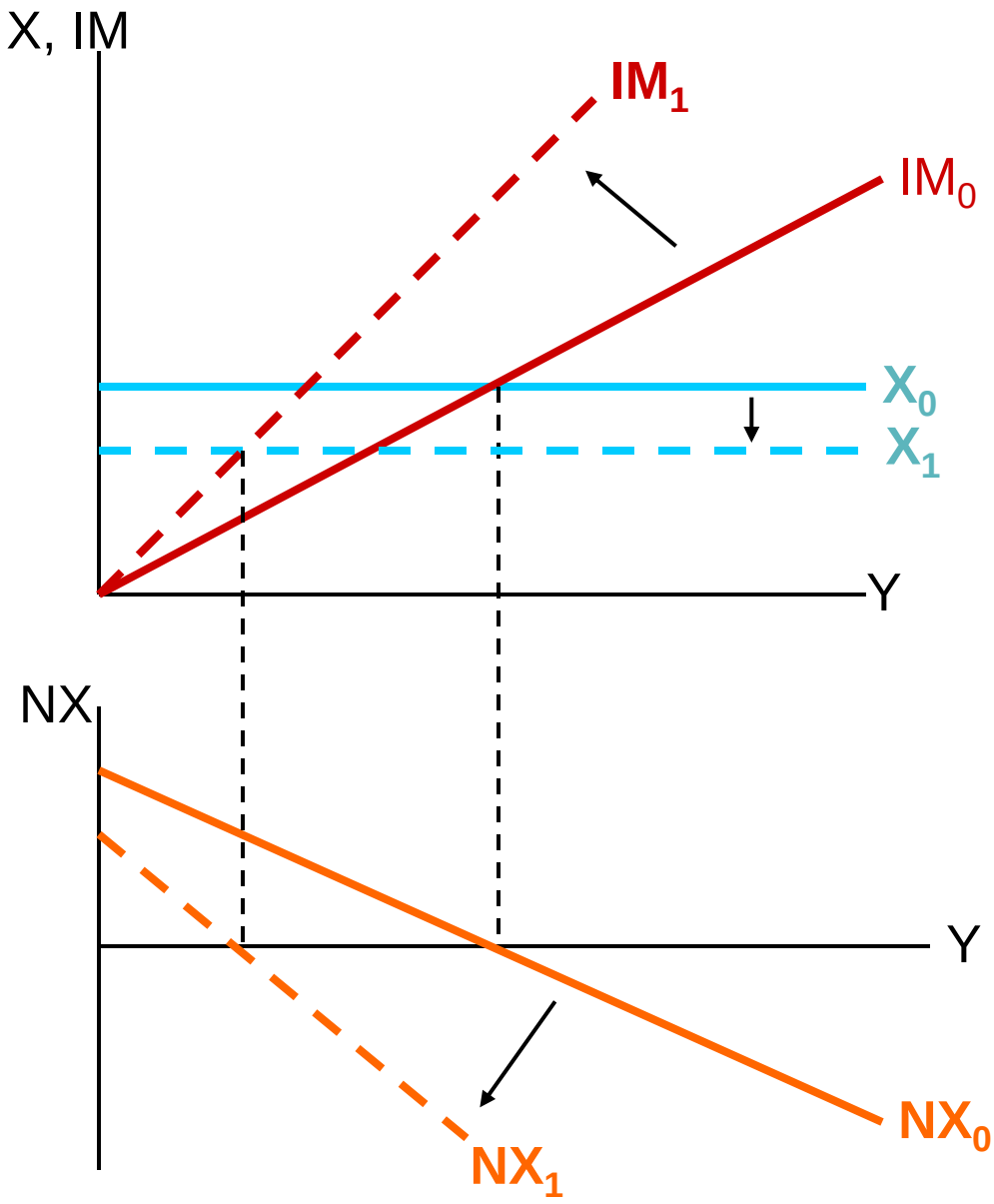
Domestic and foreign prices:

A rise in Canadian prices **relative to foreign** prices:

- reduces Canadian exports
- **X** function shifts down

- Imports increase - cheaper
- **IM** function rotates up

- **NX** function **shifts down** and gets **steeper**



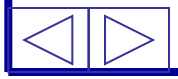
Canadian prices rise relative to foreign prices

- X fall
- IM rise
- NX fall

Exchange rates cause relative prices to change.

Appreciation of Canadian dollar:
- increases Canadian prices relative to foreign prices

Depreciation of Canadian dollar:
- decreases Canadian prices relative to foreign prices



Equilibrium GDP

• where desired aggregate expenditure (**AE**) equals national income (**Y**)

• **AE = Y**

Include:

• **government** (**T - G**)

• **net exports** (**NX = X - IM**)

Adjust consumption:

• with government, national income (**Y**) is **not** the same as disposable income ($\mathbf{Y_d}$)

$$\mathbf{Y_d = Y - T}$$

With **taxes:**

• disposable income ($\mathbf{Y_d}$) **<** national income (**Y**)

Suppose **T = 0.1Y**. (Taxes = 10% of **Y**)

Then, $\mathbf{Y_d = Y - 0.1Y = 0.9Y}$ (Disposable income = 90% of **Y**)

Consumption function (out of $\mathbf{Y_d}$):

$$\mathbf{C = 10 + 0.8Y_d}$$

$$\mathbf{C = 10 + (0.8)(0.9Y)}$$

$$\mathbf{C = 10 + 0.72Y}$$

With income taxes:

- **MPC out of national income** (0.72)
- is **less** than the **MPC out of disposable income** (0.8)
    - **$MPC_Y < MPC_{Yd}$**

Generally:

$$C = \bar{a} + b\,(Y_d)$$

or

$$C = \bar{a} + b\,(Y - T)$$

Since $T = tY$

$$C = \bar{a} + b\,(Y - tY)$$

or

$$C = \bar{a} + b[(1 - t)Y]$$

In last example, $C = 10 + 0.8\,(1 - 0.1)Y$

$$= 10 + 0.8\,(0.9)\,Y$$

$$C = 10 + 0.72Y$$

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

$C = \bar{a} + b\,Y_d \quad = \bar{a} + b(1 - t)Y$

I

G

$T = tY$

X

$IM = mY$

$AE = C + I + G + X - IM$

$= \bar{a} + b(1 - t)Y + I + G + X - mY$

Rewriting:

$AE = \mathbf{\bar{a} + I + G + X} + \mathbf{[b(1 - t) - m]Y}$

(autonomous) **(induced)**

(Induced expenditure depends on Y)

Change in Aggregate Expenditures (**AE**) when Real GDP (**Y**) changes

- $\Delta AE/\Delta Y$
- is given by **induced** expenditures
- Or, b (1 - t) – m
- MPC_Y - MPM
- This is slope of AE line
- or, **MP to spend** out of national income **[Z]**

The AE Function

$$AE = C + I + G + X - IM$$

Slope of **AE** line:

- **marginal propensity to spend** out of national income [**Z**]

Assume **Y** rises by $1:

- 72 cents is spent on consumption
- 20 cents of extra consumption is on imports
- desired spending on **domestic production** rises by only 52 cents (***Z* = 0.52**)

Equilibrium National Income

- where desired aggregate expenditure equals actual national income (**AE = Y**)

Example:

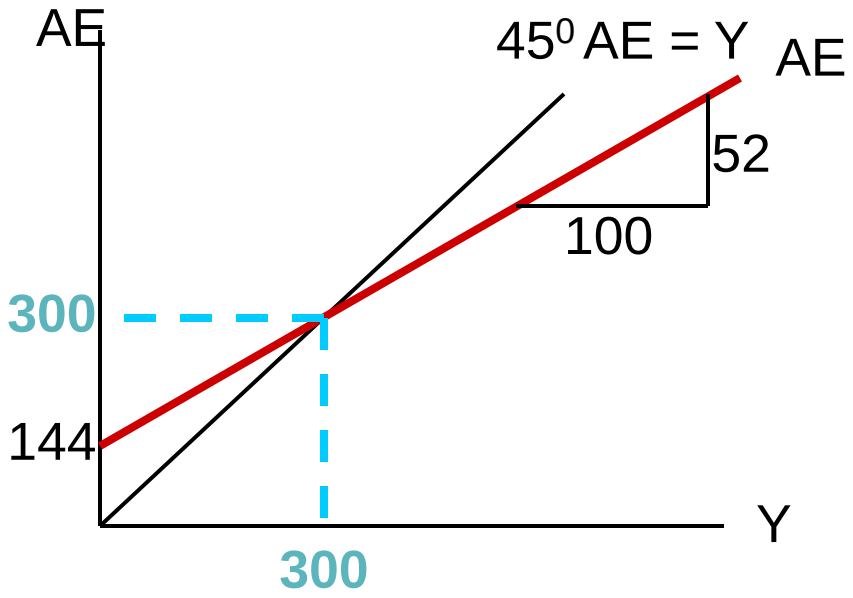
$MPC_{YD} = b = 0.8$

MPT $= t = 0.10$

MPM $= m = 0.20$

Y	C (=10 + 0.72Y)	I = 50	G = 34	X = 50	(-)IM =0.2Y	AE
0	10	50	34	50	0	144
100	82	50	34	50	20	196
200	154	50	34	50	40	248
300	226	50	34	50	60	300
400	298	50	34	50	80	352

Equilibrium national income is $300 (Y = AE at $300)



Slope of AE : **Z = 0.52**

Equilibrium GDP at $300

AE > Y

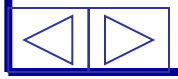
- Sales greater than production
- Depletes inventories
- Firms increase production

AE < Y

- Sales less than production
- Inventories build up
- Firms decrease production

AE = Y

- Equilibrium
- Sales equal production



AE = C + I + G + X - IM

$C = 10 + 0.8Y_D$

$I = 50$

$G = 34$

$X = 50$

$IM = 0.2Y$

$T = 0.1Y$

Eliminate Y_D:

$Y_D = Y - T = Y - 0.1Y = 0.9Y$

$C = 10 + 0.8\ Y_D = 10 + (0.8)(0.9Y)$

$C = 10 + 0.72Y$

C = 10 + 0.72Y

I = 50

G = 34

X = 50

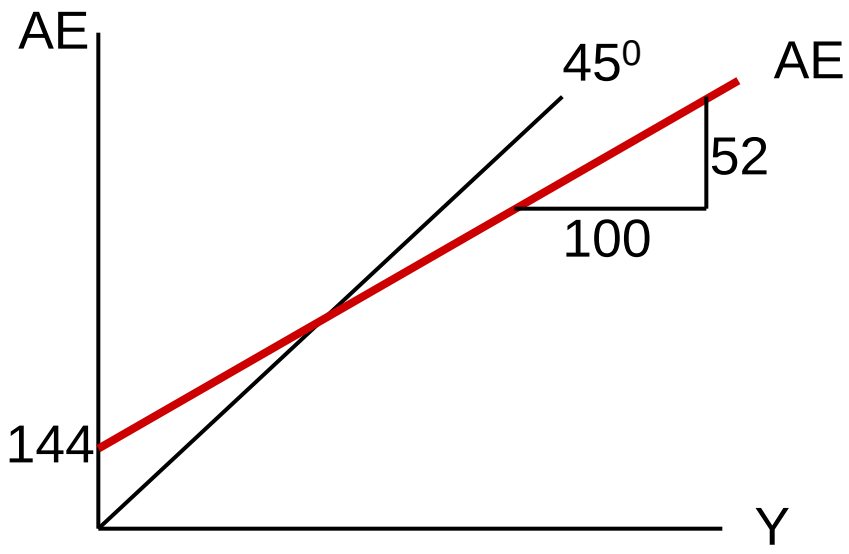
IM = 0.2Y

T = 0.1Y

AE = C+ I + G + X - IM

AE = 10 + 0.72Y + 50 + 34 +50 – 0.2Y

AE = 144 + 0.52Y



Slope of AE = 0.52

Equilibrium GDP at $300

In equilibrium, **Y = AE**

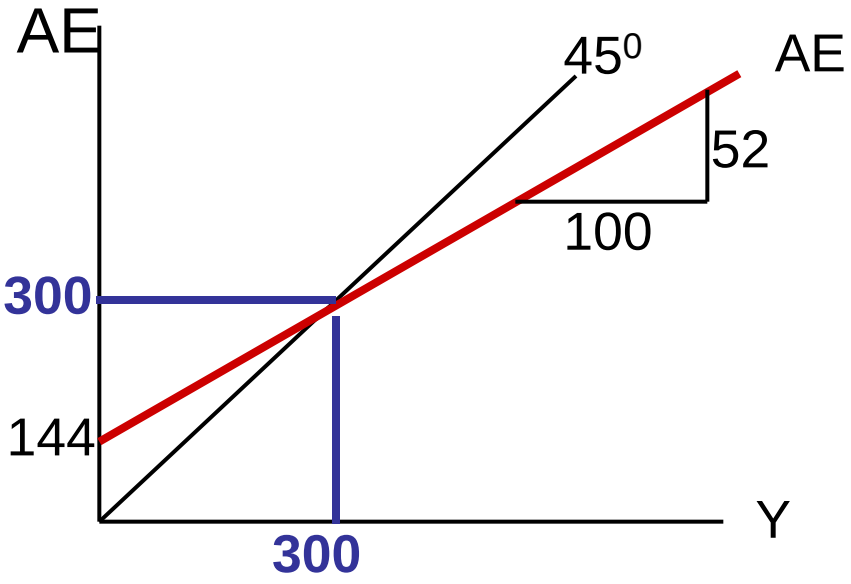
$$Y = 144 + 0.52Y$$

$$Y - 0.52Y = 144$$

$$0.48Y = 144$$

$$Y = 144/0.48$$

$$\mathbf{Y = 300}$$



Slope of AE = 0.52

Another example

$C = 500 + 0.8Y_D$ $X = 400$

$I = 400$ $IM = 0.16Y$

$G = 200$ $T = 0.3Y$

Eliminate Y_D:

$Y_D = Y - T = Y - 0.3Y = 0.7Y$

$C = 500 + 0.8\ Y_D = 500 + (0.8)(0.7Y)$

$C = 500 + 0.56Y$

C = 500 + 0.56Y

I = 400

G = 200

X = 400

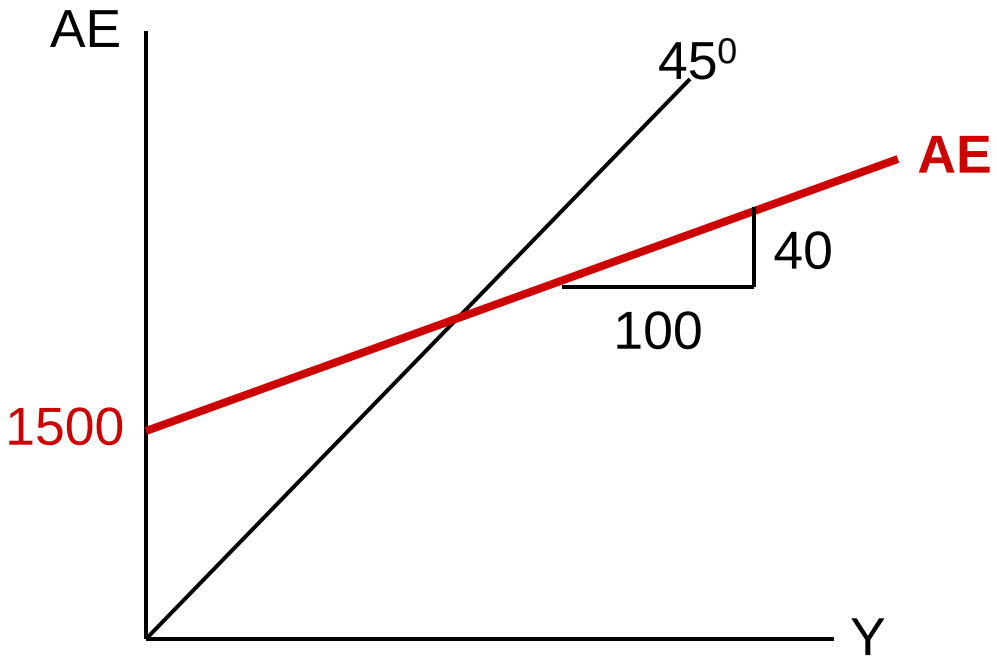
IM = 0.16Y

T = 0.3Y

AE = C+ I + G + X - IM

AE = 500+0.56Y + 400 + 200 + 400 – 0.16Y

AE = 1500 + 0.4Y



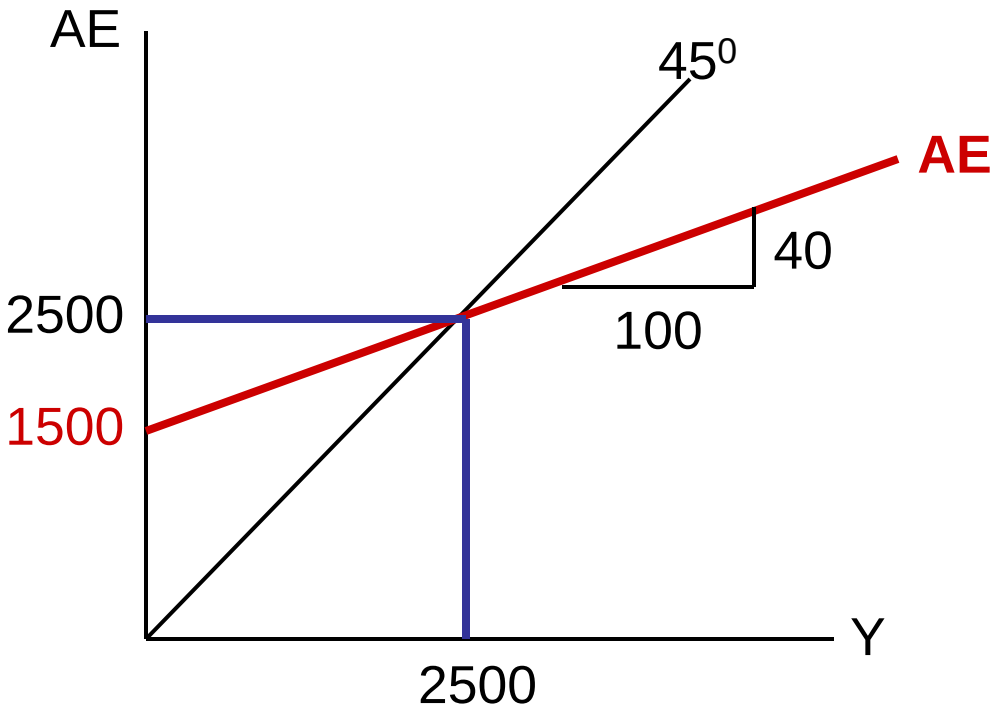
In equilibrium, **Y = AE** = 1500 + 0.4Y

$Y - 0.4Y = 1500$

$0.6Y = 1500$

$Y = 1500/0.6$

$Y = 2500$



Changes in Equilibrium National Income

The Multiplier with Taxes and Imports

With **no** government and **no** international trade:

Z = the MPC out of disposable income [$\mathbf{MPC_{YD}}$]

Simple multiplier : $\mathbf{K} = \dfrac{1}{1-z}$ **or** $\dfrac{1}{1-MPC_{YD}}$

Now, with taxes and imports: $Z \neq MPC$

- Imports and income taxes make *Z* smaller
- Simple multiplier [K] is also smaller

With **imports**
- Some spending flows outside country to pay for foreign goods

With **taxes**
- Income taxes reduce household income and spending

$$\mathbf{Z = MPC_Y - MPM}$$

Example #1

- **No income taxes:**
  - **national income = disposable income**

- **No imports**

$MPC_{YD} = 0.8$

Income rises by $100, spend $80, . . . multiplier [K] is:

$$\frac{1}{1-Z} = \frac{1}{1-MPC} = \frac{1}{1-0.8} = \frac{1}{0.2} = 5$$

Example #2
Income tax rate = 0.1Y; Imports = 0.2Y; MPC = $0.8Y_D$

Income [**Y**] rises by $100

After tax income [$\mathbf{Y_D}$] rises by $90

$72 is spent [$90 x $\mathbf{MPC_{YD}}$]

From $72 spent, $20 is spent on imports [$100 x 0.2]

Only $52 spent domestically [$72 - $20]

Multiplier effect [**K**] much **smaller**

With taxes and imports:

$$Z = MPC_{YD}\,(1 - t) - m$$

where **t** is the net tax rate

m is the marginal propensity to import

The multiplier: $K = \dfrac{1}{1 - z}$

$$K = \frac{1}{1 - [MPC_{YD}\,(1 - t) - m]}$$

Multiplier [**K**]:

$$\frac{1}{1 - [\, 0.8\,(1 - 0.1) - 0.2\,]} = \frac{1}{1 - [\, 0.8\,(\,0.9\,) - 0.2\,]}$$

$$\frac{1}{1 - [\, 0.72 - 0.2\,]} = \frac{1}{1 - 0.52} = \frac{1}{0.48}$$

$$= 2.08$$

Autonomous Expenditure [**A**] rises by $100

Real GDP rises: [Δ**A** * **K** = Δ**Y**]

$100 x 2.08 = $208

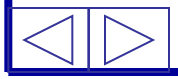
Net Exports

Exports:

- Autonomous
- Independent of level of domestic national income

Demand for Canadian exports depends on:

- Foreign income
- Foreign and domestic prices
- Exchange rate
- Consumer tastes



- Equilibrium **Y** rises, **NX** shifts down
- Equilibrium **Y** falls, **NX** shifts up

- Multiplier applies to changes in net exports [**ΔNX**]

$$\Delta A = \Delta X \qquad \Delta X \times K = \Delta Y$$

- if **m** $\uparrow$ [of **mY**] $\longrightarrow$ **Z** $\downarrow$ $\longrightarrow$ **K** $\downarrow$

Fiscal Policy

Discretionary Policy

- use **G** and **T** policies
- to influence desired **AE, AD** and **Y**

Stabilization policy:

- attempts to stabilize **Y** at or near **Y***

Example:

- National income is **below** potential **Y** **[Y < Y*]**
- **G** increases by **$100 million**

  - **ΔG** leads to
  - a change in equilibrium national income, **ΔY**

Change in Real GDP equals **[ΔY = ΔG X K]**

Suppose: **Z = 0.52**

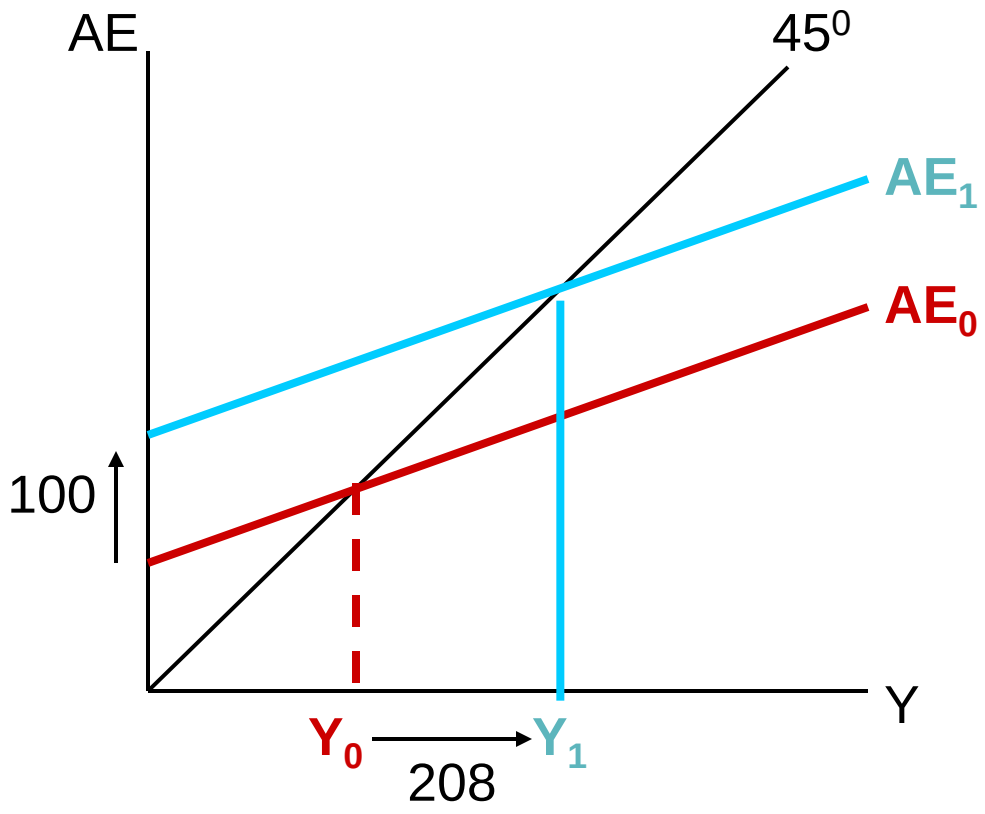
Multiplier: **K = 1 / 1 - 0.52 = 1 / 0.48 = 2.08**

- **$100 million** increase in **G**
- increases equilibrium national income (**Y**) by **$208 million**

[**ΔY = 100 x 2.08 = 208**]

ΔG shifts AE function **up** by **$100 million**

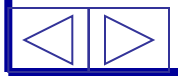
G increases by $100:



Multiplier of **2.08** produces an **increase** in **Y** of **$208** million

Reduce taxes to **raise** national income:

- Lower income-tax rate raises the $\mathbf{MPC_Y}$
- Increases ***Z*** -- **AE** function gets **steeper**



MPSpend = Z:

[MPC_{YD} (1 – t) – m] = Slope of AE line

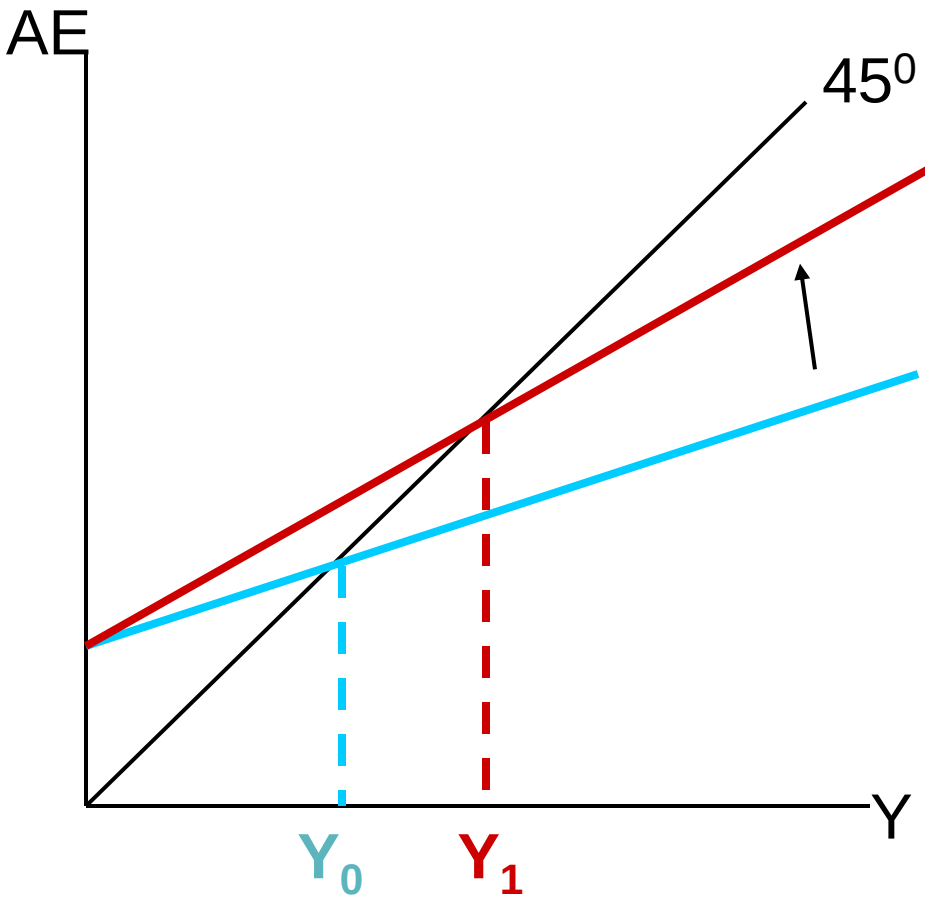
If **t = 0.2:** $MPC_{YD} = 0.8$ and m = 0.4

Z = [0.8 (0.8) – 0.4] = 0.24

If **t = 0.1:**

Z = [0.8 (0.9) – 0.4] = 0.32

Slope of AE line rises from 0.24 to 0.32 [steeper]



Rotation of **AE**

$$Z = \Delta AE \,/\, \Delta Y$$

Lower tax rate increases slope of AE line (**Z**), and raises equilibrium **Y**

Limitations of the Income-Expenditure Approach

Simple **AE** model is based on:

- **Price level** is **assumed** to be **constant**
- **GDP depends only on Demand**

- This is a **demand determined** model

The End!!!!