When economists think about year-to-year movements in economic activity, they focus on the interactions among production, income, and demand:

- Changes in the demand for goods lead to changes in production.
تغيير في الطلب يؤدي الى تغيير في الانتاج: زيادة الطلب عامل محفز للمنتجين من اجل زيادة كمية الانتاج

- Changes in production lead to changes in income.
تغيير في الانتاج يؤدي الى تغيير في الدخل: زيادة كمية الانتاج يؤدي الى زيادة النشاط الاقتصادي وبالتالي تحسن المستوى المعيشة للافراد وهذا بدوره ينعكس على زيادة الدخل

- Changes in income lead to changes in the demand for goods.

تغيير الدخل يؤدي الى تغيير الطلب على السلع: زيادة دخل المستهلكين يؤدي الى زيادة الطلب على السلع.

The Composition of GDP

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

Consumption (C): Refers to the goods and services purchased by consumers, ranging from food to airline tickets, to new cars, and so on. Consumption is by far the largest component of GDP. In 2019, it accounted for 92% of GDP.

يشمل الاستهلاك الشخصي جميع المشتريات التي يقوم بها المستهلكين على شراء السلع والخدمات الجديدة مثل شراء الطعام، الملابس ، السيارات .. الخ. يشكل الاستهلاك النسبة الاكبر من مكونات الناتج الاجمالي الفلسطيني اذ يشكل حولي 92%.

Investment (I), sometimes called fixed investment, is the purchase of capital goods. It is the sum of **nonresidential investment** (the purchase by firms of new plants or new machines) and **residential investment** (the purchase by people of new houses or apartment).

الاستثمار، يسمى أحيانًا الاستثمار الثابت ، هو شراء السلع الرأسمالية. هو مجموع الاستثمار غير السكني (شراء الشركات للمصانع الجديدة أو الآلات الجديدة) والاستثمار السكني (شراء الناس للمنازل أو الشقق السكنيةالجديدة).

Economists use “investment” to refer to the purchase of new capital goods, such as (new) machines, (new) buildings, or (new) houses. When economists refer to the purchase of gold, or shares of stock, or other financial assets, they use the term “financial investment.”

يستخدم الاقتصاديون "الاستثمار" للإشارة إلى شراء سلع رأسمالية جديدة ، مثل الآلات الجديدة أو المباني الجديدة أو المنازل الجديدة. عندما يشير الاقتصاديون إلى شراء الذهب أو الأسهم أو الأصول المالية الأخرى ، فإنهم يستخدمون مصطلح "الاستثمار المالي."

Government Spending (G): refers to the purchases of goods and services by local governments. It does not include government transfers, such as Medicare or social security payments, nor interest payments on the government debt.

الإنفاق الحكومي (G): يشير إلى شراء السلع والخدمات من قبل الحكومات المحلية. لا يشمل الانفاق الحكومي التحويلات الحكومية ، مثل خدمات الرعاية الطبية أو مدفوعات الضمان الاجتماعي ، ولا مدفوعات الفائدة على الدين الحكومي.

Imports (IM): are the purchases of foreign goods and services by consumers, business firms, and the government.

Exports (X): are the purchases of domestic goods and services by foreigners.

The difference between exports and imports (X - IM), is called net exports, or the trade balance.

- If exports exceed imports (X > IM), a country is said to run a trade surplus.
- If exports are less than imports (X < IM), a country is said to run a trade deficit.
- If exports are equal imports (X = IM), a country is said to run a trade balance.

The Composition of Palestine GDP, from 2017 to 2020

Table Components of Palestinian GDP by Expenditure (2019)

		Millions of Dollars	Percent of GDP
	GDP (*Y*)	3,448.8	100
1	Consumption (*C*)	3,185	92.35
2	Investment (*I*)	786.5	22.8
	Nonresidential	152.7	4.42
	Residential	599	18.38
3	Government spending (*G*)	802	23.25
4	Net exports	- 1,324.7	- 38.4
	Exports (*X*)	717.3	20.8
	Imports (*IM*)	2,042	-59.2
5	Inventory investment	34.8	1
Source: PCBS: Press Report, Quarterly National Accounts (Second Quarter 2019)			

The relation between production, sales, and inventory investment

In any given year, production and sales need not be equal. Some of the goods produced in a given year are not sold in that year, but sold in later years. And some of the goods sold in a given year may have been produced in an earlier year.

The difference between goods produced and goods sold in a given year-equivalently, the difference between production and sales-is called *inventory investment*.

Inventory investment = production - sales

Production = sales + inventory investment

Sales = production − inventory investment

If production exceeds sales, firms accumulate inventories: Inventory investment is positive.

If production is less than sales, firms decrease inventories: Inventory is said to be negative.

The Demand for Goods

The total demand for goods is written as:

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

We now need to think about the determinants of Z. To make the task easier, let's first make a number of simplifications:

- Assume that all firms produce the same good, which can then be used by consumers for consumption, by firms for investment, or by the government. With this (big) simplification, we need to look at only one market–the market for "the" good– and think about what determines supply and demand in that market.

- Assume that firms are willing to supply any amount of the good at a given price level P. This assumption allows us to focus on the role demand plays in the determination of output.

- Assume that the economy is *closed*–that it does not trade with the rest of the world: Both exports and imports are zero. (X = IM =0).

Under the assumption that the economy is closed, the demand for goods (Z) is simply the sum of consumption, investment, and government spending.

$Z = C + I + G$ ----------- $(total\ demand\ for\ goods\ in\ closed\ economy)$

The determents of demand for goods (Z):

Consumption (C)

Consumption depends on many factors. But the main one is surely disposable income (Y_D).

When their disposable income goes up, people buy more goods; when it goes down, they buy fewer goods.

$Y_D \uparrow \quad \Rightarrow \quad C \uparrow$

$Y_D \downarrow \quad \Rightarrow \quad C \downarrow$

Let C denote consumption, and Y denote disposable income. We can then write:

$$\underset{(+)}{C = C(YD)} \quad \text{--------------} \quad \textit{Consumption function}$$

The function $C(YD)$ is called the $Consumption\ Function.$ It is a behavioral equation, that is, it captures the behavior of consumers.

- Disposable income is defined as: $Y_D = Y - T$ (Y: Personal income; T: taxes)
- The positive sign below YD reflect the fact that when disposable income increases, consumption increase.

Assume that the relation between consumption and disposable income is linear and given by:

$C = c_0 + c_1 Y_D$

This function has two parameters, c_0 and c_1:

c_1: is called the ***marginal propensity to consume (MPC)***, or the effect of an additional dollar of disposable income on consumption. (مقدار التغيير في الاستهلاك عندما يتغيير الدخل ب 1$)

If $c_1 = 0.6$, then an additional dollar of disposable income increase consumption by 60 cents.
$c_1 = 0.6$ تعني اذا زاد دخل المستهلك ب 1$ فإن المستهلك يزيد الانفاق بمقدار 60 سنت و التوقير بمقدار 40 سنت.

A restriction on c_1: قيود على قيمة

- c_1 is positive ($c_1 > 0$): an increase in disposable income is likely to lead to an increase in consumption. ($Y_D \uparrow \rightarrow C \uparrow$)
- c_1 be less than 1 ($c_1 < 1$) : People are likely to consume only part of any increase in disposable income, and to save the rest.
- c_0 is the intercept of the consumption function *(Autonomous Consumption)* .

$c_0 \equiv$ It is what people would consume if their disposable income in the current year were equal to zero. If Y_D equal to zero then, $C = c_0$.

A restriction on c_0 :

c_0 is positive ($c_0 > 0$): if current income is equal to zero, consumption is still positive: People still need to eat.

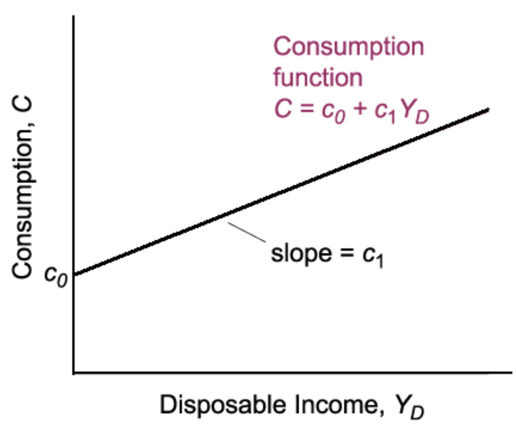
How can people have positive consumption if their income is equal to zero? *Answer*: they dissave. They consume either by selling some of their assets, or by borrowing.

The graphical relation between consumption and disposable income:

Because the consumption function is linear relation, it represented by a straight line. Its intercept with the vertical axis is c_0; its slope is c_1. Because c_1 is less than 1, the slope of the line is less than one.

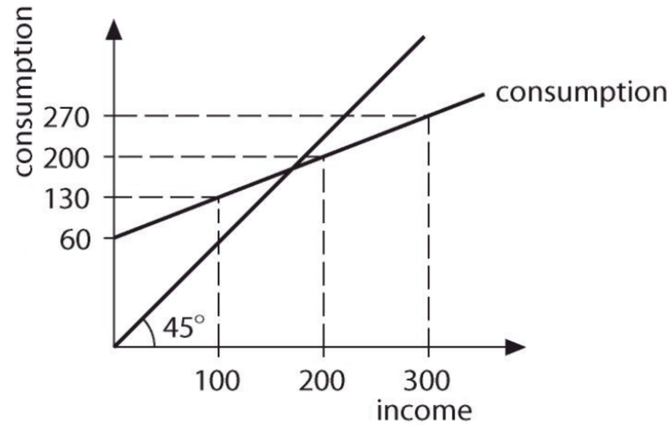
Consumption increases with disposable income, but less than one for one because its slope is less than one.

Changes in c_0 reflect changes in consumption for a given level of disposable income. Increases in c_0 reflect an increase in consumption given income, decreases in c_0 a decrease. There are many reasons why people may decide to consume more or less, given their disposable income. They may, for example, find it easier or more difficult to borrow, or may become more or less optimistic about the future.



Example

Refer to the information provided in Figure below to answer the questions that follow.



1. What is the value of autonomous consumption?

   c_0 (autonomous consumption) = 60

2. What is the value of c_1 (marginal propensity to consume)?

   $c_1 = \frac{\Delta C}{\Delta Y} = \frac{(200-130)}{(200-100)} = \frac{70}{100} = 0.70$

Example

If the consumption function is defined as: $C = 500 + 0.9Y$.

1. What is the value of autonomous consumption?

   Autonomous consumption) = 500

2. What is the value of marginal propensity to consume?

   Marginal propensity to consume = $c_1 = 0.9$ (معامل Y)

3. If disposable income was $300, what is the value of consumption?

   $C = 500 + 0.9Y = 500 + 0.9\,(300)$ = $770

The relation between consumption (C) and income (Y)

$Y_D = Y - T$

Where Y is income and T is taxes paid minus government transfer received by consumers.

Replacing Y_D in consumption function by (Y - T) given:

$$C = c_0 + c_1\,(\underset{(+)}{Y} - \underset{(-)}{T})$$

Higher income increases consumption, although less one for one. Higher taxes decrease consumption, also less than one for one.

Y ↑ ⇨ C ↑

T ↑ ⇨ C ↓

Investment (I):

Models have two types of variables. Some variable depend on other variables in the model, and are therefore explained within the model. Such variables are called *endogenous*. Other variables are not explained within the model but are instead taken as given. Such variables are called *exogenous*.

Endogenous variables: explained within the model.
Exogenous variable: taken as given.

We shall take investment as given, and write: $I = \bar{I}$

Putting a bar over investment is a simple typographical way to remind us that we take investment as given (we take investment as given to keep our model simple).

We take investment as given to keep our model simple. But the assumption is not innocuous. It implies that, when we later look at the effects of changes in production, we will assume that investment does not respond to changes in production. It is not hard to see that this implication may be a bad description of reality: Firms that experience an increase in production might well decide they need more machines and increase their investment as a result. For now, though, we will leave this mechanism out of the model. In Chapter 5 we will introduce a more realistic treatment of investment.

Government Spending (G)

The third component of demand in our model is government spending (G). Together with taxes (T), G describes *fiscal policy*.

Just as we just did for investment, we shall take G and T as exogenous variables.

The Determination of Equilibrium Output

Under the assumption that the economy is closed (X = IM = 0), the demand for goods is the sum of consumption (C), investment (I), and government spending (G).

$Z = C + I + G$

Replacing C and I with $C = c_0 + c_1 (Y - T)$ and $I = \bar{I}$ we get

$Z = c_0 + c_1 (Y - T) + \bar{I} + G$

The demand for goods (Z) depends on income (Y), taxes (T), investment (I), and government spending (G).

Equilibrium in the goods market

Equilibrium in the goods market required that production (Y), be equal to the demand for goods (Z).

At equilibrium: production (Y) = demand (Z).

At equilibrium: $Y = c_0 + c_1 (Y - T) + \bar{I} + G$

In equilibrium, production, Y (the left side of the equation), is equal to demand (the right side). Demand in turn depends on income, Y, which is itself equal to production.

If production (Y) > demand (Z) ⇨ positive inventory investment

If production (Y) < demand (Z) ⇨ negative inventory investment

Equilibrium in the goods market: Using Algebra

Rewrite the equilibrium equation as:

$Y = c_0 + c_1Y - c_1T + \bar{I} + G$

Move (c_1Y) to the left side and reorganize the right side:

$Y - c_1Y = c_0 - c_1T + \bar{I} + G$

$(1 - c_1)\, Y = c_0 + \bar{I} + G - c_1T$

Divide both sides by ($1 - c_1$):

$Y = \frac{1}{1 - c_1}(c_0 + I + G - c_1T)$ ⇨ *Equilibrium condition in the goods market*

Let's look at both terms on the equilibrium condition:

- The term $[c_0 + \bar{I} + G - c_1T]$ is called ***autonomous spending***; is the part of the demand for goods that does not depend on output.

Is autonomous spending positive?

The first two terms in brackets, c_0 and $\bar{I}$, are positive. What about the last two, ($G - c_1T$)? Suppose the government is running ***a balance budget*** ($T = G$). If $T = G$, and $c_1 < 1$, then ($G - c_1 T$) is positive and so is autonomous spending.

If the government run a very large *budget surplus* ($T > G$), could autonomous spending be negative

- The term [$1 / (1 - c_1)$] is called the ***spending multiplier***. Because the propensity to consume (c_1) is between zero and one ⇨ $1 / (1 - c_1)$ is a number greater than one. The closer c_1 is to one, the larger the multiplier.

  $$m = \frac{1}{1 - c_1}$$

Where does the multiplier effect come from? Looking back at equation ($Y = c_0 + c_1Y - c_1T + \bar{I} + G$) gives us the clue: An increase in c_0 increases demand. The increase in demand then leads to an increase in production. The increase in production leads to an equivalent increase in income (remember the two are identically equal). The increase in income further increases consumption, which further increases demand, and so on.

Example

If the consumption functions is given by: $C = 150 + 0.8\ Y$. for a given level of income, consumers decide to consume more. Assume that autonomous consumption (c_0) increase to 200. How much will output (Y) change?

Δ Y = multiplier x ΔC

$$m = \frac{1}{1-c_1} = \frac{1}{1-0.8} = \frac{1}{0.2} = 5$$

$\Delta C = 200 - 150 = 50$

$\Delta Y = m\ x\ \Delta C$

$\Delta Y = 5\ x\ 50 = 250$ increase in output.

Example

The consumption function of an economy is given by: C = 200 + 0.75Y, investment (I) = 400. The economy is in equilibrium output at Y = 3,400. Calculate

1. Government purchases (G) at equilibrium.

   At equilibrium: Y = Z ⇨ Y = C+ I + G ⇨ 3,400 = 200 + 0.75(3,400) + 400 + G

   3,400 = 3,150 + G ⇨ G = 3,400 - 3,150 = 250

2. If investment decreases to 350, what is the new equilibrium output (Y)?

   Δ Y = multiplier x ΔI

   $$m = \frac{1}{1-c_1} = \frac{1}{1-0.75} = \frac{1}{0.25} = 4$$

   Δ Y = 4 x (350 - 400) = -200

   New equilibrium output (Y) = 3,400 - 200 = 3,200

3. What level of government purchases (G) is needed to achieve an output level of 4,000?

   Δ Y = multiplier x ΔG

   (4,000 - 3,400) = 4 * ΔG

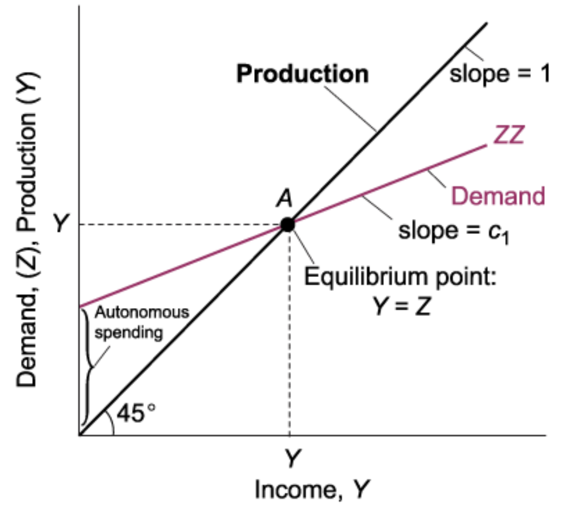
   ΔG = $\frac{600}{4} = 150$ (G increase by 150)

Equilibrium in the goods market: Using a Graph

Let's characterize the equilibrium graphically:

- Measure production on the vertical axis, and measure income on the horizontal axis.
- Plot demand as a function of income: $Z = (c_0 + \bar{I} + G - c_1 T) + c_1 Y$
- The relationship between demand and income is drawn as ZZ in the graph. The intercepts with the vertical axis equals autonomous spending. The slope of the line is the propensity to consume (c_1): when income increases by 1, demand increases by c_1.

In equilibrium, production equals demand. Thus equilibrium output (Y) is given by the intersection of the 45-degree line and the demand relation, at point A. To the left of A, demand exceeds production; to the right of A, production exceeds demand. Only at A are demand and production equal.



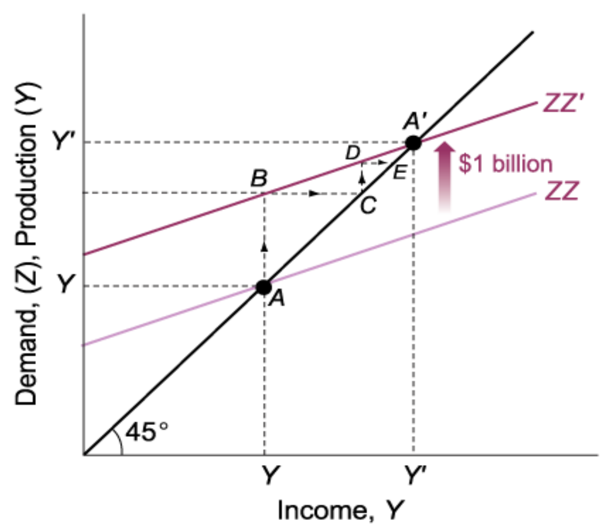
The Effects of an Increase in Autonomous Spending on output

Suppose that c_0 increase by \$1 billion. At the initial level of income, consumers increase their consumption by \$1 billion. And this leads to increase demand by \$1 billion.

Before the increase in c_0, the relation between demand and income was given by the line ZZ. After the increase in c0 by \$1 billion, the relation between demand and income is given by the line ZZ', which is parallel to ZZ but higher by \$1 billion (the demand relation shifts up by \$1 billion). The new equilibrium is at the intersection of the 45- degree line and the new demand relation, at point A'.

An increase in autonomous spending has a more than one-for-one effect on equilibrium output.

Equilibrium output increases from Y to Y'. The increase in output, $Y_1 - Y_2$, which we can measure either on the horizontal or the vertical axis, is larger than the initial increase in consumption of \$1 billion. This is the multiplier effect.



$\Delta Y = \text{multiplier} * \Delta C$

Using Words

How can we summarize our findings in words? Production depends on demand, which depends on income, which is itself equal to production. An increase in demand, such as an increase in government spending, leads to an increase in production and a corresponding increase in income. This increase in income leads to a further increase in demand, which leads to a further increase in production, and so on. The end result is an increase in output that is larger than the initial shift in demand, by a factor equal to the multiplier. The size of the multiplier is directly related to the value of the propensity to consume: The higher the propensity to consume, the higher the multiplier.

Example

Suppose that the economy is characterized by the following behavioral equations:

C = 160 + 0.6 YD
I = G = 150
T = 100

Solve for;
1. equilibrium output (Y)
2. Disposable income (YD)
3. Consumption spending (C)
4. Assume that G decrease to 120. What is the new equilibrium output?

At equilibrium: production (Y) = demand (Z)

Z = C + I + G

Z = 160 + 0.6 YD + 150 + 150

But YD = Y - T

Z = 160 + 0.6 (Y - T) + 150 + 150

Z = 160 + 0.6Y – (0.6 x 100) + 300

Z= 400 + 0.6 Y

At equilibrium: Y = Z ⇨ Y = 400 + 0.6 Y

Y – 0.6Y = 400 ⇨ 0.4Y = 400 ⇨ Y = 400/0.4 = $\boxed{1{,}000}$

2. YD = Y - T = 1,000 – 100 = $\boxed{900}$

3. C = 160 + 0.6 YD = 160 + 0.6(900) = 160 + 540 = $\boxed{700}$

4. ΔY = multiplier x ΔG

   Multiplier = $1/(1-c_1) = 1/(1-0.6) = 1/0.4 = 2.5$

   ΔG = 120 – 150 = −30

   Δ Y = multiplier x ΔG = 2.5 x −30 = −75

   New output (Y) = 1,000 – 75 = $\boxed{925}$

Example
Suppose that the economy is characterized by the following behavioral equations:

C = 300 + 0.8 (Y - T)   I = 120   G = 160   T = 100

1. Find the equilibrium output (Y)?

   At equilibrium: production (Y) = demand (Z)

   Z = C + I + G

   Z = 300 + 0.8(Y - 100) + 120 + 160

   Z = 500 + 0.8Y

   Y = Z ⇨ Y = 500 + 0.8Y ⇨ Y - 0.8Y = 500 ⇨ 0.2Y = 500 ⇨ Y = $\frac{500}{0.2}$ = 2,500

2. Suppose that G increase to 200, what is the new equilibrium output (Y)?

   ΔY = m x ΔG

   $m = \frac{1}{1-c_1} = \frac{1}{1-08} = \frac{1}{0.2} = 5$

   ΔY = m x ΔG = 5 * (200 – 160) = 200

   New equilibrium output = 2,500 + 200 = 2,700

Investment Equal Saving: An Alternative Way of Thinking About Goods Market Equilibrium

By definition, private saving (S), saving by consumers is equal to their disposable income minus their consumption.

S = YD - C

Using the definition of disposable income, we can rewrite private saving as income minus taxes minus consumption.

S = Y - T - C

Now return to the equation in the goods market. Production must be equal to demand, which is the sum of consumption, investment, and government spending.

Y = C + I + G

Subtract taxes (T) from both sides and move consumption to the left side:

Y - T - C = I + G - T

The left side of this equation is simply private saving (S), so

S = I + G - T   or equivalently   I = S + (T - G)

The first term on the right is <u>private saving (S)</u>, the second term is <u>public saving (T - G)</u>.

- If taxes exceed government spending, the government is running a budget surplus ⇨ public saving is positive

- If taxes are less than government spending, the government is running a budget deficit ⇨ public saving is negative

The equation $I = S + (T - G)$, gives us another way of thinking about equilibrium in the goods market: it says that equilibrium in the goods market requires that investment equal saving (the sum of private and public saving).

To summarize: There are two equivalent ways of stating the condition for equilibrium in the good market.

Production (Y) = Demand (Z)

Investment (I) = Saving (S)

We now do the equilibrium using the second condition. The results will be the same, but the derivation will give you another way of thinking about the equilibrium:

$S = Y - T - C$

But $C = c_0 + c_1(Y - T)$

⇨ $S = Y - T - c_0 - c_1(Y - T) \quad = Y - T - c_0 - c_1Y - c_1T$

Rearranging, we get:

$S = -c_0 + (1 - c_1)(Y - T)$ → ***Saving Function***

$(1 - c_1)$ = propensity to save (how much people save out of an additional unit of income)

In equilibrium, investment must be equal to saving, the sum of private and public saving. Replacing private saving in the equation $I = S + (T - G)$, we get.

$I = -c_0 + (1 - c_1)(Y - T) + (T - G)$

Solving for output:

$I = -c_0 + Y - T - c_1Y - c_1T + T - G$

$Y - c_1Y = c_0 + I + G - c_1T$

$Y(1 - c_1) = [c_0 + I + G - c_1T]$

$Y = \frac{1}{1-c_1}(c_0 + I + G - c_1T)$ -→ Equilibrium condition in the goods market

Example
The consumption function of an economy is given by: C = 200 + 0.75Y. What is the saving function?

If $C = c_0 + c_1(Y - T)$, then

$S = -c_0 + (1 - c_1)(Y - T)$

S = – 200 + (1 - 0.75) (Y - T)

S = – 200 + 0.25 (Y - T)

Example
Suppose that the economy is characterized by the following behavioral equations:

S = −160 + 0.4 YD   I =150   G = 150   T = 100

Find the equilibrium output (Y)

At equilibrium: saving = investment (I = S + (T - G)

150 = − 160 + 0.4 (Y - 100) + 100 - 150

150 = − 160 + 0.4 Y - 40 + 100 - 150

⇨ 0.4 Y = 150 + 250 ⇨ 0.4 Y = 400 ⇨ Y = 400/0.4 = 1,000

Tax Multiplier, Balance Budget Multiplier

We examine the effect of the change in taxes (T) on equilibrium output (Y).

$Y = c_0 + c_1(Y - T) + I + G$

By how much does Y decrease when T increase by one unit?

$Y = c_0 + c_1(Y - T)$

$Y = c_0 + c_1 Y - c_1 T$

$Y - c_1 Y = c_0 - c_1 T$

$Y(1 - c_1) = c_0 - c1\,T$

$$Y = \frac{1}{1 - c_1}[c_0 - c_1 T]$$

$$Y = \frac{c_0}{1 - c_1} - \frac{c_1}{1 - c_1} T$$

$$\text{Tax multiplier} = \frac{-c_1}{1 - c_1}$$

Example
Consider a closed economy where consumption is given by the equation C= 700 + 0.6 (Y - T). By how much does output (Y) decrease when taxes (T) increases by 40?

Δ Y = tax multiplier * Δ T

Tax multiplier = $\frac{-c_1}{1-c_1}$ = $\frac{-0.6}{1-0.6}$ = $\frac{-0.6}{0.4}$ = -1.5

Δ Y = -1.5 x 40 = -60 (output decrease by 60)

Example
Suppose that the economy is characterized by the following behavioral equations:

C = 300 + 0.8 (Y - T) I = 120 G = 160 T = 100

3. Find the equilibrium output (Y)?

   At equilibrium: production (Y) = demand (Z)

   Z = C + I + G

   Z = 300 + 0.8(Y - 100) + 120 + 160

   Z = 500 + 0.8Y

   Y = Z ⇨ Y = 500 + 0.8Y ⇨ Y - 0.8Y = 500 ⇨ 0.2Y = 500 ⇨ Y = $\frac{500}{0.2}$ = 2,500

4. Suppose that T increase to 130, what is the new equilibrium output (Y)?

   $\Delta Y = m_t \times \Delta T$

   $mt = \frac{-c_1}{1-c_1} = \frac{-0.8}{1-08} = \frac{-0.8}{0.2} = -4$

   $\Delta Y = m_t \times \Delta T = -4 * (130 - 100) = -120$

   New equilibrium output = 2,500 $-$ 120 = 2,380

Balance Budget Multiplier

Suppose that the economy starts with a balanced budget (T = G). If the increase in G is equal the increase in T, then the budget remains in balance.

If both G and T increase by one unit, then output (Y) increase by one unit.

If G ↑ ⇨ output increase by (spending multiplier x ΔG)

If T↑ ⇨ output decrease by (tax multiplier x ΔT)

But spending multiplier > tax multiplier

⇨ Net effect: increase output by (balance budget multiplier x ΔG)

Balance budget multiplier = Spending Multiplier + Tax Multiplier

Balance budget multiplier = $\frac{1}{1-c_1} + \frac{-c_1}{1-c_1} = \frac{1-c_1}{1-c_1} = 1$

Example

Suppose that a hypothetical economy is characterized by the following equations:

C = 200 + 0.75(Y-T)

I = 200; G = 100; T = 100

a. Find the equilibrium level of output (Y)

At equilibrium: Y = Z

Z = C + I + G

Z = 200 + 0.75(Y-100) + 200 + 100

Z = 200+ 0.75Y - (0.75 x 100) + 300

Z= 425 + 0.75 Y

At equilibrium: Y = Z ⇨ Y = 425 + 0. 75 Y

Y - 0.75Y = 425 ⇨ 0.25Y = 425 ⇨ Y = 425/0.25 = $\boxed{1{,}700}$

b. Suppose that the government increases G to 150 and increases T to 150. What is the new level of Y?

When government increases G and T by 50, then output (Y) increase by 50

When government increases G to 150

$\Delta Y = m * \Delta G$

$\Delta Y = \frac{1}{1-0.75} * (150 - 100) = 200$

When government increases T to 150

$\Delta Y = m_t * \Delta T$

$\Delta Y = \frac{-0.75}{1-0.75} * (150 - 100) = -150$

Net effects = + 200 - 150 = 50 increase in output (Y)

Equilibrium Output: Taxes is a Function of Income

In this chapter we have been assuming that the fiscal policy variables G and T are independent of the level of income. In the real world, however, this is not the case. Taxes typically depend on the level of income, and so tend to a higher when income is higher.

Consider the following behavioral equations:

$C = c_0 + c_1 YD$

$T = t_0 + t_1 Y$

$YD = Y - T$

G and I are both constant

Assume that t1 is between zero and one. Solve for equilibrium output. What is the multiplier?

At equilibrium output (Y) = Demand (Z)

$Z = C + I + G$

$Z = c_0 + c_1 [Y - (t_0 + t_1 Y)] + I + G$

$Z = c_0 + c_1Y - c_1t_0 - c_1 t_1 Y + I + G$

At equilibrium: Y = Z

$Y = c_0 + c_1Y - c_1t_0 - c_1 t_1 Y + I + G$

$Y - c_1Y + c_1 t_1 Y = c_0 - c_1t_0 + I + G$

$Y (1 - c_1 + c_1 t_1) = c_0 - c_1t_0 + I + G$

$Y = \frac{1}{1- c_1 (1- t_1)} [c_0 - c_1 t_0 + I + G]$

Where : $\frac{1}{1- c_1 (1- t_1)}$, the multiplier

$[c_0 - c_1 t_0 + I + G]$, autonomous spending

Example
Suppose that the economy is characterized by the following behavioral equations:

$C = 160 + 0.6\ YD$
$I = G = 150$
$T = 40 + 0.5Y$

A. Solve for equilibrium output.

At equilibrium output (Y) = Demand (Z)

$Z = C + I + G$

$Z = 160 + 0.6\ [Y - 40 - 0.5Y] + 150 + 150$

$Z = 160 + 0.6Y - 24 - 0.3Y + 300$

$Z = 436 + 0.3Y$

But $Y = Z \Rightarrow Y = 436 + 0.3Y \Rightarrow 0.7Y = 436 \Rightarrow Y = 436 / 0.7 = 622.8$

B. Suppose that G increase to 250. What is the new equilibrium output?

$\Delta Y = 1 / [1 - 0.6\ (1 - 0.5)] * \Delta G$

$\Delta Y = 1 / [1 - 0.6\ (1 - 0.5)] * (250 - 150) = 1/0.7 \times 100 = 142.85$

New output (Y) = 622.8 + 142.85 = 765.65