

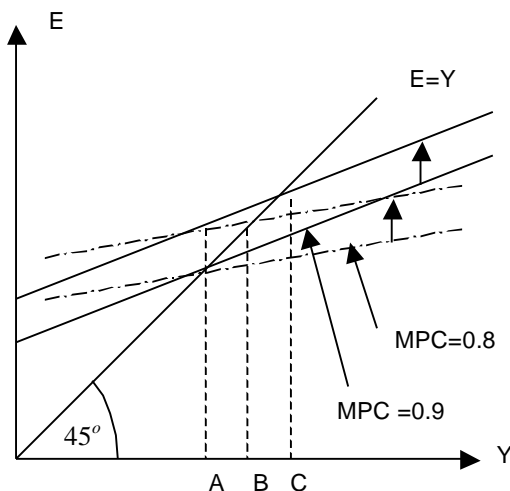
Lecture 12: Multipliers

I. OVERVIEW

- In the last lecture we built a simple model that we can use to study economic fluctuations; it examined the impact of changes in consumption, investment, government purchases and net exports on output. In the model changes in consumption were related to changes in income; this creates a feedback effect whereby changes in government purchases, for example, have an additional impact on output through increases in consumption.
- We showed that a 1 unit increase in spending will increase output by the size of the spending multiplier, $\frac{1}{1-b}$. In today's lecture, we will first take a closer look at the spending multiplier, especially at the relationship between the multiplier and the marginal propensity to consume.
- We will also derive a tax multiplier, the impact of a 1 unit change in taxes on output; finally we will make some changes to the simple model presented in the last lecture and analyze the impact of those changes on the spending multiplier.

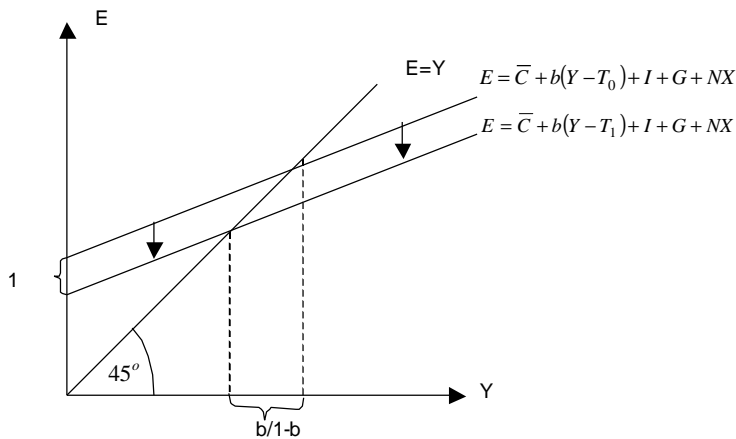
II. THE RELATIONSHIP BETWEEN MPC AND THE SPENDING MULTIPLIER

- The spending multiplier was calculated as $\frac{1}{1-b}$. Economists typically think of the MPC in an economy to be around 0.9. This would imply a spending multiplier of 10; every dollar of expenditure in the economy adds 10 dollars worth of output through the direct and feedback effects.
- How does the spending multiplier change when the MPC changes. Well suppose MPC was 0.95; individuals spend 95 cents of every dollar in income. Then the spending multiplier would be equal to $\frac{1}{(1-0.95)} = \frac{1}{0.05} = 20$. So an increase in the MPC raises the size of the multiplier.
- Conversely, if MPC falls to 0.80 then the spending multiplier would be $\frac{1}{(1-0.8)} = \frac{1}{0.2} = 5$. A decrease in the MPC decreases the size of the multiplier. If we look at a graph, Given that MPC describes the slope of the expenditure line; a change in spending has a greater effect when the slope is steeper [A to C instead of B]



III. THE TAX MULTIPLIER

- We showed that the spending multiplier was $\frac{1}{1-b}$, in that a \$1 increase in spending would lead to a $\frac{1}{1-b}$ increase in output. Does this result hold true for a tax cut as well? To answer this question we can calculate the size of the tax multiplier.
- From the equation for equilibrium output, $Y = \frac{\bar{C} - bT + I + G + NX}{(1-b)}$, we can calculate that a 1 unit increase in T leads to a fall in output of $\frac{b}{1-b}$ units. We define $\frac{-b}{1-b}$ as the tax multiplier. Note that the absolute value of the tax multiplier is smaller than the regular multiplier.
- Graphically we can illustrate this as follows, where $(T_1 - T_0) = 1$



- Mathematically, the mechanism by which this happens can be explained fairly easily. Suppose taxes go up by \$1. Since $C = \bar{C} + b(Y - T)$, consumption, and therefore output, will fall by \$b.
- When output (income) decreases by \$b, consumption will decrease by b^2 since the consumer spends a fraction b of every dollar that he/she receives. This is called a feedback effect. This feedback effect does not end here: the b^2 decrease in consumption causes income to go down by b^3 and so on ad-infinity.
- Basically, an increase in taxes causes a decrease in consumption spending, which in turn leads to a magnified impact on the economy through a series of chain-reaction type cutbacks in spending. The magnitude of the impact of a \$1 increase in taxes is smaller than the impact of a \$1 decrease in spending.
- Intuitively, the difference stems from the fact that a 1 unit increase in taxes has a direct effect of reducing income by only b units whereas the direct effect of a 1 unit decrease in spending is to reduce income by 1 unit.
- Essentially, since a tax hike itself does not affect GDP, the initial impact of a \$1 tax hike on the economy occurs only when people cut back on their consumption spending. In contrast, the impact of a \$1 cut in government purchases, for example, directly affects Y. So the total impact of a \$1 cut in spending is actually greater than the total impact of a \$1 rise in taxes.

IV. THE OPEN ECONOMY MULTIPLIER

- The model of the underlying economy that we used to derive the multiplier was the simplest possible model; only income was assumed to depend on another macroeconomic variable, output.
- We found a large multiplier of about 10, implying that a 1 unit increase in domestic spending (higher government purchases for example) would translate into a 10 unit increase in output.

- A multiplier that is so large seems somewhat implausible: if every dollar of spending had a tenfold impact on output then governments would find it very easy to expand production in the economy.
- One small change that we could incorporate into the model is to assume that Net Exports are related to income. Basically, we build into our model the idea that countries with higher incomes are likely to import more goods leading to a negative relationship between income and NX.
- The following modification to the Keynesian Cross model captures the fact that net exports are a decreasing function of income.

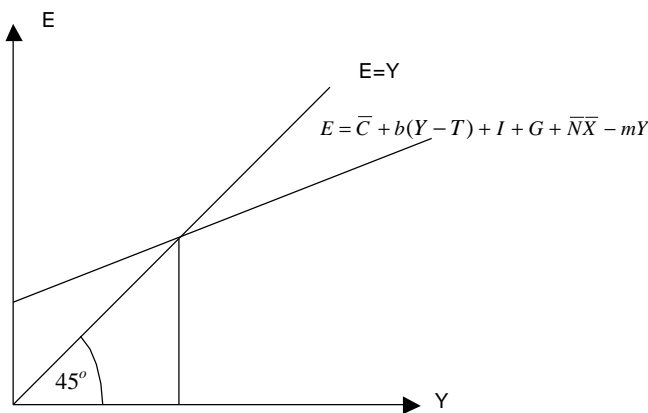
$$Y = C + \bar{I} + \bar{G} + NX \quad E=Y \quad \text{where}$$

$$C = \bar{C} + b(Y - T) \quad NX = \bar{N}\bar{X} - mY$$

- In this equation, $\bar{N}\bar{X}$ can be thought of as representing changes in net exports attributable to reasons other than income, e.g. a preference for Swiss chocolates over Hershey chocolates. Meanwhile m can be thought as the marginal propensity to import: how much of an additional dollar of income is spent on importing goods from abroad.
- We can solve this simple model and obtain an expression for the equilibrium value of Y in this economy as

$$Y = \bar{C} + b(Y - T) + I + G + \bar{N}\bar{X} - mY$$

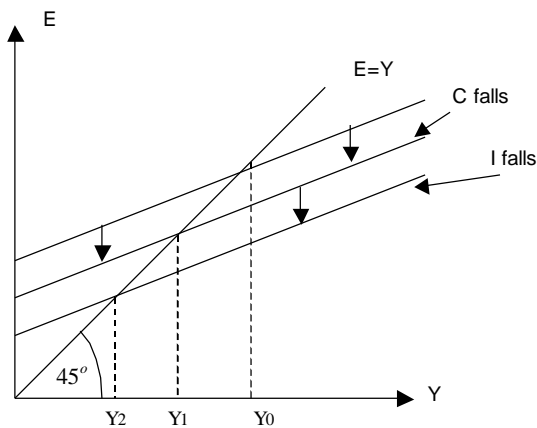
$$Y = \frac{\bar{C} + I + G + \bar{N}\bar{X} - bT}{1 - b + m}$$
- If we graph the expenditure line, we can now see that it has a slope of $(b-m)$ rather than b . The intercept term is now $\bar{C} - bT + I + G + \bar{N}\bar{X}$ $E = \bar{C} + b(Y - T) + I + G + \bar{N}\bar{X} - mY$



- A \$1 increase in G will cause Y to go up by $\frac{1}{1 - b + m}$. So the multiplier is smaller in an open economy when imports are a function of income. Intuitively, some of the money being spent in the economy is being spent on imported goods; essentially at every stage of the process feedback process, some spending leaks out of the domestic economy.
- This leakage reduces the spending on domestic goods and services and therefore reducing GDP. If we think of reasonable values for b and m , say $b=0.9$ and $m=0.3$ (90 cents of an additional dollar of income is spent on consumption, only 60 cents go to domestic goods, 30 cents go to foreign goods), the spending multiplier becomes smaller $\frac{1}{1 - b + m} = \frac{1}{1 - 0.9 + 0.3} = \frac{1}{0.4} = 2.5$ instead of 10.

V. AN APPLICATION OF THE KEYNESIAN CROSS MODEL

- Keynes' study of economic fluctuations originated with trying to understand the Great Depression. In this section, we will use the Keynesian Cross model to understand some of the underlying causes of the Great Depression.
- For those of you unfamiliar with the Great Depression, it suffices to know that it was the most devastating contraction of output in the U.S. Between 1929 and 1933, unemployment rose from 3.2% to 25.2%, GDP fell by 30%, investment fell by 75% and consumption fell by 20%.
- A plausible story that once can tell is as follows. In 1929, there was a major stock market crash coupled with several major bank failures that eroded consumer confidence about the future prospects of the economy. As a result consumers become more uncertain about the future: \bar{C} falls and as a result consumption falls.
- Widespread bank failures undermine the transfer of funds to potential investors: investment spending falls as well. As we have seen, the decrease in consumption spending (reduces Y to Y_1) and investment spending (reduced Y to Y_2) have a dramatic contractionary impact on the economy: the contraction of Y is even more substantial because of the multiplier effects.



- The situation was worsened by the actions of the government, which decided to raise taxes in order to cover a budget deficit that it was running. The increase in taxes is even worse for the economy, it further reduces spending and lowers Y in the economy.
- Keynes forcefully argued that the government was wrong to raise taxes and not change G during the times of the Great Depression. He argued that the government needed to increase its purchases of goods and services (raise G) dramatically without worrying about budget deficits. In one of his more famous statements, he suggested that people be paid to dig holes in the ground and others be paid to fill those holes back again, theorizing that the additional income that this people earned would lead to greater spending and a reviving of the economy through multiplier effects.
- Keynes argued that the economy was stuck in a vicious circle: people weren't spending money on goods and services, as a result firms weren't producing goods because they could not sell them. Since firms were not producing goods, they could not afford to pay workers and would have to fire workers. When workers lose their jobs, their income falls and their spending on goods and services falls leading to the whole cycle again.
- Keynes figured that the government should step in and hire workers: their spending on the services of these workers will put more money into their pockets and lead them to increase consumption spending. When government workers are spending money on goods and services, firms can increase their production of goods and services, leading them to hire more workers and putting more money into the pockets of workers.