Keynesian Cross

Or The Aggregate Expenditure Model

Or Circular Flow Gone Wild

Do Activity 19

The model of chapter 27 was an important step in understanding macroeconomics.

However, it is inadequate to explain all the activities of the economy.

It has been superceded.

However, some of the concepts it gives us are foundational and refered part of our preferred model.

What we need to understand from chapter 27 and 28:

Mr. Benjamin's Base Case Flow Version of the Keynesian Cross

DI = S + C (or S = DI - C)

I = S as a starting point

The % of income consumed changes with income level
OR the % of income saved changes with income level

There exists a breakeven income level
above which people save
below which people borrow to consume

The amount consumed is determined by Income
The shape and level of the consumption (and savings) schedules are determined by:
Wealth
Expectations
Interest rates
Debt
Taxation

The model:
The consumption schedule and axis
APS, APC, MPS, MPC (MPS+MPC = 1)
Changes in consumption versus changes in the amount consumed

Investment is determinded by interest rates
Expected rate of return
Real interest rate

The amount invested is determined by real interest rates
The shape and level of the investment demand curve is determied by:
Costs: Acquisition, maintenance, and operating
Taxes
Technology change
Stock of capital
Expectatoins

Investment is unstable:
Durability and descretion in maintenance vs. acquisition allows firms can manage timing
Innovation is unpredictable.
Profits are a by-product of complex circumstance
Expectations are variable

The model:
The investment demand curve and axis

Multiplier model:
Mechanism
Multiplier = 1/ (1-mpc)

Recessionary/Inflationary Gap
Limitations of the model

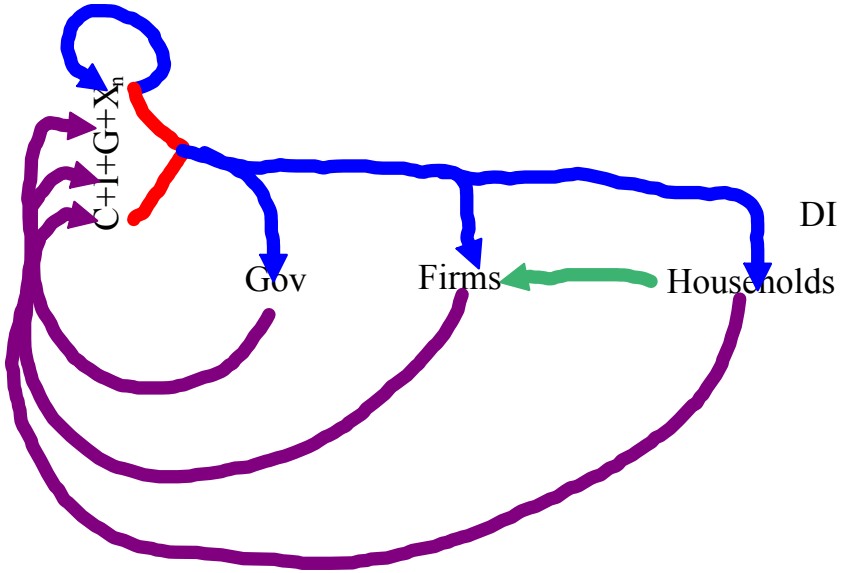
IN = OUT but amount of both can increase

Chapter 27 and 28

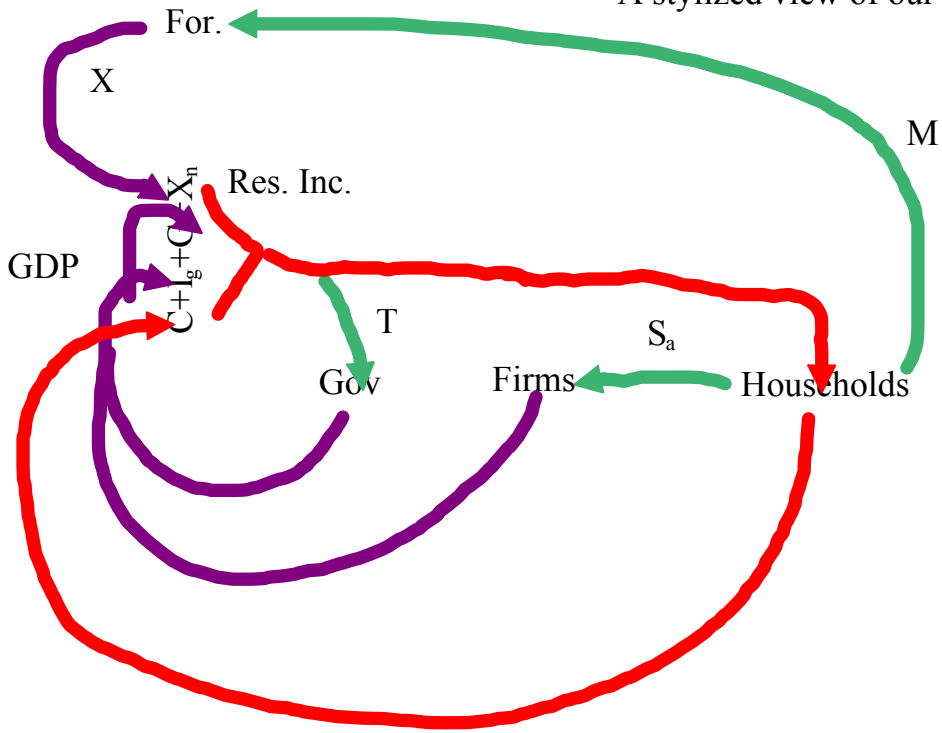
Building models to understand C,I,G, X_n

Understanding the mechanisms by which aggregate spending equilibrates with aggregate income.

Further exploring the leakages along the cycle from
C+I+G+X_n=> Resource Payments => DI



A stylized view of our macro-economic model.



The main artery is GDP providing resource income which should turn into C.

Everything else is a leakage or an injection.

Household don't spend, they save? Leakage from C

Government taxes income? Leakage from C

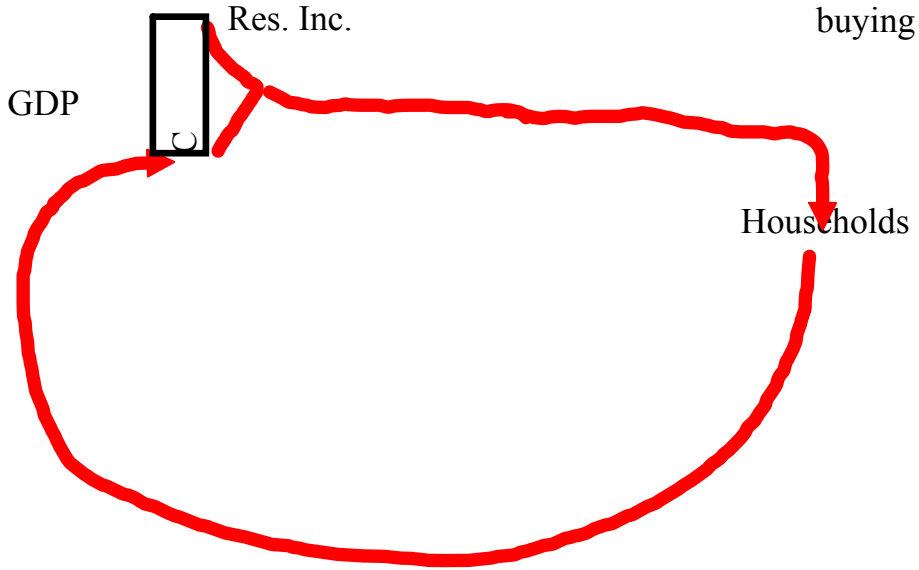
Households buy foreign goods? Leakage from C

Government spends? An added injection

Firms decide to invest? An added injection.

Foreigners import our stuff? An added injection

GENERAL RULE: INJECTIONS OR LEAKAGE HAVE A MULTIPLIED GDP IMPACT.
Coming next



Kill the government, forget Foreigners, and firms

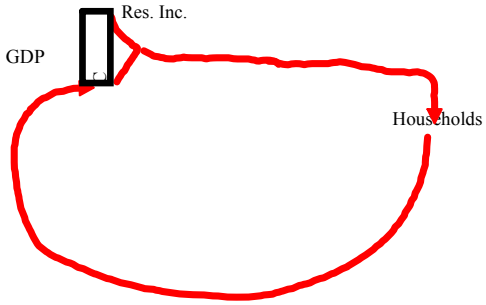
Assume everyone is a farmer eating what they make, at most buying from thier neighbors.

Res. Inc. = C =GDP

No injectors or leakers.

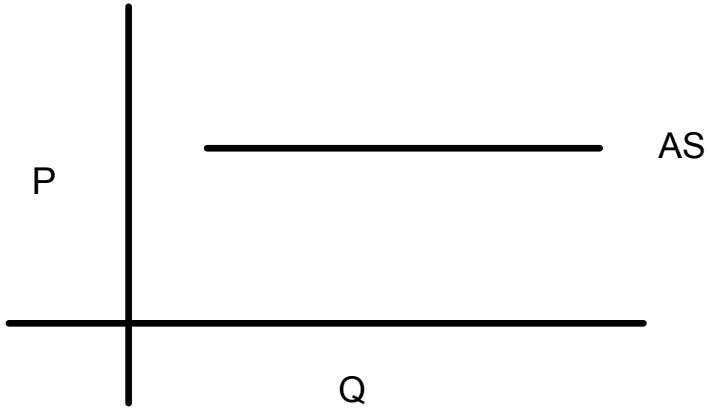
START HERE:
IF CONSUMERS WANT MORE, THEY BUY MORE IT TURNS INTO INCOME, IT KEEPS GOING.

Problem: No equilibrating mechanism, limiting factor



If people want more
& firms figure it out
=> they make more.

Economy is any size you want.



BUT,
People don't spend every thing.

What are the implications of that?

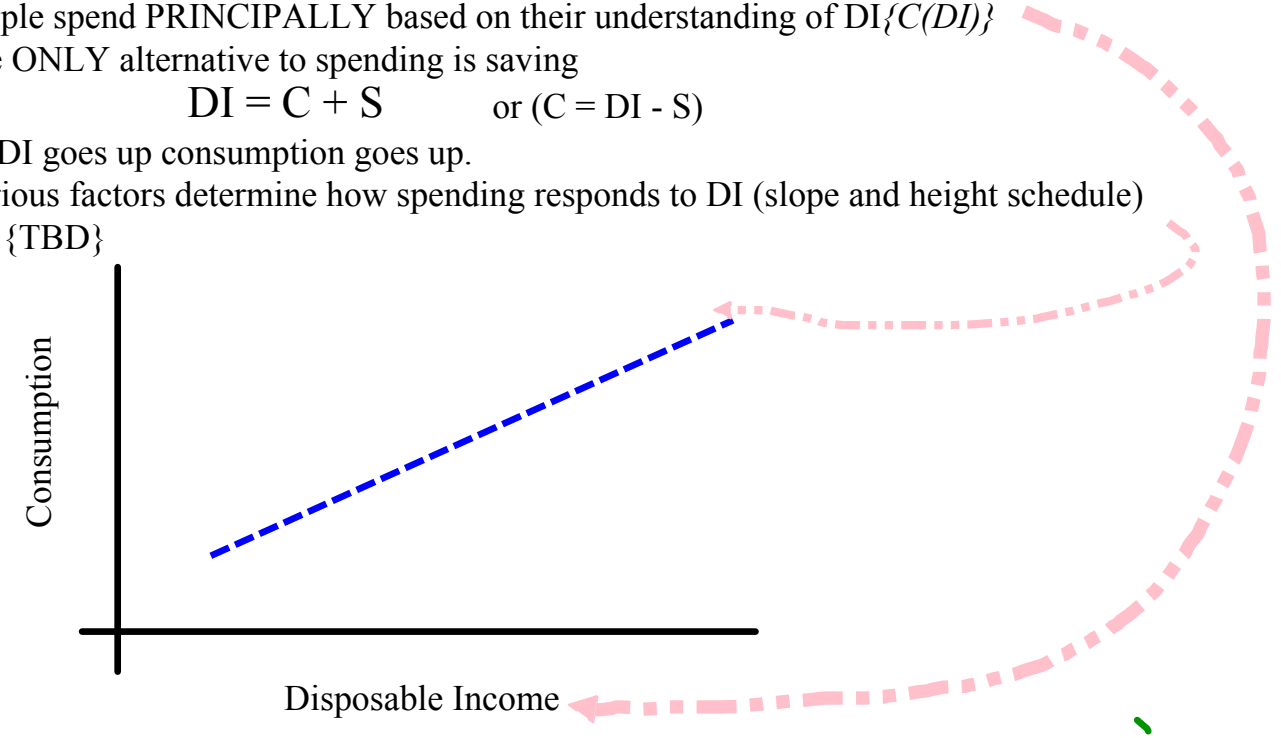
Top story C We are satisfying wants and needs of consumers.
Their buying and saving is the heart of the story.

The Model of C - the consumption schedule

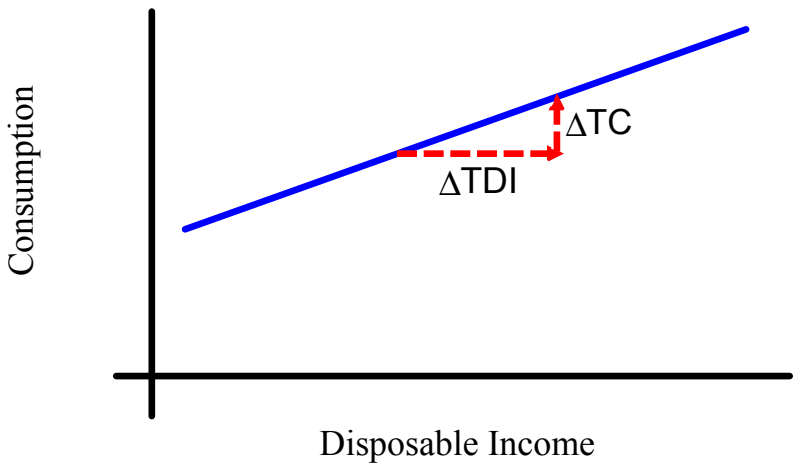
1) People spend PRINCIPALLY based on their understanding of DI*{C(DI)}*
2) The ONLY alternative to spending is saving

$$DI = C + S \qquad \text{or } (C = DI - S)$$

3) As DI goes up consumption goes up.
4) Various factors determine how spending responds to DI (slope and height schedule)
{TBD}



KNOW THIS



1) The marginal propensity to consume is the slope of the consumption schedule

$$MPC = \frac{\Delta \text{ total dollars of Consumption}}{\Delta \text{ total disposable income}}$$

If DI^ $1=>C^.75 then MPC = .75

2) The households take every new dollar and spend some and save some.

MPS = Marginal propensity to save

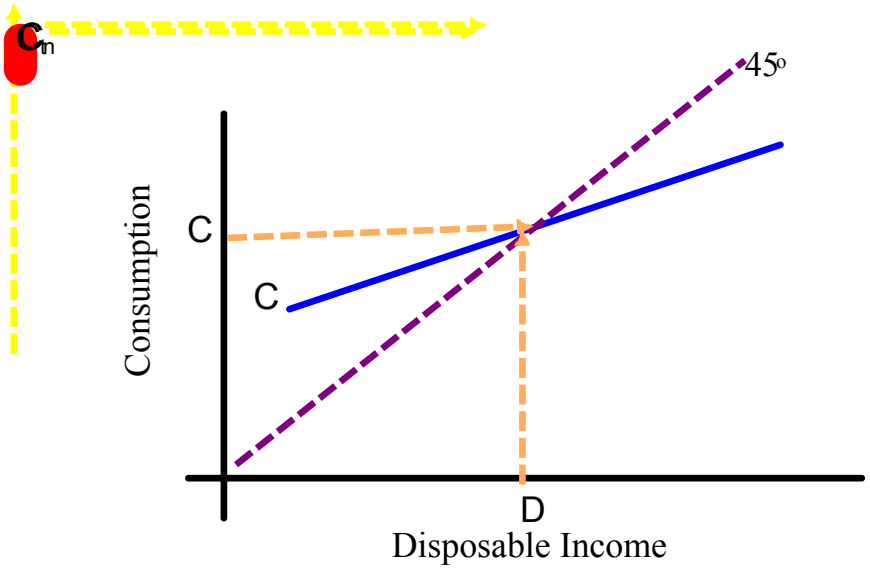
$$MPS = \frac{\Delta \text{ total dollars saved}}{\Delta \text{ total disposable income}}$$

If DI^ $1=>C^.75 then MPC = .75
& MPS = .25

3) If every dollar is partially spent and partially saved:

1 = MPC + MPS
MPC = 1 - MPS
MPS = 1- MPC

4) Simplifying assumption: MPC is constant



What changes the way people spend?

Wealth - Perceived.

$W_{\wedge} \Rightarrow$C schedule ?

Expectations

Exp. Better $\Rightarrow$C schedule ?

Interest rates

i (real) $_{\vee} \Rightarrow$C schedule ?

Debt

debt $_{\wedge} \Rightarrow$C schedule ?*

Taxation

taxes $_{\wedge} \Rightarrow$C schedule ?

The line has two key features, <u>concepts</u>:

1) MPC (slope)

2) 45° tells us breakeven income level
The level at which you have exactly what you need to live.

- Above this DI people save some
- Below this DI people dis-save, borrow

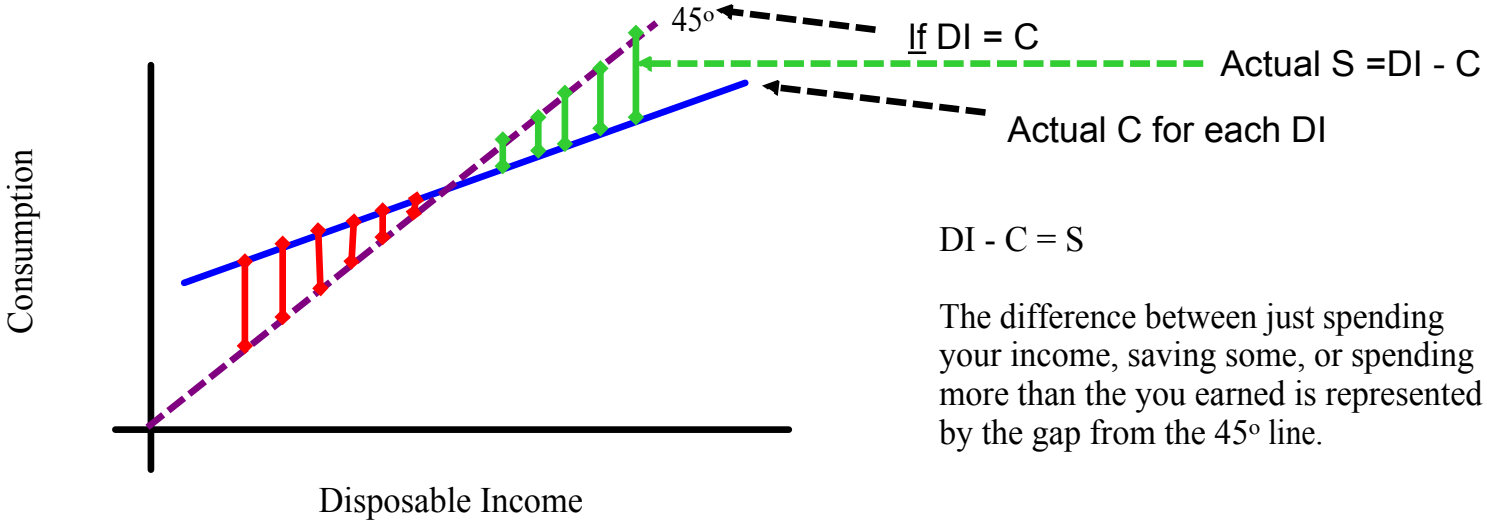
The graph tells us

The quantity consumed
The quantity saved
(see next slide)

"increase in consumption"
- the curve shifted up

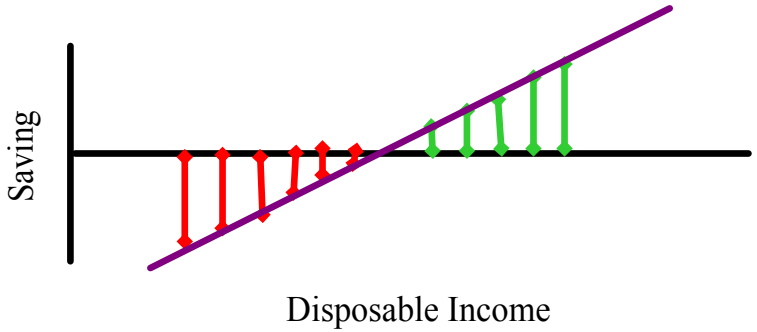
"increase in quantity consumed"
- Increase in DI moves us along the curve

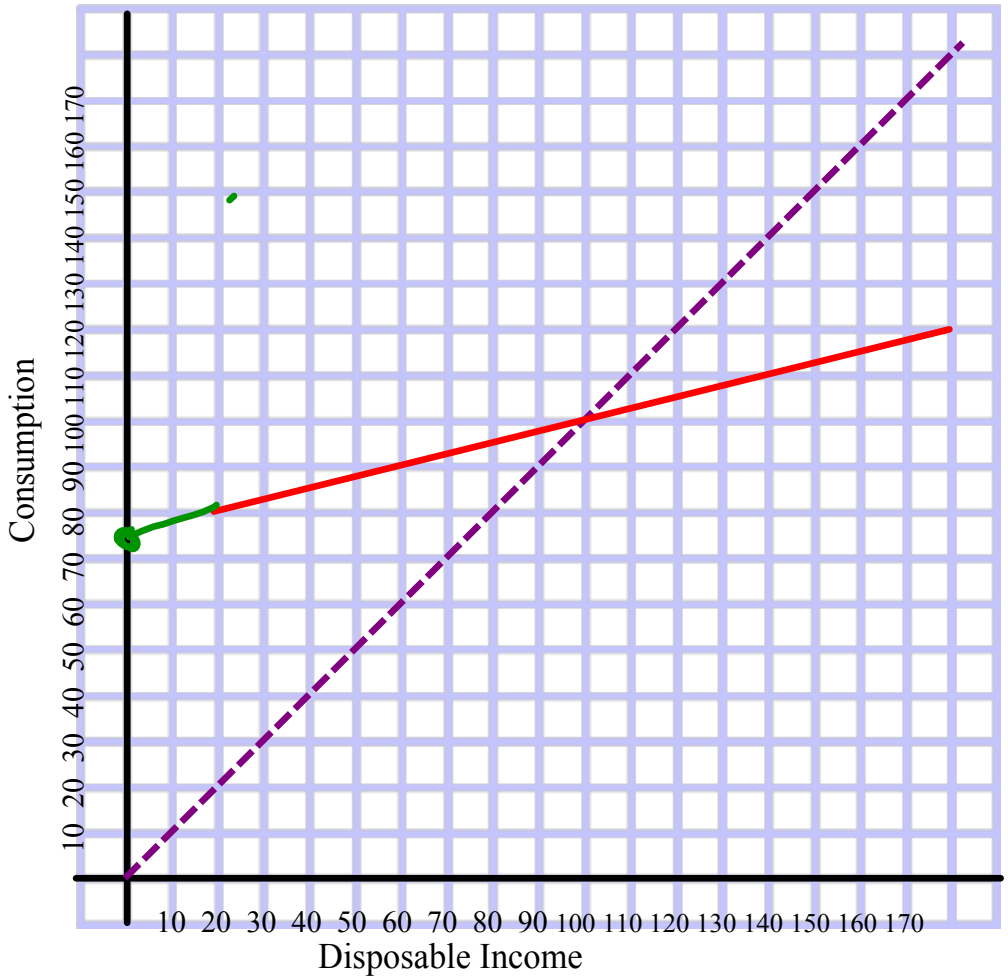
Deriving the quantity saved from the quantity consumed



DI - C = S

The difference between just spending your income, saving some, or spending more than the you earned is represented by the gap from the 45° line.





What is the MPC?

What is the MPS?

At what disposable income do are people spending exactly all their income?

What is the average propensity to consume when income is $140?

What is the average propensity to save when income is $20?

At what income level are consumers saving $30?

At what income level are consumers borrowing $30?

If income went from $50 to $70 what would happen?

If income went from $130 to $140 what would happen?

Key idea: Difference between average and marginal. LOOKING AT AGGREGATE

Other: $APC = \frac{\text{total consumption}}{\text{income}}$ $APS = \frac{\text{total savings}}{\text{income}}$

If

MPC is constant and positive
and
at lowest income levels people dis-save or save nothing

MPC =.75

DI<$10,000 people dis-save

then

Average propensity to consume
Starts at 1 or above
and
Declines towards MPC as INCOME INCREASES

APC when DI<$10,000?
APC when DI>$10,000?

Two statements:
As inomce increases the % of income consumed: ?
As income increases the % of income saved: ?

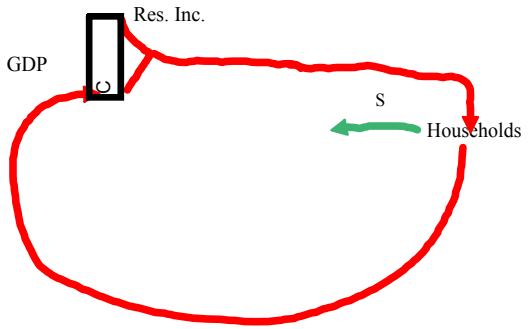
So, what can we do now:

Tell me how much DI moves and tell me MPC and I can tell you
- How much C changes
- How much S changes

Tell me about a change in Wealth, Expectations, Interest rates, Debt, or Taxation
and I can tell you what happens to C and S

AND TELL ME WHAT HAPPENS TO C AND I CAN TELL YOU WHAT HAPPENS TO GDP RIGHT?

NOT, more to discuss


Res. Inc.
GDP
S
S
Households

The multiplier effect

Assumptions:

Each expenditure turns into income to the households providing resources.

Each household saves some and spends some.

The marginal propensity to consumer for all citizens is .75.
The government prints $1,000 and buys guns from Daria's Demolition

Spending | Savings

Daria provides all the resources to her company....
Daria takes home $1,000 of new income
She does what with his $1,000?

Everything Daria wants can be bought from Taylor's Teashop
Taylor provides all the resources to her company....
Taylor takes home _____ of new income
She does what?

Everything Taylor wants can be bought from Karen's K-mart
As Karen provides all the resources to her company....
Karen takes home _____ of new income
She does what?

Everything Karen wants can be bought from Brittany's Bargain's
As Brittany provides all the resources to her company....
Brittany takes home _____ of new income
She does what?

Brittany provides David with _____ of income with which David makes new purchases of _____

etc.....

A new amount of money spent generates an improvement of GDP as follows:

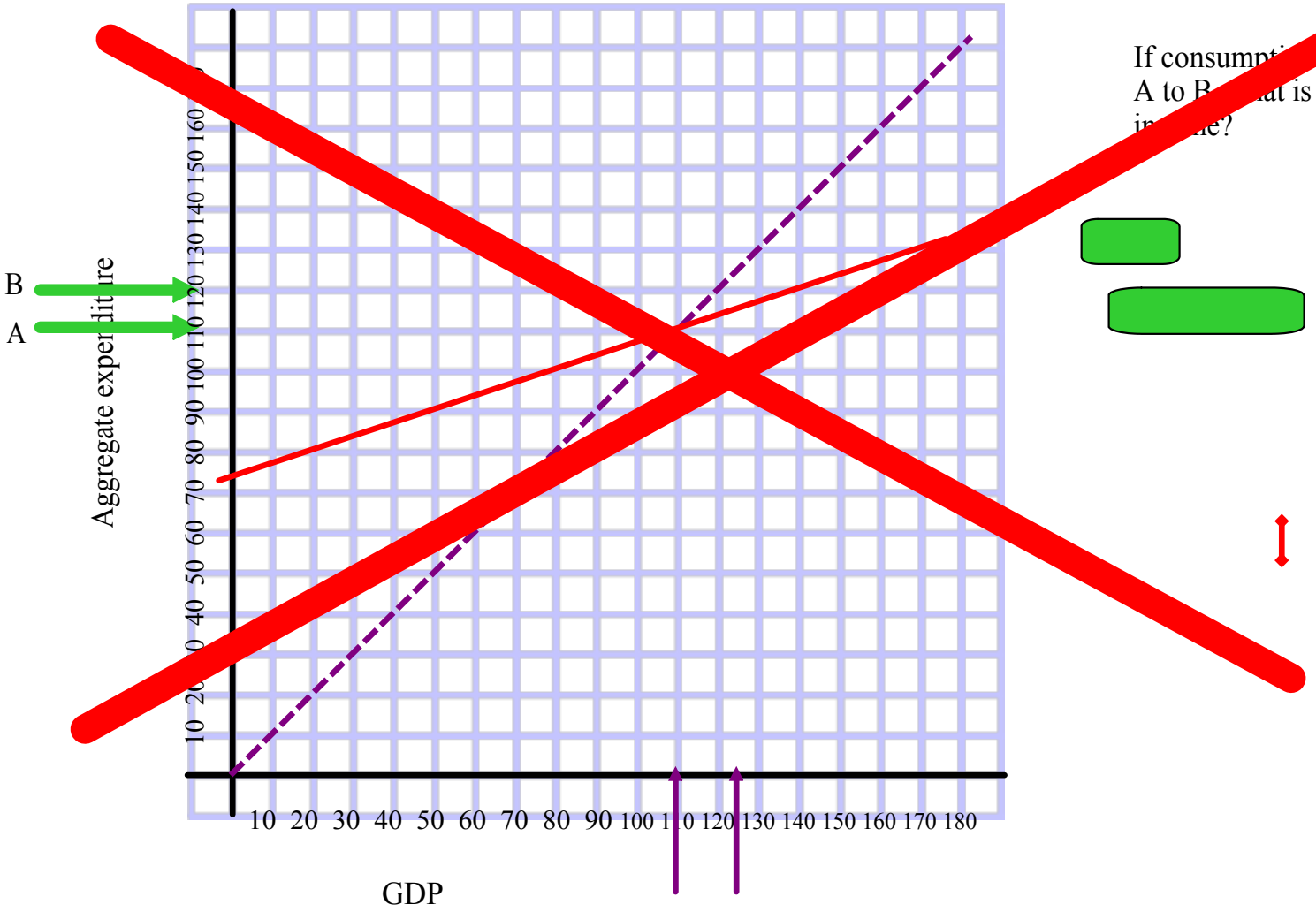
$$\text{Initial money spent} * \frac{1}{(1\text{-MPC})} = \text{Total GDP Increase}$$

$$= \frac{1}{\text{MPS}}$$

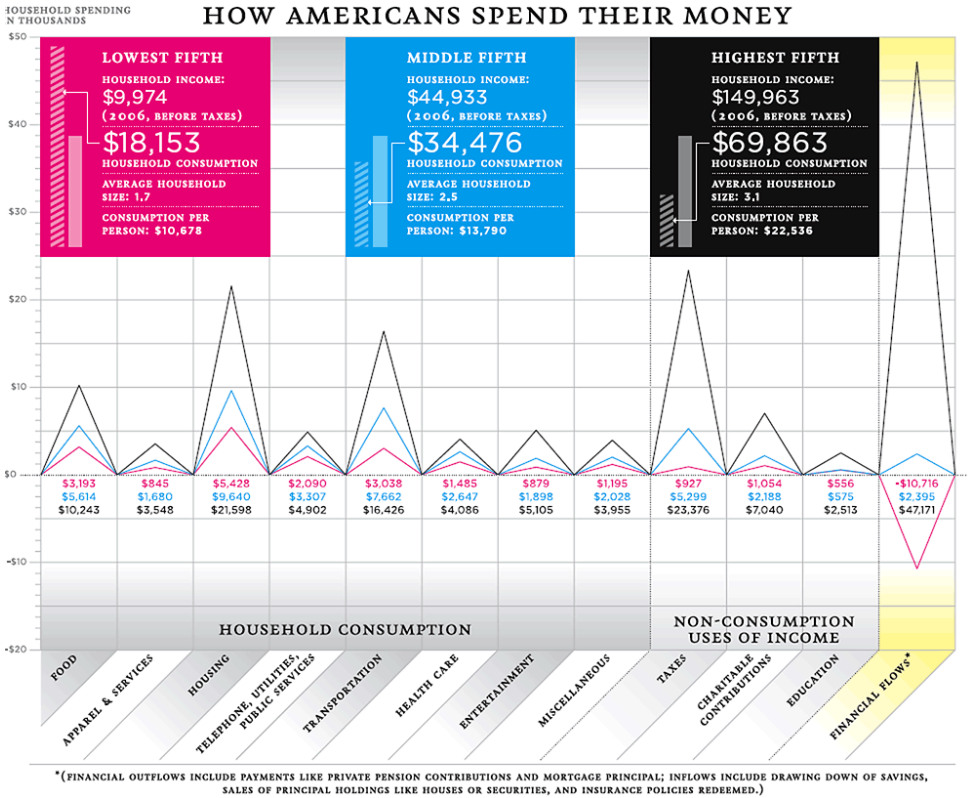
$1,000 of new spending, MPS = .2.

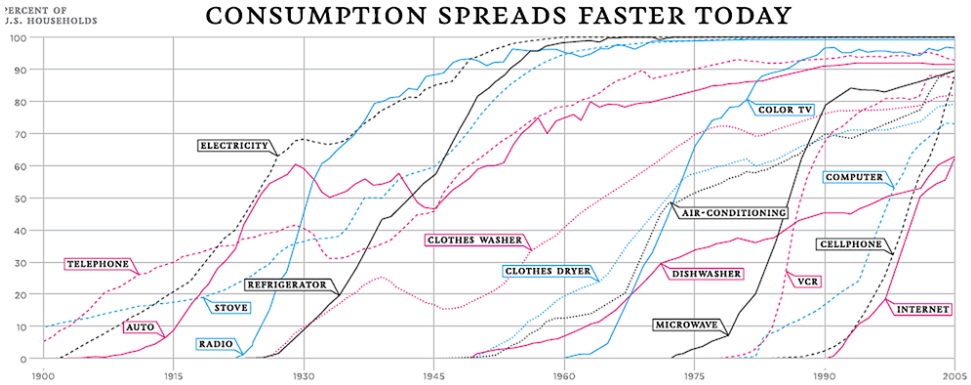
What is the total impact on GDP?

What is the impact of the initial spending? What is the additional due to the multipier effect?

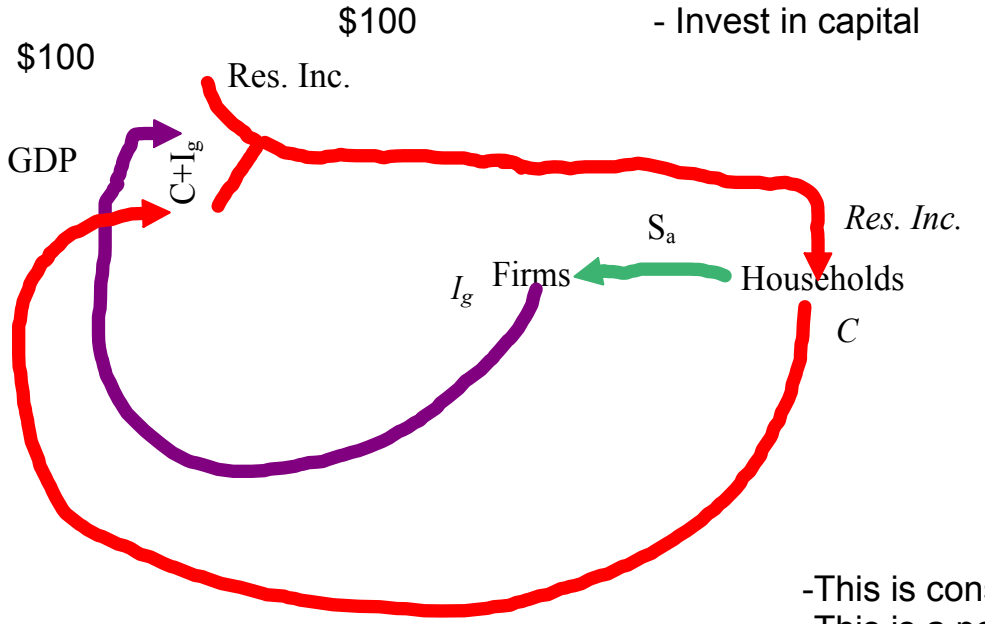


If consumption increases from A to B what is the impact on total income?


HOUSEHOLD SPENDING IN THOUSANDS
HOW AMERICANS SPEND THEIR MONEY
LOWEST FIFTH
HOUSEHOLD INCOME: $9,974 (2006, BEFORE TAXES)
$18,153 HOUSEHOLD CONSUMPTION
AVERAGE HOUSEHOLD SIZE: 1.7
CONSUMPTION PER PERSON: $10,678
MIDDLE FIFTH
HOUSEHOLD INCOME: $44,933 (2006, BEFORE TAXES)
$34,476 HOUSEHOLD CONSUMPTION
AVERAGE HOUSEHOLD SIZE: 2.5
CONSUMPTION PER PERSON: $13,790
HIGHEST FIFTH
HOUSEHOLD INCOME: $149,963 (2006, BEFORE TAXES)
$69,863 HOUSEHOLD CONSUMPTION
AVERAGE HOUSEHOLD SIZE: 3.1
CONSUMPTION PER PERSON: $22,536
$50
$40
$30
$20
$10
$0
-$10
-$20
$3,193 $5,614 $10,243
$845 $1,680 $3,548
$5,428 $9,640 $21,598
$2,090 $3,307 $4,902
$3,038 $7,662 $16,426
$1,485 $2,647 $4,086
$879 $1,898 $5,105
$1,195 $2,028 $3,955
$927 $5,299 $23,376
$1,054 $2,188 $7,040
$556 $575 $2,513
-$10,716 $2,395 $47,171
HOUSEHOLD CONSUMPTION
NON-CONSUMPTION USES OF INCOME
FOOD
APPAREL & SERVICES
HOUSING
TELEPHONE, UTILITIES, PUBLIC SERVICES
TRANSPORTATION
HEALTH CARE
ENTERTAINMENT
MISCELLANEOUS
TAXES
CHARITABLE CONTRIBUTIONS
EDUCATION
FINANCIAL FLOWS*
*(FINANCIAL OUTFLOWS INCLUDE PAYMENTS LIKE PRIVATE PENSION CONTRIBUTIONS AND MORTGAGE PRINCIPAL; INFLOWS INCLUDE DRAWING DOWN OF SAVINGS, SALES OF PRINCIPAL HOLDINGS LIKE HOUSES OR SECURITIES, AND INSURANCE POLICIES REDEEMED.)


PERCENT OF U.S. HOUSEHOLDS
CONSUMPTION SPREADS FASTER TODAY
100
90
80
70
60
50
40
30
20
10
0
1900
1915
1930
1945
1960
1975
1990
2005
ELECTRICITY
TELEPHONE
AUTO
RADIO
STOVE
REFRIGERATOR
CLOTHES WASHER
CLOTHES DRYER
COLOR TV
AIR-CONDITIONING
DISHWASHER
MICROWAVE
COMPUTER
CELLPHONE
VCR
INTERNET

But we know savings go to firms:
- Invest in inventory
- Invest in capital



For households:

$$\text{Res. Inc.} = DI = C + S_a$$

Assume Firms:

$$S_a = I_g$$

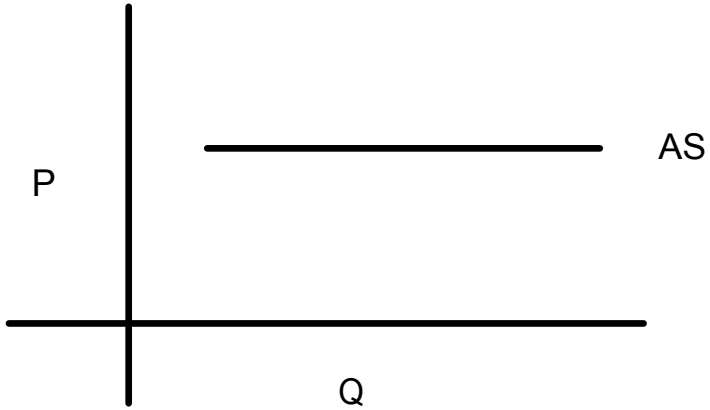
-This is consistent with our capital markets model.
-This is a point of contention.

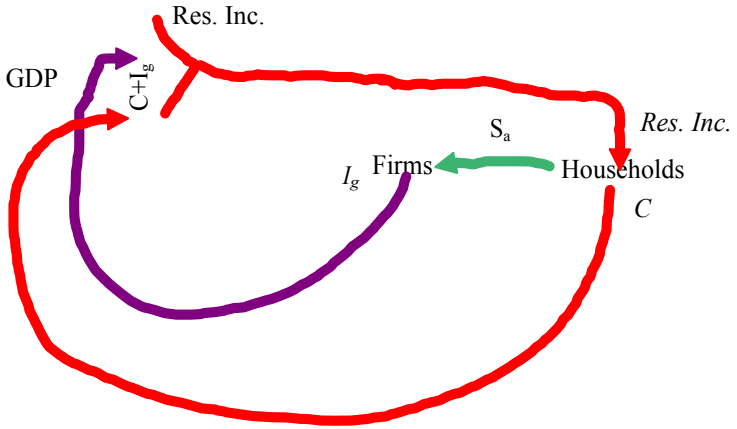
WHEN WE ARE IN A STABLE STATE
S=I

Problem: No equilibrating mechanism, limiting factor

If people want more
& firms figure it out
=> they make more.

Economy is any size you want.





OK, but who decides where we are?

To have stuff people must work, so we know the answer is not an infinite amount.

Before we get answer, is it all up to consumers or can firms increase level of GDP?

No. If firms produce more to try boost C:
- The extra production increases DI
=> DI^ => C^ BUT because of S, C^<DI^ and so is **less than the value of new goods**.
=> Some of the new production stays on shelf
UNINTENDED INVESTMENT (I ^) happens => cut production
=> DI v => Cv => unintended investment (I v some) => Not enough? Cut production =>
Until we get back to original C.

There are three stories we can tell:

- What happens if firms cut production? DI v=> C v, {C v < DI v, C v **less than prod. cut**} =>
  Unintended disinvestment (I v) => increased production=> DI^ => C ^ => until
- What happens when households want more C?
  C ^ => Unintended disinvestment (I v) => increased production=> DI^ => C ^ => until
- What happens when households want less C?
  C v => Unintended investment (I ^) => decreased production=> DI v => C v => until

Bottom line:
Investment must = Savings.

Business can only invest as much as people set aside through saving.

So, any change in their injection, I
will be matched by a change household leakage, S

HOUSEHOLDS ARE IN CHARGE

Keynes: Firms can not determine
1) Size of economy
2) Total investment

But, savings is affected by interest rates:

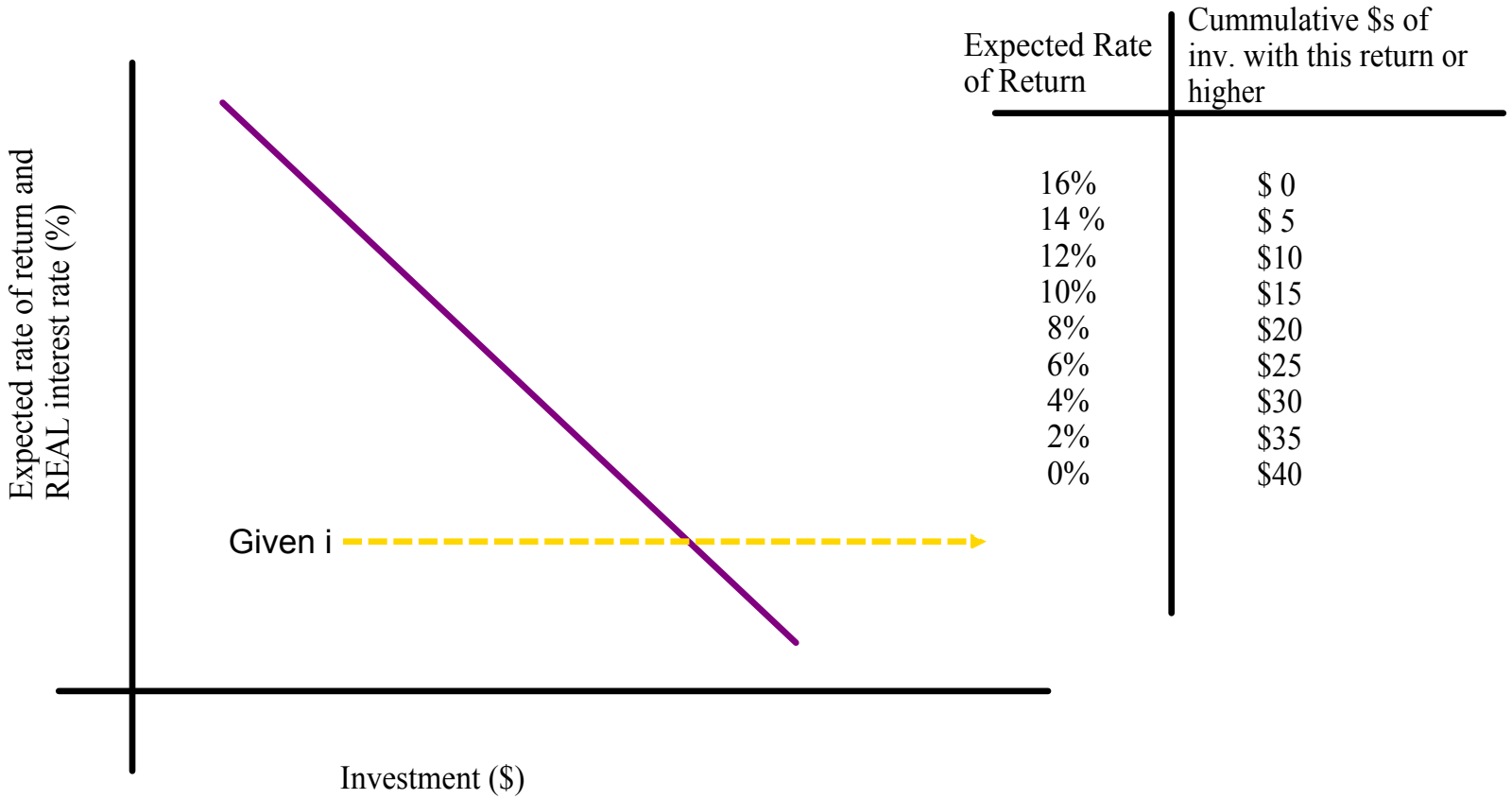
Keynes cross does not give interest rate mechanism we can think about the following

Firm demand ^ => i ^ => S ^, possibly

Government sets i v => Quantity demand ^, but S v, shortage => gets back
Government sets i ^ => Quantity demand v, but S ^, surplus => gets back

A MORE NEEDED TOPIC

Investment Demand - Revisited Side Bar



Expected Rate of Return	Cummulative $s of inv. with this return or higher
16%	$ 0
14 %	$ 5
12%	$10
10%	$15
8%	$20
6%	$25
4%	$30
2%	$35
0%	$40

A CHANGE SHIFTS THE EXPENDITURE CURVE AS A WHOLE

So I is a function of the real interest rate.

$$E(Ret) = \frac{E(Rev) - Costs}{Outlay/Inv.}$$

But what will shift the curve

Acquisition, maintenance, and operating costs

Costs $\vee \Rightarrow$?

Business taxes

Taxes $\wedge \Rightarrow$?

Technological Change

$\Rightarrow$?

Stock of capital

Comparison of one state to another

Expectations

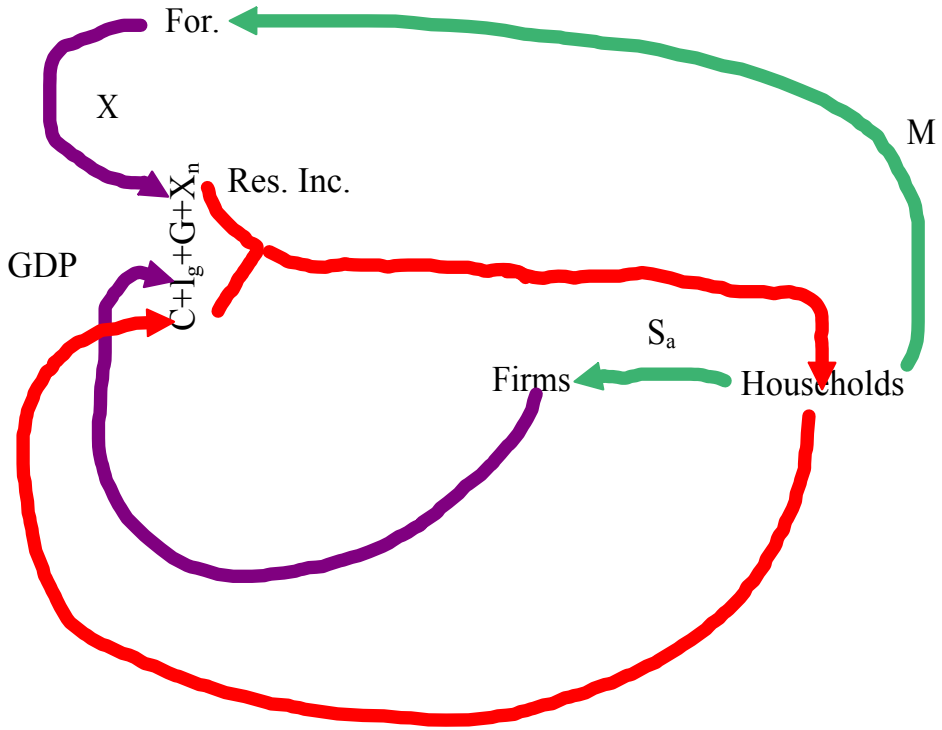
Investment is unstable:

Costs of buying high quality capital purchased and/or maintaining capital weighed against acquisition allows firms can manage timing

Innovation is unpredictable.

Profits are a by-product of complex circumstance

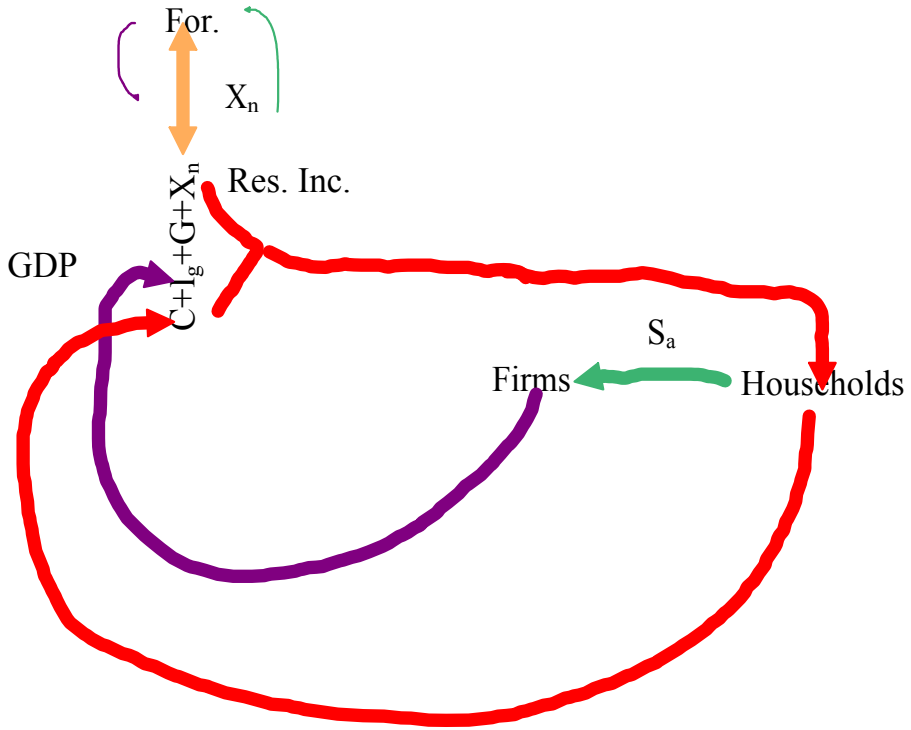
Expectations are variable



Looking at X_n

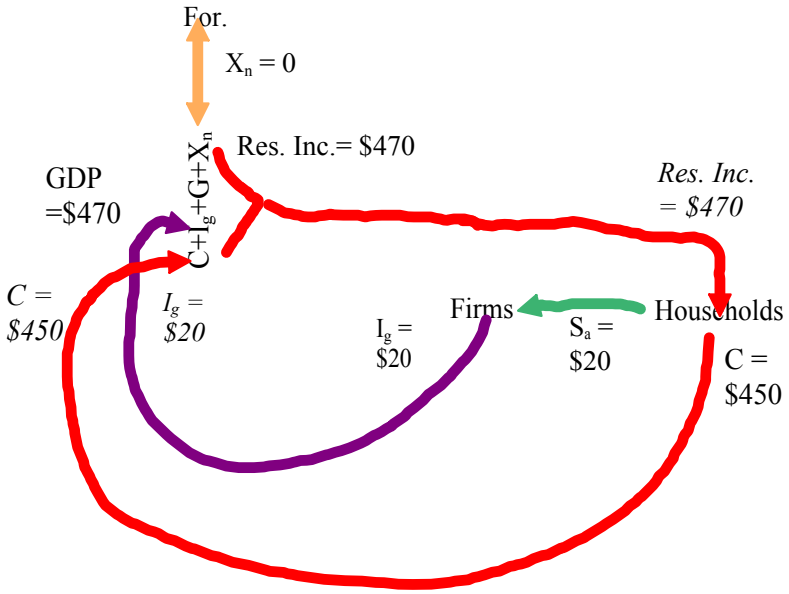
This is the more realistic picture but

let's simplify:

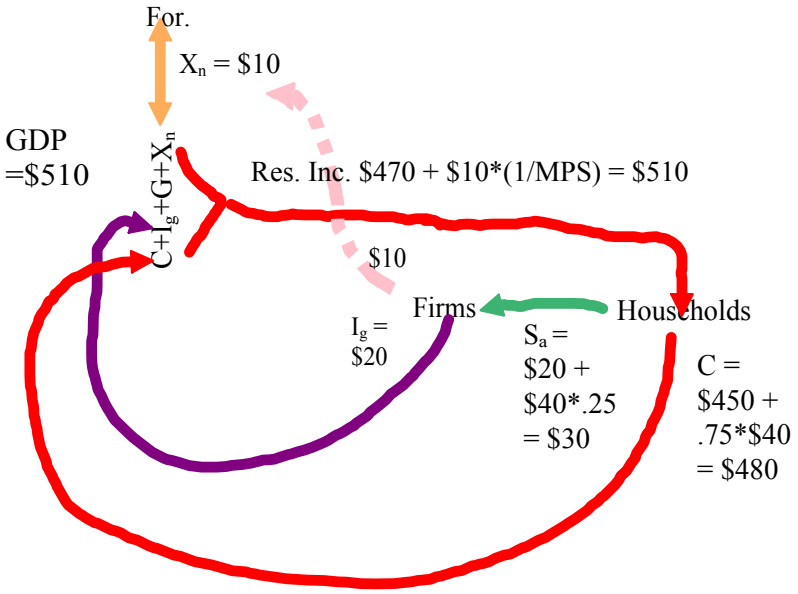


If X_n reflects higher X than M then the this is an injection to the economy.

Hit the spending with the mulitplier and it grows equilibrium GDP.



If this is equilibrium with no foreign flows, then....



If we are selling more goods than we import, then that is an injection subject to the mulitplier.

$10, after multiple rounds, will grow equilibrium to $510.

Note: You either have to assume that
- X always = M at equilibrium
- Firms finance exports.(closer to reality)

A MORE NEEDED TOPIC

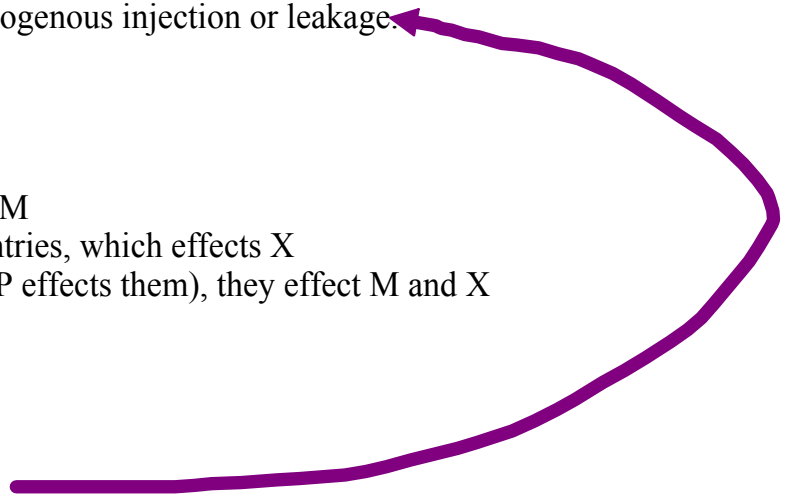
Important idea:

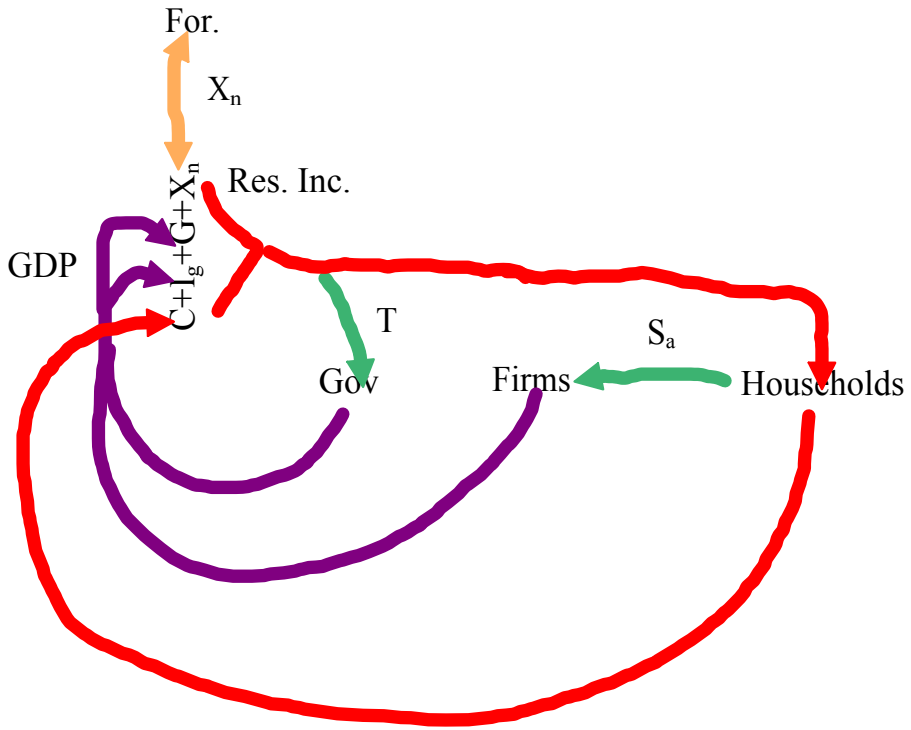
X_n is assumed to be this thoroughly exogenous injection or leakage.

Hmmm....

No, our GDP effects C, which effects M
Also, our M effects GDP in other countries, which effects X
Exchange rate are not exogenous (GDP effects them), they effect M and X

But this is a good basic first thought





Add government.

It would be neat to think of it in the same net way as the foreign spending.

But a problem.

The government has two possible actions.

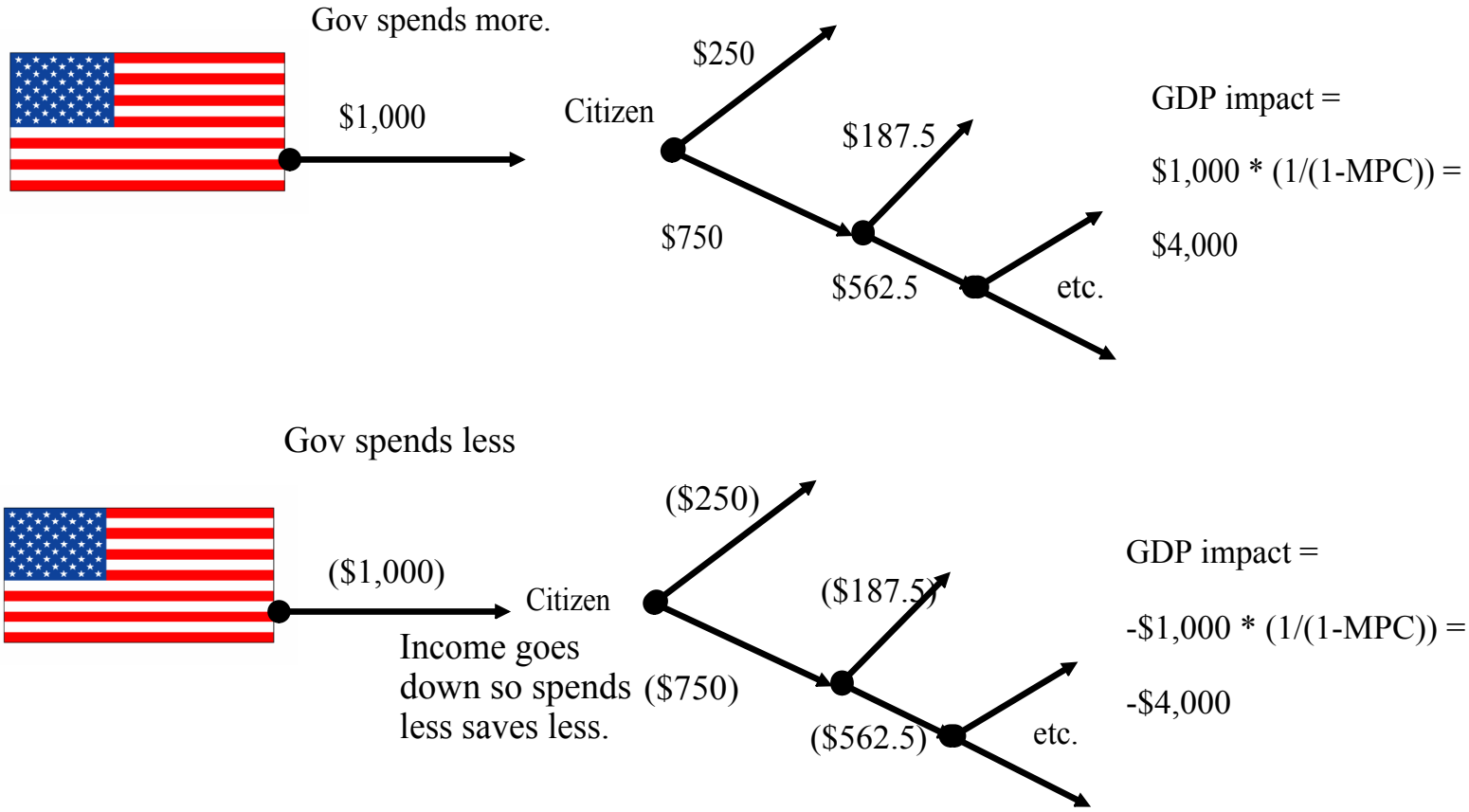
- Tax or spend

THEY DO NOT HAVE THE SAME EFFECT.

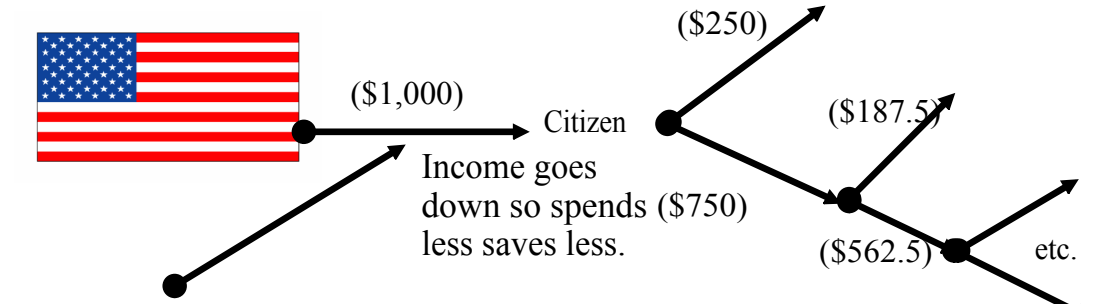
G is a direct insertion.

G * (1/(1-MPC)) = GDP impact

T is a DEDUCTION from income, not the same


Gov spends more.
$1,000
Citizen
$250
$187.5
$750
$562.5
etc.
GDP impact =
$1,000 * (1/(1-MPC)) =
$4,000
Gov spends less
($1,000)
Citizen
Income goes down so spends less saves less.
($250)
($187.5)
($750)
($562.5)
etc.
GDP impact =
-$1,000 * (1/(1-MPC)) =
-$4,000

Gov spends less



Income goes down so spends ($750) less saves less.

This number is an subtraction from GDP the rest follow. This is first round.

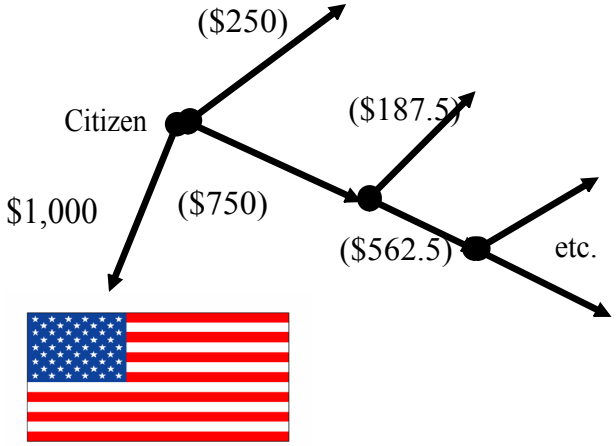
GDP impact =

-$1,000 * (1/(1-MPC)) =

-$4,000

With taxes, Citizen, takes from savings and spending budget and gives it to government.

There is no first round from government.



GDP impact, same as above EXCEPT their is no first round impact.

-$1,000 * MPC *(1/(1-MPC)) =

-$1,000 * MPC/(1-MPC) =

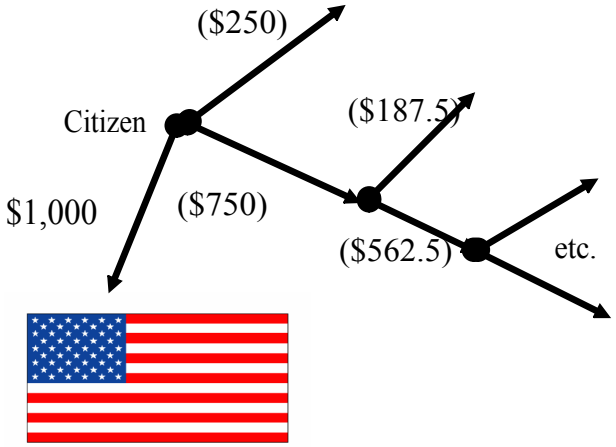
-$1,000 * (3/4)/(1-(3/4))

-$1,000 * 3 = - $3,000

Tax increase

With taxes, Citizen,
takes from savings and spending
budget and gives it to government.

There is no first round from
government.



GDP impact, same as above
EXCEPT their is no first round
impact.

-$1,000 * MPC *(1/(1-MPC)) =

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-$1,000 * (3/4)/(1-(3/4))

-$1,000 * 3 = - $3,000

Tax decrease

Citizen has $250 more to save and
spend, because he/she does
not give it to the government.

GDP impact, same as above
EXCEPT their is no first round
impact.

$1,000 * MPC *(1/(1-MPC)) =

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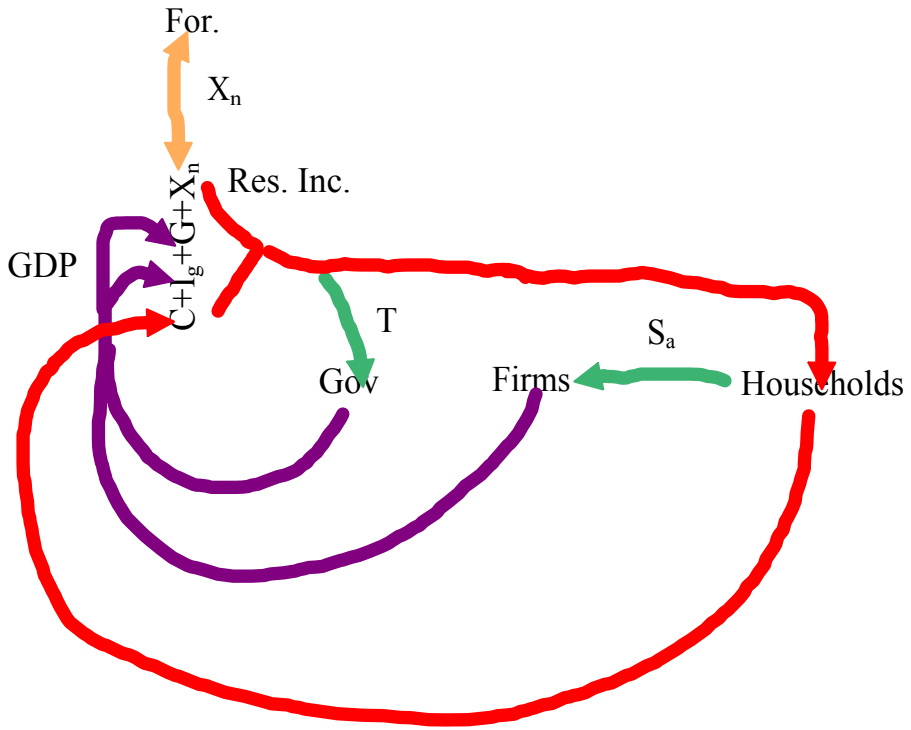
$1,000 * (3/4)/(1-(3/4))

$1,000 * 3 = $3,000

Taxes can be an increased or decreased leakage,
increasing GDP at multiplied values or decreasing GDP at multiplied values.

Government spending is an injection or a leakage,
increasing GDP at multiplied values or decreasing GDP at multiplied values.

BUT, tax impacts effect the economy at Multiplier -1



$C + I_g + G + X_n = GDP$

$(Res.\ Inc. - T - S_a) + I_g + G + (X - M) = GDP$

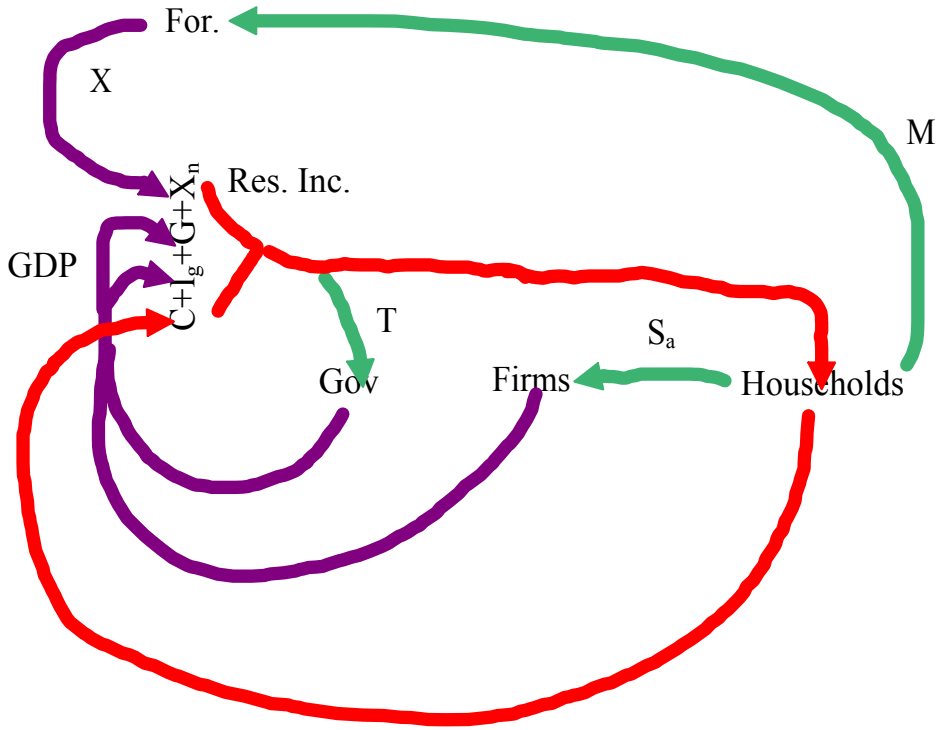
$(- T - S_a) + I_g + G + (X - M) = 0$

$I_g + G + X = T + S_a + M$

"Injections" "Leakages"
$I_g + G + X = T + S_a + M$

If you assume:
$I_g + G = T + S_a$

If savings does not support investment, or investment is less than savings, then the government can stablize by taking up the slack.



The main artery is GDP provides resource income which should turn into C.

Everything else is a leakage or an injection.

$C + I_g + G + X_n = GDP$

$(Res.\ Inc. - T - S_a) + I_g + G + (X - M) = GDP$

$(- T - S_a) + I_g + G + (X - M) = 0$

$I_g + G + X = T + S_a + M$

"Injections" "Leakages"
$I_g + G + X = T + S_a + M$

Equilibrium vs. Full employment

In this model equilibrium is determined by:

Desired level of investment by firms, government injections/leakages, imports and the mechanisms of consumers spending and saving preferences.

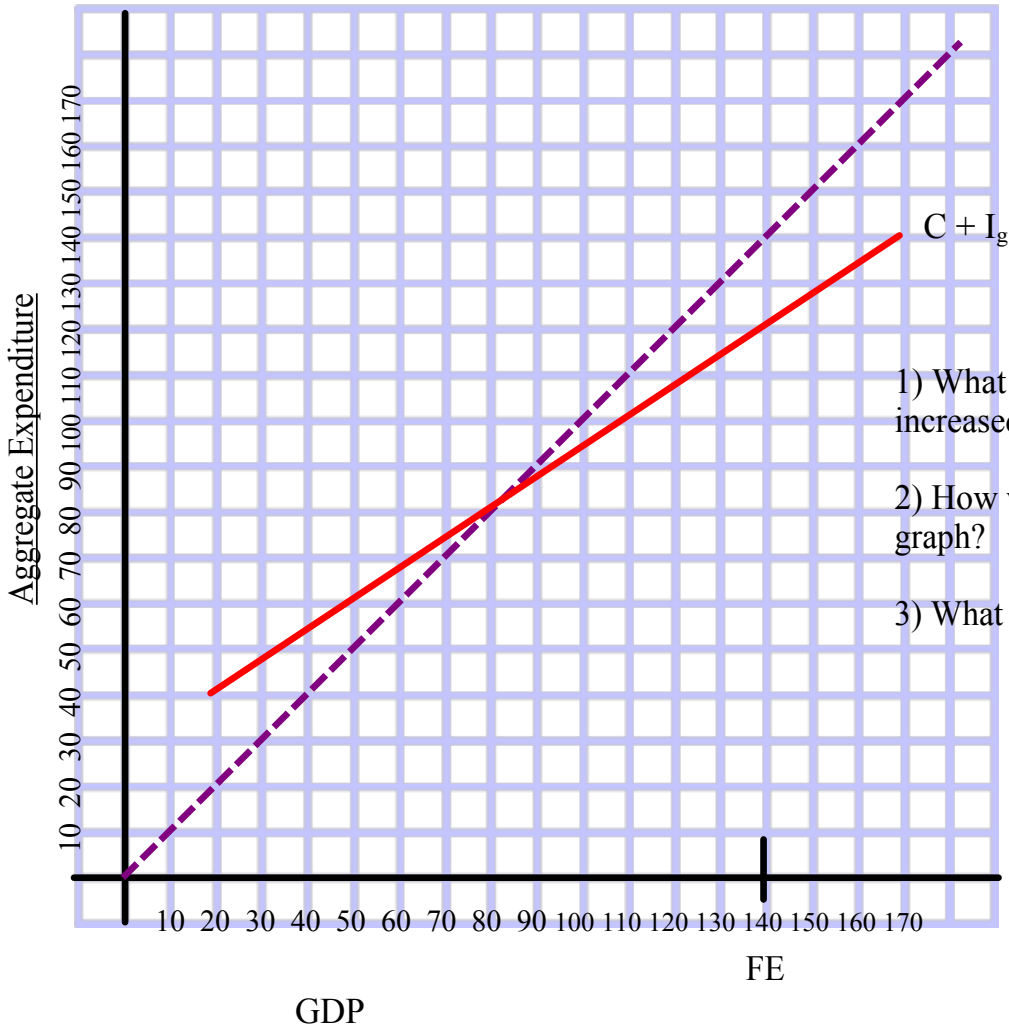
No real regard to price or Full employment.

If the economy is equilibrating at somewhere other than full employment then there is a full employment gap.

It can be recessionary or inflationary.

The gap is the amount of an injection or leakage, the amount of extra expenditure required to get to full employment GDP.

$$\frac{\text{(Full employment GDP - Actual GDP)}}{\text{Multiplier}}$$



1) What would happen to GDP if G increased by $10?

2) How would we depict that on the graph?

3) What is the Full-Employment GAP?

Inflationary
or
recessionary

Points of value:

- Income = Expenditure
- Multiplier
- Leakages and injections (and multiplication)
- Involuntary disinvestment/investment mechanism
- The actors C, I, G, Foreigners and their leaks/inject.
- S supports I

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Revisit my mispeak:

Slope on both graphs is MPC from which you can get the multiplier.

The Economy is at equilibrium at $420 billion dollars.

MPS = .1

The full employment GDP is $520.

What is the GDP gap?

Firms have unintended or planned invesment

Trying to produce too little will result in unplanned disinvestment (inventories run down)

IF THEY WANT TO KEEP UP THEIR LEVEL OF INVESTMENT UP, they must produce more and end up back at the equilibrium level.

How much more?

They don't know because they will find it when disinvestment stops.

Sequence of events:

1) Firms choose product level and borrow to support a certain Ig
2) That determines Resource income and DI.
3) Consumers decide their C and S choices
4) If firms made too little to support C, then customers take the extra out of inventory.
5) Inventories are lower than firms want, they replace.
6) This increases Resource income, which increase C and S
7) Changes keep happening until
   - Inventories are what firms want.
   - They are borrowing the right amount for year to support Ig

:

Goods wanted => $DI = C_d + S_d$

Income generated by production $GDP = C_p + I_p$

Stable when $C + S = C + I$, $S = I$