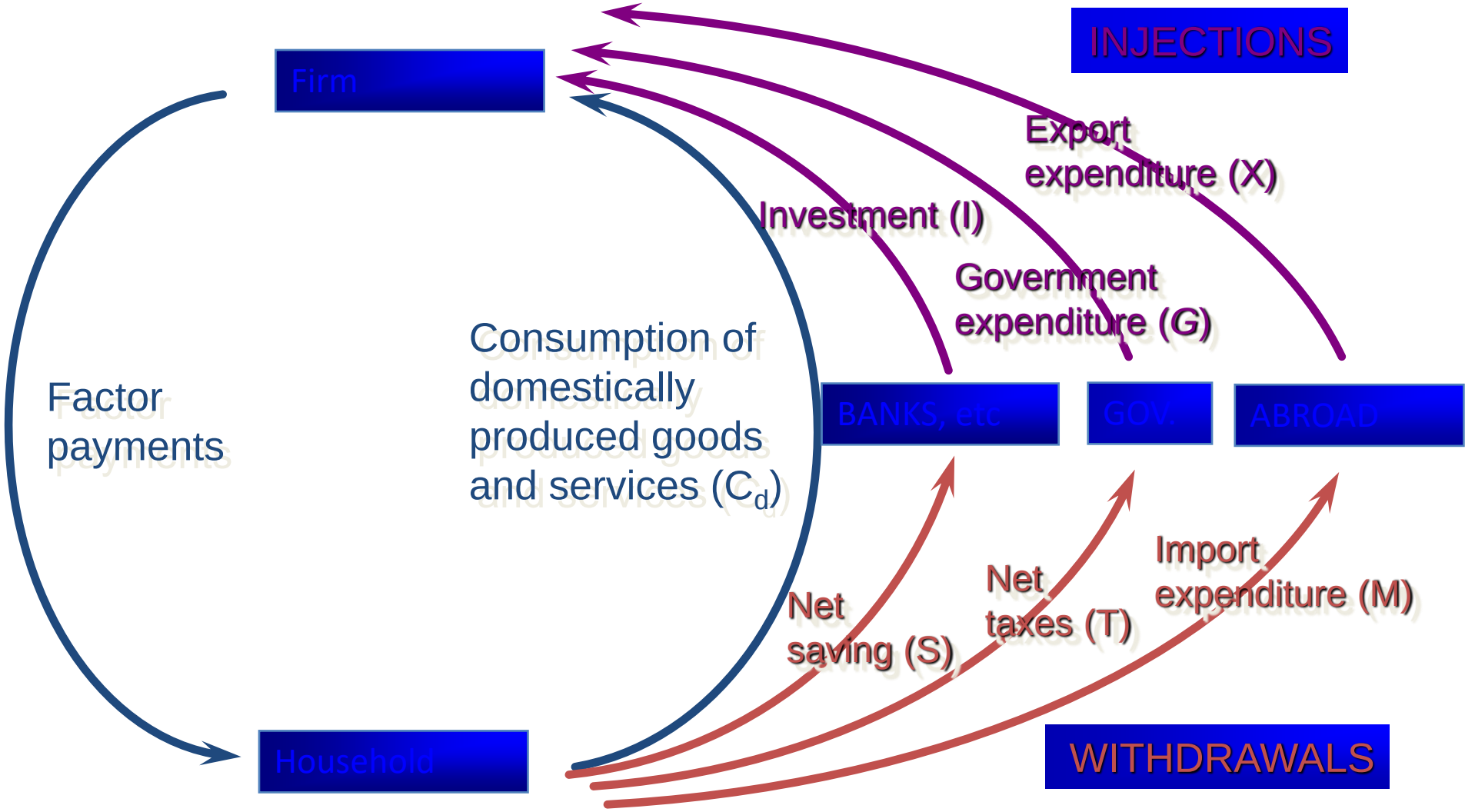
The Theory of Income Determination

The circular flow of income



THE KEYNESIAN REVOLUTION

- Keynes' rejection of classical theory
  - rigidities in the labour market
  - the problem of deficiency of demand
  - rejection of increased saving as a means of increasing investment
  - rejection of a balanced budget
- Keynes' analysis of employment and inflation
  - the importance of aggregate demand
  - the multiplier process

Assumptions

- A single concept of national income (Yd)
- A constant level of potential/full employment national income (Y_f)
- Existence of unemployment
- Constant price level

The Consumption Function

Absolute Income Hypothesis

- $Y_d = C + S$

$C = a + b\ Y_d$

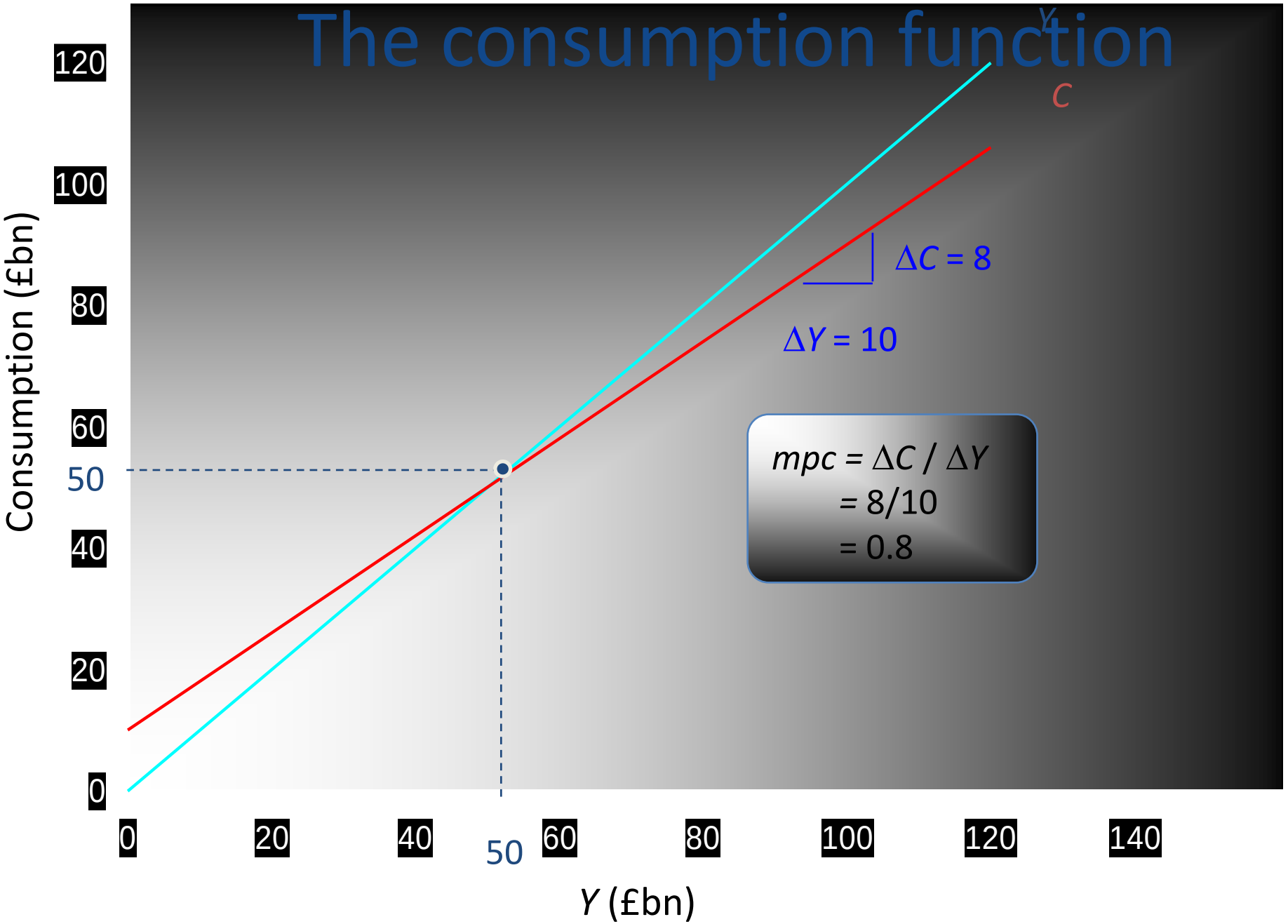
  - C = current consumption
  - a = autonomous consumption
  - b = marginal propensity to consume
  - Yd = Current disposable income (Y-tax + transfers)

Absolute Income Hypothesis

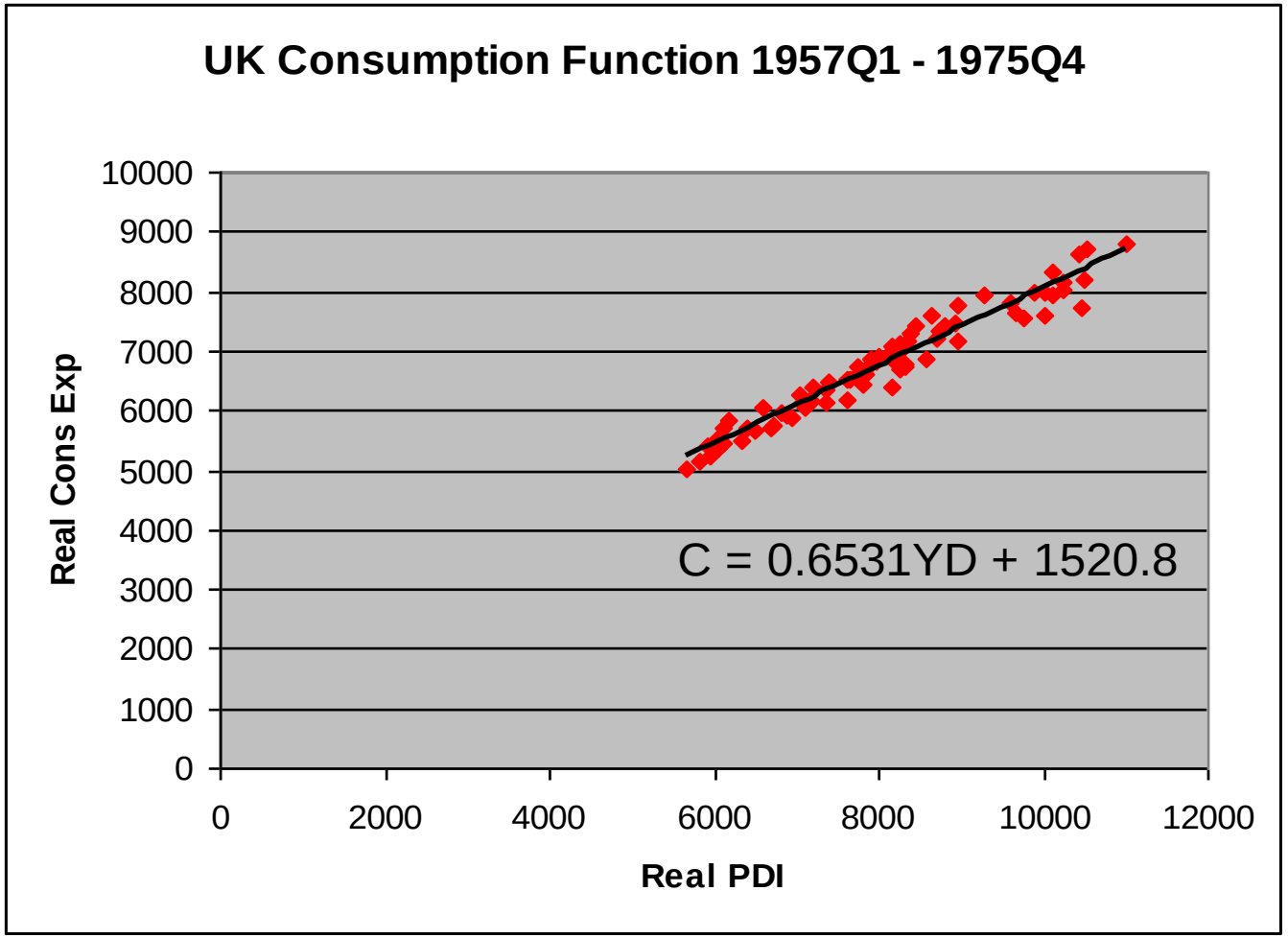
Keynes relied on the psychological law that the satisfaction of "immediate primary needs" is a stronger motive for consumption than "accumulation."

For example, if a millionaire and a welfare recipient each received $500, the millionaire would likely just add the money to her savings account since her primary needs are already met.

The welfare recipient, on the other hand, would likely immediately spend the money on food, clothing, and shelter.


The consumption function
Y
C
120
100
80
60
50
40
20
0
Consumption (£bn)
ΔC = 8
ΔY = 10
mpc = ΔC / ΔY
= 8/10
= 0.8
0
20
40
50
60
80
100
120
140
Y (£bn)

UK Consumption Function (SR)



- Autonomous consumption
  - A change in autonomous consumption is unrelated to income and causes a shift in AE
    - Wealth
    - Credit
    - Expectations
    - Age
    - Price Levels
      - **↓PL → ↑real wealth (savings)**
      - **↓PL → ↑NX**

Properties

- Value of MPC is constant
- $0<MPC<1$
- APC = a/yd + b

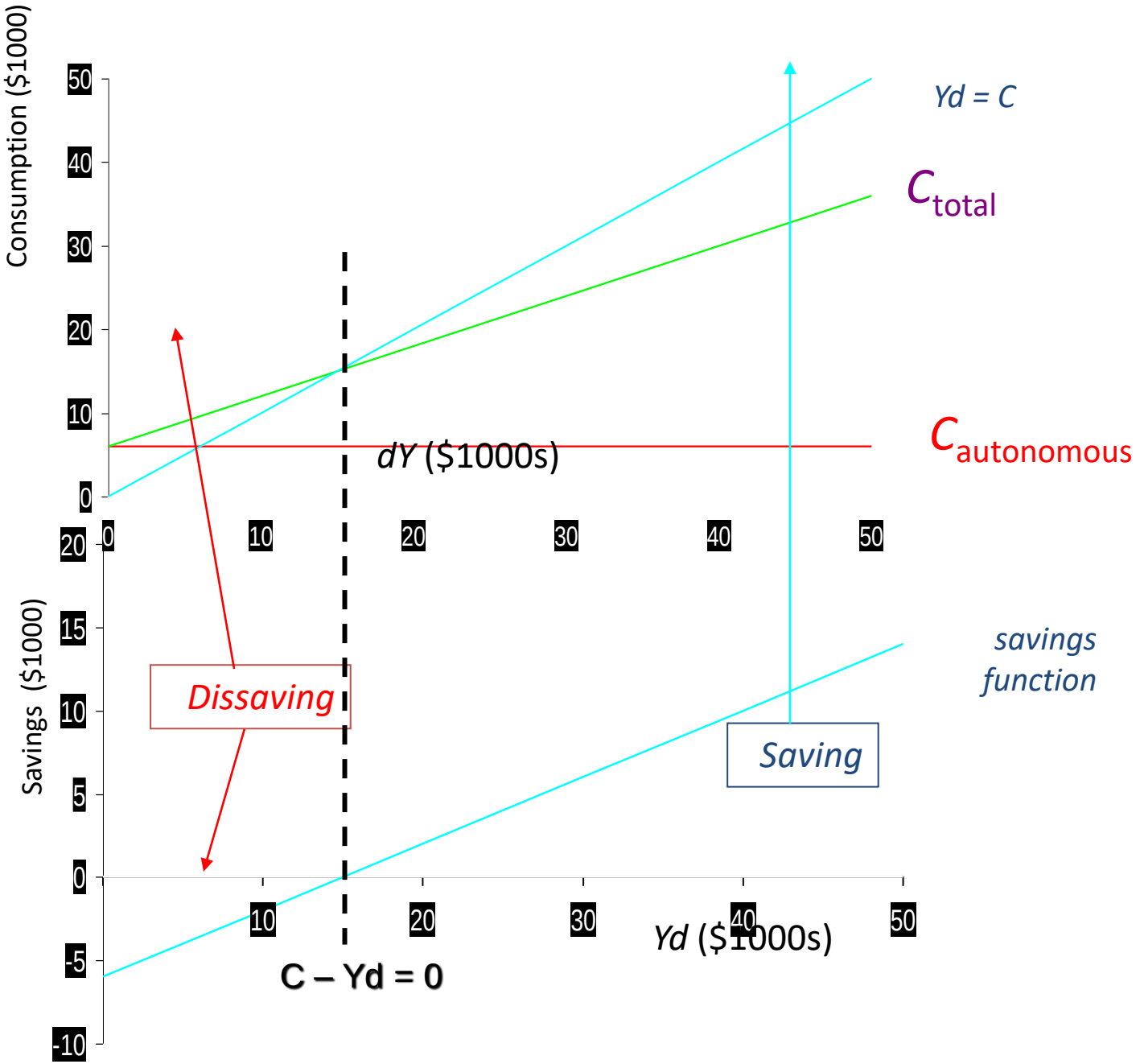
Savings Function

$S = Y_d - C$

$= Y_d - a\text{-}b\ Y_d$

$S = -a + (1 - b)\ Y_d$

- Thus MPS = 1-b
- APS = -a/yd + (1-b)
- MPC + MPS =1
- APC + APS = 1

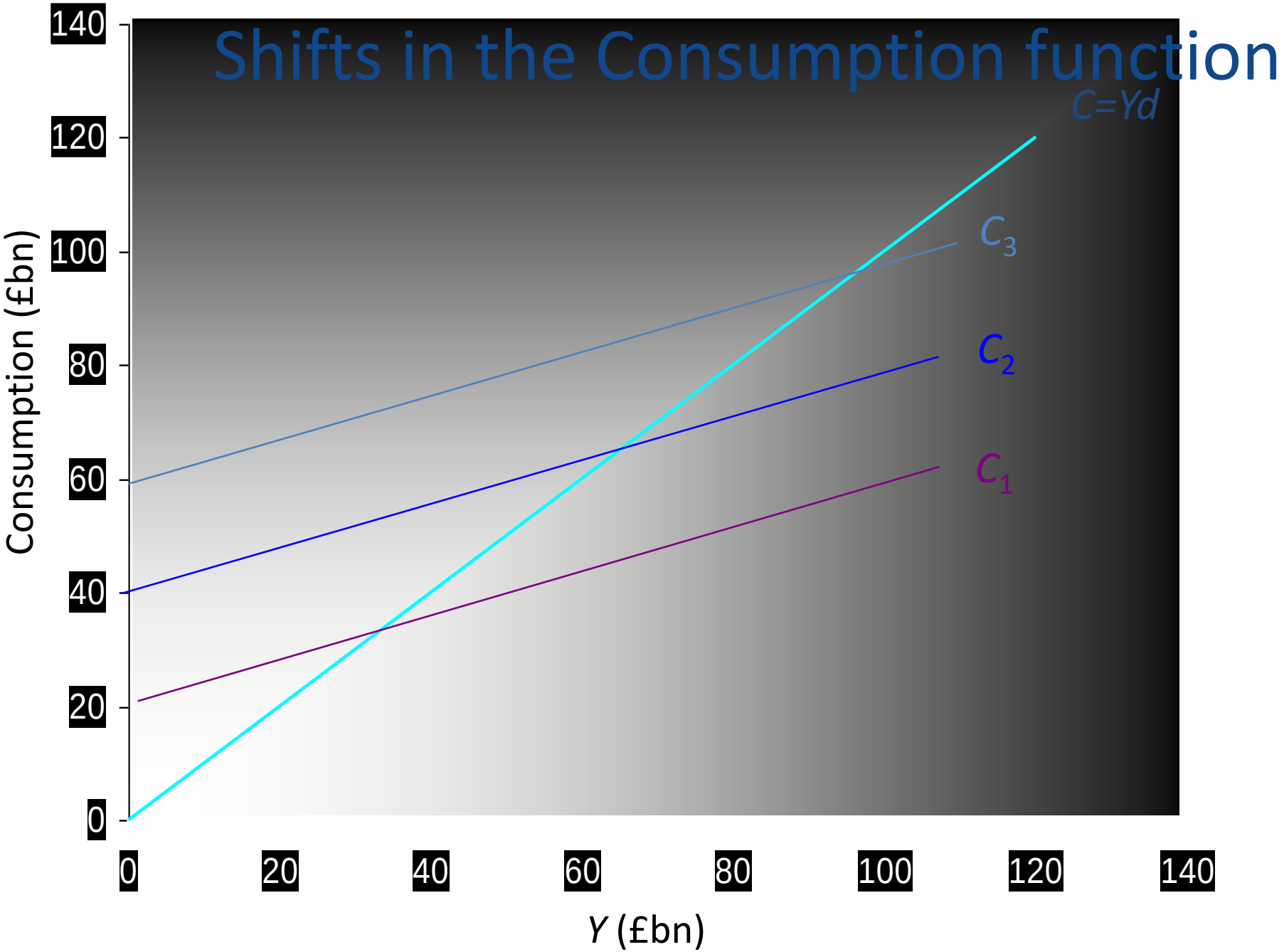

Consumption ($1000)
50
40
30
20
10
0
0
10
20
30
40
50
Yd = C
C total
C autonomous
dY ($1000s)
20
15
10
5
0
-5
-10
Savings ($1000)
Dissaving
Saving
savings function
10
20
30
40
50
Yd ($1000s)
C – Yd = 0

Implications

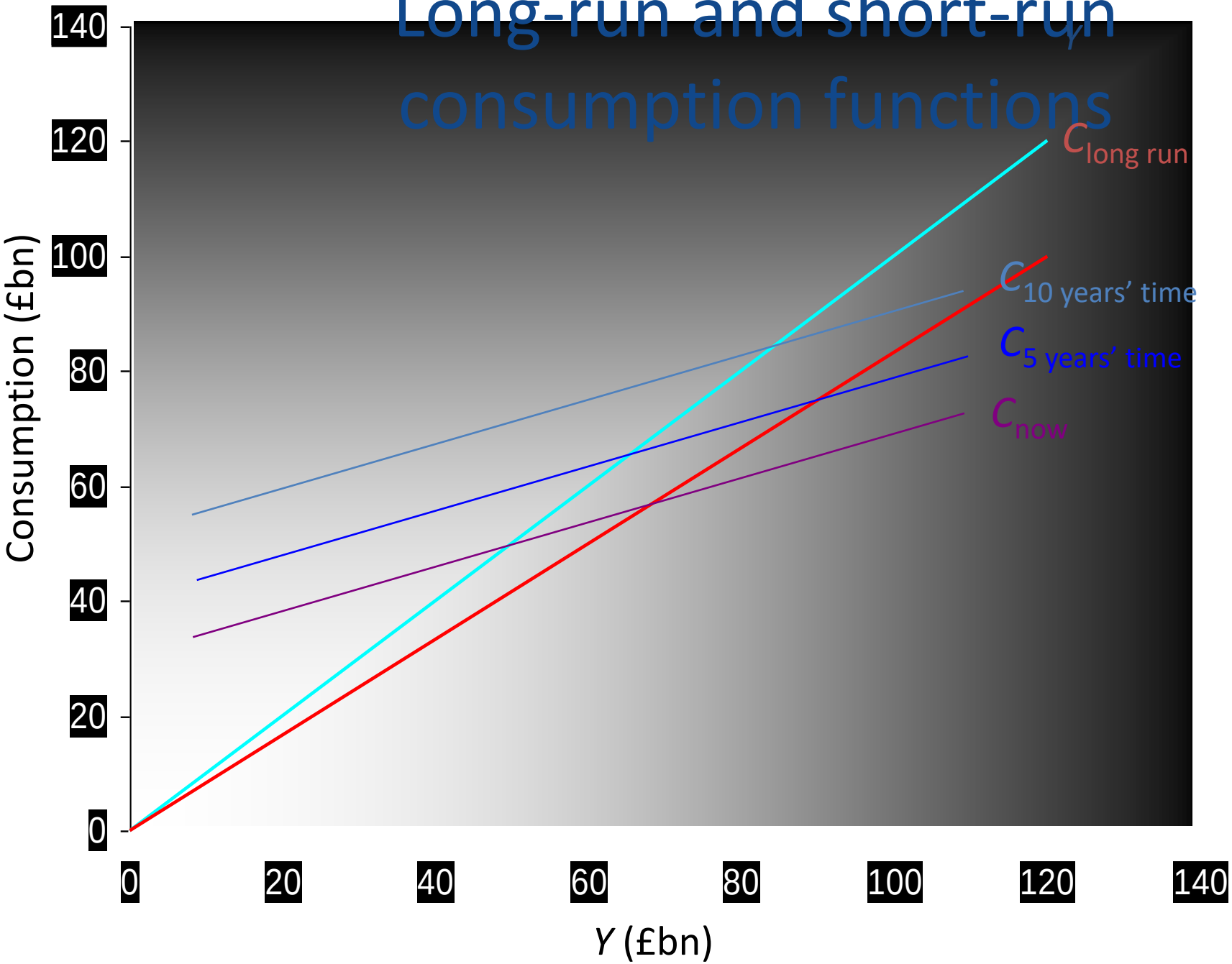
- As an economy prospers, income goes up and so does the savings rate (APS).
- Thus, prosperity leads to stagnation

Reasons

- As Y goes up, APC goes down and APS goes up. Thus, consumption expenditure falls leading to fall in AD.
- Savings do not lead to investment as the opportunities for investment may not be favorable.
- This leads to increase in inventory, fall in production and then to stagnation (Secular Stagnation Hypothesis)


Shifts in the Consumption function
C=Yd
C3
C2
C1
Consumption (£bn)
Y (£bn)
0
20
40
60
80
100
120
140

Long-run and short-run consumption functions



Early Empirical Successes: Results from Early Studies

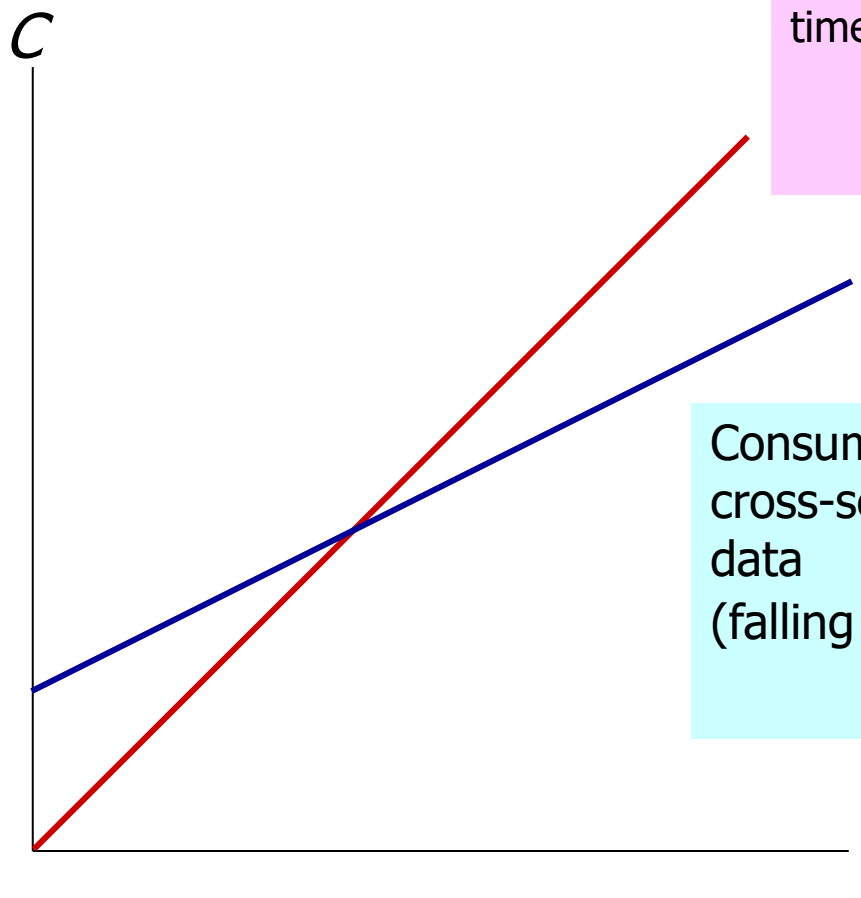
- Households with higher incomes:
  - $\Rightarrow MPC > 0$
  - $\Rightarrow MPC < 1$
  - $\Rightarrow APC \downarrow$ as $\boldsymbol{Y} \uparrow$
- Very strong correlation between income and consumption

  $\Rightarrow$ income seemed to be the main determinant of consumption

Objections

  - Found valid in cross-section data only.
- Kuznets found a constant APS using time-series data.
- Great depression has not occurred again.

The Consumption Puzzle



Consumption function from long time series data (constant *APC*)

Consumption function from cross-sectional household data
(falling *APC*)

Alterative Models

- Irving Fisher and Inter-temporal Choice
- Life Cycle Income Theory
- Permanent Income Hypothesis
- Relative Income Hypothesis

Life Cycle Income Theory: Modigliani, Ando and Brumberg

- Consumption depends on a person's life-time income and not on the current income.

Irving Fisher and Intertemporal Choice

- The basis for much subsequent work on consumption.
- Assumes consumer is forward-looking and chooses consumption for the present and future to maximize lifetime satisfaction.
- Consumer's choices are subject to an inter-temporal budget constraint,
  a measure of the total resources available for present and future consumption

The basic two-period model

- Period 1: the present
- Period 2: the future
- Notation

  Y_1 is income in period 1

  Y_2 is income in period 2

  C_1 is consumption in period 1

  C_2 is consumption in period 2

Deriving the intertemporal budget constraint

In the first period:

$S = Y_1 - C_1$

(S < 0 if the consumer borrows in period 1)

(S>0, if the consumer consumes less than income)

Deriving the intertemporal budget constraint

- Period 2 budget constraint:

$$\boldsymbol{C_2 = Y_2 + (1 + r)S}$$

Here consumption equals the accumulated savings including the interest earned + income in period II.

To derive the consumer's budget constraint, combine the above two equation and solve it for C2.

$$C_2 = Y_2 + (1 + r)(Y_1 - C_1)$$

- Rearrange to put *C* terms on one side and *Y* terms on the other:

$$\boldsymbol{(1 + r)C_1 + C_2 = Y_2 + (1 + r)Y_1}$$

- Finally, divide through by (1+*r*):

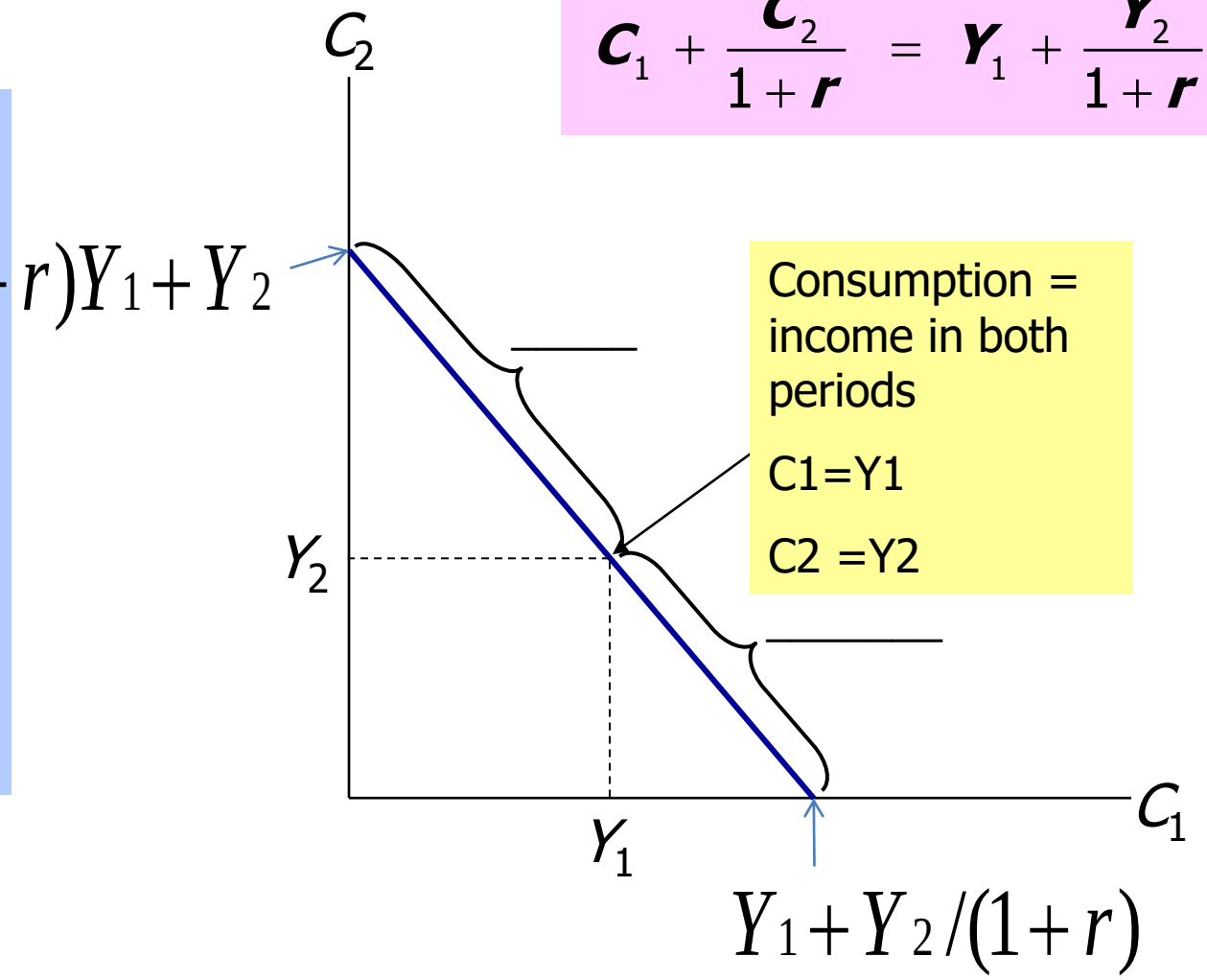
The intertemporal budget constraint

$$\underbrace{C_1 + \frac{C_2}{1+r}}_{\text{present value of } \_\_\_\_\_} = \underbrace{Y_1 + \frac{Y_2}{1+r}}_{\text{present value of } \_\_\_\_\_}$$

The intertemporal budget constraint

$$C_1 + \frac{C_2}{1+r} = Y_1 + \frac{Y_2}{1+r}$$

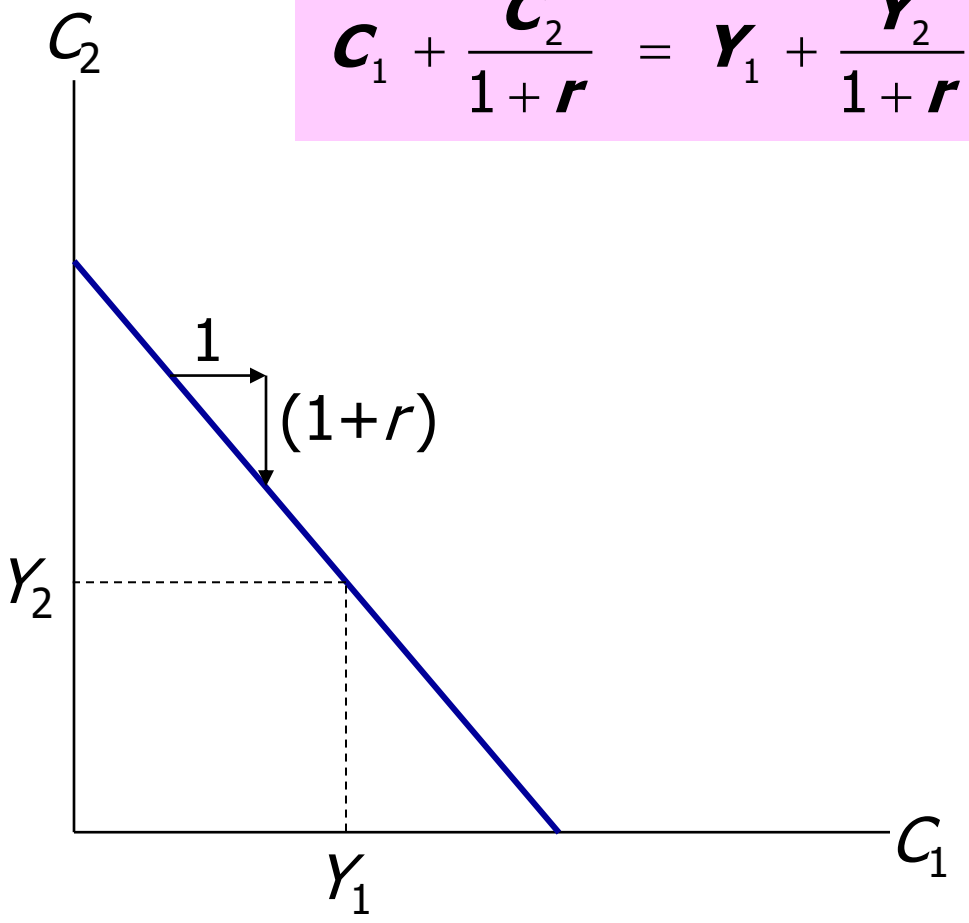
The budget constraint shows all combinations of C_1 and C_2 that just exhaust the consumer's resources.



The intertemporal budget constraint

The slope of the budget line equals

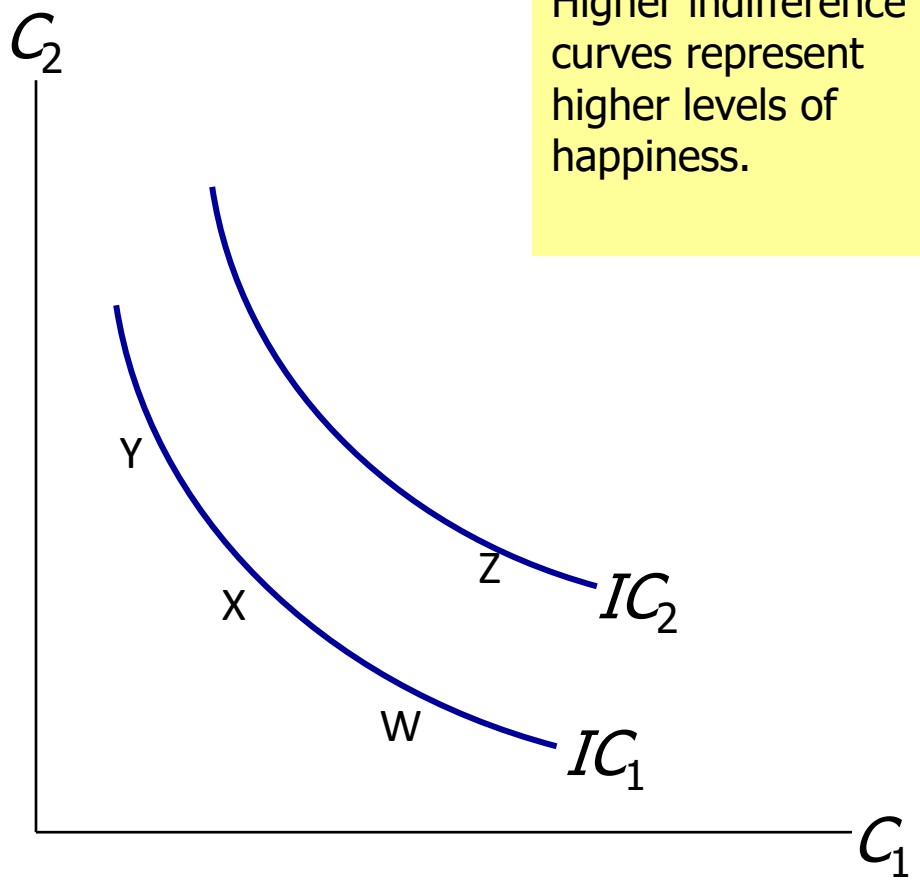
$$C_1 + \frac{C_2}{1+r} = Y_1 + \frac{Y_2}{1+r}$$



Consumer preferences

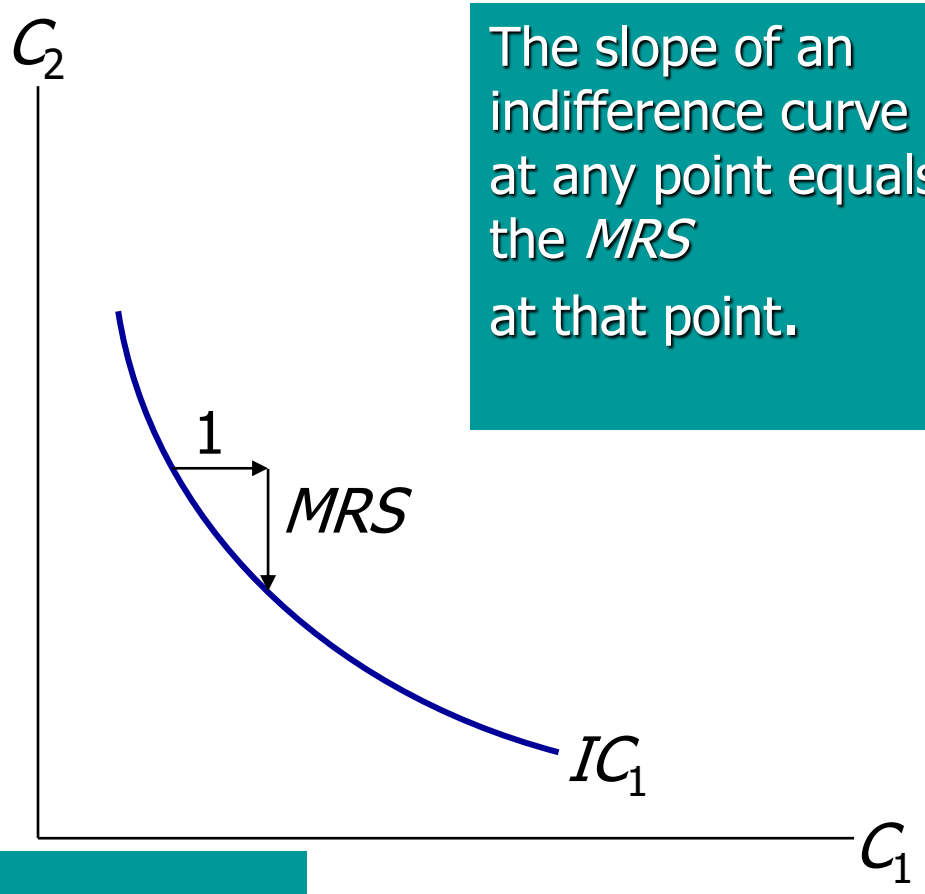
An IC shows all combinations of C_1 and C_2 that make the consumer equally happy.

Higher indifference curves represent higher levels of happiness.



Consumer preferences

Marginal rate of substitution (*MRS*): the amount of C_2 consumer would be substituting for one unit of C1

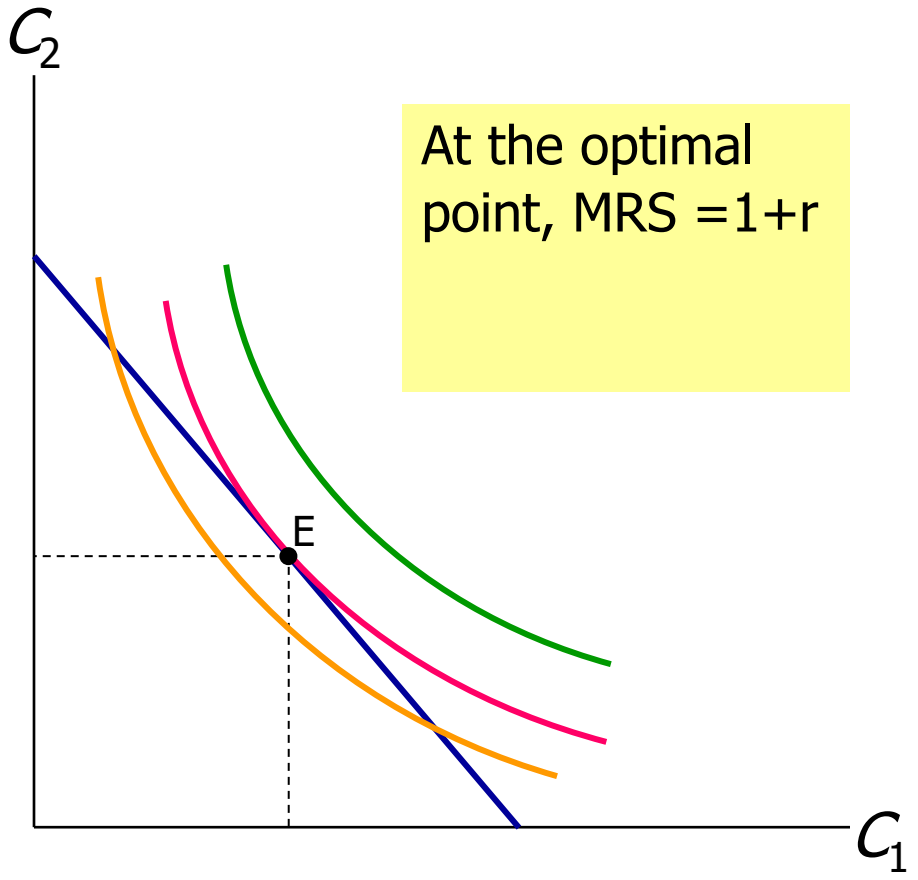


The slope of an indifference curve at any point equals the *MRS* at that point.

MRS is negative

Optimization

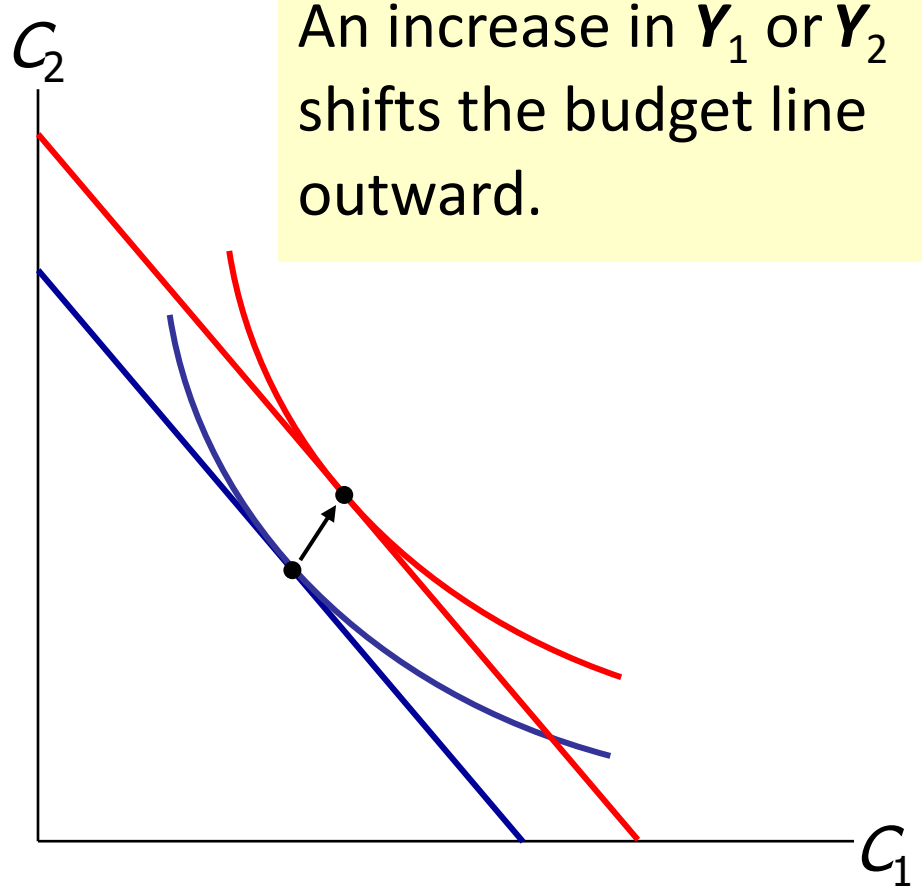
The optimal (C_1,C_2) is where the budget line just touches the highest indifference curve.



At the optimal point, MRS =1+r

How C responds to changes in Y

Provided they are both normal goods, C_1 and C_2 both increase, when income rises



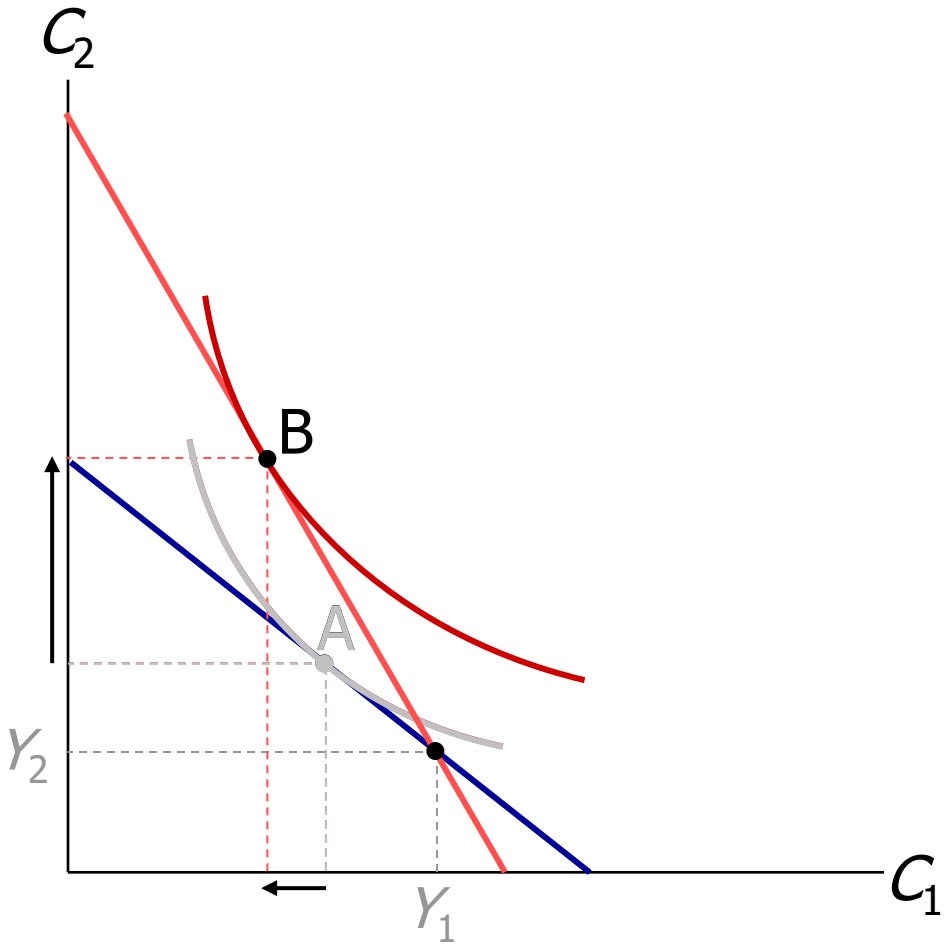
An increase in $\boldsymbol{Y}_1$ or $\boldsymbol{Y}_2$ shifts the budget line outward.

Keynes vs. Fisher

- Keynes:
  current consumption depends only on current income
- Fisher:
  - Current consumption depends on the resources the consumer expects over his lifetime.
  - The timing of income is irrelevant because the consumer can borrow or lend between periods.
  - Consumption depends on the present value of current and future incomes.
- i.e. $$Y_1 + \frac{Y_2}{1+r}$$

How C responds to changes in r

An increase in r pivots the budget line around the point (Y_1, Y_2).



How C responds to changes in r

- If consumer is a saver, the rise in r makes him better off, which tends to increase consumption in both periods.
- The rise in r increases the opportunity cost of current consumption, which tends to reduce C_1 and increase C_2.
- Both Income and substitution effects $\Rightarrow \uparrow C_2$.

  Whether C_1 rises or falls depends on the relative size of the income & substitution effects.

We treat consumption in both periods as normal goods.

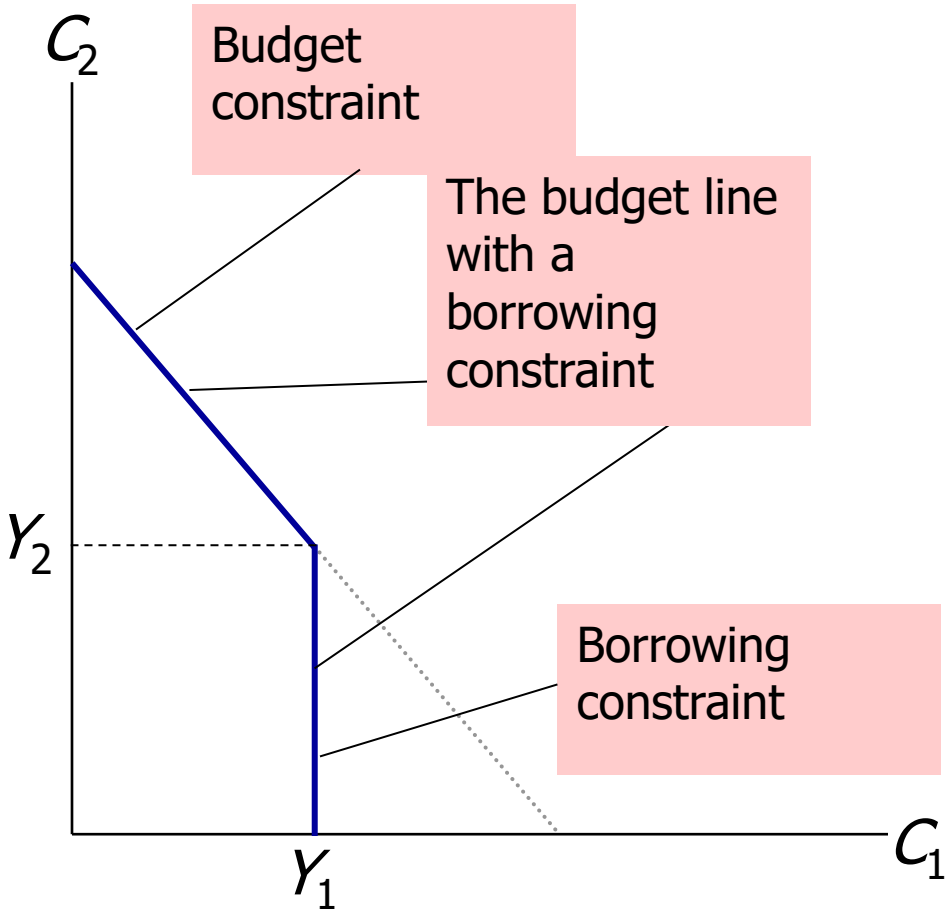
Constraints on borrowing

- In Fisher's theory, the timing of income is irrelevant because the consumer can borrow and lend across periods.
- Example: If consumer learns that her future income will increase, she can spread the extra consumption over both periods by borrowing in the current period.
- However, if consumer faces **borrowing constraints or** "liquidity constraints", then she may not be able to increase current consumption and her consumption may behave as in the Keynesian theory (Current Consumption depends on current income) even though she is rational & forward-looking.

Constraints on borrowing

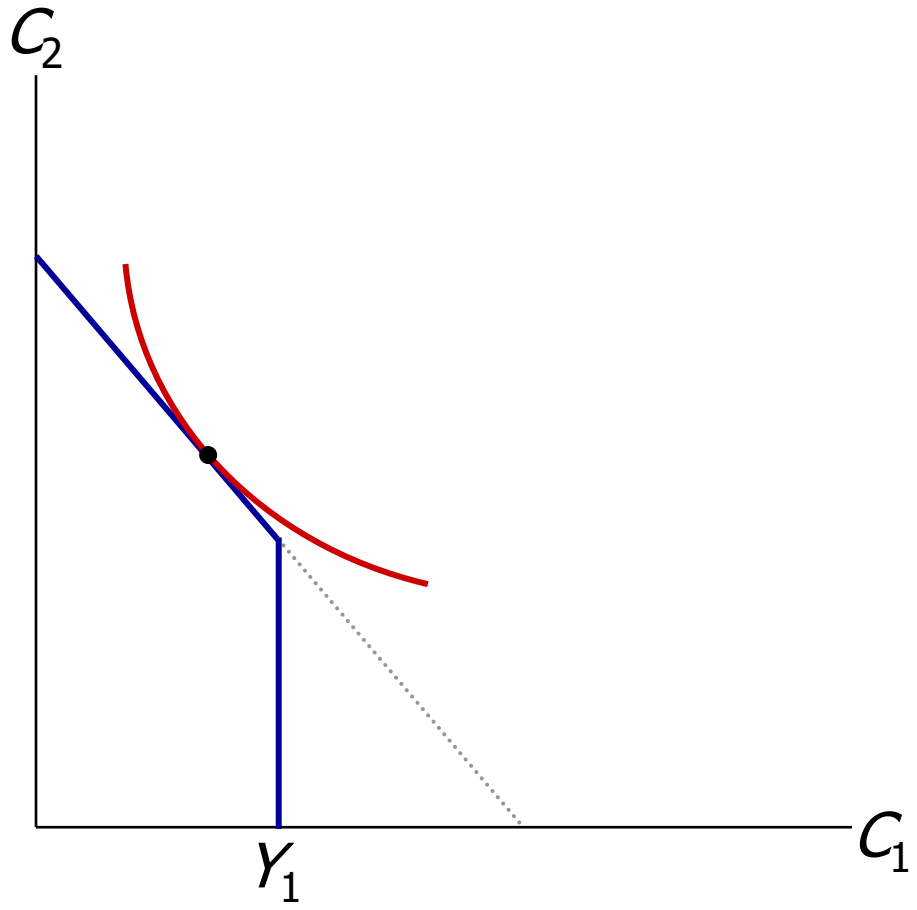
The borrowing constraint takes the form:

$$C_1 \leq Y_1$$



Consumer optimization when the borrowing constraint is not binding

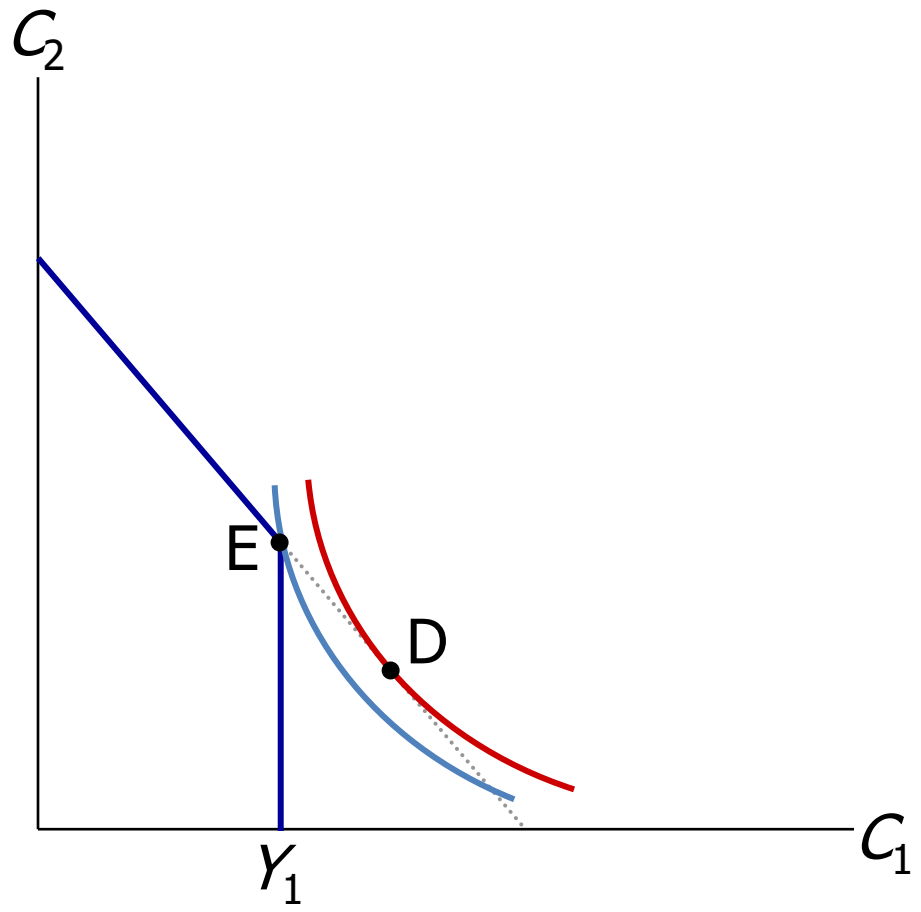
The borrowing constraint is not binding if the consumer's optimal $\boldsymbol{C}_1 < Y_1$ _____.



Consumer optimization when the borrowing constraint is binding

The optimal choice is at point D.

But since the consumer cannot borrow, the best he can do is point E.



The Life-Cycle Hypothesis

Franco Modigliani (1950s)

- Fisher's model says that consumption depends on lifetime income, and people try to achieve smooth consumption.
- The LCH says that income varies systematically over the phases of the consumer's "life cycle".
- Saving allows the consumer move income from times when it is low to when it is high to achieve smooth consumption.

The Life-Cycle Hypothesis

- The basic model:

  W = wealth

  Y = Income one earns until one retires

  (assumed constant) (average income)

  R = number of years until retirement

  T = lifetime in years (one expects to live)

- Assumptions:
  - zero real interest rate (for simplicity)
  - consumption-smoothing is optimal

The Life-Cycle Hypothesis

- Lifetime resources = W + (R x Y)
- To achieve smooth consumption, consumer divides her resources (W + RY) equally over time (T years) and each year consumes

  C = (W + RY)/T

Or

C = W/T + (RY)/T

= (1/T)W + (R/T)Y

$$APC = \frac{1}{T}\left(\frac{W}{Y}\right) + \frac{R}{T}\left(\frac{Y}{Y}\right)$$

The Y in numerator may be treated as average Y.

Example

If the consumer expects to live for 50 years more and works for 30 years of them, then T =50 and R = 30.

Then her consumption function is

$C = 0.02W + 0.6Y$

0r

$C = \alpha W + \beta Y$

where

$\alpha = (1/T)$ is the marginal propensity to consume out of wealth

$\beta = (R/T)$ is the marginal propensity to consume out of income

Example Cont…

- A person starts working when she is 30 years old, works till 65, earns an average annual income of Rs 500000 and expects to die at the age of 80.
- By LCT, her consumption in any year between 30 to 80 years

$$\frac{65-30}{80-30}(500000) = 0.7(500000) = \text{Rs } 350000 \, \textit{per year}$$

Example Cont…

- If this person earns Rs 300000 annually when she is 30-40 years, Rs 450000 when she is 40 to 55 years and Rs 600000 when she is 55 to 65 years, annual consumption will be

$$\frac{65-30}{80-30}\left[\frac{300000\times 10+450000\times 15+600000\times 10}{10+15+10}\right]=0.7(450000)=\text{Rs } 315000\ \textit{per year}$$

Example Cont…

- If the said person wins a lottery of Rs 10,00,000 when she is 60, her annual consumption will in increase by

$$\frac{1000000}{80-30} = \text{Rs } 20000 \, per \, year$$

- If she gets promotion at the age of 50 and her salary increases by Rs 100000 per annum, her annual consumption will rise by

$$\frac{100000 \times 15}{80-30} = \text{Rs } 30000 \, per \, year$$

Example Cont..

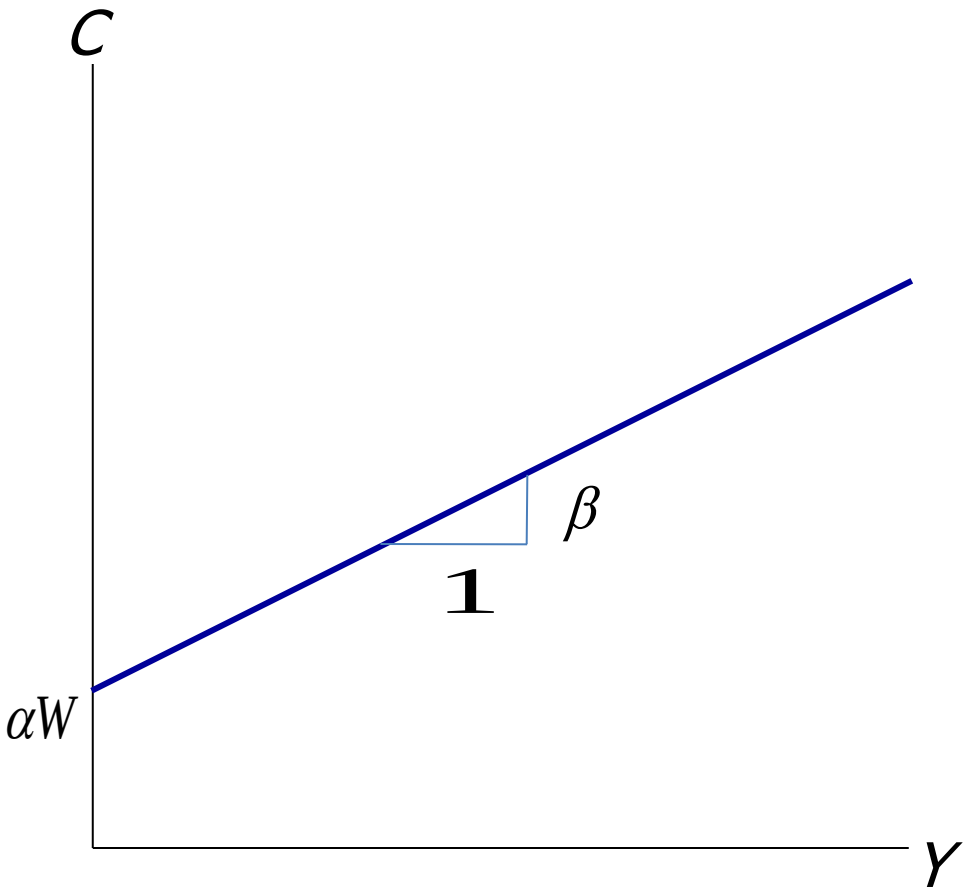
- If her annual net wealth is Rs 100000, her consumption will increase by

$$\frac{100000}{80-30} = \text{Rs } 2000 \textit{ per year}$$

Implications

- For any given level of wealth, the model yields a conventional consumption function.
- However, the intercept is not a fixed value.
- Intercept is αW and thus depends on wealth.

The Life Cycle Consumption Function



Implications

The LCH can solve the consumption puzzle:

- The *APC* implied by the life-cycle consumption function is

$$C/Y = \alpha(W/Y) + \beta$$

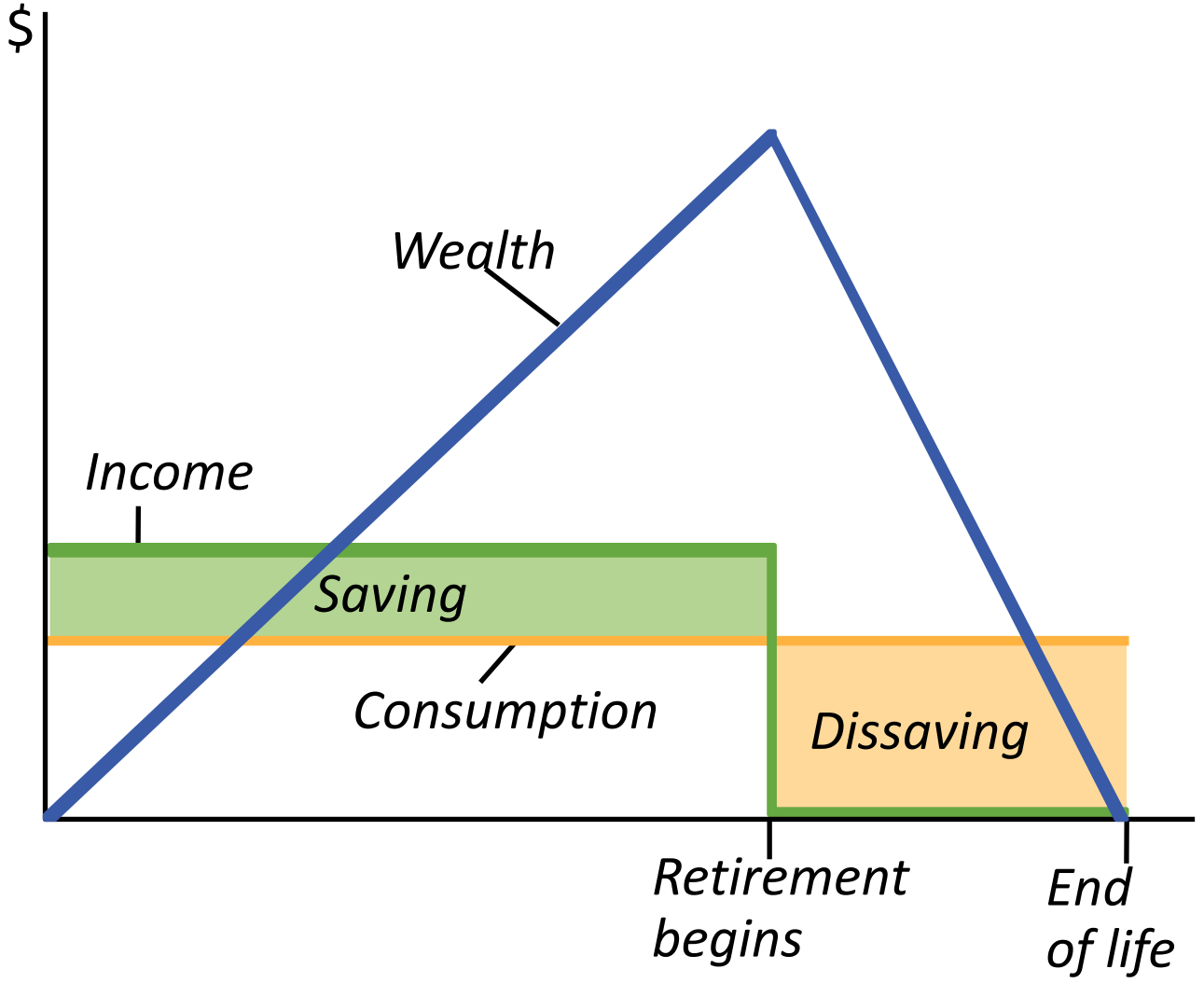
- In the short-run, across households, wealth does not vary as much as income, so high income households experience low APC.
- In the long-run, aggregate wealth and income grow together, resulting in constant W/Y and constant APC.

Implications put differently

- For a given wealth, LC consumption function behaves similar to what is Keynes'.
- This holds only in the short run, as wealth is constant.
- In the long run, C function shifts upward that prevents APC to fall as Y increases.

Implications of the Life-Cycle Hypothesis

The LCH implies that saving varies systematically over a person's lifetime.



Limitations

- Future incomes are unknown and thus the life time average income may be uncertain.
- Capital market may not be quite conducive for borrowing or savings.

The Permanent Income Hypothesis (Milton Friedman,1957)

- While LCH suggests that income follows a regular pattern over a person's life time, the PIH emphasizes that people experience random and temporary changes in their incomes from year to year.

The Hypothesis

- The PIH views current income ***Y*** as the sum of two components:

  Permanent Income: $\boldsymbol{Y}^{\mathbf{P}}$ (average income, which people expect to persist into the future): Average Income

  Transitory Income: $\boldsymbol{Y}^{\mathbf{T}}$ (temporary deviations from average income): Random Deviation from Average Income

$$Y = Y_p + Y_t$$

- Permanent income can be derived as the weighted average of the current and the past incomes, weights declining geometrically.

$Y^p = \alpha Y + \alpha(1-\alpha)y_{-1} + \alpha(1-\alpha)^2 y_{-1} + \ldots$

And so

$(1-\alpha)Y^p{}_{-1} = \alpha(1-\alpha)y_{-1} + \alpha(1-\alpha)^2 y_{-1} + \ldots$

Subtracting second equation from the first gives

$Y^p = \alpha Y + (1-\alpha)Y^p{}_{-1}$

- A good education provides permanently higher income
- A good monsoon provides transitorily higher income.

- Consumption is a function of permanent income.

$$C = \alpha Y_p$$

where α is the fraction of permanent income that people consume per year.

C is proportional to Yp.

- Consumers use saving & borrowing to smooth consumption in response to transitory changes in income.
- Consumers spend their permanent income (salary rise annually) and save their transitory income (lottery).

Implications

- The PIH can solve the consumption puzzle: C depends on Yp and not on current income.

$$APC = \frac{C}{Y} = \alpha Y_p / Y$$

- APC depends on the ratio of permanent income to current income.
- When current income rises temporarily above Yp, APC temporarily falls and vice versa.
  - To the extent that high income households have higher transitory income than low income households, the APC will be low.
  - Saving ratios are high during boom and low during recession.
  - When transitory income is positive, Y > Yp and Yp/Y < 1.
  - Over the long run, income variation is due mainly if not solely to variation in permanent income, which implies a constant APC.

PIH vs. LCH

- In both, people try to achieve smooth consumption in the face of changing current income.
- In the LCH, current income changes systematically as people move through their life cycle.
- In the PIH, current income is subject to random, transitory fluctuations.
- Both hypotheses can explain the consumption puzzle.

Relative Income Hypothesis

(Duesenberry)

Defining Relative Income

- Current income relative to the past peak income
- Own income relative to the average income in the neighborhood/nation

How it works?

- Consumption determines the standard of living and by habit, people enjoy raising their standard but hate letting it slide downwards.
- When income rises, they raise their consumption but they refuse to reduce their consumption when income falls.
- Ratio of the household's current income to the past peak income acts as an additional determinant of its current consumption.
- If this ratio falls, ceteris paribus, the current consumption goes up and vice versa.

Algebraically, it can be expressed as

$$C = a + bY - c\frac{Y}{Y_{mp}}$$

Y_{mp} represents the past peak income.

$$APC = \frac{C}{Y} = a\left(\frac{1}{Y}\right) + b - c\left(\frac{1}{Y_{mp}}\right)$$

Here APC varies directly with the past peak income.

Hence, $APS = \frac{S}{Y} = (1 - b) - a\left(\frac{1}{Y}\right) + c\left(\frac{1}{Y_{mp}}\right)$

- Saving ratio is a negative function of the past peak income.
- If income continues to rise, the ratio $\frac{Y}{Y_{mp}}$ goes up and hence, consumption falls.
- Opposite holds good when income tends to fall.

Implications of RIH

- An economy's saving ratio rises slower than otherwise during the time of prosperity and to fall slower than otherwise during recession.
- Hence, prosperity may not lead to recession.

Random-Walk Hypothesis

(Robert Hall,1978)

- based on Fisher's model & PIH, in which forward-looking consumers base consumption on expected future income
- Hall adds the assumption of **rational expectations**, that people use all available information to forecast future variables like income.

The Hypothesis

- If PIH is correct and consumers have rational expectations, then changes in consumption over time is unpredictable
- Consequently, consumption should follow a **random walk.**
  - A change in income or wealth that was anticipated has already been factored into expected permanent income, so it will not change consumption.
  - Only unanticipated changes in income or wealth that alter expected permanent income will change consumption.

Implications

If consumers obey the PIH and have rational expectations, then only unexpected policy changes will affect their consumption

The Psychology of Instant Gratification (David Laibson)

- Theories from Fisher to Hall assumes that consumers are rational and act to maximize lifetime utility.
- Recent studies by David Laibson and others consider the psychology of consumers.

The Psychology of Instant Gratification

- Consumers consider themselves to be imperfect decision-makers.
  - E.g., in one survey, 76% said they were not saving enough for retirement.
- Laibson: The "pull of instant gratification" explains why people don't save as much as a perfectly rational lifetime utility maximizer would save.

Two Questions and Time Inconsistency

1. Would you prefer
   (A) a candy today, or
   (B) two candies tomorrow?
2. Would you prefer
   (A) a candy in 100 days, or
   (B) two candies in 101 days?

In studies, most people answered A to question 1, and B to question 2.

A person confronted with question 2 may choose B. When he is confronted with question 1, the pull of instant gratification may induce him to change his mind.

Summing up

- Keynesian consumption function:

$$C = a + bY$$

where only current income (Y) mattered.

- Other models advocate that other things should be included:
  - expected future income (permanent income model)
  - wealth (life cycle model)
  - interest rates (Fisher model)
  - but current income should still be present (due to borrowing constraints)
  - Consumer Expectations
  - Income/wealth distribution
  - Credit availability