



NATIONAL INCOME

Overview of Lecture 3

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National Income: macro measures and micro foundations

- **GDP:**
 - definition
 - computation methods
- **Consumption:**
 - John Maynard Keynes: consumption and current income
 - Irving Fisher: intertemporal choice
 - Milton Friedman: permanent income hypothesis
 - Robert Hall: random-walk hypothesis
 - David Laibson: pull of instant gratification

Gross Domestic Product - GDP

Definition

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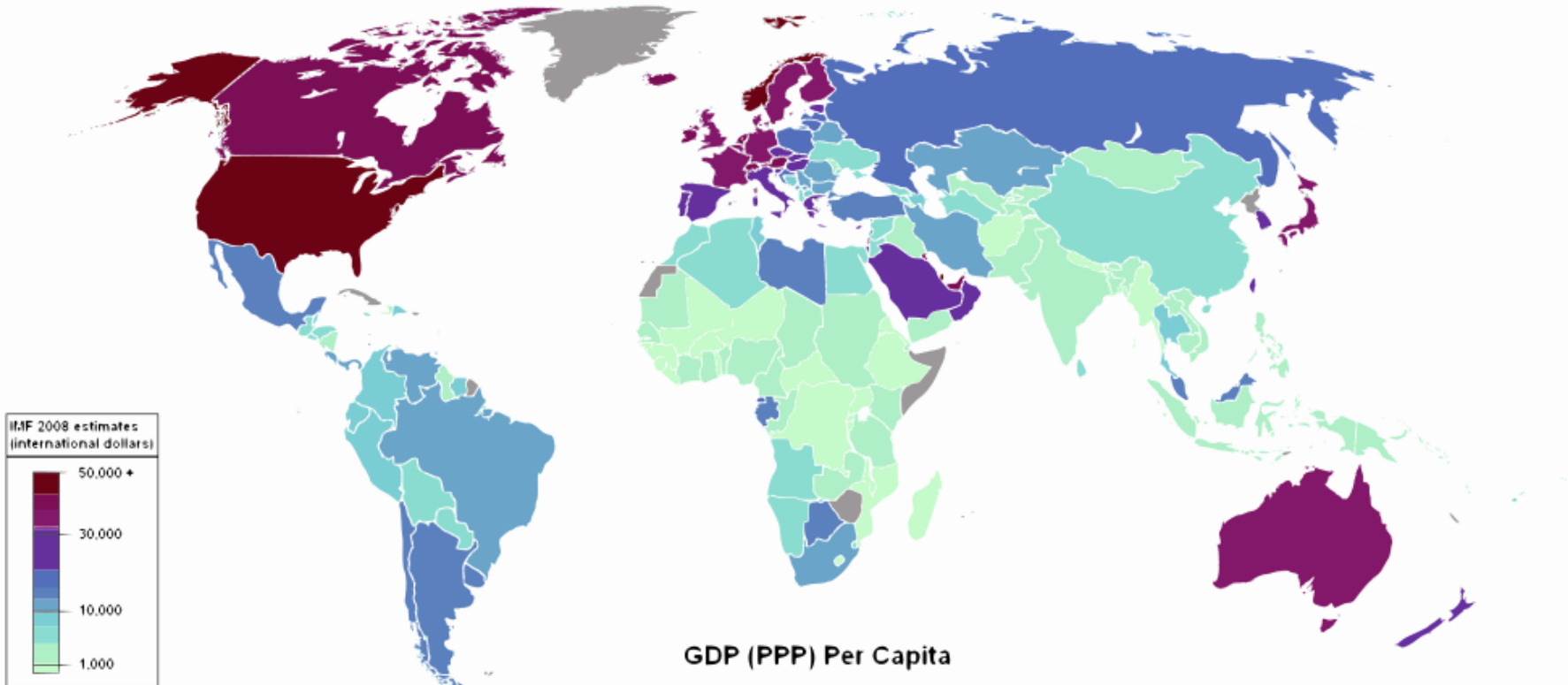
- **GDP** = total **market value** of all **final** goods and services within nation's **borders** in given **time** period
- **G National P** = output produced by nationally-owned factors of production
 - ▣ ex.: Japanese-owned car production in Kolin

- **GDP per capita** = $\text{GDP} / \text{total population}$
 - ▣ Allows for international comparison
 - ▣ Approximation of difference in living standards

Gross Domestic Product

Global overview

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Source: http://en.wikipedia.org/wiki/File:GDP_PPP_Per_Capita_IMF_2008.png

GDP

Rules for computation – production method

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- Valued at **market prices** – how much people are willing to pay for good / service
- Resale of **used goods** not included
 - ▣ Transfer of ownership, not new product
- Increase in **inventory** = increase in GDP; sale out of inventory = no change in GDP
- Value of **intermediate goods** + **value added** at each stage of production = value of final goods
- **Imputed values** for G & S not sold in the market place
 - ▣ People living in own homes; gvt services
- Left out: home production, underground economy

GDP

Real vs. Nominal

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- Nominal GDP: $GDP_{2009} = \sum_i^N P_{i,2009} * Q_{i,2009}$
 - ▣ change in GDP can be due to change in quantity or change in price
- Real GDP: $GDP_{2009} = \sum_i^N P_{i, BASE} * Q_{i,2009}$
 - ▣ Choose the base year and use its prices
 - ▣ Allows comparison of econ. activity across years
 - ▣ Problem: fixing the relative prices (ex. computers)
 - Updating base year + recalculating
 - Chain-weighted measures

GDP

Expenditure method

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Idea: all output of economy must be claimed / bought by someone

$$\text{GDP} = C + I + G + \text{NX}$$

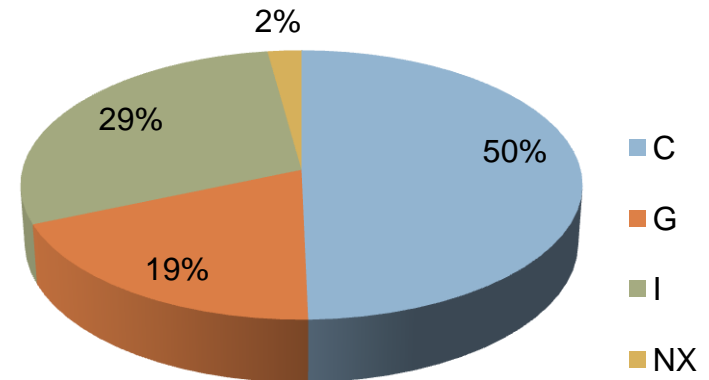
C – consumption

I – investment

G – gvt. expenditure

NX – net export

GDP - shares of uses of output - ČR



GDP

Expenditure method

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Consumption (C) – output bought by households

- Nondurable goods – immediate consumption
- Durable goods – e.g. TV, car
- Services

Investment (I) – goods bought for future use; condition = new capital is created (e.g. not purchase of stocks)

- Business fixed: new plants + new equipment
- Residential investment: new housing
- Inventory investment: increase in inventories of goods

Government purchases (G)

Net Exports (NX) – exports - imports

GDP

Income method

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Idea: one person's expenditure must equal another person's income



Measures of income

From national to personal income

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- **Net domestic product (NDP)** = GDP – depreciation (F)
 - ▣ Depreciation = wearing out of capital; needs to be reinvested in order to keep the production possibilities
- **National income (NI)** = NDP + net foreign income
- **Personal income** = NI – indirect business taxes (G) – corporate taxes (G) – retained earnings (F) – Social Security taxes (G) + transfer payments (H) + net interest (H)
- **Personal disposable income (H)** = personal income – personal taxes (G)
 - ▣ All disposable income is either consumed or saved

Note: (F), (G), (H) – to whom is income distributed

GDP

Imprecise measure of quality of life

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Limitations:

- Black market, barter, volunteer production, home production – all not included
- Bubbles in prices – housing, oil
- In some cases, increase in GDP may cause decrease in well-being of society
 - ▣ Ex. polluting production, military spending, child work
- **Easterlin Paradox:** happiness data are typically stationary over time despite considerable increases in income
 - ▣ Happiness of women actually goes down

Quality of life

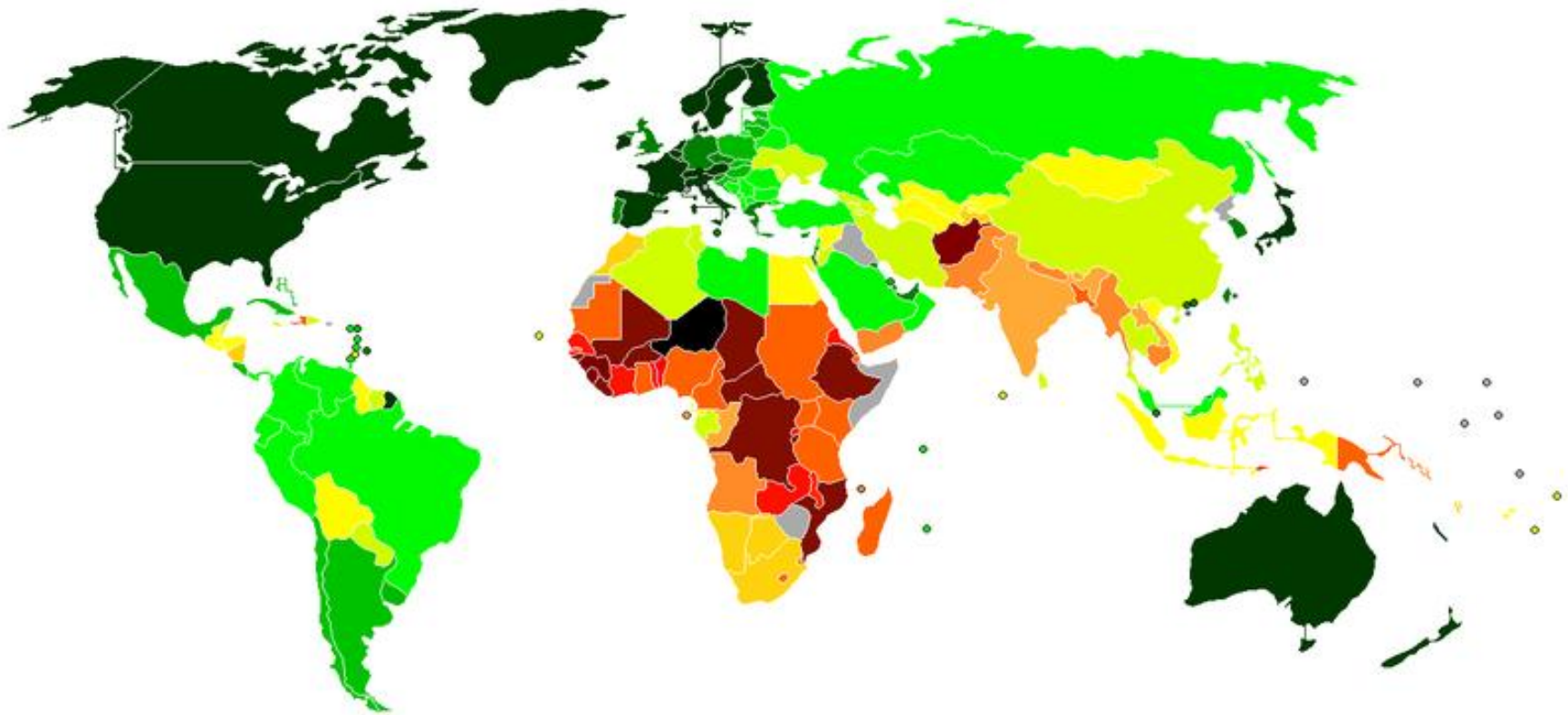
Alternative measures

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- Human development index (HDI):
 - ▣ Includes life expectancy, literacy, education, and standards of living (GDP); since 1990 used by UN
 - ▣ Top 3: Norway, Australia, Iceland
 - ▣ Selected: ČR – 36, USA – 13, Austria – 14, Russia – 71, China - 92
- Happy Planet Index (HPI):
 - ▣ Composite index with 3 dimensions: life expectancy, life satisfaction, ecologic footprint
 - ▣ Cons.: no political freedom or human rights included
 - ▣ Selected: ČR – 92, USA – 114, Austria – 57, Russia – 108, China - 20

Human development index (HDI) – 2009

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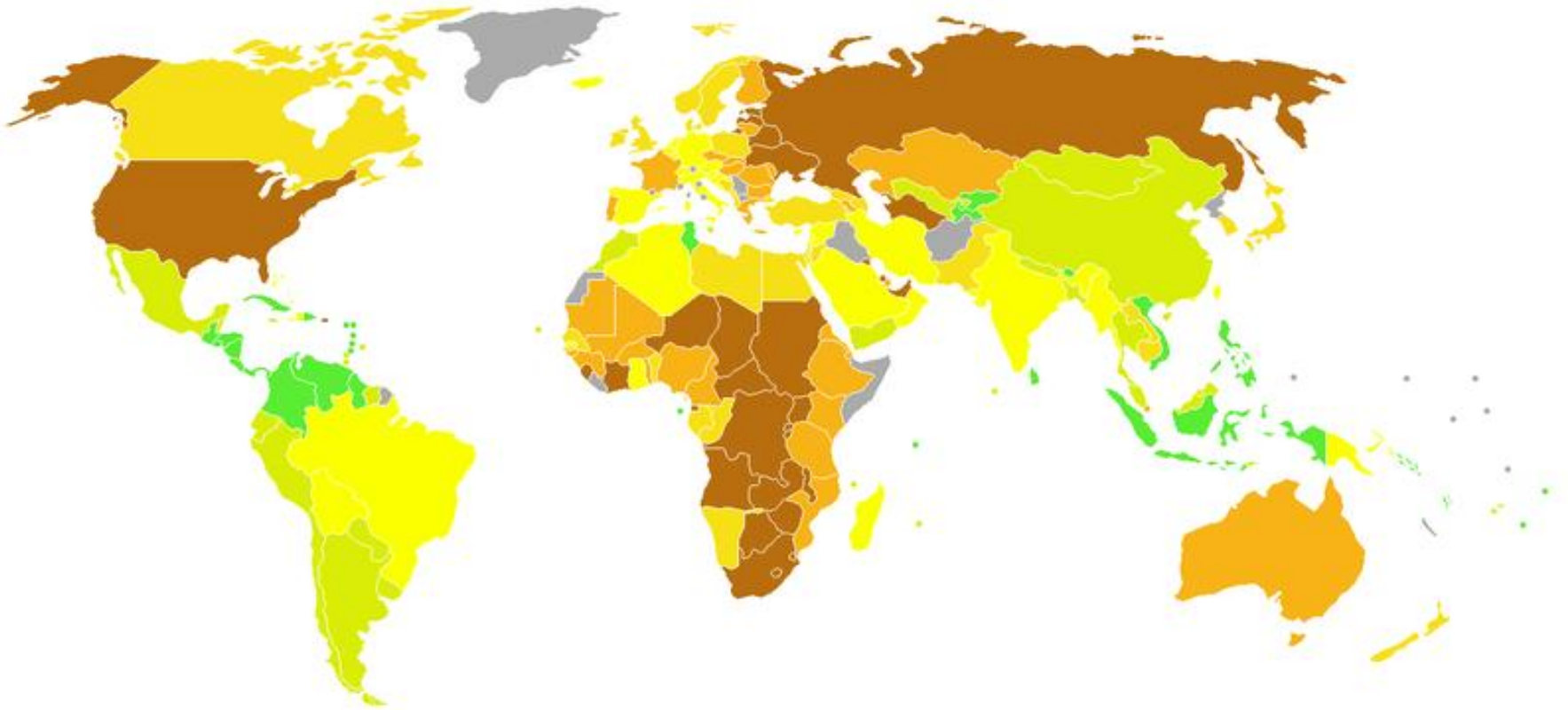


Source: http://en.wikipedia.org/wiki/File:UN_Human_Development_Report_2009.PNG

- Highest ranked countries are dark green, lowest are dark red

Happy Planet index (HPI) – 2006

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Source: http://en.wikipedia.org/wiki/Happy_Planet_Index
- Highest-ranked countries are green, the lowest are brown

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Consumption

Microfoundations

From Keynes to behavioral theories

Consumption – micro-foundations

Motivation

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- **MICRO** question: How do households decide how much of income they **consume now** and how much will they **save for future**
 - **MACRO** relevance:
 - **Long-run**: effect on economic growth: savings = source of capital = key determinant of growth
 - **Short-run**: consumption = 50% of CR GDP, thus fluctuations will affect booms and recessions
- Chronological approach**: How did understanding of determinants of demand for consumption evolved over the history of modern economic thinking

1. Keynes's consumption function

Basic assumptions

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3 conjectures about consumption function

- based on casual observation, no economic data was available + no computers to analyze them
- 1. **Marginal propensity to consume** is between 0 and 1
 - MPC = amount consumed out of 1 additional unit of income
 - Explanation = precaution
- 2. **Average propensity to consume** falls as income rises
 - APC = C / Y ratio of consumption to total income
 - Explanation = savings are luxury good
- 3. Key determinant of consumption is **income**, interest rate does not play important role

Formally:
$$C = \bar{C} + cY$$

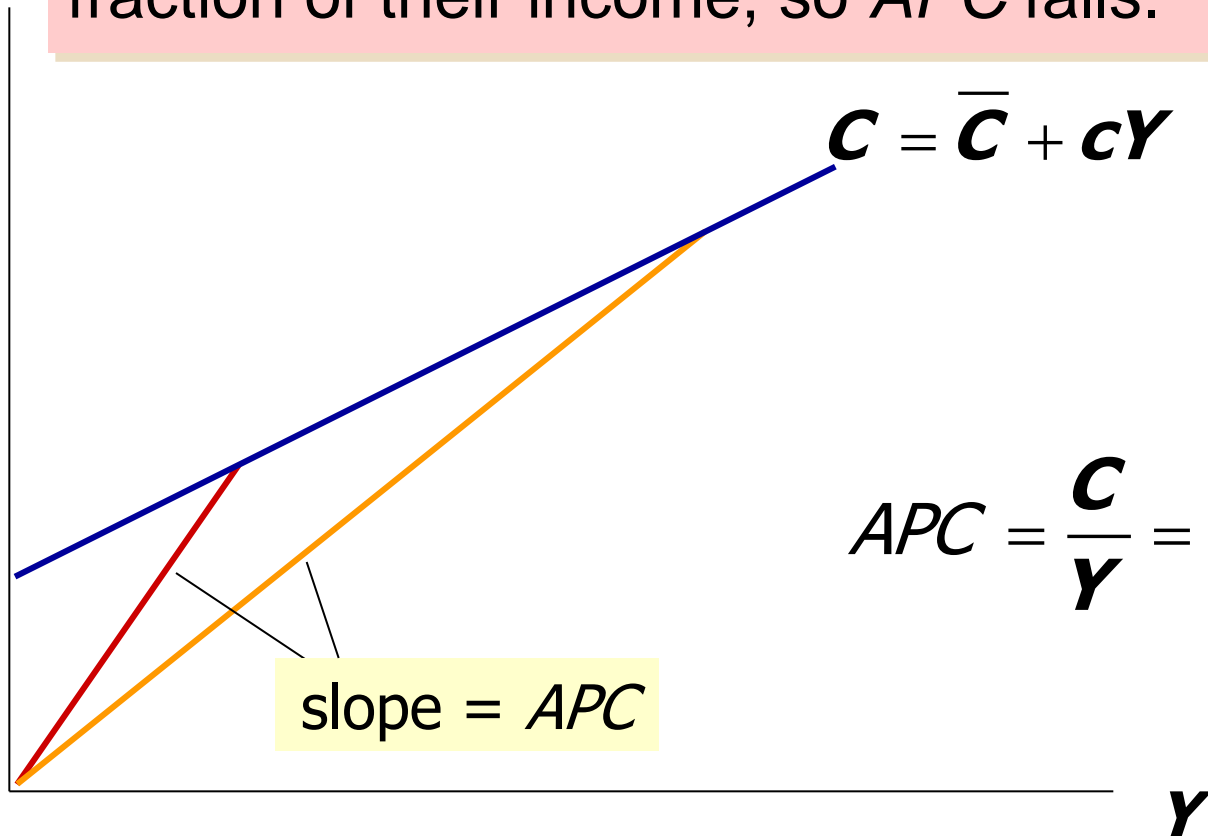
1. Keynes's consumption function

Illustration

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As income rises, consumers save a bigger fraction of their income, so APC falls.

C



$$APC = \frac{C}{Y} = \frac{\bar{C}}{Y} + c$$

1. Keynes's consumption function

Empirical verification

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Positive evidence

- Individual HHs data (cross section)
HHs with higher income
 - consumed more \Rightarrow $MPC > 0$
 - saved more \Rightarrow $MPC < 1$
 - saved larger fraction of income \Rightarrow falling APC
- Aggregate data on consumption and income (time series)
 - Years of low income = years of low C and S \Rightarrow $0 < MPC < 1$
 - Years of low income = years with high C/Y ratio \Rightarrow falling APC

Negative evidence

- All concerning falling APC
 - **Secular stagnation:** prediction about long depression after WWII – not confirmed by actual development
 - **Kuznets dataset** – aggregate data on income and consumption since 1869
 - APC remarkably stable despite large fluctuations in income

1. Keynes's consumption function

Empirical verification - Summary

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Keynes's conjectures **hold well** in **cross section** studies of HH's data and in short time-series, but **fail** when **long time-series** are concerned

- MPC between 0 and 1
- APC constant with income

2. Theory of intertemporal choice

(Irving Fisher)

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- Forward looking consumer chooses consumption for present and future to maximize lifetime happiness
- 2 period model:
 - T=1: person is young => earns income Y_1 (given) and consumes C_1 (choice)
 - T=2: person is old => earns income Y_2 (given) and consumes C_2 (choice)
 - Opportunity to borrow/save S at int. rate s

2. Theory of intertemporal choice

(Irving Fisher)

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- Period 1 budget constraint:

$$C_1 + S = Y_1$$

- Period 2 budget constraint:

$$C_2 = Y_2 + (1+r)S$$

- Intertemporal budget constraint:

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

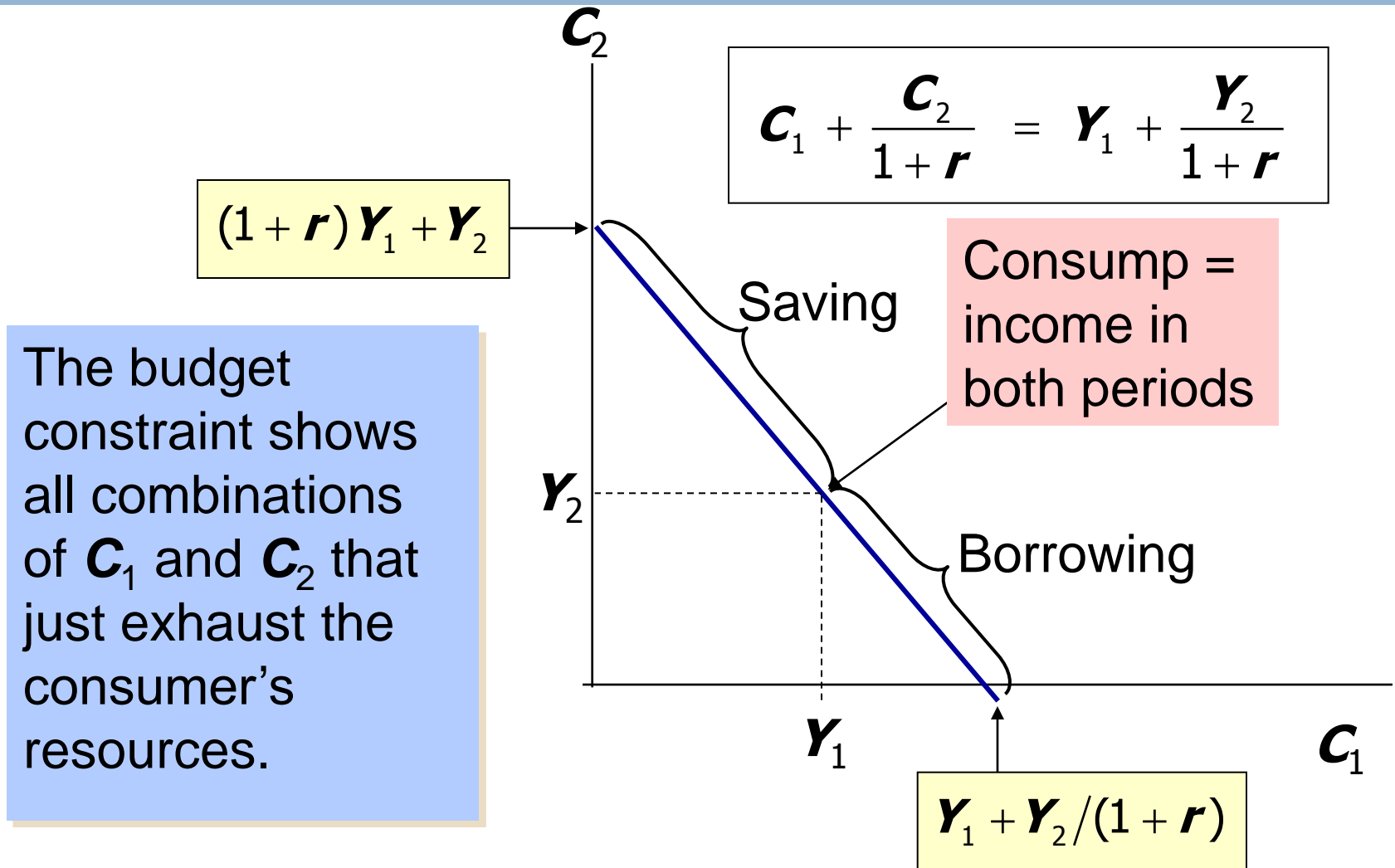
present value of
lifetime consumption

present value of
lifetime income

2. Theory of intertemporal choice

Intertemporal budget constraint

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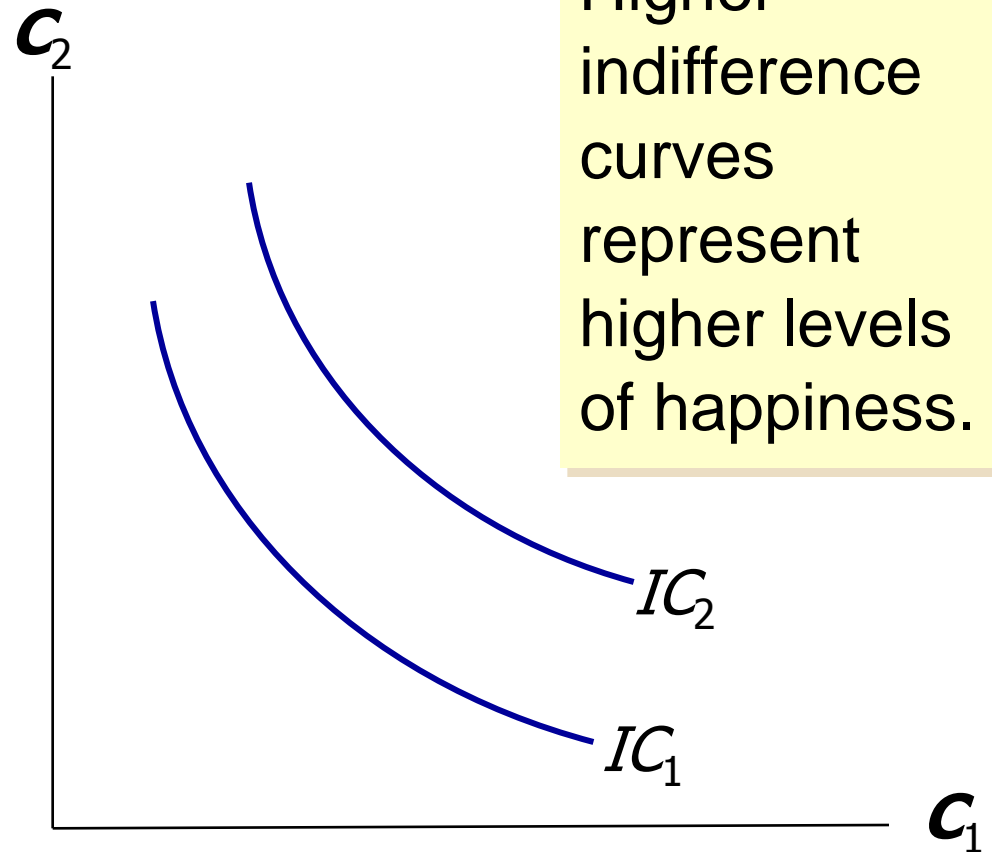


2. Theory of intertemporal choice

Consumer preferences

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An **indifference curve** shows all combinations of C_1 and C_2 that make the consumer equally happy.



Higher indifference curves represent higher levels of happiness.

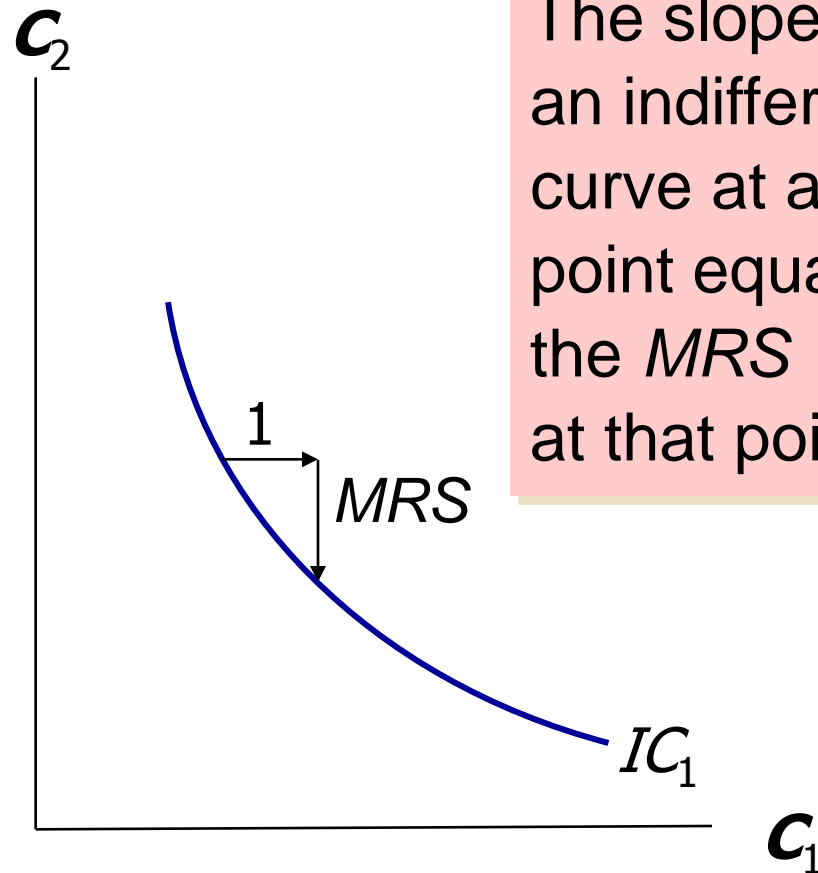
2. Theory of intertemporal choice

Consumer preferences

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Marginal rate of substitution

(*MRS*): the amount of C_2 the consumer would be willing to substitute for one unit of C_1 .



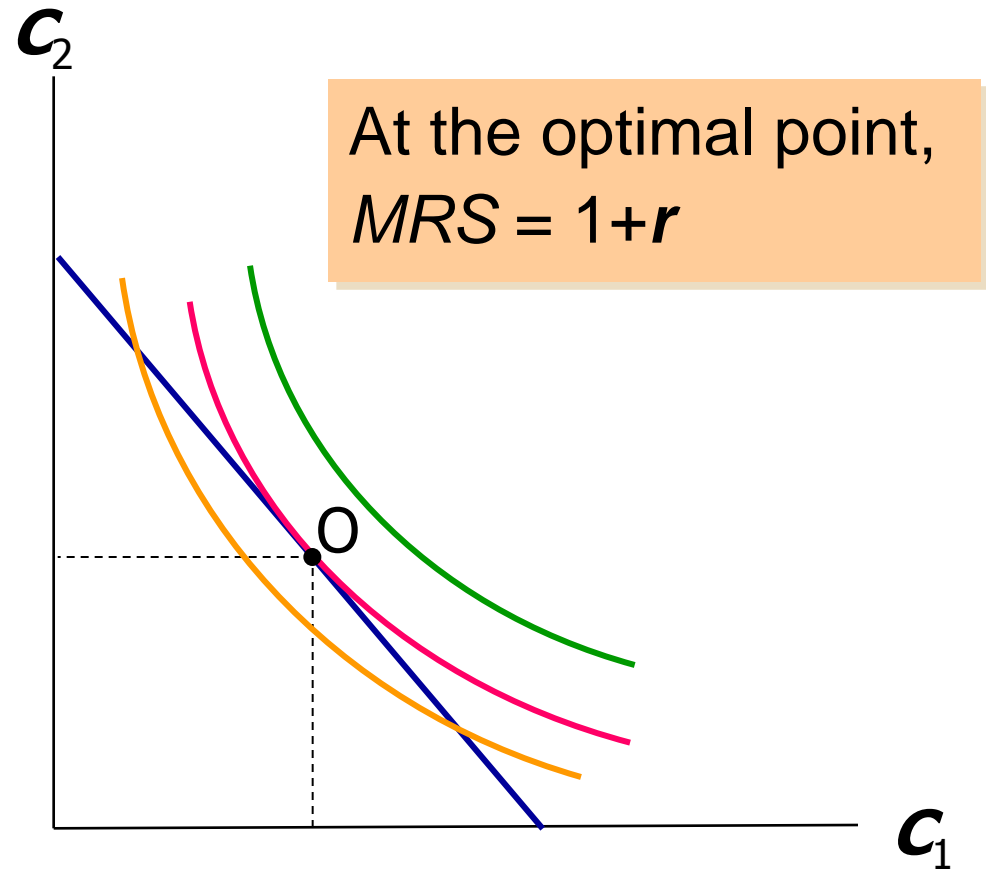
The slope of an indifference curve at any point equals the *MRS* at that point.

2. Theory of intertemporal choice

Optimization

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

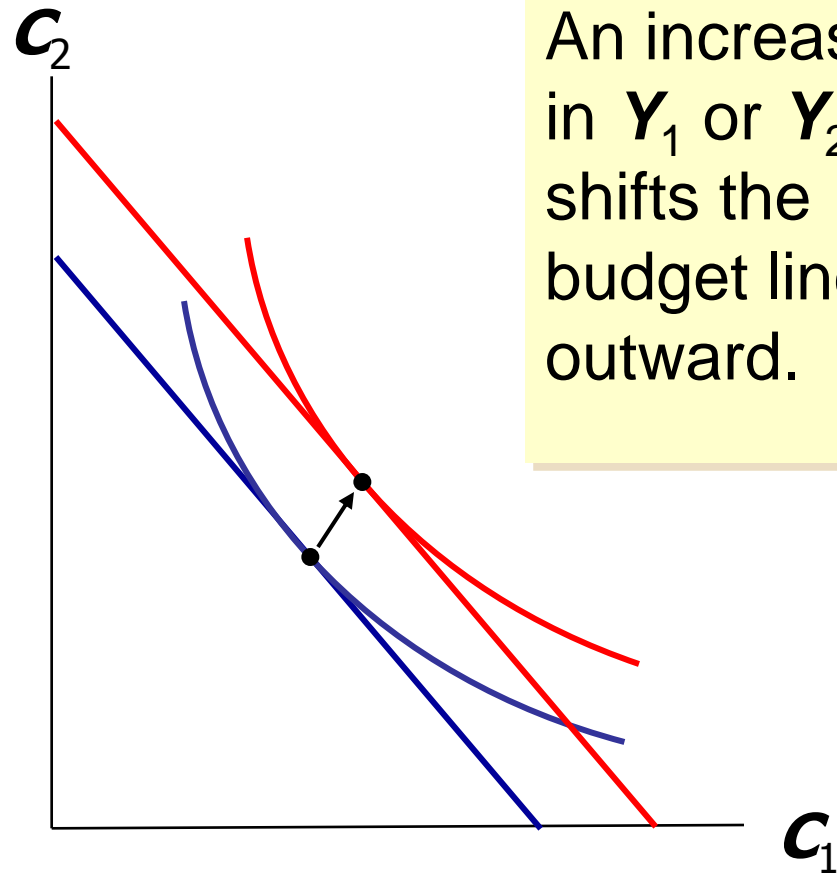


2. Theory of intertemporal choice

Increase in Y

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Results:
Provided they are both normal goods, C_1 and C_2 both increase, *...regardless of whether the income increase occurs in period 1 or period 2.*



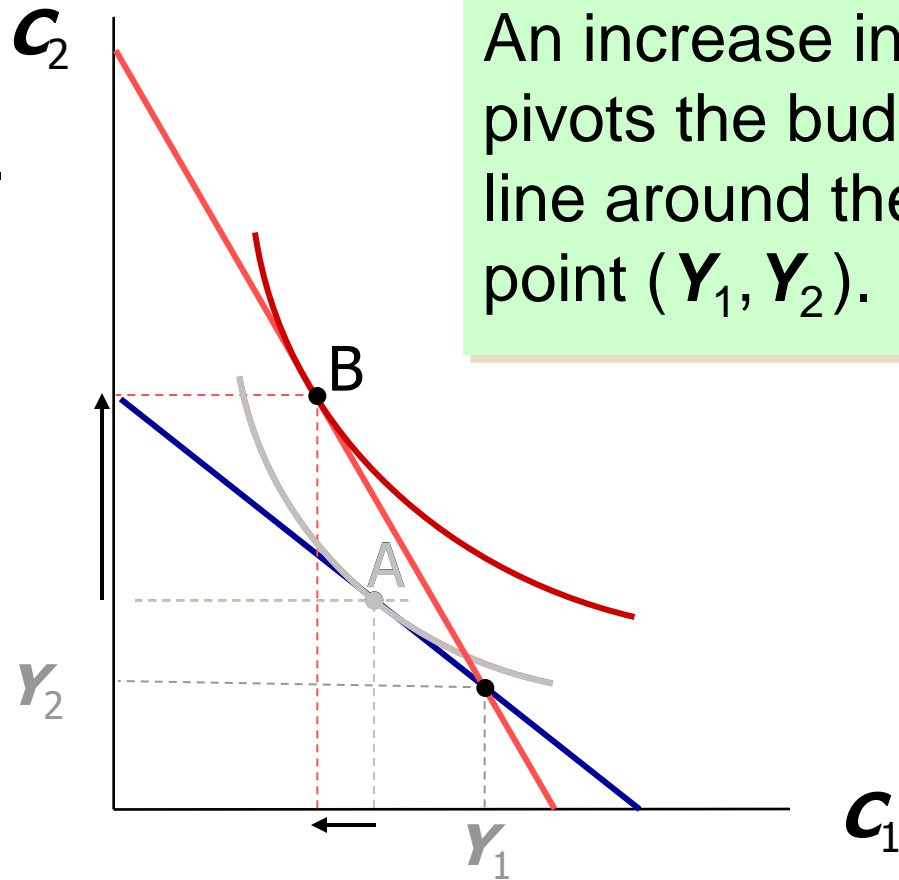
An increase in Y_1 or Y_2 shifts the budget line outward.

2. Theory of intertemporal choice

Increase in r – case of net saver

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As depicted here,
 C_1 falls and C_2 rises.
However, it could
turn out differently...



2. Theory of intertemporal choice

Increase in r – case of net saver

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- **income effect:** If consumer is a saver, the rise in r makes him better off, which tends to increase consumption in both periods.
- **substitution effect:** The rise in r increases the opportunity cost of current consumption, which tends to reduce C_1 and increase C_2 .
- Both effects $\Rightarrow \uparrow C_2$.
Whether C_1 rises or falls depends on the relative size of the income & substitution effects

2. Theory of intertemporal choice

Determinants of consumption

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Keynes:

- Current consumption depends only on current income.
- Interest rate matters only in theory

Fisher:

- Current consumption depends only on the present value of lifetime income. The timing of income is irrelevant because the consumer can borrow or lend between periods.
- Interest rate affects current consumption
- Problem: borrowing constraints

3. Life-cycle hypothesis

Hypothesis

(Franco Modigliani)

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- Income varies systematically over people's lives
- Savings allow people to move income from high-income period to low-income period (productive age -> retirement)

Example:

- Person with current wealth W expect to live T more years: R working and earning Y , $T-R$ years in retirement with no earnings
- Goal = smooth consumption over life time

$$C = \frac{W + R*Y}{T} = \frac{1}{T}W + \frac{R}{T}Y$$

- $T=50, R=30 \Rightarrow C = 0.02*W + 0.6*Y$

3. Life-cycle hypothesis

Implications

(Franco Modigliani)

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Formally: $C = \alpha W + \beta Y$

where α - MPC out of wealth, β - MPC out of income

- Explanation of APC paradox: $APC = C/Y = \alpha * W/Y + \beta$
 - ▣ Short-run: W does not vary with Y – falling APC
 - ▣ Long run: W and Y grow at the same rate – constant W/Y as well as APC
- Testable prediction: young people who are working save while old who are retired dissave
 - ▣ In data, elderly do not dissave as much as model predicts
 - ▣ Possible explanations:
 - Insurance: live longer than expected, possibility of illness
 - Altruism: bequests to their children

4. Permanent income hypothesis

Hypothesis

(Milton Friedman)

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People experience random and temporary changes in income
Savings are then derived from their expected income:

$$Y = Y^P + Y^T$$

- Y^P **permanent income**: part of Y a person expects to persist
 - e.g. return to one's education
- Y^T **transitory income**: part of Y a person does not expect to persist in future
 - e.g. good weather => big harvest => high income
- Consumption depends primarily on **permanent income**
- Savings / borrowing are used **to smooth consumption** in response to transitory changes

4. Permanent income hypothesis

Implications

(Milton Friedman)

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Formally: $C = \alpha Y^P$

Explanation of APC paradox:

- HHs survey:
 - ▣ If variation (income) in income is based on permanent income => HHs add proportionally to their consumption => constant APC
 - ▣ If variation (income) in income is based on temporary income => HHs do not change their consumption => decreasing APC
- Time series
 - ▣ Short-term: fluctuations determined by temporary income => falling APC
 - ▣ Long-term: fluctuations determined by permanent income => const APC

5. Random walk hypothesis

Hypothesis

(Robert Hall)

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

If assumptions are satisfied, then consumption should follow a **random walk**: changes in consumption should be unpredictable.

- 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**.

5. Random walk hypothesis

Implications

(Robert Hall)

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- ❑ If consumers behave according to permanent income hypothesis and have rational expectations then **policy changes will affect consumption only if they are unanticipated!**
- ❑ Changed expectations will have immediate effect on consumption (e.g. student)

PROBLEM: not supported by data:

- ❑ Predictable changes in income => predictable changes in consumption

6. Instant gratification

(David Laibson)

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What is people are not rational optimizers?

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?

Time inconsistency: Q1 – answer A, Q2 – answer B

- people generally prefer smaller, sooner payoffs to larger but later payoffs, when the smaller payoffs would be imminent - instant gratification (Q1)
 - when the same payoffs are distant in time, people tend to prefer the larger outcome, even though the time lag from the smaller to the larger would be the same as before(Q2)
- => People save less than they rationally know they should

Summary

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Keynes: consumption depends primarily on current income

Recent work: consumption also depends on

- ▣ Expected future income
 - ▣ Wealth
 - ▣ Interest rates
-
- ▣ Borrowing constraints
 - ▣ Psychological factors