

# CONSUMPTION AND INVESTMENT

- Remember the dynamic equation for capital stock

$$\dot{K} = F(K, TL) - C - \delta K$$

where  $C$  stands for both household and government consumption. When rearranged

$$F(K, TL) - C = \dot{K} + \delta K = I$$

- This equation states that part of the output that is not consumed is saving of the economy and is used for investment: to renew depreciated capital and also to increase the existing capital stock. The same equation can be obtained from the national account identity (for closed economies)

$$Y = C + I + G \quad \Rightarrow \quad Y - C - G = \text{Saving} = I(r)$$

- What makes  $Y - C - G$  equal to  $I$  is the interest rate:  $r$ . Even if we assume the interest rate does not affect the saving decision of consumers, it changes the investment demand of firms

1 Collecting all the equations

$$Y - C - G = \text{Saving} = I(r) \quad (= \dot{K} + \delta K) \quad Y = F(K, TL)$$

part of the output that is not consumed is saved, which determines investment. Investment increases the capital stock, and hence affects output (Real GDP). Hence,  $C$  and  $I$  are crucial for *Economic Growth (Economy in the Long Run)*

2 To explain the economy in the short run, the above equation can be written as

$$Y = C + G + I$$

showing that the aggregate supply equals to the the aggregate demand. This equation indicates that fluctuations in the demand for  $C$  and  $I$  cause  $Y$  to fluctuate as well. These fluctuations are called *Business (Economic) Cycles*. Hence, both  $C$  and  $I$  are crucial to explain the *Economy in the Short Run*. (If  $Y$  fluctuates due to the shocks to the technological component of production function, then they are called *Real Business Cycles*.) Notice that consumption depends, among other things, on income:  $C(Y)$ . Hence, any change in consumption not parallel to the change in aggregate income is capable of creating Business Cycles

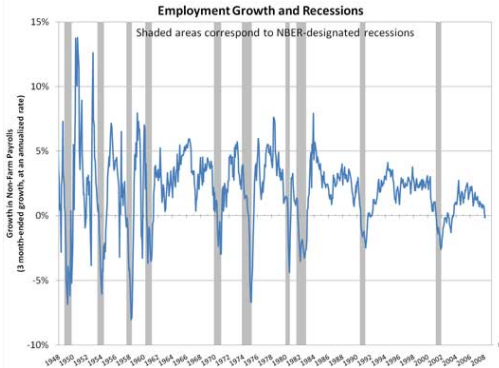
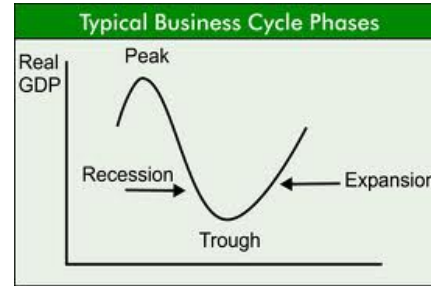
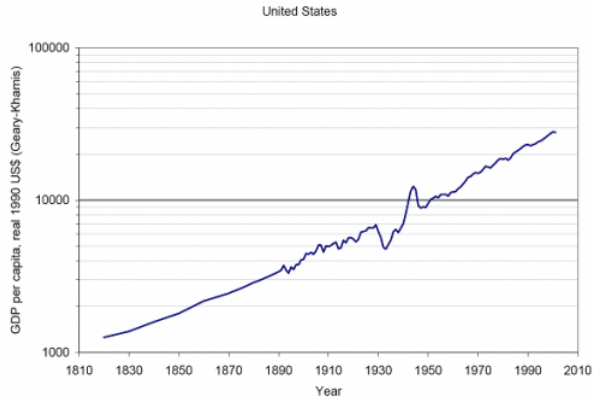


Figure 3.1: Consumption and labor income: US, 1953, Q2 to 1984, Q4



## CONSUMPTION

- There are several consumer behavior theories that interpret the data on consumption and income

### 1- Keynes' Conjectures

- The marginal propensity to consume is between zero and one. This means if a person earns an extra dollar, he typically spends some of it and saves the rest
- The ratio of consumption to income, called the average propensity to consume, falls as income rises. This means rich people save a higher proportion of their income than the poor people
- Income is the primary determinant of consumption but not the interest rate

- Hence the Keynesian consumption function is:

$$C(Y) = \bar{C} + cY \quad \bar{C} > 0, 0 < c < 1$$

where  $C$  is consumption,  $Y$  is disposable income (total personal income minus taxes),  $\bar{C}$  and  $c$  are constants. This function satisfies Keynes' Conjectures

- The marginal propensity to consume is between zero and one:

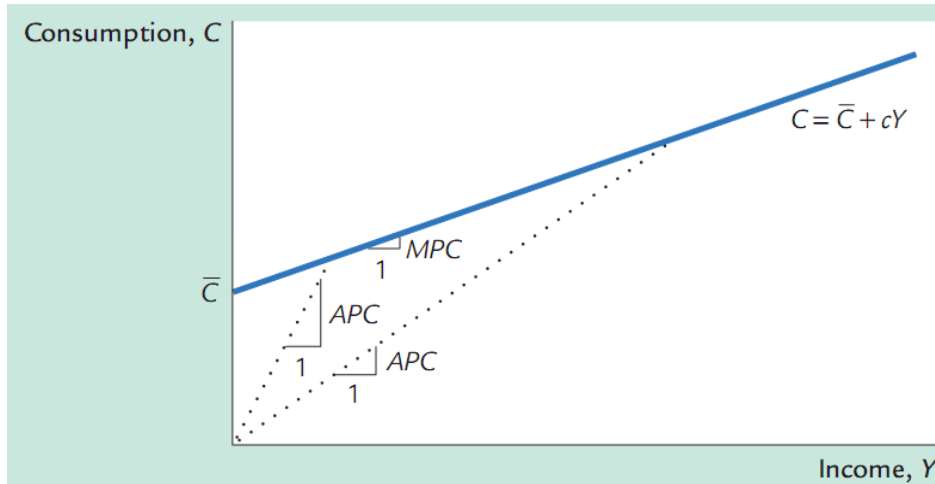
$$MPC = \frac{\partial C(Y)}{\partial y} = c$$

- The average propensity to consume, falls as income rises:

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

- The interest rate is not included in this equation as a determinant of consumption

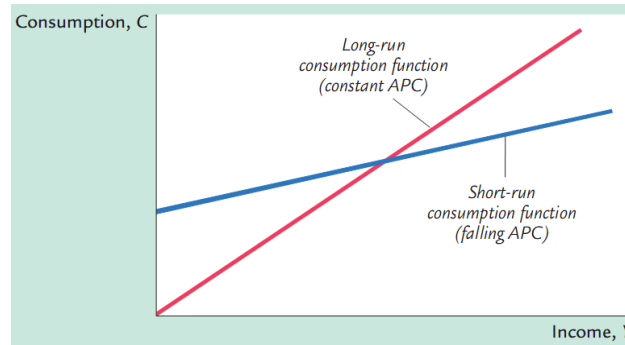
- The figure of the Keynesian consumption function



**The Keynesian Consumption Function** This figure graphs a consumption function with the three properties that Keynes conjectured. First, the marginal propensity to consume  $c$  is between zero and one. Second, the average propensity to consume falls as income rises. Third, consumption is determined by current income.

*Note:* The marginal propensity to consume,  $MPC$ , is the slope of the consumption function. The average propensity to consume,  $APC = C/Y$ , equals the slope of a line drawn from the origin to a point on the consumption function.

- The earliest studies indicate that the Keynesian consumption function is a good approximation of how consumers behave
- Then Kuznet (with Nobel prize award) found that the average propensity to consume is fairly constant over long periods of time
  - *The Consumption Puzzle*: Studies of household data and short time-series found a relationship between consumption and income similar to the one Keynes conjectured. But studies of long time-series found that the average propensity to consume did not vary systematically with income



- Franco Modigliani (life-cycle hypothesis) and Milton Friedman (permanent-income hypothesis) each proposed explanations of these seemingly contradictory findings (each won the Nobel). Both rely on the theory of consumer behavior proposed earlier by Irving Fisher

## **2- Irving Fisher and Intertemporal Choice**

- Unlike consumption function introduced by Keynes that relates current consumption to current income, Irving Fisher developed the model where consumers faces an intertemporal budget constraint and chooses consumption depending on the current and expected future income, discount rate and interest rate

## **3- Franco Modigliani and the Life-Cycle Hypothesis**

- Franco Modigliani used Fisher's model of consumer behavior to study the consumption function. Modigliani emphasized that individual's incomes varies systematically over people's lives and that saving allows consumers to move income from those times in life when income is high to those times when it is low (like



the times of retirement). This interpretation of consumer behavior formed the basis for his *life-cycle hypothesis*

- Consider a consumer who expects to live another  $T$  years. She has wealth of  $W$ , and expects to earn income  $Y$  until she retires  $R$  years from now. Then she earns 0 income. Hence, the consumer's lifetime resources are composed of initial wealth  $W$  and lifetime earnings of  $R \cdot Y$ . Without an utility function, we assume that she wishes to achieve the smoothest possible path of consumption over her lifetime. Therefore, she divides this total of  $W + RY$  equally among the  $T$  years and each year consumes

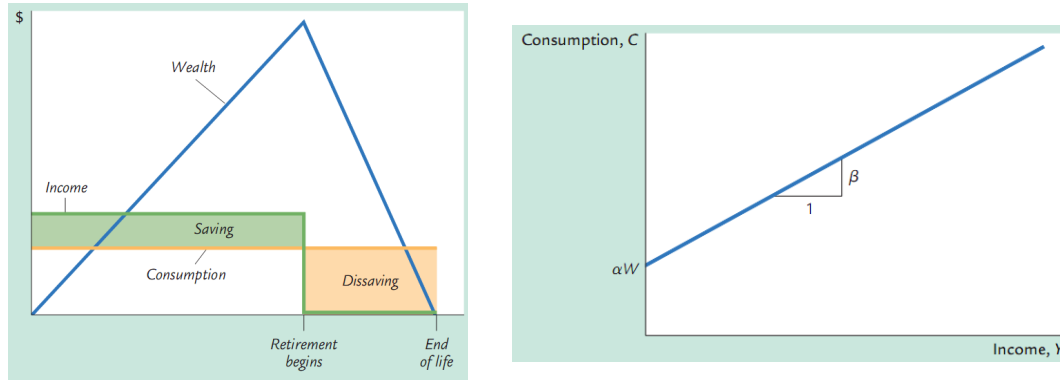
$$C = (W + RY)/T$$

The model can be summarized as follows

$$C = (W + RY)/T \quad \Rightarrow \quad C = \alpha W + \beta Y \quad \Rightarrow \quad C/Y = \alpha(W/Y) + \beta$$

where the parameter  $\alpha$  is the marginal propensity to consume out of wealth,

and the parameter  $\beta$  is the marginal propensity to consume out of income



- Because wealth does not vary proportionately with income from person to person or from year to year, high income ( $Y$ ) corresponds to a low average propensity to consume when looking at data across individuals or over short periods of time. But, over long periods of time, wealth and income grow together, resulting in a constant  $W/Y$ , and thus a constant  $C/Y$  (if the US is two times richer in per capita terms than Turkey, we would expect US citizens to consume two times more than Turkish citizens)

#### 4- Milton Friedman and the Permanent-Income Hypothesis

- Like the life-cycle hypothesis, this hypothesis uses Irving Fisher's theory of the consumer to argue that consumption should not depend on current income alone. But unlike the life-cycle hypothesis, which emphasizes that income follows a regular pattern over a person's lifetime, the permanent-income hypothesis emphasizes that people experience random and temporary changes in their incomes
- The Hypothesis Friedman suggested that we view current income  $Y$  as the sum of two components, permanent income  $Y_P$  and transitory income  $Y_T$ . That is

$$Y = Y_P + Y_T$$

- Permanent income is the part of income that people expect to persist into the future (like wage earnings). Transitory income is the part of income that people do not expect to persist
  - Ex: A good education provides a permanently higher income, whereas booming economy provides only transitorily higher income

- Ex: If a person received a permanent raise of \$10,000 per year, his consumption would rise by about as much. Yet if a person won \$10,000 in a lottery, he would not consume it all in one year. Thus, consumers spend their permanent income, but they save rather than spend most of their transitory income
- Friedman concluded that we should view the consumption function approximately as

$$C = \alpha Y_P$$

where  $\alpha$  is a constant that measures the fraction of permanent income consumed. This equation, states that consumption is proportional to permanent income ( $Y_P$ ), not to current income ( $Y$ )

- This hypothesis emphasizes that because consumers can save and borrow, and because they want to smooth their consumption, consumption does not respond much to transitory income, but on permanent income

- The Permanent-Income Hypothesis Explanation for the Consumption Puzzle: Divide both sides of the above equation by  $Y$

$$APC = C/Y = \alpha Y_P/Y = \alpha Y_P/(Y_P + Y_T)$$

When current income rises above permanent income due to temporary changes in income,  $C/Y$  temporarily falls; when current income temporarily falls below permanent income,  $C/Y$  temporarily rises

- Consider the studies of household data. Households with high permanent income have proportionately higher consumption. Households with high transitory income do not have higher consumption. Therefore, researchers find that high-income households have, on average, lower  $C/Y$
- Similarly, consider the studies of time-series data. Friedman reasoned that year-to-year fluctuations in income are dominated by transitory income. Therefore, years of high income should be years of low average propensities to consume. But over long periods of time—say, from decade to decade—the variation in income comes from the permanent component. Hence, in long time-series, one should observe a constant  $C/Y$

## 5- Robert Hall and the Random-Walk Hypothesis

- The rational-expectations assumption states that people use all available information to make optimal forecasts about the future. Hall's random-walk hypothesis combines the permanent-income hypothesis with the assumption that consumers have rational expectations about future income. It implies that changes in consumption are unpredictable, because consumers change their consumption only when they receive news about their lifetime resources. When changes in a variable are unpredictable, the variable is said to follow a random walk. According to Hall, the combination of the permanent-income hypothesis and rational expectations implies that consumption follows a random walk.
- If consumers obey the permanent-income hypothesis and have rational expectations, then only unexpected policy changes influence consumption. These policy changes take effect when they change expectations. Hence, if consumers have rational expectations, policymakers influence the economy not only through their actions but also through the public's expectation of their actions