

INTERMEDIATE MACROECONOMICS

MACROECONOMIC CONCEPTS

3. GDP OVER TIME

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# GDP OVER TIME

- government's goal: measure production over time
- **nominal GDP**: final goods  $\times$  **current prices**
- nominal GDP increases for two reasons:
  - the productions of most goods increase
  - the prices of most goods increase
- **real GDP**: final goods  $\times$  **constant prices**

# CONSTRUCTING GDP

- consider an economy in which only cars are produced
- take expenditure approach:

<b>Year</b>	<b>Quantity of Cars</b>	<b>Price of Cars</b>	<b>Nominal GDP</b>	<b>Real GDP (in 2009 dollars)</b>
2008	10	\$20,000	\$200,000	\$240,000
2009	12	\$24,000	\$288,000	\$288,000
2010	13	\$26,000	\$338,000	\$312,000

# CONSTRUCTING NOMINAL GDP

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↑  
we want to clean the time series of GDP from the increase in car prices, which does not reflect an increase in production

# CONSTRUCTING REAL GDP

Year	Quantity of Cars	Price of Cars	Nominal GDP	Real GDP (in 2009 dollars)
2008	10	\$20,000	\$200,000	\$240,000
2009	12	\$24,000	\$288,000	\$288,000
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- **base year:** the year used to construct prices (2009)
- for more than one good, relative prices may change over time
  - constant-price real GDP keeps relative price constant
  - chain-weighted real GDP reflects changing relative prices

# LEVEL & GROWTH RATE OF GDP

- because GDP grows over time, it is useful to look at growth rate instead of level
- the growth rate of GDP is:

$$\frac{Y(t) - Y(t - 1)}{Y(t - 1)}$$

- growth rate of GDP = percentage change in GDP

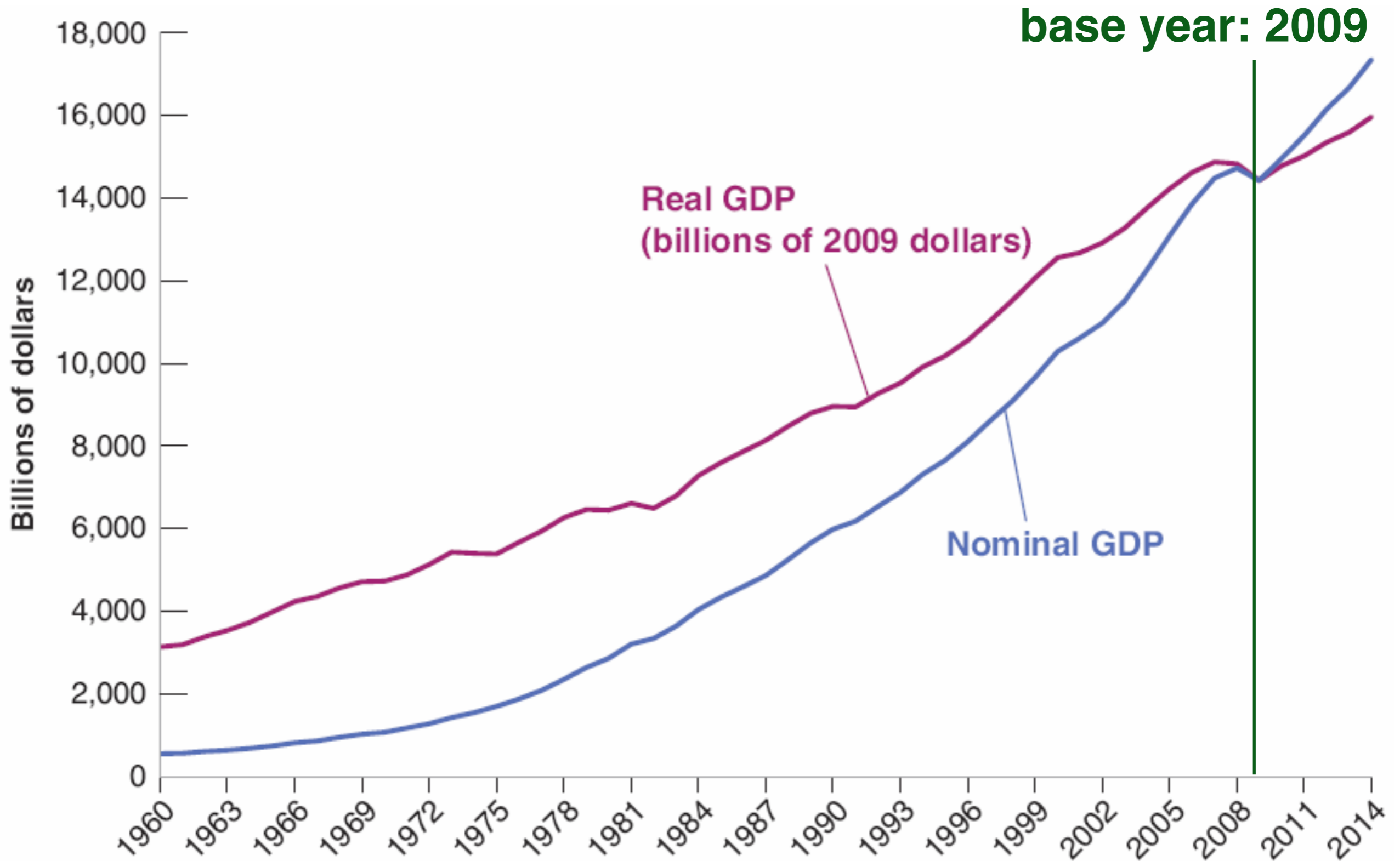
**1. For any variables  $X$  and  $Y$ ,**  
percentage change in  $(X \times Y)$   
 $\approx$  percentage change in  $X$   
+ percentage change in  $Y$

**2. Percentage change in  $(X/Y)$**   
 $\approx$  percentage change in  $X$   
– percentage change in  $Y$

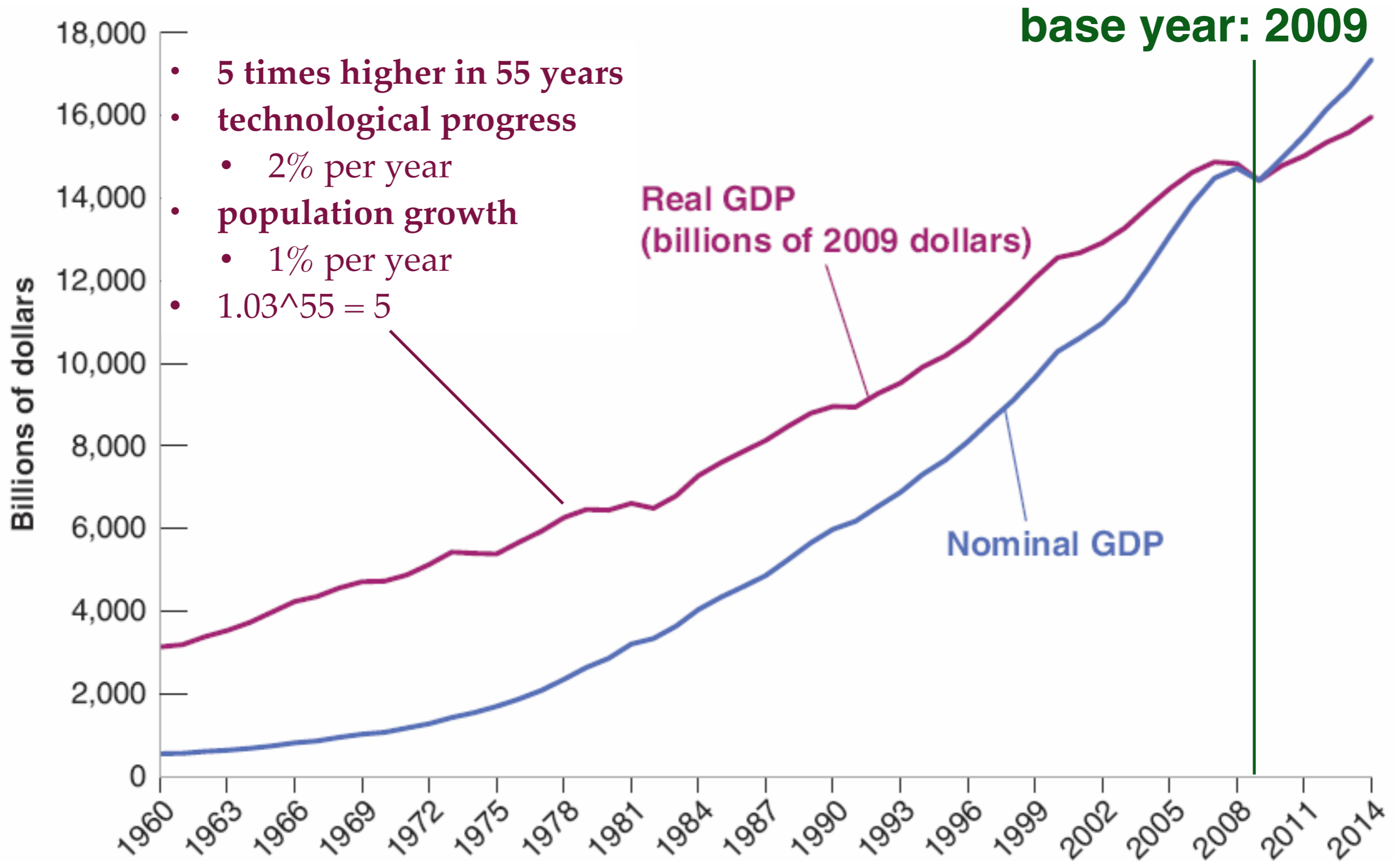


- equivalently:
- growth rate of  $(X \times Y) = \text{growth rate of } X + \text{growth rate of } Y$
- growth rate of  $(X/Y) = \text{growth rate of } X - \text{growth rate of } Y$
- and growth rate of  $X^a = a \times \text{growth rate of } X$
- these are the same properties as the log function!

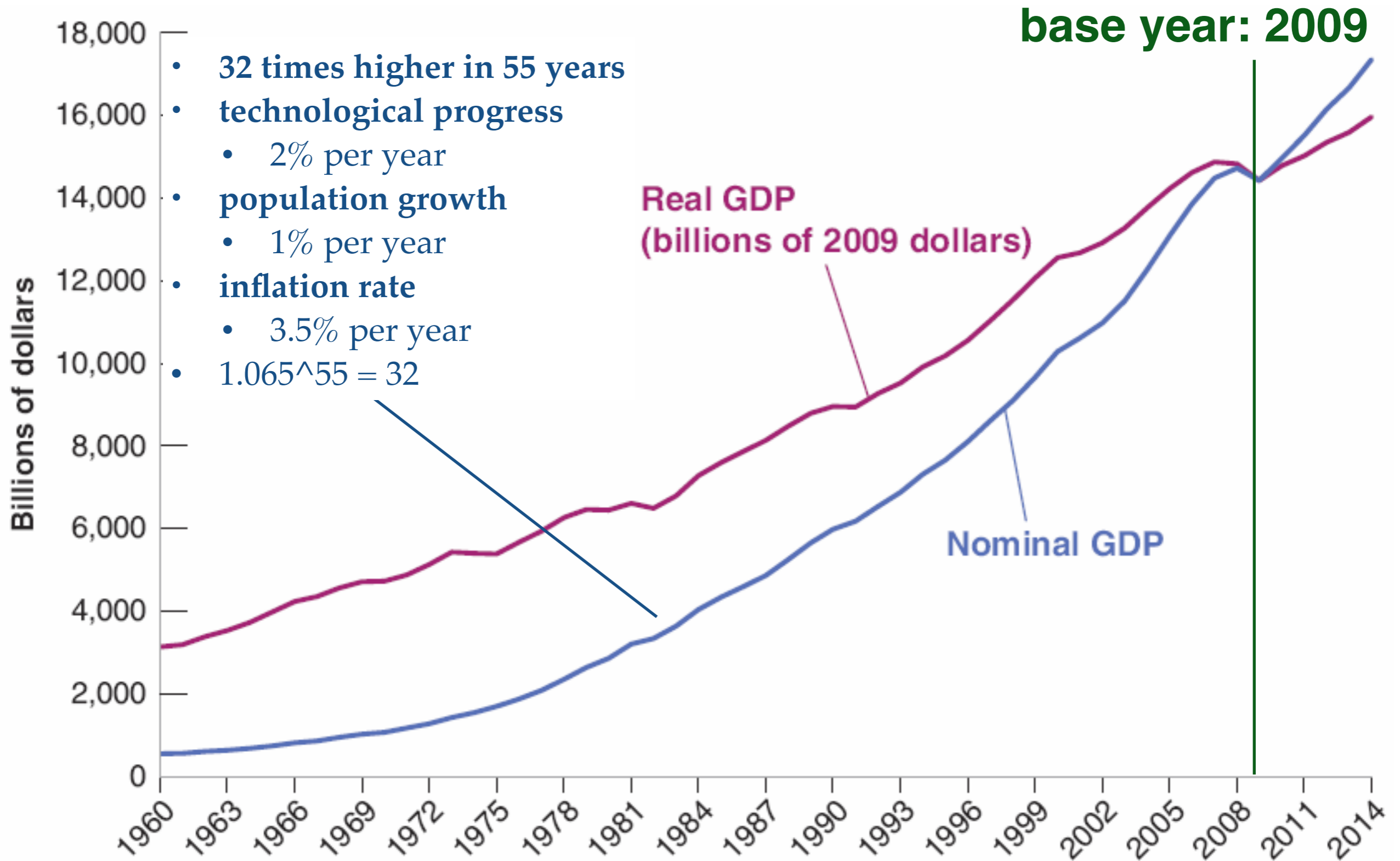
# NOMINAL & REAL GDP



# NOMINAL & REAL GDP



# NOMINAL & REAL GDP



# HEDONIC PRICING

- the Department of Commerce deals with **changes in the quality of existing goods** with the method of hedonic pricing
  - treats goods as providing a collection of characteristics
- the quality of a new laptop computer has increased by 18% per year since 1995
  - higher memory, higher CPU, better battery, better screen
- the price of a laptop has declined by 7% per year since 1995
- the hedonic price of a laptop has fallen at  $18\% + 7\% = 25\%$  per year since 1995