

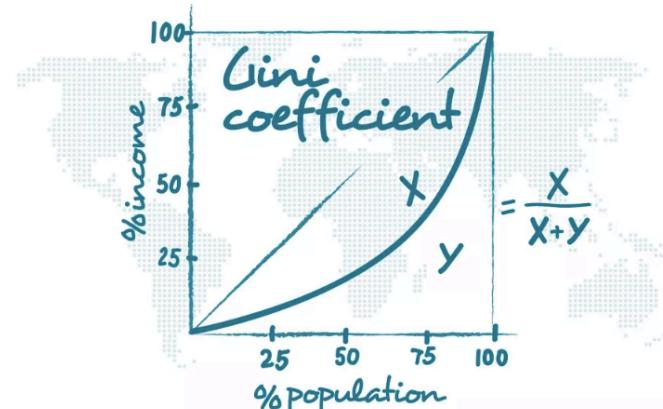
ECONOMICS Lecture 18

Factor Markets & Income Distribution

Biwei Chen

Topics

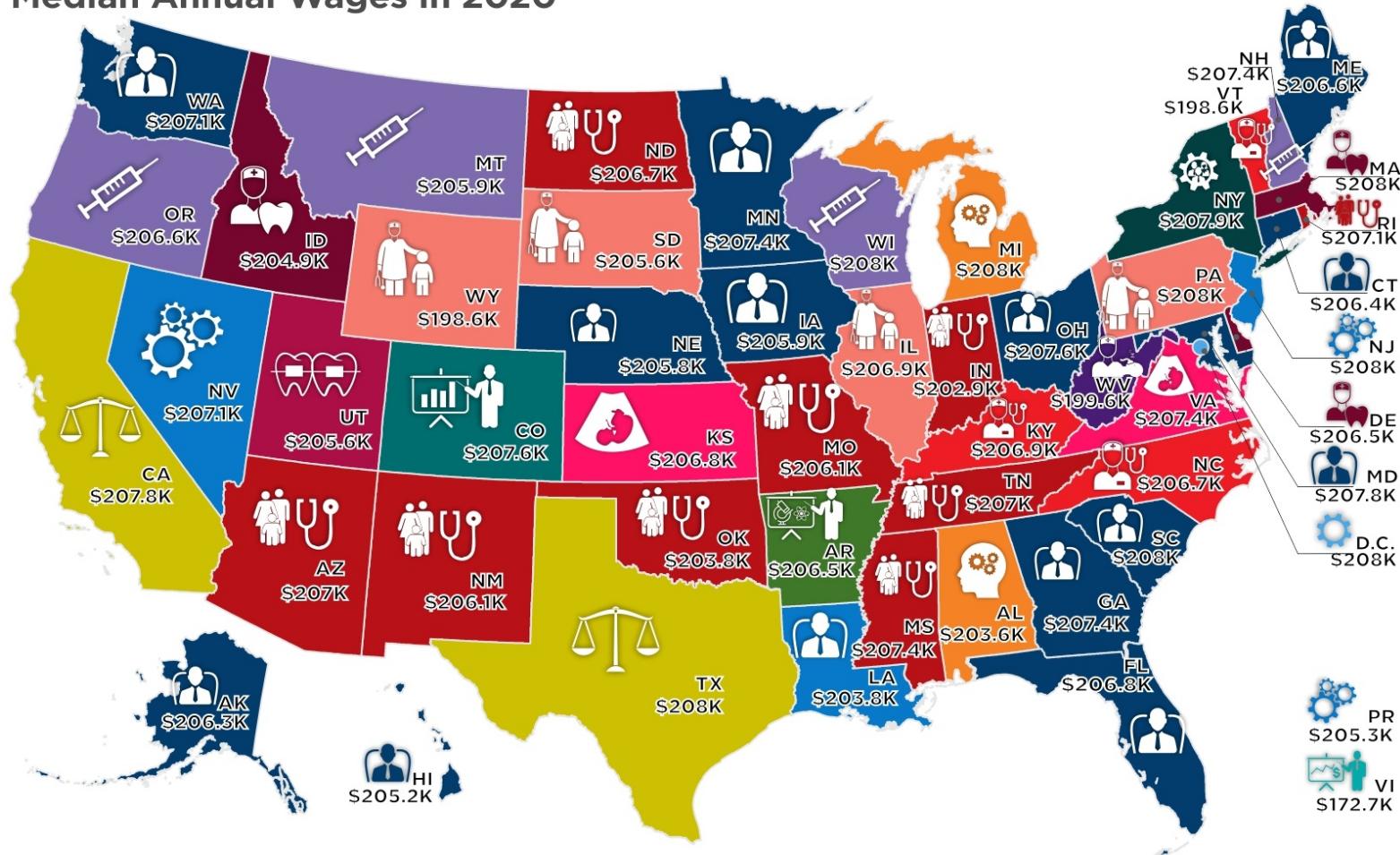
- Factor Markets Analysis
- Income Distribution Theory
- Measuring Income Inequality



This lecture extends the demand and supply model to the factors market and derives the demand curve for labor; discusses the role of factor markets in income distribution and presents the neoclassical theory of factor income distribution. In applications, most recent data on U.S. household income/wealth distribution are illustrated and a popular measurement of income inequality is introduced.

The Best-Paying Occupation in Each State

Median Annual Wages in 2020



Anesthesiologist



Obstetrician & Gynecologist



Psychiatrists



Human Resources Managers



Natural Sciences Managers



Nurse Anesthetist



Family Medicine Physicians



Chief Executives



Marketing Manager



Project Management Specialists & Business Operations Specialists



Dentists



Physicians



General & Operations Managers



Orthodontist



Pediatrician



Management Occupations

Article & Sources:

<https://howmuch.net/articles/best-paying-occupation-in-each-state>
U.S. Bureau of Labor Statistics - <https://www.bls.gov/>

Earnings by Ethnicity and Education

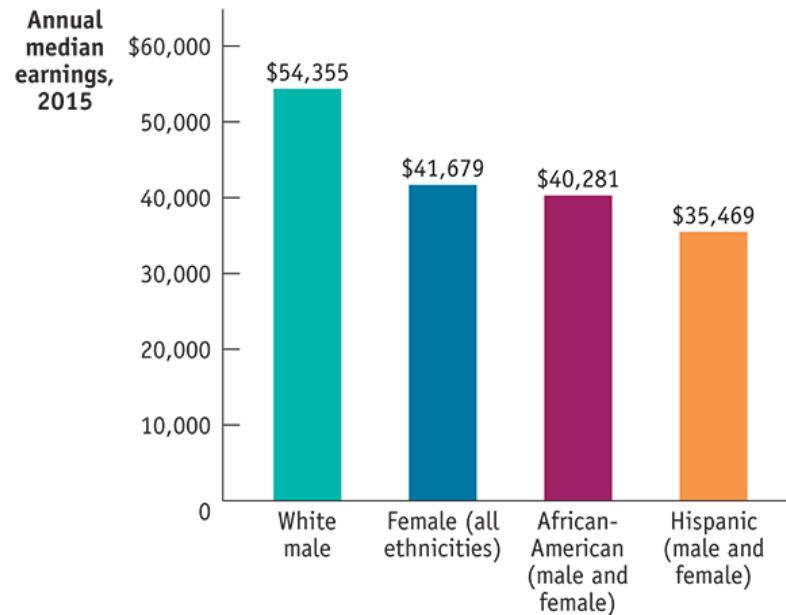


FIGURE 19-8
Krugman/Wells, *Microeconomics*, 5e
Data from: U.S. Census Bureau.

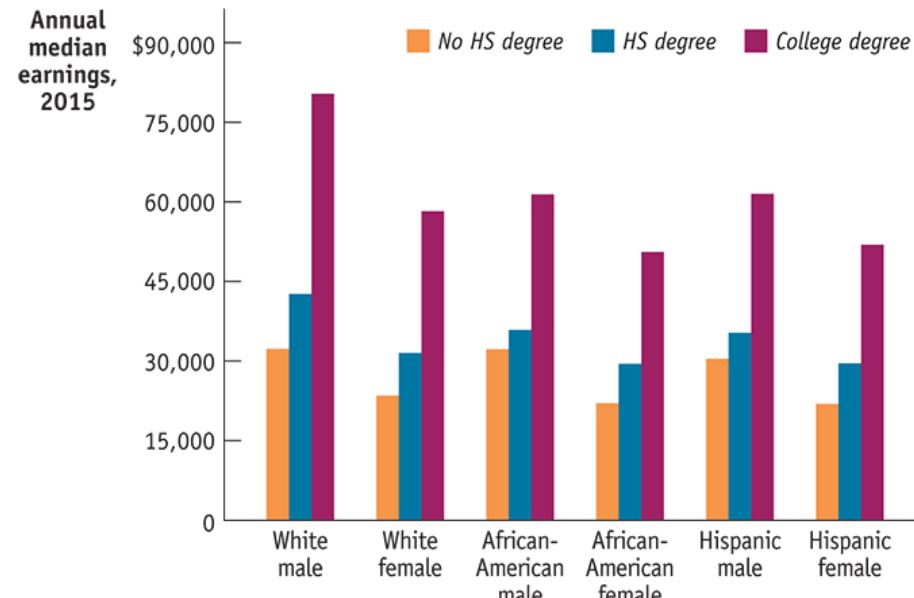


FIGURE 19-9
Krugman/Wells, *Microeconomics*, 5e
Data from: U.S. Census Bureau.

Wage disparities in practice: The U.S. labor market continues to show large differences across workers according to gender and ethnicity. An important reason for wage differences is differences in the quantity of human capital, measured by education attainments.

The Cheapest/Most Expensive Cities to Rent an Apartment

Average 2-Bedroom Apartment Rent in the U.S. 2021

San Francisco, CA

\$4,084

Oakland, CA

\$3,305

San Jose, CA

\$3,034

Los Angeles, CA

\$4,514

San Diego, CA

\$3,232

Fresno, CA

\$942

Chicago, IL

\$3,065

Fort Wayne, IN

\$1,077

Toledo, OH

\$949

Boston, MA

\$4,728

New York, NY

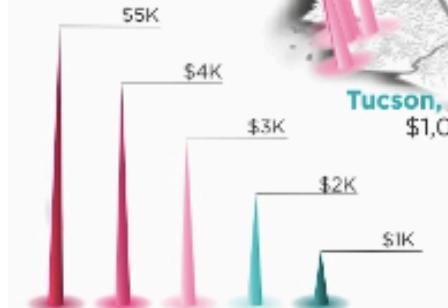
\$4,927

Jersey City, NJ

\$3,821

Greensboro, NC

\$1,026



1. New York

NY

\$4,927

2. Boston

MA

\$4,728

3. Los Angeles

CA

\$4,514

4. San Francisco

CA

\$4,084

5. Jersey City

NJ

\$3,821

6. Oakland

CA

\$3,305

7. San Diego

CA

\$3,232

8. Chicago

IL

\$3,065

9. San Jose

CA

\$3,034

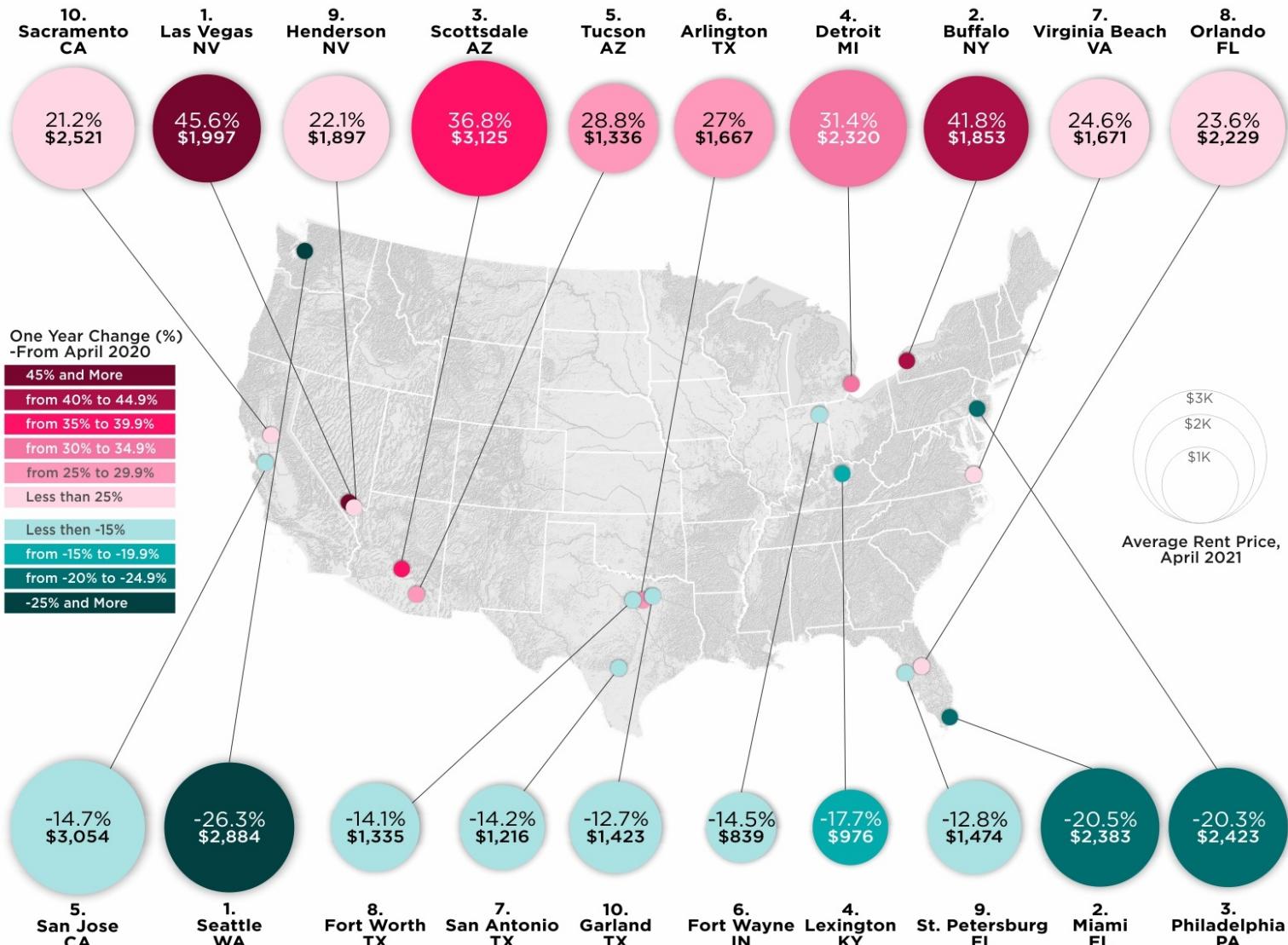
10. Scottsdale

AZ

\$3,020

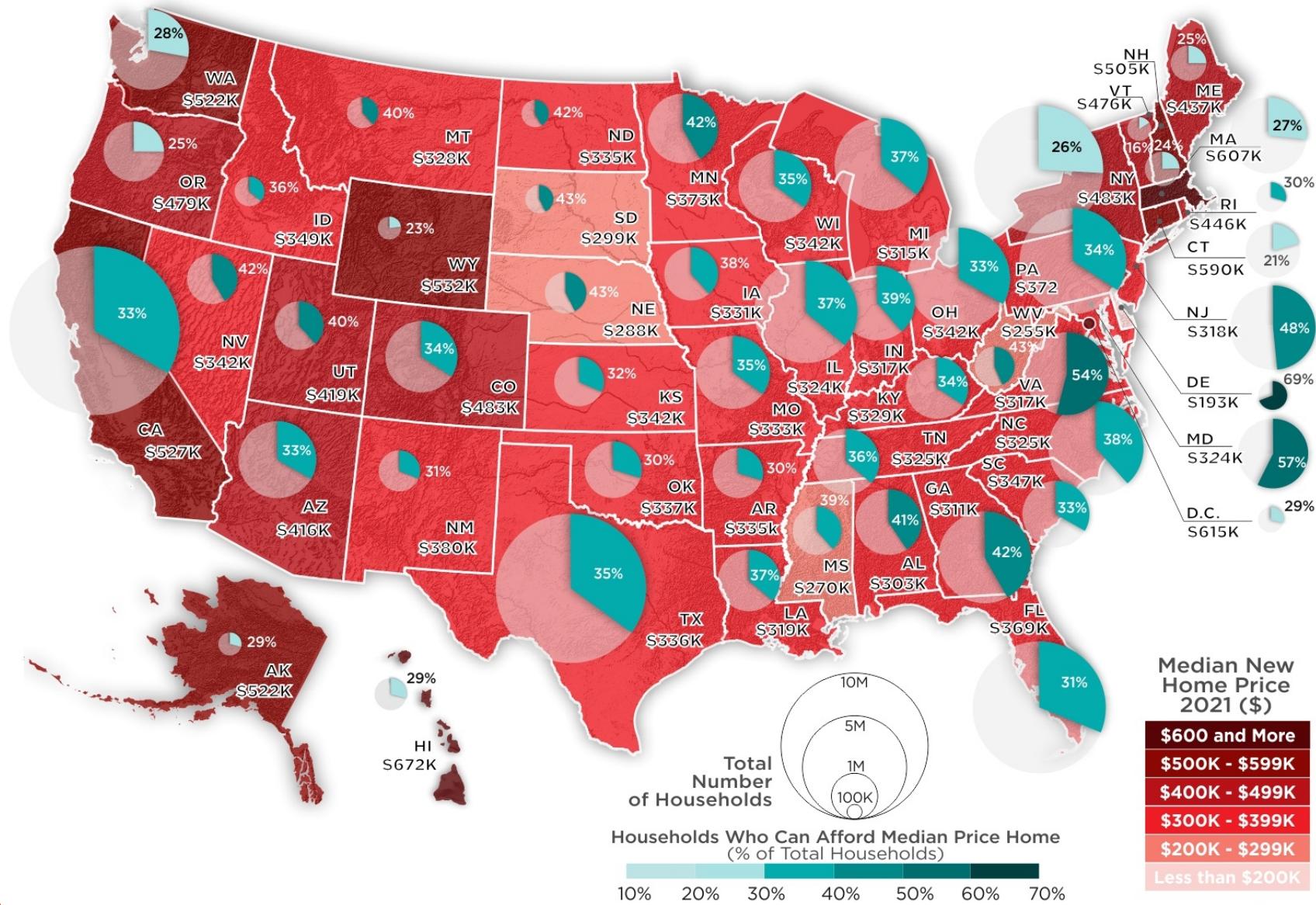
Top 10 U.S. Cities by Fastest Growing/Declining Rent Prices

Percentage of Change & Average Rent Price of Two-Bedroom Apartment



Home Affordability in the U.S.

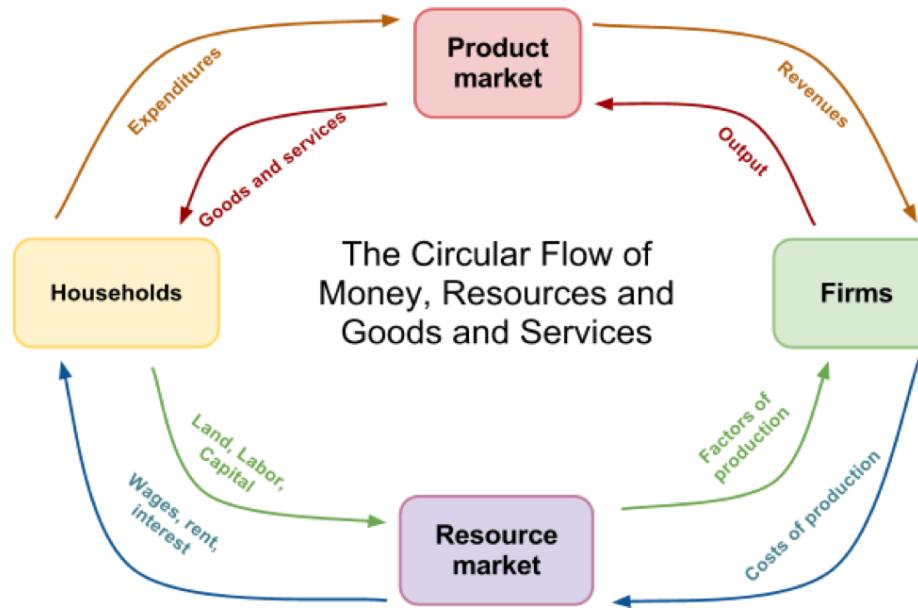
Median New Home Price & Percentage of Households Who Can Afford It



Factor Markets: Price and Quantity

- What explain the differences in wages and earnings in the US?
- What explain the huge gaps in rental and real estate markets?
- To understand how markets function, economists invented the demand and supply model, which focuses on explaining and predicting the changes in the price and quantity of a good.
- What are the price and quantity for a production factor?
- Labor market: wage and labor unit (hours/pieces of work).
- Land market: rent and rental unit (square feet/meters).
- Capital market: interest and capital unit (dollars/euros).
- Can you compare the measurements of factor price and unit with those of product price and quantity? How do they differ?

Goods Market and Factor Market



- In the market place, economists draw a circular flow diagram to depict the transactions between consumers and producers.
- What are the respective roles of households and firms in their transactions? How do economists model the markets for goods?

Demand for Production Factors

- Production factors or inputs are the intermediate resources employed in the production of final goods and services.
- Economists put production factors into three main categories: labor, land, and capital.
- Correspondingly: labor market, land market, capital market.
- All markets follow the fundamental laws of demand and supply.
- Production functions link factor markets to goods markets.
- The demand and supply of production factors are derived from the demand and supply of final goods and services.
- Hence, economists derive the demand for factors from the demand for goods and services. It is a derived demand.

Labor Market Equilibrium Model

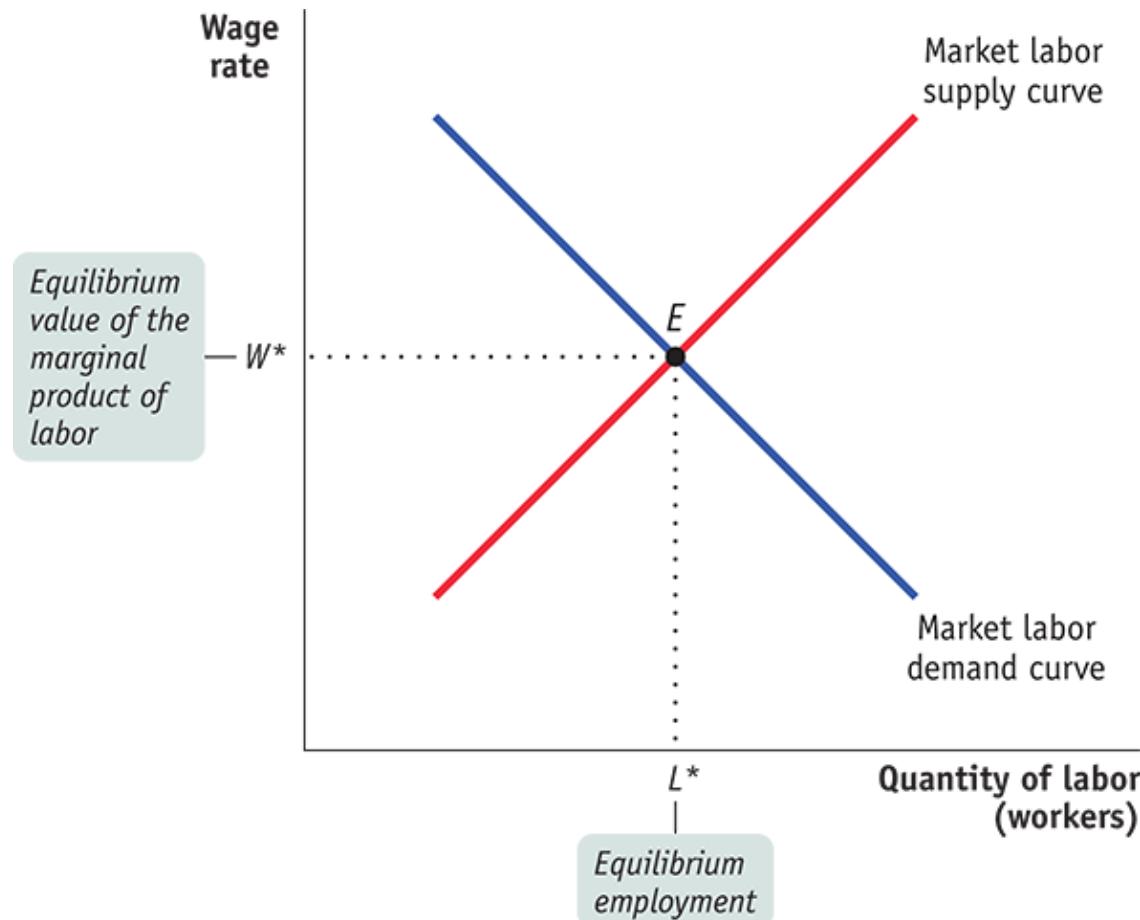


FIGURE 19-6

Krugman/Wells, *Microeconomics*, 5e, © 2018 Worth Publishers

Factor Markets: Land and Capital

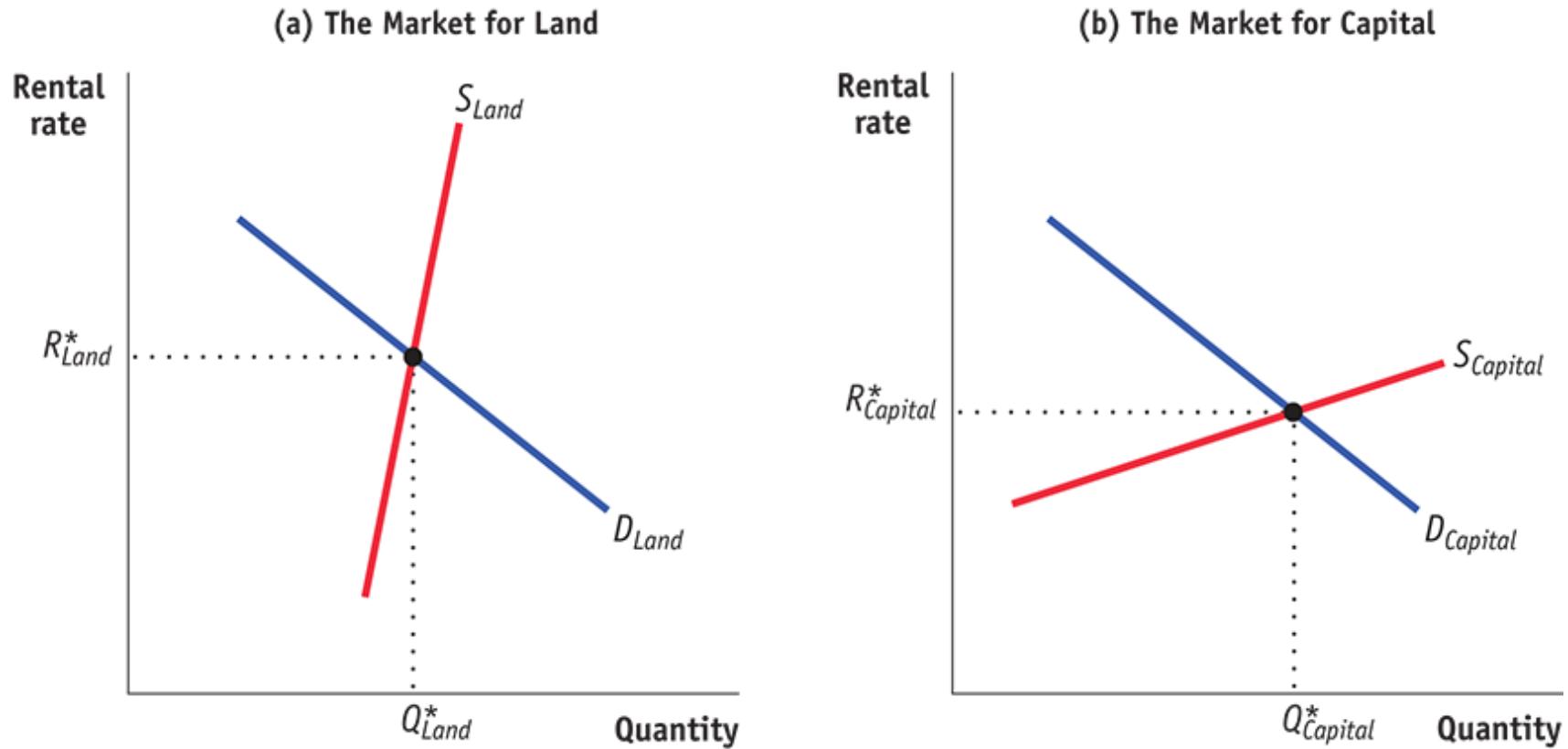


FIGURE 19-7

Krugman/Wells, *Microeconomics*, 5e, © 2018 Worth Publishers

Factor Market: Demand & Supply

- Who are the decision makers in the factor markets?
- Demand for factor: Firms. The demand for a production factor is derived from a firm's decision to supply its products.
- Supply of factor: Households. The supply of a production factor is derived from households' decision to purchase goods and services. One person's expenditure is another person's income.
- Firms are consumers for input factors and producers of goods; households are suppliers of factors and consumers for goods. Hence, economic agents are all “prosumers.”
- Input demand and output supply are two sides of the same coin.
- In this lecture, we will derive the equilibrium equation below.
- Demand for labor $P \cdot MPL = W = MC \cdot MPL$ supply of product.

Labor Demand: Firm's Decision

- Decision maker: a firm, the production unit.
- Economic objective: profit maximization.
- Economic decision: number of workers to hire.
- Decision rule: **MR of labor = MC of labor**.
- Assumptions: In competitive markets, firms sell their products at unit price P and hire workers at hourly wage W.
- Marginal revenue of labor is the market value created by hiring an additional worker. How to compute its contribution? $MPL \cdot P$
- Marginal cost of labor is the wage for that marginal worker.
- In a competitive market, firms hire workers at the prevailing wage determined by the labor market demand and supply.

Marginal Revenue of Labor MRL

- To maximize its profit, a firm must decide the number of workers to be hired based on $MR=MC$.
- The marginal revenue product of labor (MRPL) is the revenue created by hiring one more unit of labor. In the market place, it is the market value of products produced by the marginal worker.
- The value of marginal product of labor (VMPL) is equal to the price of the product times the quantity of product produced.
- In a competitive market, firms are price-takers and their marginal revenue of output equals unit price of the goods ($MR=P=AR$).
- Formula: **MRPL=VMPL=MR•MPL=P•MPL**.
- Since the price of the good P is given, the shape of MRPL or VMPL is determined by the marginal product of labor MPL.

Marginal Product of Labor MPL

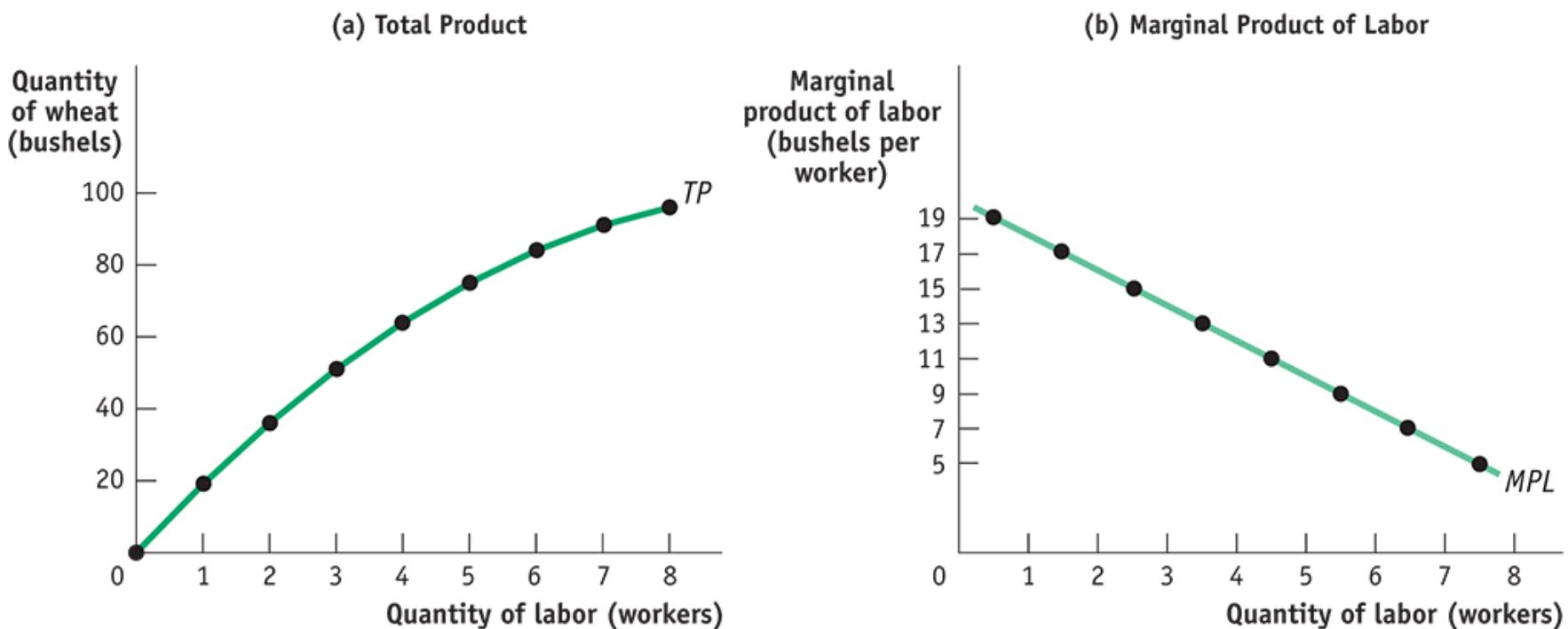
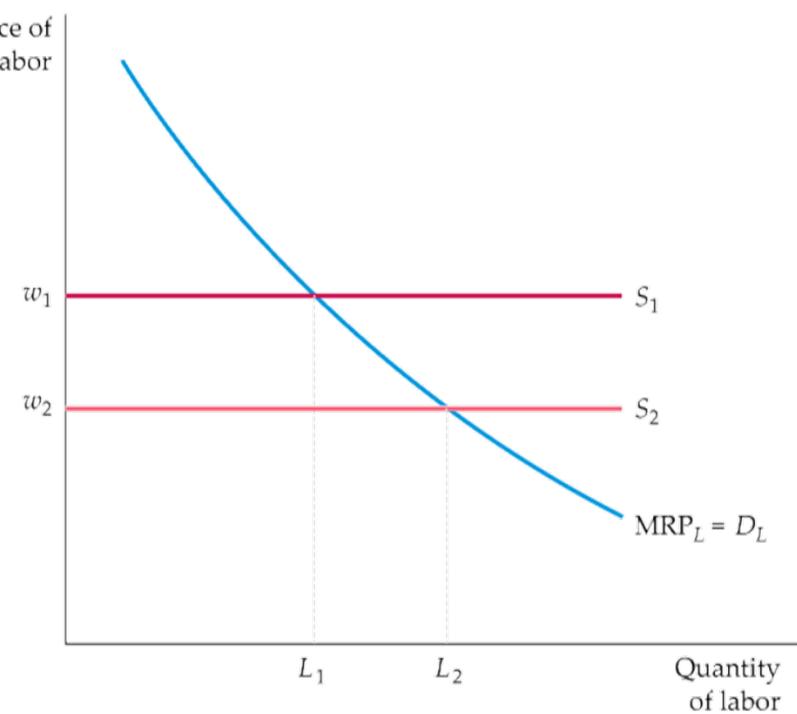
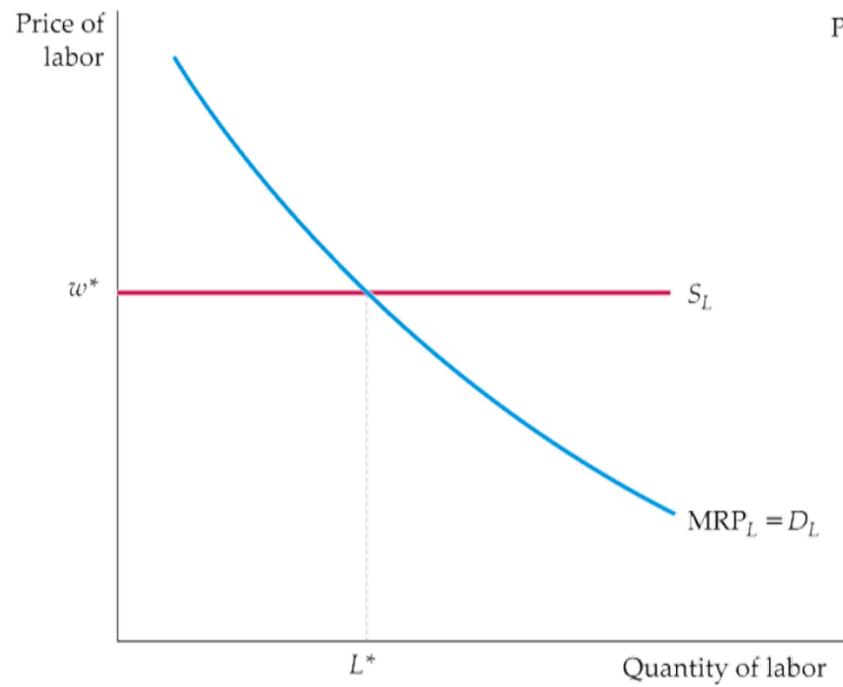


FIGURE 19-2

Krugman/Wells, *Microeconomics*, 5e, © 2018 Worth Publishers

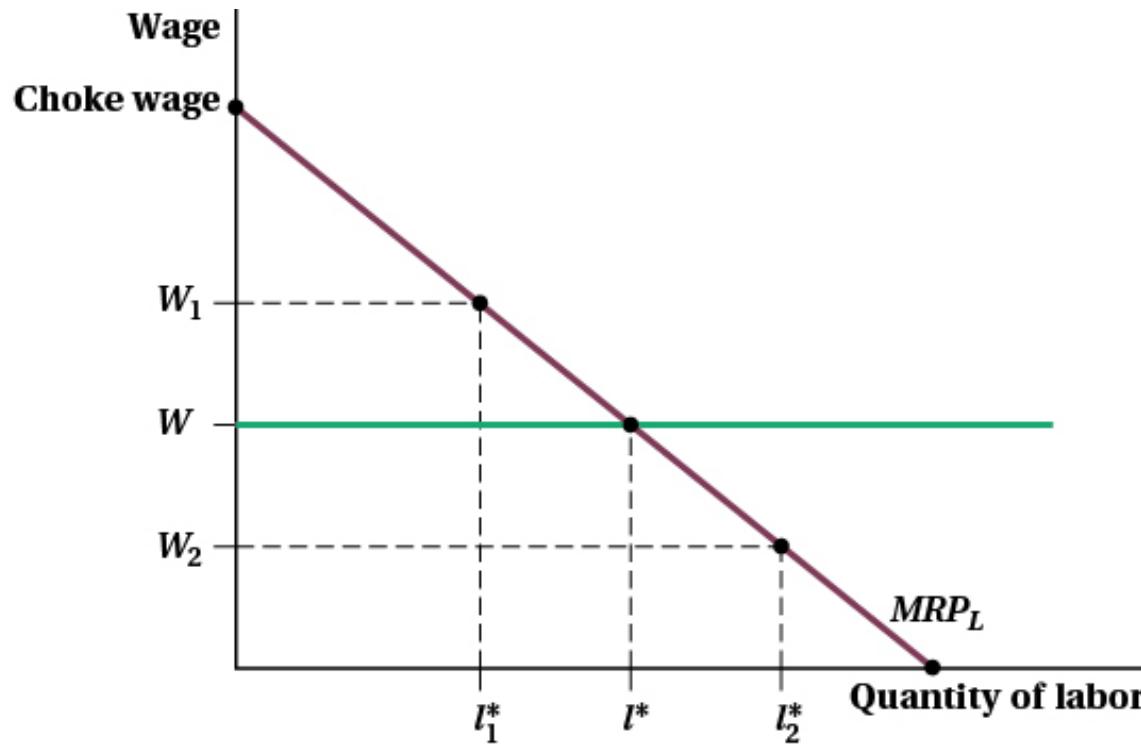
The law of diminishing marginal product governs the real-world production. Based on the relationship between total and marginal values, we can derive their functions and graphs. Recall that the optimal production decision is in the second stage of production when MP is falling.

The Demand Curve for Labor D_L



In a competitive labor market, a firm faces a perfectly elastic supply of labor S_L and can hire as many workers as it wants at a wage rate w^* . The firm's demand for labor D_L is given by its marginal revenue product of labor MRP_L . The profit-maximizing firm will hire L^* units of labor at the point where the marginal revenue product of labor is equal to the wage rate.

Demand for Labor: $W=MPL \cdot P$



For any competitive, profit-maximizing firm, it hires workers up to the point where $MRPL=P \cdot MPL=W=MCL$. For different wage levels, there is always a one-to-one correspondence between wage and workers hired: (W with L , L_1 with W_1 , L_2 with W_2). Thus, **the $MRPL$ or $VMPL$ curve is the demand curve for labor**.

Labor Demand Curve Shifters

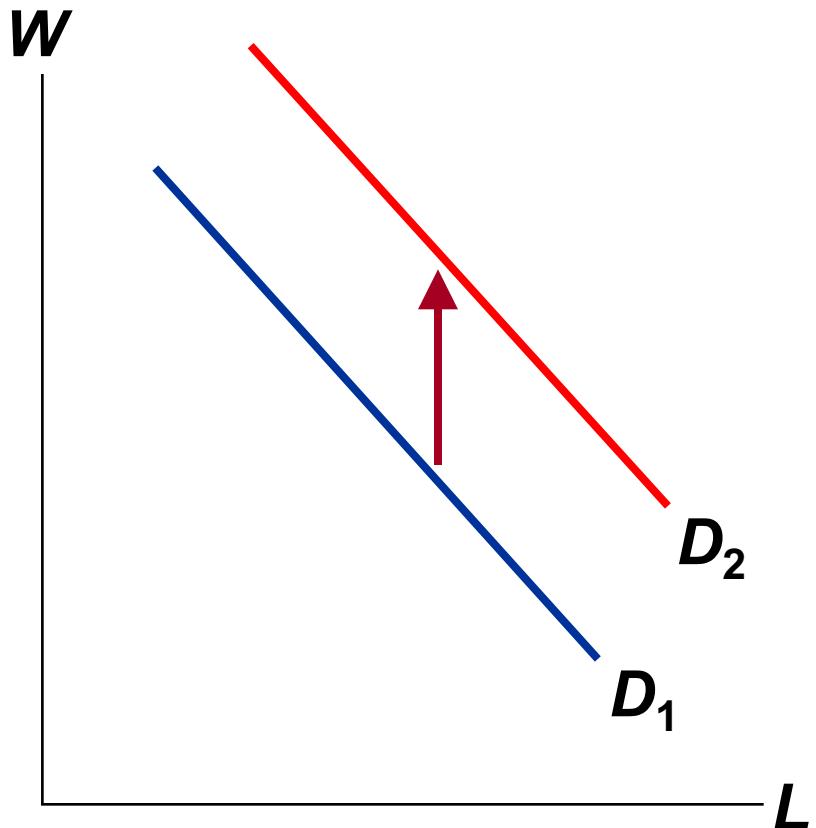
The labor demand curve:

MRPL curve or $P \cdot MPL$

Anything that increases P or MPL at each L will increase MRPL and shift the labor demand curve upward.

- Technology \rightarrow MPL \rightarrow D
- Product price \rightarrow P \rightarrow D
- Capital utilization \rightarrow MPL

And vice versa.

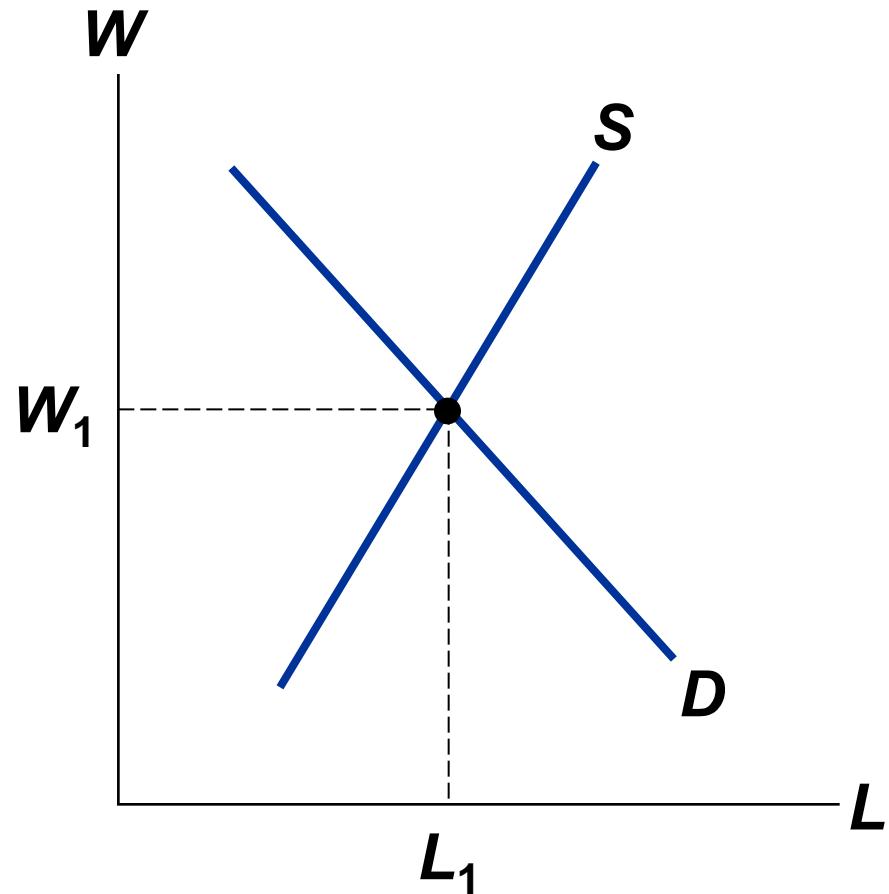


Labor Supply Decisions

- Household workers decide on the trade-off between work and leisure. The more time spent on working, the less time left for leisure, though more income earned on wage.
- Since workers must sacrifice leisure for work, wage is the opportunity cost of leisure.
- To derive the labor supply curve, economists apply consumer choice theory—utility maximization model—to the optimal trade-off between work and leisure, induced by market wage.
- As in the utility maximization model, wage can generate substitution and income effects on a worker's supply of work.
- The supply of labor hours depends on the wage rate and the dominance of substitution effect over income effect.

Labor Market Equilibrium

- Labor market is in equilibrium when firms demand for labor and households' supply of labor are matched by a market wage rate.
- Labor market demand and supply consist of aggregation of all firms' and households' decisions.



Factor Markets: Income Distribution

- The demand and supply forces work the same in the factor market as well as in the output market: market is kept at equilibrium with the “right” price and quantity in exchange.
- In the market system, price signals can be viewed as an invisible hand guiding individuals to perform their duties.
- Efficient resource allocation (who gets what) can be achieved; income distribution (how much the factor owners receive) is also determined. In this sense, the key role of factor markets is to return incomes to the owners according to their contributions.
- The functioning of the factor market is via an economic institution called the firm, which enters into transactions with most of the factor owners via various forms of contractual arrangements.

Factor Markets vs Output Markets

- What is the critical difference between a good and a factor?
Can production factors be bought and sold as final goods?
- The key difference is outright transaction in output markets vs retained property rights in factor markets. Some attributes of the production factors cannot be easily and precisely priced.
- Why do firms exist in lieu of markets? Two must-read papers.
- Ronald Coase, 1937, The nature of the firm.
- Steven Cheung, 1980, The contractual nature of the firm.
- Overall, transaction costs are more prohibitive in factor markets than in output markets. Firms can lower these costs.
- Labor market transaction costs include information costs, measurement costs, contract costs, monitor costs, legal costs.

Factor Distribution of Income in the US

- Factor distribution of income studies the division of total income among labor, land, and capital.
- The pie chart decomposes the U.S aggregate income for the 2015 BEA data.
- Within each specific factor market, the disparity of factor price can also be highly unequal, hence the study of income inequality.

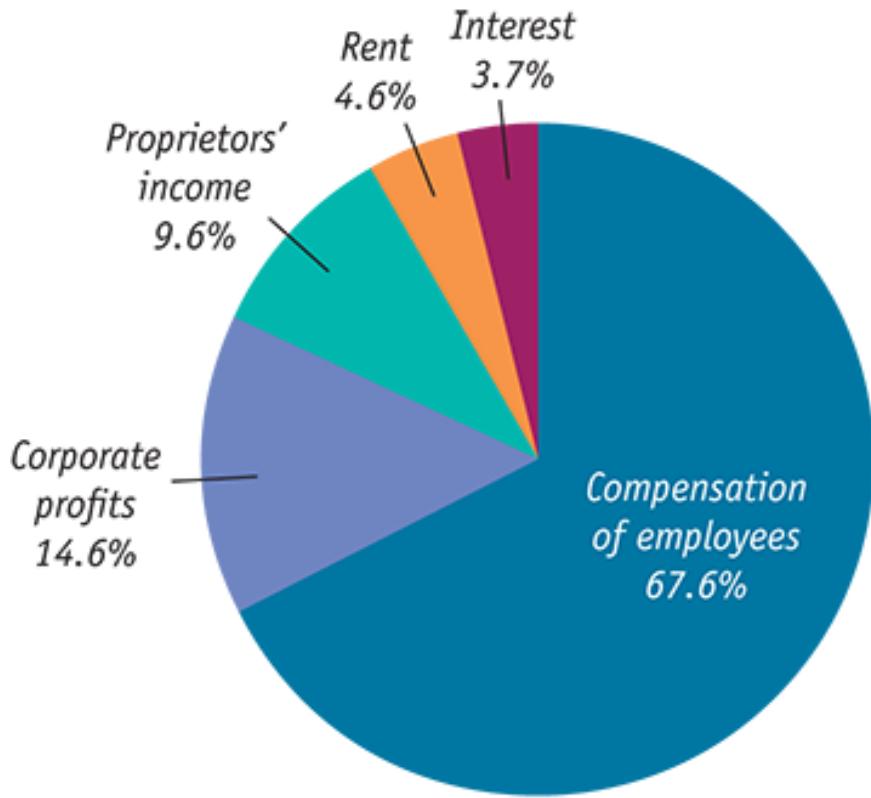
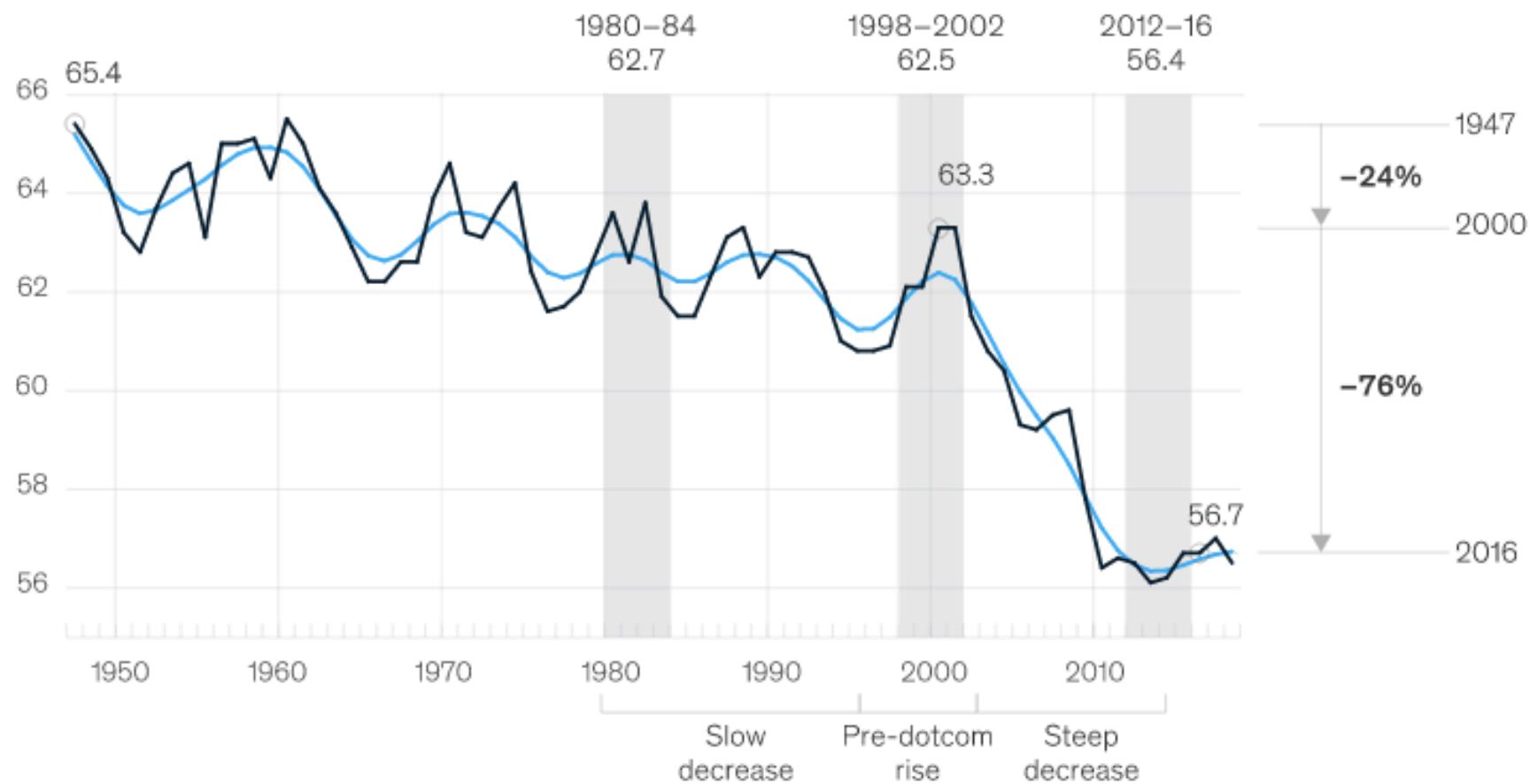


FIGURE 19-1
Krugman/Wells, *Microeconomics*, 5e
Data from: Bureau of Economic Analysis.

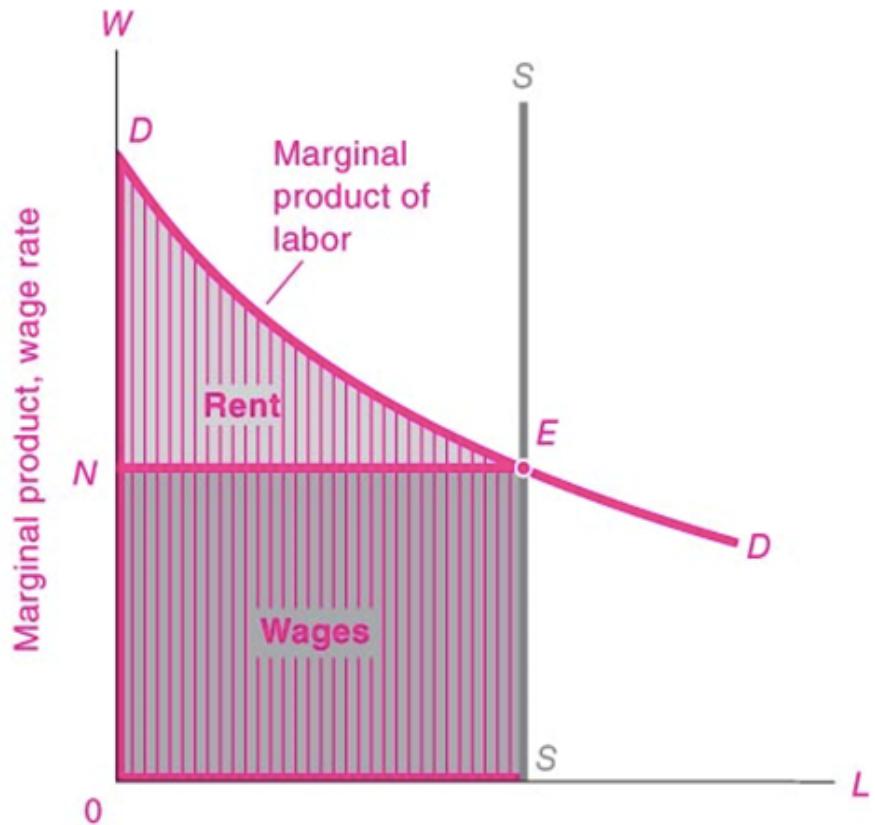
Labor Share in the U.S. 1947-2016



¹Detrended using Hodrick-Prescott filter (restriction parameter = 6); adjusted for self-employed income (nonfarm business sector, 75% of total economy), from Labor Productivity and Costs database, Bureau of Labor Statistics.

Source: BLS (March 2019 release); McKinsey Global Institute analysis

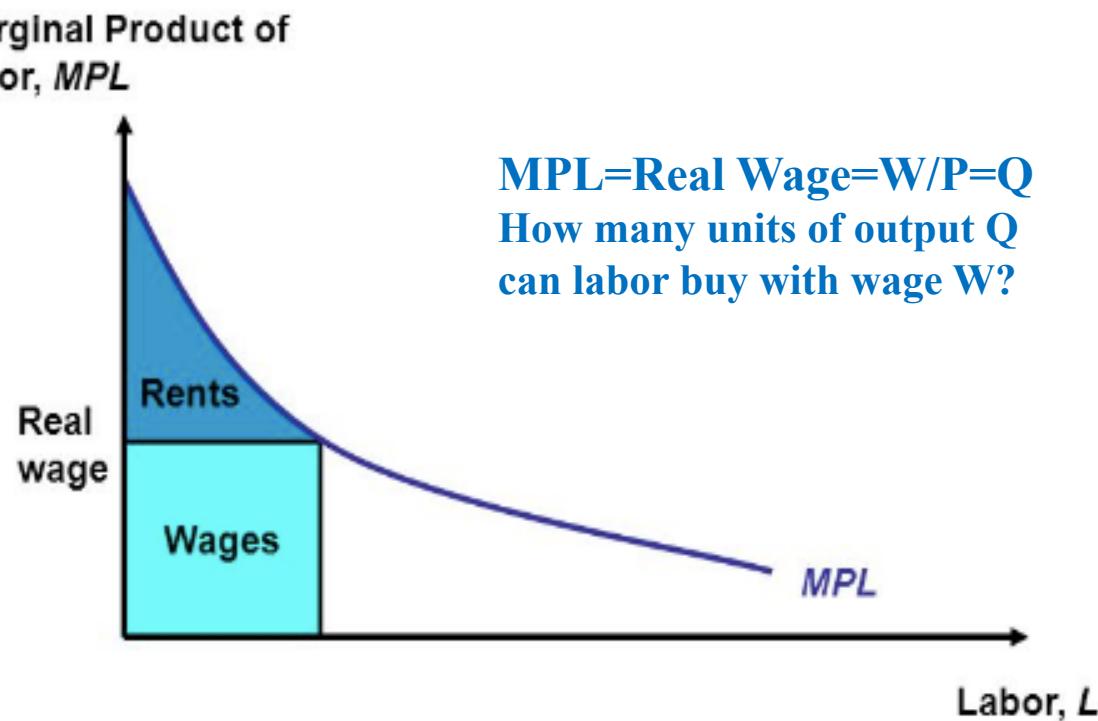
Neoclassical Theory of Factor Income Distribution $Q=F(K, L)$



$$MRL = MPL \cdot P = W = MCL$$

The traditional neoclassical theory states that factor incomes are determined based on the productivity of the factor and supply of factor. The figure assumes that labor is the only variable factor and all other factors are fixed, the income of the labor depends on the interaction between the supply of labor and the marginal productivity of labor (demand).

MPL Theory of Income Distribution

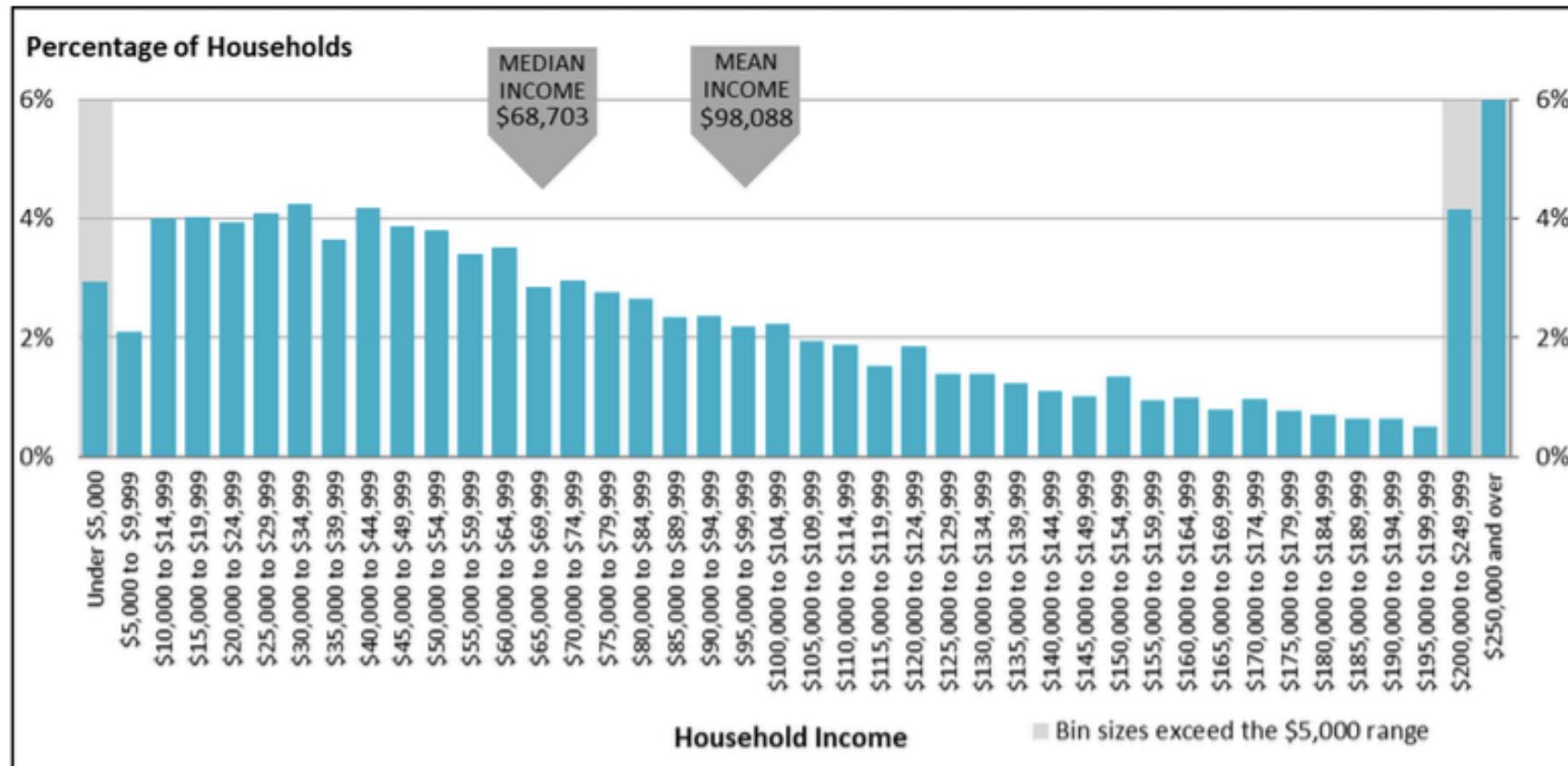


- Assume two production factors: labor (wage) and land (rent).
- The total income or output (real) is the sum of two shaded areas.
- Labor income = $MPL \cdot L = (W/P) \cdot L$, which is the squared area wages.
- Capital income = total income - labor income, which is the area of the rents.

Euler's Theorem of Income Distribution

- Consider the Cobb-Douglas production function: $Q=AK^\alpha L^\beta$, where A is the technology coefficient, alpha is the capital share, beta is the labor share, and $\alpha+\beta=1$.
- What kind of return to scale is the C-D production function?
- The marginal products are $MPK=\alpha Q/K$ and $MPL=\beta Q/L$, which means each factor's MP is proportional to its AP.
- In competitive markets, Euler's theorem of income distribution: $Q=MPK\cdot K+MPL\cdot L=\alpha Q+\beta Q=Q$, which states that real output is distributed proportionally to capital and labor according to their shares of contribution.
- Thus, total income = capital income + labor income, all incomes are exclusively distributed to their owners.

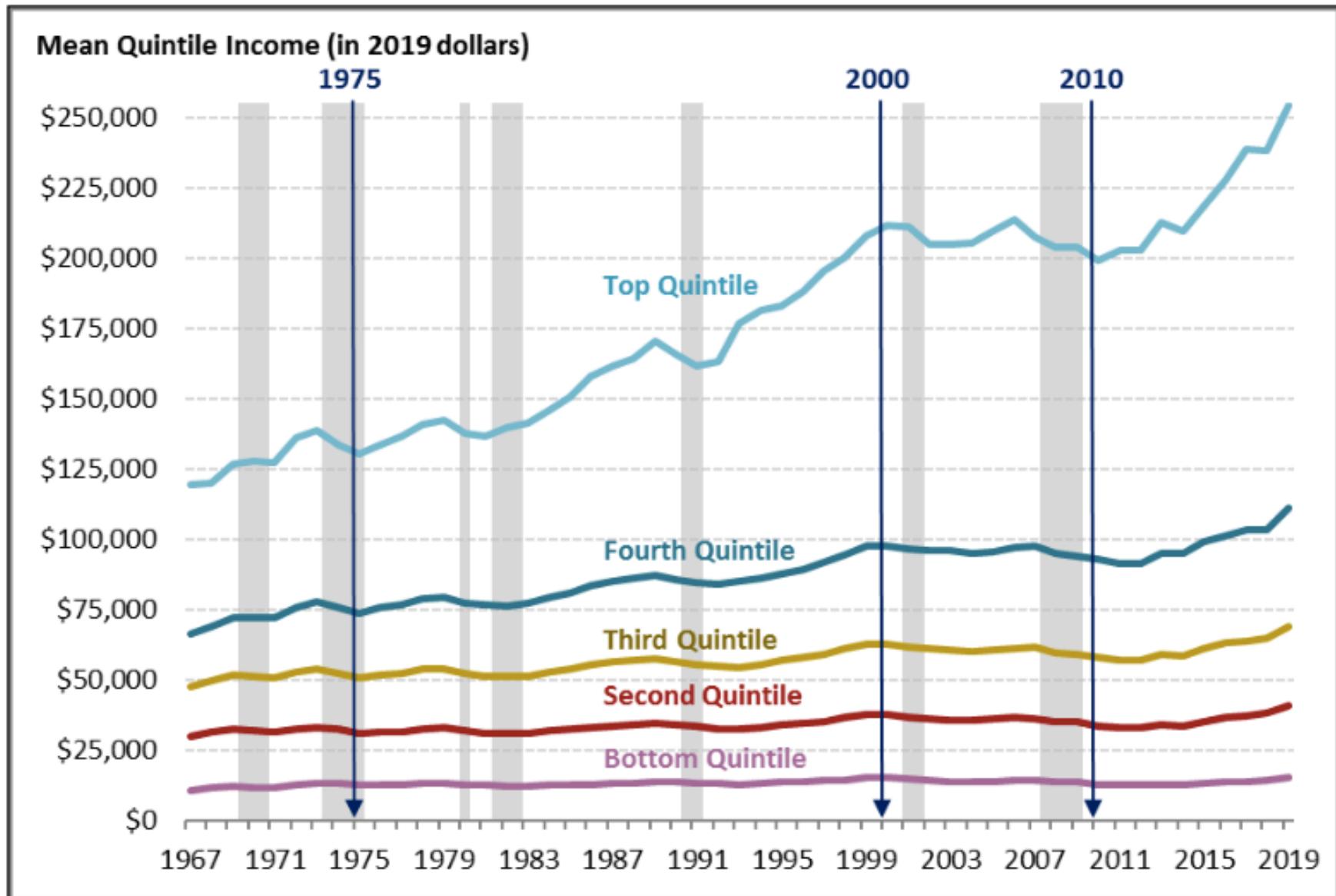
Figure 1. Distribution of Household Income, 2019



Source: U.S. Census Bureau, *Annual Social and Economic Supplement*, available at <https://www.census.gov/data-tables/time-series/demo/income-poverty/cps-hinc/hinc-06.html>.

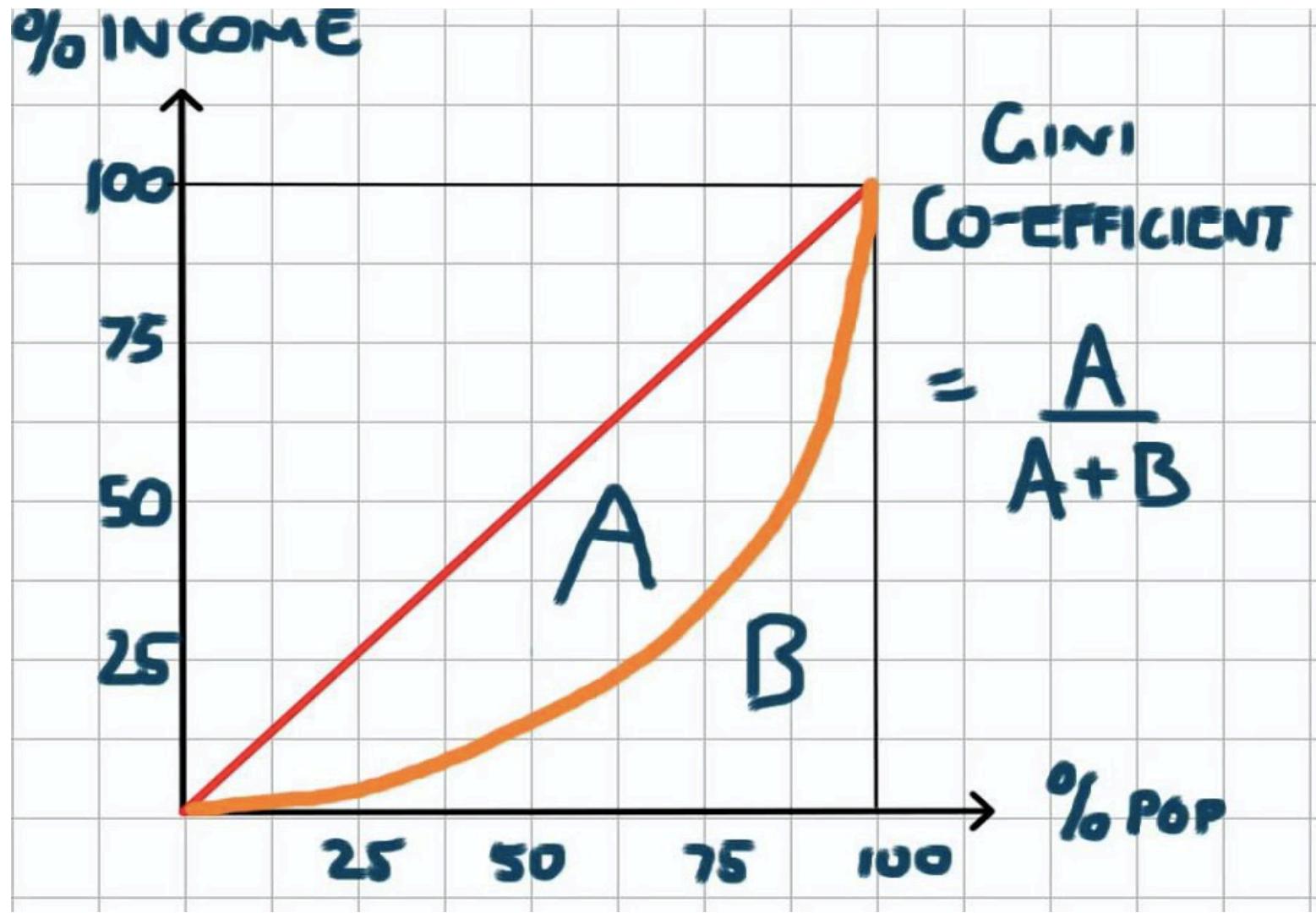
Notes: Income in this figure refers to household money income as defined by the Census Bureau: pre-tax cash income received by households on a regular basis from market and nonmarket sources. Money income excludes periodic income, such as capital gains, and in-kind transfers (e.g., SNAP, housing subsidies). Due to the way the Census Bureau aggregates incomes at the top of the distribution, the top two income groups—“\$200,000 to \$249,000” and “\$250,000 and over”—represent wider income ranges than the groups that categorize the majority of the distribution. The “Under \$5,000” group includes households earning zero or negative money income.

Figure 2. Mean Quintile Household Income, 1967-2019

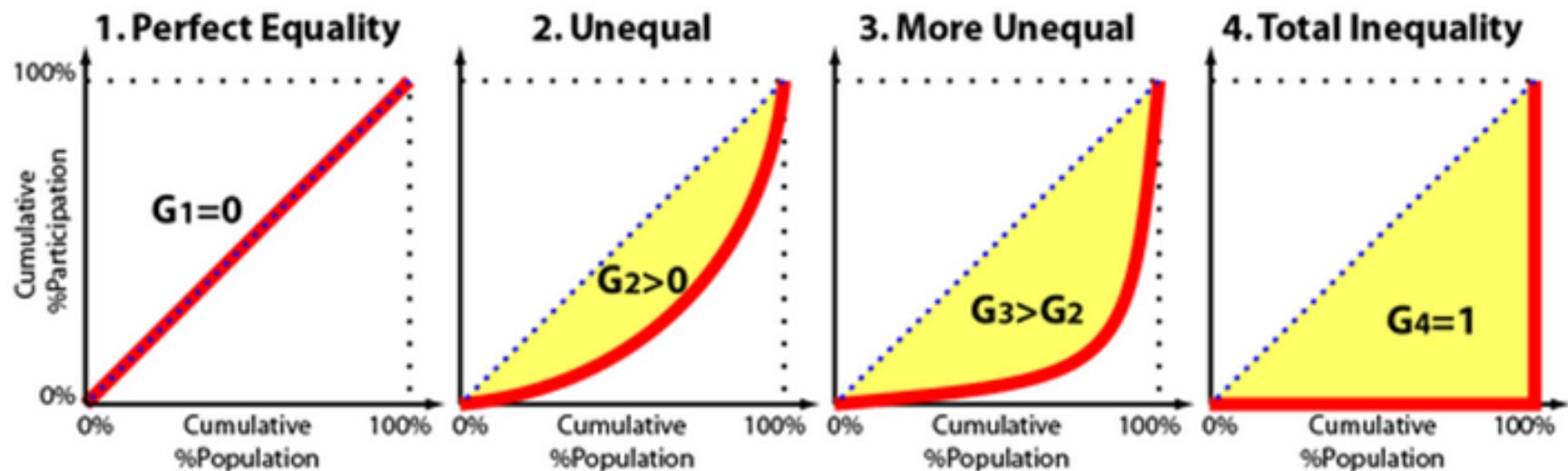


Source: Figure created by the Congressional Research Service (CRS) based on data from U.S. Census Bureau, Current Population Survey (CPS), Annual Social and Economic Supplements (ASEC), available at

Measuring Income Inequality

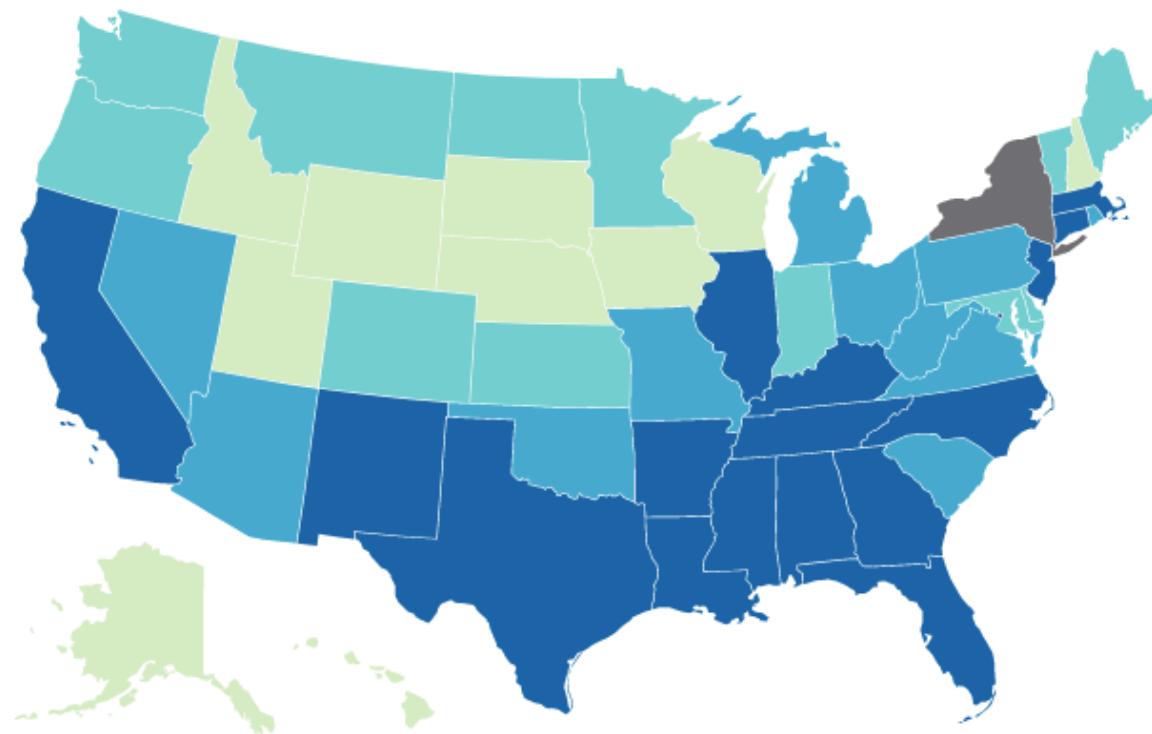


Gini Coefficient for Income Inequality



The **Gini Coefficient** measures the equality of incomes of the population in an economy. Ranking the entire population in an ascending order of individual incomes, the percentage cumulative population is marked on the x-axis and the corresponding cumulative incomes are marked on the y-axis. The red curve showing actual distribution of incomes is called **Lorenzo curve** and **the distance between the line of equality and Lorenzo curve is measured by the Gini coefficient**. A score closer to 0 indicates perfect equality whereas a score of 100 indicates perfect inequality.

GINI INDEX OF INCOME INEQUALITY (2015-2019)



UNITED STATES, 2015-2019

48.23

GINI INDEX OF INCOME INEQUALITY

NEW YORK, 2015-2019

51.42

GINI INDEX OF INCOME INEQUALITY

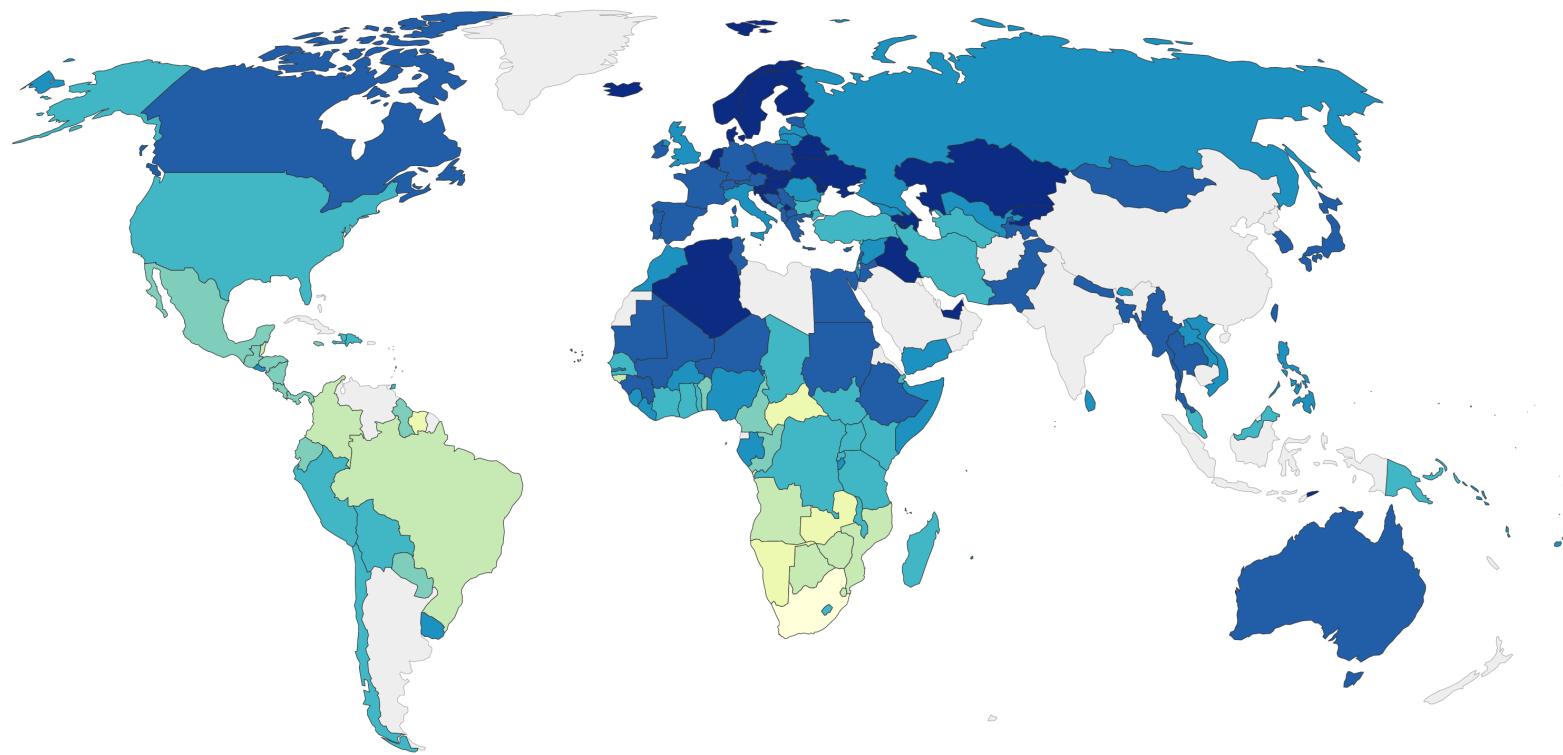


Sources: U.S. Census Bureau, American Community Survey (accessed January 2021). Levels of income inequality in the U.S. are increasing. The Gini index is a measure of income dispersion across the distribution of all household incomes. A Gini value of 0 represents total income equality (all households have an equal share of income), while a value of 1 (or 100) represents total income inequality (one household has all the income). In the U.S., the Gini index increased from 46.7% in 2006-2010 to 48.2% in 2015-2019.

<https://www.prb.org/usdata/indicator/gini/snapshot/>

Income inequality – Gini Index, 2019

A higher Gini index indicates higher inequality.

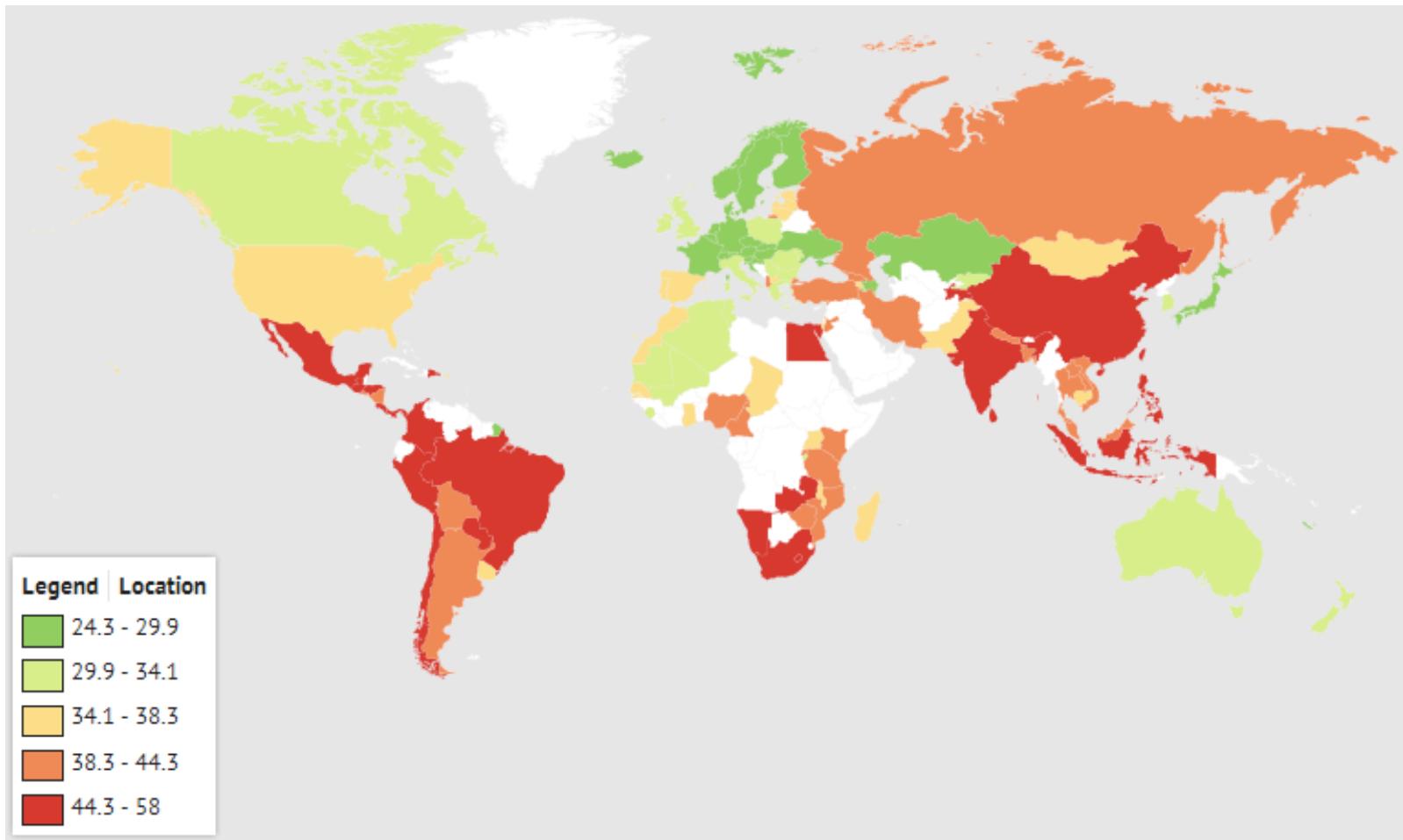


Source: PovCal (2021)

Note: Shown is the World Bank (Povcal) inequality data. This data includes both income and consumption measures and comparability across countries is therefore limited.

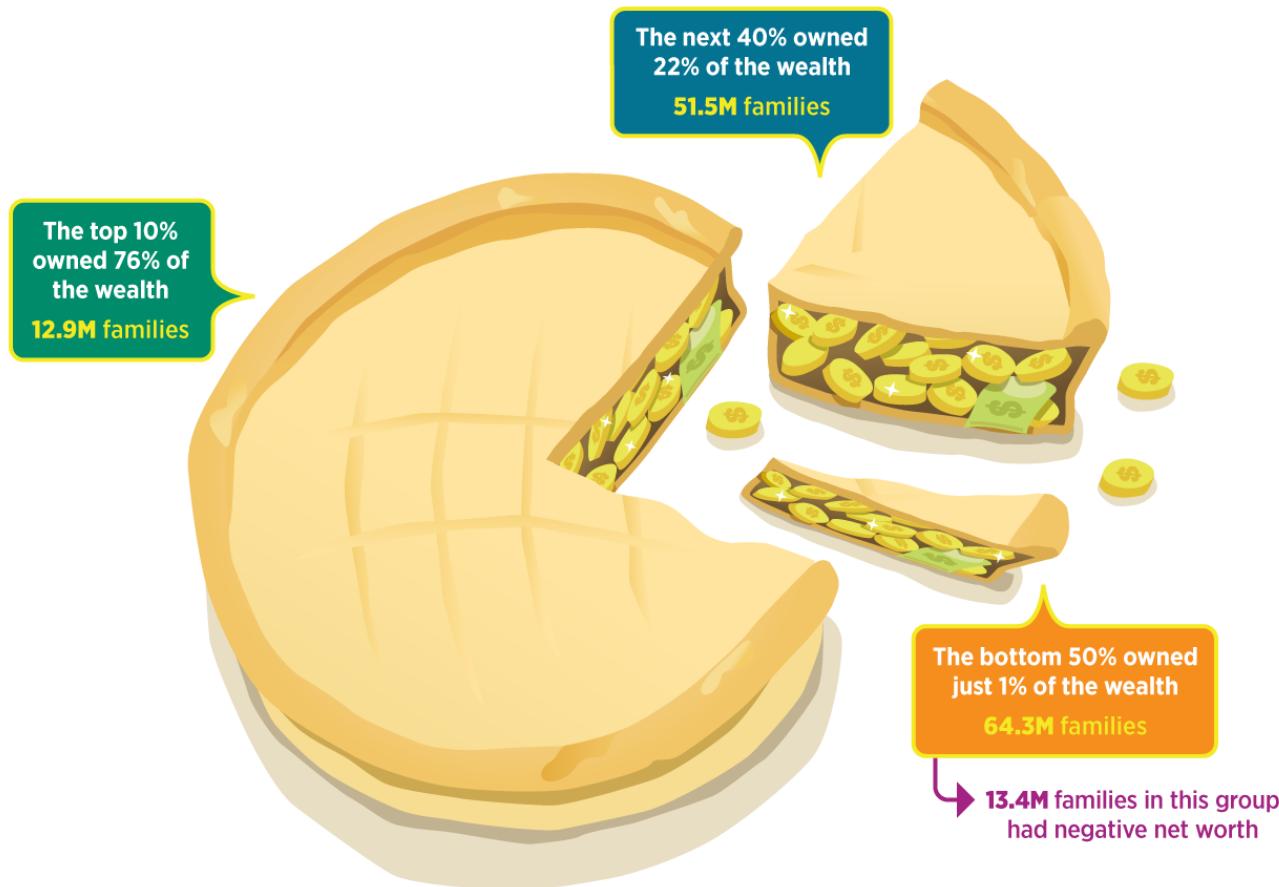
OurWorldInData.org/income-inequality/ • CC BY

2018 Global Gini Index Map



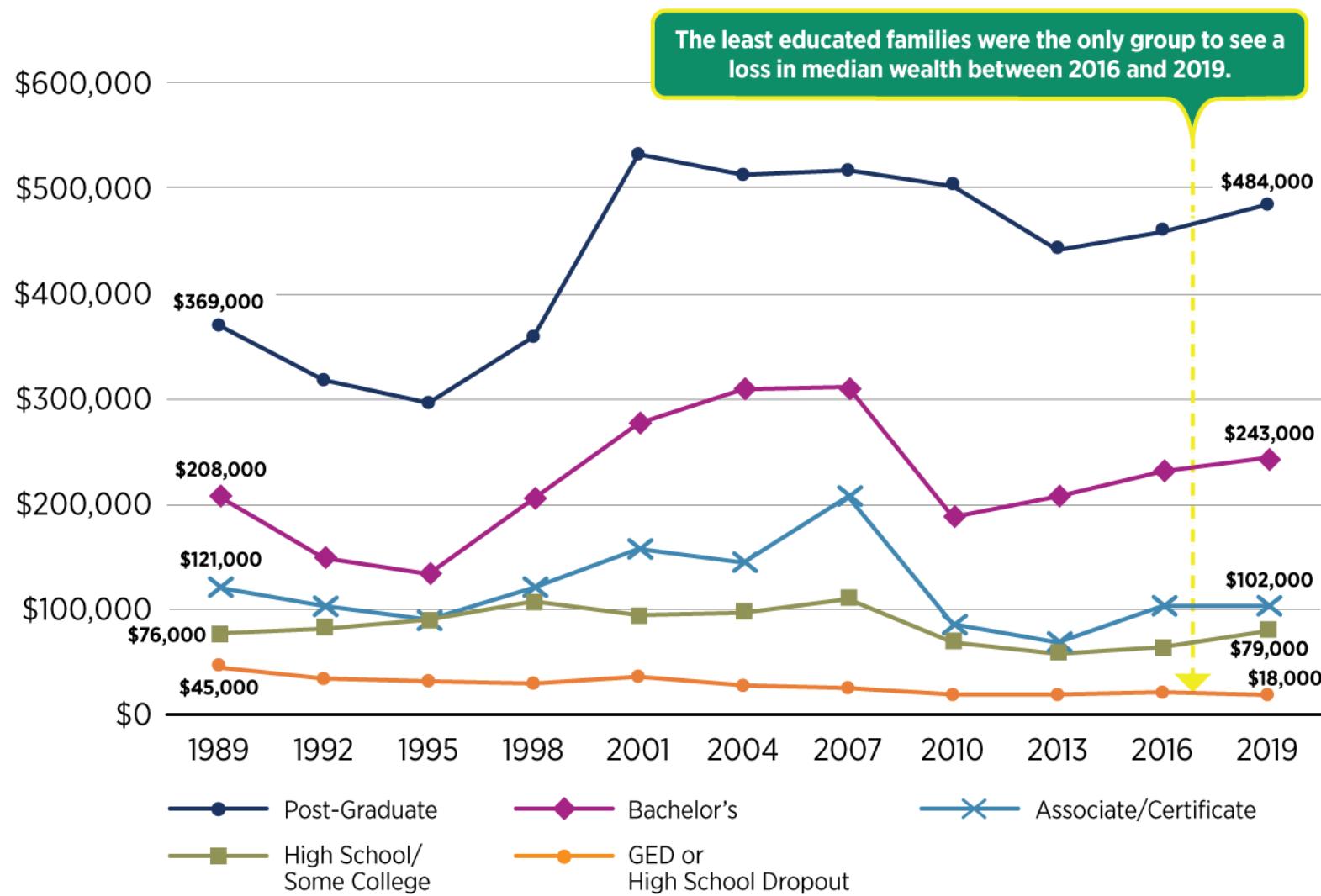
South Africa is the top country by GINI index in the world. As of 2018, GINI index in South Africa was 57.7 %. The top 5 countries also includes Namibia, Sri Lanka, China, and Zambia.

U.S. Wealth Distribution in 2019



Sources: Federal Reserve Board's Survey of Consumer Finances. Wealth is what a family owns, minus what they owe. The distribution of \$96.1 trillion in total American wealth. This graph shows how wealth was concentrated (or not) among the U.S. population of 129 million families.

U.S. Wealth Gap by Education Levels



Case Study: Universal Basic Income

201702 Devarajan: Three reasons for universal basic income

1. Efficient use of natural-resource rents.
2. Improving the welfare of the poor.
3. Adjusting to labor-saving technologies.

“From Mongolia to Finland to India, we are seeing heightened interest in the idea of a universal basic income (UBI)—an unconditional cash grant given to every citizen, regardless of their employment status or wealth. The idea is controversial, receiving criticism from many quarters including Future Development. I happen to be an advocate. To sharpen the debate, it’s useful to distinguish three separate arguments for UBI.”

UBI and Income Equality in the U.S.

201908 Brookings Report: Universal basic income as a policy response to current challenges

“We briefly review the main motivations behind recent calls for a Universal Basic Income (UBI) in the United States and the main features of some current UBI proposals. We then argue that a UBI would be extremely expensive and yet do very little to reduce inequality or advance opportunity and social mobility. We argue that instead of a UBI, the federal government should pursue a pro-work strategy of income support, paying wage subsidies to low-wage workers along with targeted transfer benefits consisting of both cash and near-cash types of support paid to the most needy individuals and households”

<https://www.brookings.edu/research/universal-basic-income-as-a-policy-response-to-current-challenges/>

References

- [1] N. Mankiw, Principles of Microeconomics, 8th edition. Cengage.
- [2] Pindyck & Rubinfeld, Microeconomics, 9th edition. Pearson.
- [3] Krugman & Wells, Economics, 5th edition. Macmillan.
- [4] Goolsbee, Levitt & Syverson, Microeconomics, 3rd edition, Worth
- [5] Distribution of Income <https://www.econlib.org/library/Enc/DistributionofIncome.html>
- [6] CRS Report (2021) The U.S. Income Distribution: Trends and Issues. Congressional Research Service <https://fas.org/sgp/crs/misc/R44705.pdf>
- [7] Pew Research Center (2020) Trends in income and wealth inequality.
<https://www.pewresearch.org/social-trends/2020/01/09/trends-in-income-and-wealth-inequality/>

Data and Videos

[1] In this one-minute video, see how \$96.1 trillion in total American family wealth was distributed among the U.S. population of 129 million families in 2019. <https://youtu.be/aONigLMAk3w>

[2] 201712 CNBC: What is Universal Basic Income?

https://www.youtube.com/watch?v=W2Xv_9vSDE8

[3] 201801 CNBC: Is Universal Basic Income Working?

<https://www.youtube.com/watch?v=mkF-Lsy-SlM>

Data on income distribution and inequality

<https://knoema.com/atlas/ranks/GINI-index>

<https://www.cbo.gov/topics/income-distribution>

<https://www.salaryexplorer.com/best-paying-jobs.php>

<https://howmuch.net/articles/home-affordability-in-the-US>

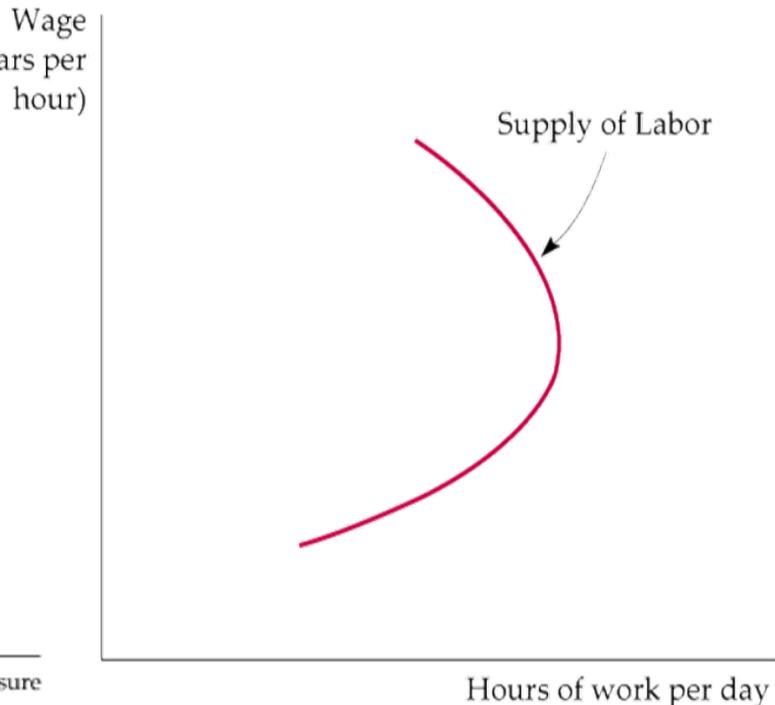
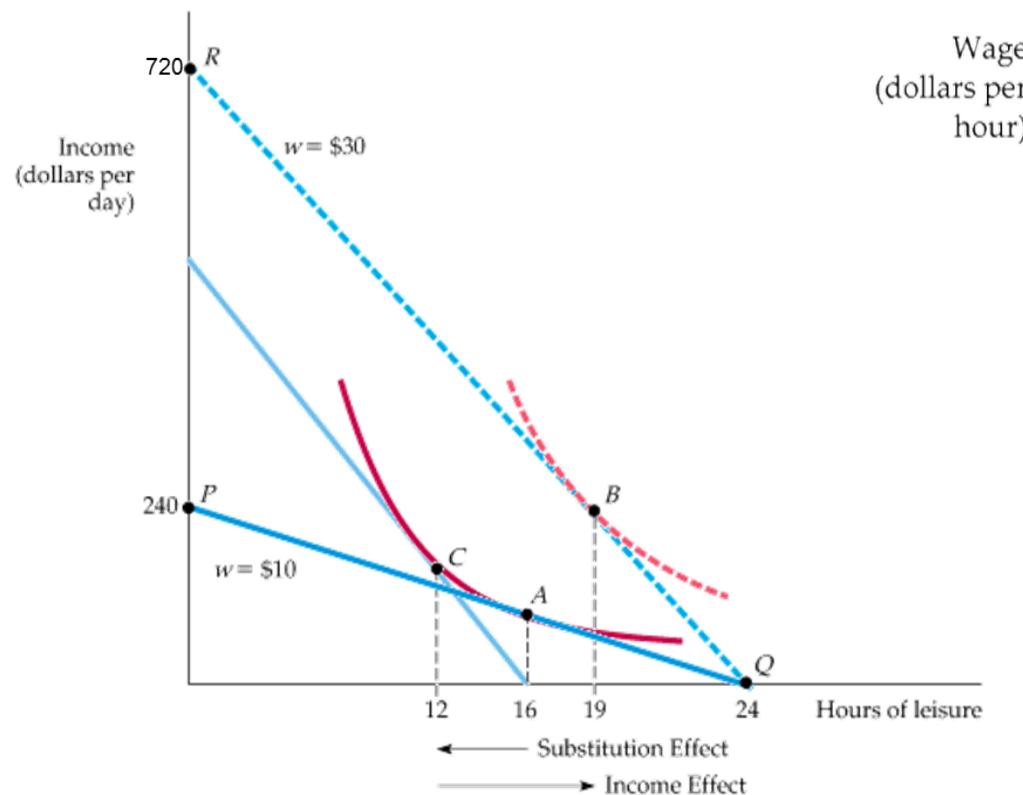
<https://howmuch.net/articles/total-interest-paid-mortgage-by-state>

<https://howmuch.net/articles/top-10-us-cities-by-fastest-growing-or-declining-rent-prices>

<https://howmuch.net/articles/the-cheapest-and-most-expensive-cities-to-rent-an-apartment-us-2021>

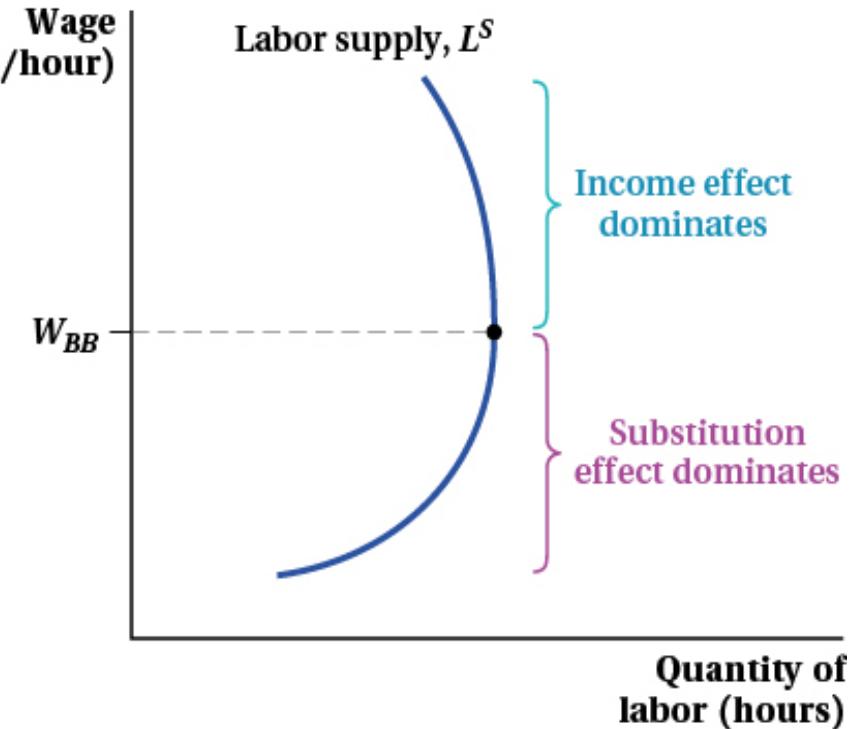
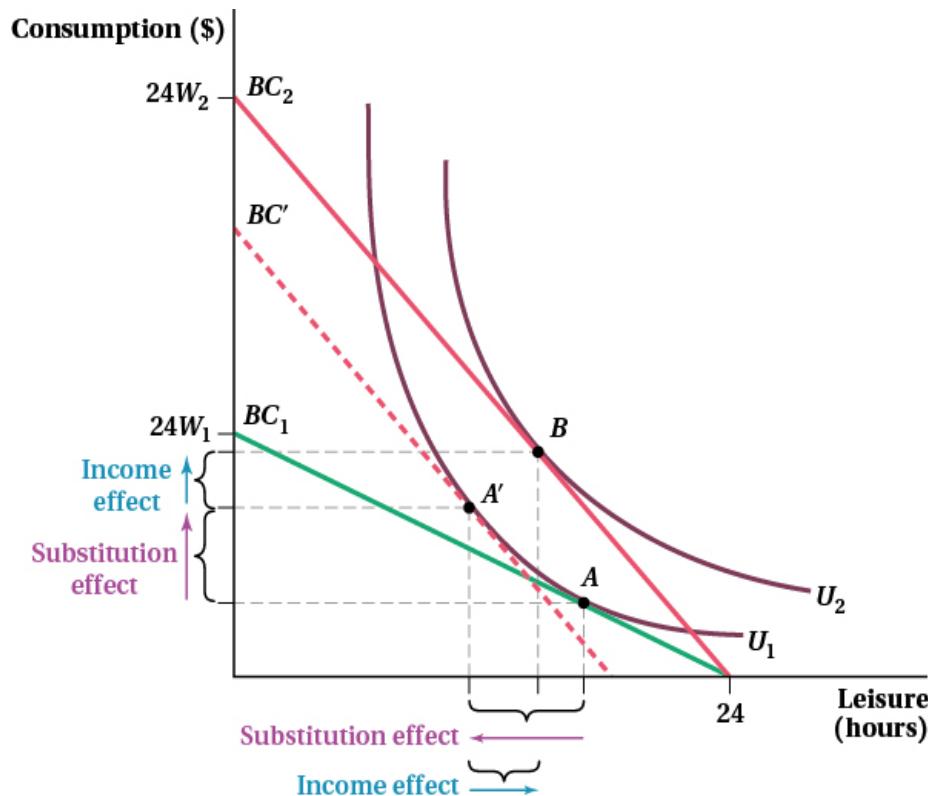
<https://www.statista.com/statistics/219643/gini-coefficient-for-us-individuals-families-and-households/>

Appendix: Derive the Labor Supply



Initially, as wage increases, the substitution effect is larger than income effect. Result: increase in the number of hours worked. Once wage rises above certain value, the income effect dominates and individuals choose more leisure rather than work, resulting in a decrease in the number of hours worked.

Substitution and Income Effects of Wage



The substitution effect decreases leisure and increases consumption because leisure has become relatively more expensive A to A'. The income effect, shown by the tangency of the new budget constraint and the original indifference curve, increases leisure and work A' to B.