CHAPTER 7

7-1. Evaluate the validity of the following claim: The increasing wage gap between highly educated and less educated workers will itself generate shifts in the U.S. labor market over the next decade. As a result of these responses, much of the "excess" gain currently accruing to highly educated workers will soon disappear.

The incentives for young workers to stay in school rose as a result of the increasing wage differential across schooling groups. The widening wage inequality, therefore, would be expected to increase the number of young persons who obtain a college education. This increase in the supply of highly educated workers will eventually narrow the wage gap between the highly educated and the less educated. The extent to which the supply response narrows the "excess gain" depends on two parameters: (1) the elasticity of supply measuring how college enrollments respond to the increasing relative wage of college graduates; and (2) the elasticity of demand measuring the responsiveness of the relative wage of college graduates to an increase in their supply. The greater these elasticities are in the coming years, the greater role the "self-correcting" mechanism will play in reducing wage inequality in the future.

7-2. What effect will each of the following proposed changes have on wage inequality?

(a) Indexing the minimum wage to inflation.

Indexing the minimum wage to inflation should reduce wage inequality because the minimum wage helps prop up the wages of less skilled workers. Note that an increase in the minimum wage may have negative employment effects, but the proposed policy is not to increase the minimum wage but rather simply to prevent it from falling in real terms.

(b) Increasing the benefit level paid to welfare recipients.

Wage inequality measures the dispersion of wages in the *working* population. An increase in welfare benefits would likely induce less-skilled workers out of the labor force, and would reduce measured wage inequality by effectively eliminating the bottom of the wage distribution.

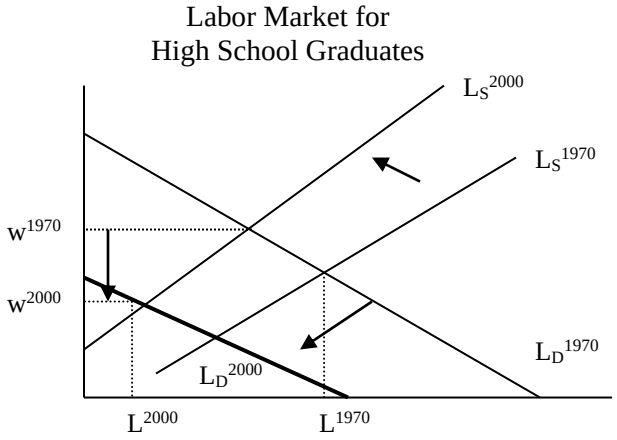
(c) Increasing wage subsidies paid to firms that hire low-skill workers.

Wage subsidies would increase the demand for less skilled workers, reducing wage inequality.

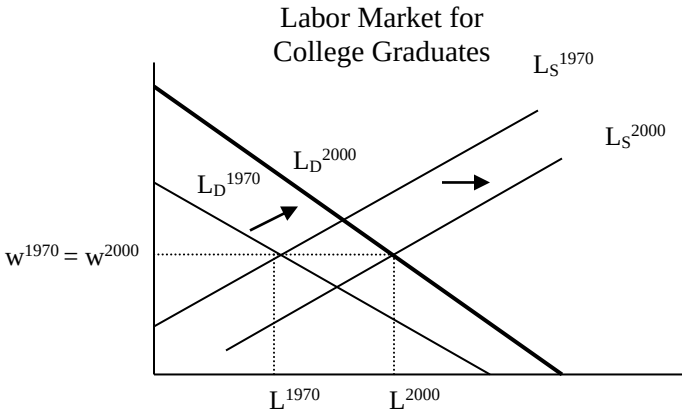
7-3. From 1970 to 2000, the supply of college graduates to the labor market increased dramatically, while the supply of high school (no college) graduates shrunk. At the same time, the average real wage of college graduates stayed relatively stable, while the average real wage of high school graduates fell. How can these wage patterns be explained?

The graphs below show equilibrium movements in the market for high school graduates and in the market for college graduates. The decrease in labor supply among high school graduates and the increase in labor supply among college graduates is taken as given. The analysis, therefore, focuses on labor demand for each type of labor.

Given a lower supply of high school graduates, the only way for their average wage to fall is for labor demand for high school graduates to have decreased (shifted in).



Given a greater supply of college graduates, the only way for their average wage to stay the same is for labor demand for college graduates to have increased (shifted out).



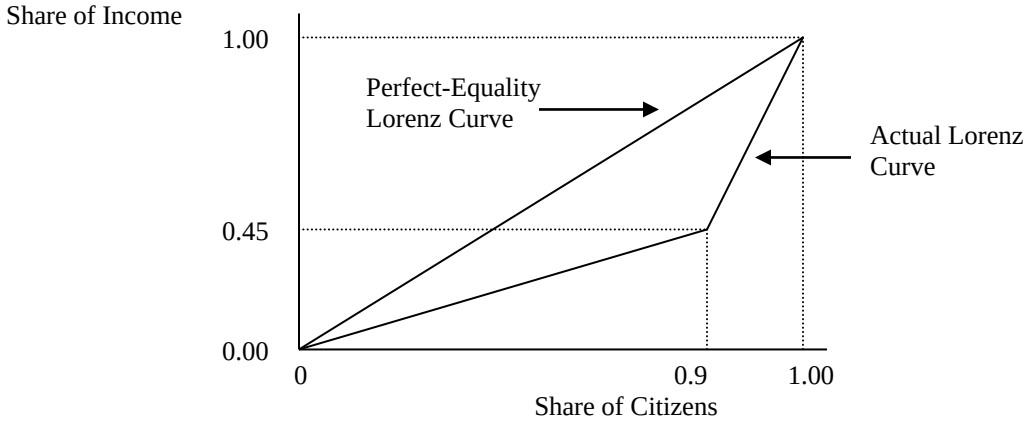
7-4.

(a) Is the presence of an underground economy likely to result in a Gini coefficient that over-states or under-states poverty?

The larger the underground economy, the more the Gini coefficient is likely to over-state poverty as the underground economy tends to employ low-skill, low-income workers.

(b) Consider a simple economy where 90 percent of citizens report an annual income of $10,000 while the remaining 10 percent report an annual income of $110,000. What is the Gini coefficient associated with this economy?

As all citizens in each group receive an equal income, the actual Lorenz curve will be a straight line *within each group*. Let's suppose there are 1,000 citizens. The 90% of poorest citizens, therefore, receive 0.90 × 1,000 × $10,000 = $9 million. The entire economy, though, earns 0.90 × $10,000 + 0.1 × $110,000 = $20 million. Therefore, the bottom 90% receives 9 ÷ 20 = 45% of total income. The perfect and actual Lorenz curves can now be drawn rather easily.



The Gini coefficient is now easily calculated by seeing that the area beneath the actual Lorenz curve is two triangles and one rectangle.

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(c) Suppose the poorest 90 percent of citizens actually have an income of $15,000 because each receives $5,000 of unreported income from the underground economy. What is the Gini coefficient now?

The problem is identical to that above, but the income levels change. In this case, per capita GDP is 0.9 x 15,000 + 0.1 x 110,000 = $24,500 so total income of the 1,000 citizens is $24,500,000. Lastly, the total income share of the poorest 90% of citizens is 900 x 15000 ÷ 24.5 million = 55.1%. (That is, in the graph on the previous page, the income share at 90% of citizens increases from 45% to 55.1%.) The Gini coefficient is not calculated as it was before:

7-5. Use the two wage ratios for each country in Table 7-4 to calculate each country's percent increase in the 90-10 wage ratio from 1984 to 1994. Which countries experienced a compression in the wage distribution over this time? Which three countries experienced the greatest percent increase in wage dispersion over this time?

The results are:

	90-10 Wage Gaps		
Country	1984	1994	Percent Change
Germany	138.7	124.8	-10.02%
Canada	301.5	278.1	-7.76%
Norway	105.4	97.4	-7.59%
Japan	177.3	177.3	0.00%
Finland	150.9	153.5	1.72%
France	232	242.1	4.35%
Netherlands	150.9	158.6	5.10%
Australia	174.6	194.5	11.40%
Sweden	103.4	120.3	16.34%
United States	266.9	326.3	22.26%
United Kingdom	177.3	222.2	25.32%
New Zealand	171.8	215.8	25.61%
Italy	129.3	163.8	26.68%

Thus, Germany, Canada, and Norway (with Japan holding constant) all experienced a compression in the wage distribution over this time. The United Kingdom, New Zealand, and Italy experienced the largest percent increases in wage dispersion.

7-6.

(a) What is the difference between income inequality and wealth inequality?

Income inequality refers to differences in earned income, sometimes just labor income, sometimes both labor and investment income. Wealth inequality refers to differences in accumulated wealth, which is driven in part by income inequality but also in part by saving and spending behavior. The difference is important, because wealth (accumulated savings) is almost always more unequal than income.

(b) Most policies that target inequality either target it at the low end of the income distribution by trying to increase wages of low-income workers, or at the high end of the income distribution by limiting wages of high-income workers. List a few potential policies of each type.

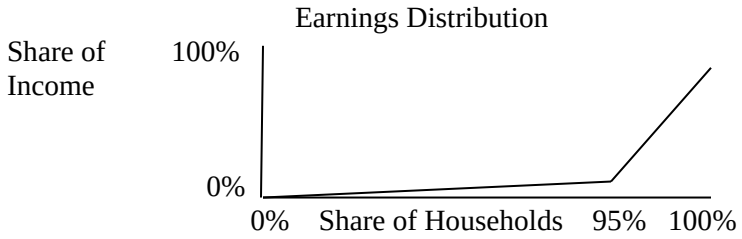
Pell grants and guaranteed student loans are designed to fundamentally lessen inequality by giving children of low-income parents greater access to education. Policies like the minimum wage, the progressive tax system, and the Earned Income Tax Credit are all designed in part to partially offset income inequality by transferring resources from the rich to the poor. The estate tax is a primary policy aimed at alleviating inequality by targeting the high end as it is supposed to prohibit family dynasties in terms of wealth.

(c) In your opinion, should the government focus on the low end or the high end? Why?

In many people's opinion, the government should focus most of its efforts at the low end for a couple of reasons. Most importantly, there are a lot more people at the low end than at the high end, so having effective policies in place (like Pell grants) can give everyone a chance to make decisions to help themselves economically. Also, many proposals to alleviate inequality targeted at the high end would, to some extent, stifle innovation. In simple terms, the question is whether inequality is a problem because Bill Gates created Microsoft or because 20% of minority students drop out of high school and don't go to college.

(d) In order to better understand how sensitive inequality measures are to the choice of measure, provide a graph of an economy with a 90-10 wage gap that is essentially zero but for which the Gini coefficient is close to 1.

Consider an economy where 95% of the economy earns essentially nothing, with 5% of the economic agents earning essentially everything. Such an economy will have a 90-10 wage gap that is essentially zero (as the 90 percentile person earns roughly what the 10 percentile person earns) but also has a Gini coefficient close to 1 as 5% of the agents earn almost all of the income.



7-7. The two points for the international income distributions reported in Table 7-2 for countries in 2013 can be used to make a rough calculation of the Gini coefficient. Use a spreadsheet to estimate the Gini coefficient for each country. Which three countries had the most equal income distribution in 2013? Which three countries had the most unequal income distribution in 2013?

If one considers the percent of income received by the poorest and richest 10 percent of households called *P* and *R* respectively, the Gini coefficient is

Conveniently, this equation carefully reduces to Gini = 0.9(*R* – *P*). The results are:

Country	*P*	*R*	Gini
Australia	3%	27%	0.216
Austria	3%	24%	0.189
Belgium	3%	22%	0.171
Canada	2%	25%	0.207
Chile	2%	36%	0.306
Dominican Republic	2%	37%	0.315
France	3%	26%	0.207
Germany	3%	25%	0.198
Guatemala	1%	42%	0.369
Hungary	3%	24%	0.189
India	4%	30%	0.234
Israel	2%	30%	0.252
Italy	2%	26%	0.216
Mexico	2%	39%	0.333
Norway	4%	21%	0.153
Sweden	3%	22%	0.171
United Kingdom	3%	25%	0.198
United States	2%	30%	0.252

The three countries in the sample with the most inequality in 2013 were Guatemala (0.369), Mexico (0.333), and the Dominican Republic (0.315). The three countries in the sample with the most equality in 2013 were Norway (0.153), Belgium (0.171), and Sweden (0.171). It should be emphasized that these are very crude measures as they rely on only two points in the income distribution.

7-8. Most government-provided job training programs are optional to the worker. Describe how the self-selection issue might be used to call into question empirical results suggesting there are large economic benefits to be gained by requiring all workers to receive government-provided job training.

As job training programs are optional, and a desire or willingness to work or try to get a new job or to get retrained is probably the most important factor in a person's success, there is certainly a self-selection story to be told. In particular, the successful people coming out of job training programs would likely have been successful even if left on their own because of their innate ability or motivation. Similarly, the people who did not choose job training and failed to get a job would likely have failed to get a job even if the government required them to pursue job training.

7-9. Before 1990, the 80-50 and the 50-20 log wage gap was higher for women than for men (see Figure 7-7). What are some possible reasons for this?

This pattern is likely a result of three empirical facts. Before the 1990s (1) women had much lower labor force participation rates than males, (2) women were less likely to be professionals, and (3) women were more likely to work part-time. All of these "facts" are likely to lead to greater wage gaps across the wage distribution. Moreover, all of these patterns have reversed to some degree since 1990. In the 2000's, for example, more women are in college than men, and in the near future there will be more female doctors and lawyers than male doctors and lawyers. As labor force attachment and professional options have converged for men and women since 1990, Figure **7-7** demonstrates convergence in the gender wage gaps as a result as well.

7-10. Jill is planning the timing of her on-the-job training investments over the life cycle. What happens to Jill's OJT investments if

(a) the market-determined rental rate to an efficiency unit falls?

When the marginal revenue of investing in OJT declines, Jill will invest less at each age as the return to making the investment has fallen.

(b) Jill's discount rate increases?

If Jill's discount rate increases she becomes more "present oriented", reducing the future benefits associated with OJT. Thus her OJT investments fall as she no longer values the benefits from making the investment as much as she had before her discount rate fell.

(c) the government passes legislation delaying the retirement age until age 70.

The marginal revenue of investing in OJT increases because the payoff period to the investment is longer. Thus, she undertakes more OJT in this case.

(d) technological progress is such that much of the OJT acquired at any given age becomes obsolete within the next 10 years.

The marginal revenue to investing in OJT declines, so the amount of OJT acquired falls.

7-11. Suppose two households earn $40,000 and $56,000 respectively. What is the expected percent difference in wages between the children, grandchildren, and great-grandchildren of the two households if the intergenerational correlation of earnings is 0.2, 0.4, or 0.6?

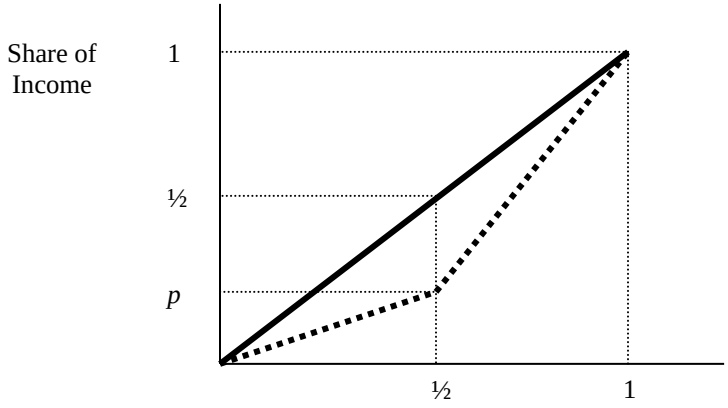
If the intergenerational correlation of earnings is r, the percent difference in earnings of the children is $(56{,}000 - 40{,}000)r / 40{,}000 = 0.4r$, of grandchildren is $.4r^2$, and of great-grandchildren is $.4r^3$. Therefore, we have that the expected percent difference in earnings is:

Correlation	Children	Grandchildren	Great-Grandchildren
20%	8%	1.6%	0.32%
40%	16%	6.4%	2.56%
60%	24%	14.4%	8.64%

7-12. Suppose 50 percent of a population all receive an equal share of p percent of the nation's income while the other 50 percent of the population all receive an equal share of $1 - p$ of the nation's income where $0 \leq p \leq 50$.

(a) For any such p, what is the Gini coefficient for the country?

Calculating the Gini coefficient is most easily done with reference to a graph. Notice, given the set-up of the problem, there are two sections to the graph of the distribution of national income, and both are linear segments.



So, now the Gini coefficient is the area between the bold line and the dashed bold line divided by one-half. This is easiest to figure as the area below the bold line (one-half) less the area below the dashed bold line. The area below the dashed bold line equals

$$(0.5)(0.5)p + 0.5p + (0.5)(0.5)(1 - p) = 0.25 + 0.5p.$$

Finally, the Gini coefficient is $(0.5 - 0.25 - 0.5p) / 0.5 = 0.5 - p$.

(b) For any such p, what is the 90 – 10 wage gap?

Each person (percentile) in the lower half of the distribution receives $0.02pM$, where M is national income. Similarly, each person (percentile) in the top half of the distribution receives

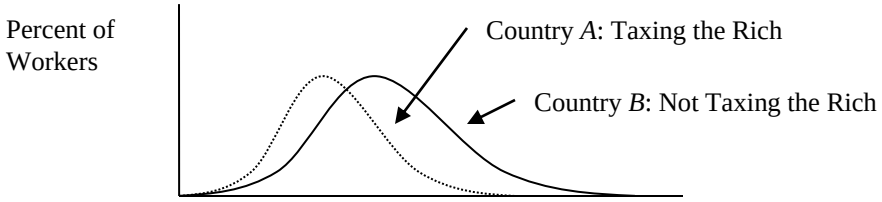
$0.02(1–p)M$. As the 10^{th} percentile person is in the lower half and the 90^{th} percentile person is in the upper half, the 90 – 10 wage gap is $0.02(1–p)M / 0.02pM = (1–p)/p$.

7-13. Consider two developing countries. Country A, though quite poor, uses government resources and international aid to provide public access to quality education. Country B, though also quite poor, is unable to provide quality education for institutional reasons. The distribution of innate ability is identical in the two countries.

(a) Which country is likely to have a more positively skewed income distribution? Why? Plot the hypothetical income distributions for both countries on the same graph.

At the outset, there is no reason to think the distribution of income is different between the two countries. However, one could argue that Country *A* collects more taxes than Country *B*, and as taxes are likely to fall more heavily on the rich, that the simple act of collecting taxes in Country *A* will cause it to lessen the skewness in its income distribution relative to Country *B*. Of course, one could make the alternative argument – that developing countries over-tax their poorest workers more than the rich. The graph below, however, assumes the first case.

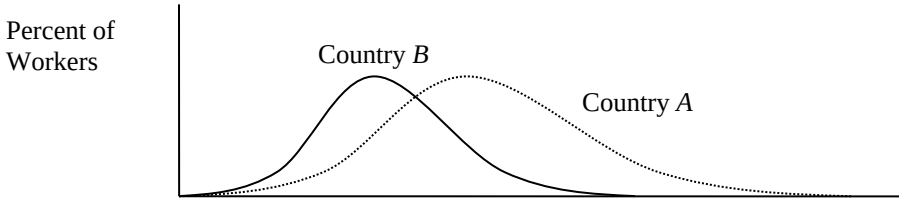
Original Wage Distribution



(b) Which country is more likely to develop faster? Why? Plot the hypothetical income distributions in 20 years for both countries on the same graph.

Country *A* is likely to develop faster because of its savings and investments into education (human capital).

Wage Distribution after 20 Years



7-14. Consider an economy with 10,000 individuals. Of them, 5,000 each earn $25,000; 3,000 each earn $40,000; and 2,000 each earn $100,000.

(a) What is the Gini coefficient for this economy?

Total income in the economy is 5,000 × $25,000 + 3,000 × $40,000 + 2,000 × $100,000 = $445 million. The bottom group receives 5,000 × $25,000 / $445m = 28.09%. The middle group receives 3,000 × $40,000 / $445m = 26.97%. The top group receives 2,000 × $100,000 / $445m = 44.94%. Therefore, the Gini coefficient is calculated as:

The calculation produces a Gini coefficient equal to 0.30.

(b) What would the Gini coefficient be if the wealthiest 2,000 individuals were taxed 30% of their income with the proceeds being transferred to the 5,000 poorest individuals?

To begin we need to know what the amount of the transfer is. As the wealthiest group is taxed at 30%, their $100,000 incomes will be reduced to $70,000. Moreover, as there are 2,000 people in this group, total tax revenue equals 2,000 × $30,000 = $60 million. This $60 million is equally distributed to the poorest 5,000 individuals, so each of these individuals receives an additional $60m / 5,000 = $12,000 in income for a total income of $37,000 per individual. Now the problem can be repeated as above.

Total income in the economy is 5,000 × $37,000 + 3,000 × $40,000 + 2,000 × $700,000 = $445 million. The bottom group receives 5,000 × $37,000 / $445m = 41.57%. The middle group receives 3,000 × $40,000 / $445m = 26.97%. The top group receives 2,000 × $70,000 / $445m = 31.46%. Therefore, the Gini coefficient is calculated as:

The calculation produces a Gini coefficient equal to 0.1247. Thus, the tax transfer reduced inequality quite substantially if one considers the Gini coefficients you produced in question 7 for a wide variety of countries.

7-15. Explain why the intergenerational correlation of earnings would likely be higher or lower than average for the following groups and factors in the United States:

(a) Improved educational outcomes for all populations (e.g., minority, low-income, rural).
Improved educational outcomes for all populations should lower the intergenerational correlation of earnings as wealth becomes less of a factor in determining educational outcomes and economic success.

(b) The elimination of legacy admits to colleges and universities.
The elimination of legacy admits to colleges and universities should lower the intergenerational correlation of earnings as parental education becomes less of a factor in determining educational outcomes and eventually economic success.

(c) The implementation of a federal inheritance tax.
The implementation of a federal inheritance tax should lower the intergenerational correlation of earnings as children are less able to benefit from their parent's wealth.