Economics 460: Labor Economics

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Problem Set #5

1. Evaluate the folowing claim: The increasing wage gap between highly skilled 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 accuring to highly educated workers will soon disappear.

2. From 1970 to 2000, the supply of high school (no college) graduates shrunk. At teh same time, the average real wage of college graduates remained relatively stable, while the average real wage of high school graduate fell. How can these wage patterns be explained?

3. Use the two wage ratios for each country in Table 8.4 to calculate the 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?

4. Calculate the Gini coefficient for the distribution of household income reported in Table 8.2.

5. The two points for the international income distributions reported in Table 8.1 can be used to make a rough calculation of the Gini coefficient. Use a spreadsheet to estimat the Gini coefficient for each country. Which three countries have the most equal income distribution? Which three countries have the most unequal distribution?

TABLE 8.1 International Differences in the Income Distribution

Source: World Bank, *World Development Indicators*, CD-ROM, 2002.

Country	Percentage of Total Income Received by Bottom 10% of Households	Percentage of Total Income Received by Top 10% of Households
Australia	2.0%	25.4%
Austria	2.3	22.4
Belgium	2.9	22.6
Canada	2.7	23.9
Chile	1.1	45.4
Dominican Republic	2.1	37.9
France	2.0	25.1
Germany	3.7	28.0
Guatemala	1.6	46.0
Hungary	4.1	20.5
India	3.5	33.5
Israel	2.4	28.2
Italy	1.9	27.4
Mexico	1.2	41.6
Norway	4.1	21.8
Sweden	3.4	20.1
United Kingdom	2.1	27.5
United States	1.8	30.5

the income in the United States. In Canada and the United Kingdom, the income share for the equivalent workers is between 2 and 3 percent, and in Chile it is only 1.1 percent.

Most studies of the shape of the wage distribution use the human capital model as a point of departure. This approach has proved popular because it helps us understand many of the key characteristics of the wage distributions that are typically observed in modern labor markets. In the human capital framework, wage differentials exist not only because some workers accumulate more human capital than others, but also because young workers are still accumulating skills (and are forgoing earnings), whereas older workers are collecting the returns from prior investments.

The human capital model also provides an interesting explanation for the positive skewness in the wage distribution. Recall that a worker invests in human capital up to the point where the marginal rate of return to the investment equals the rate of discount. This stopping rule generates a positively skewed wage distribution *if the distribution of ability in the population is symmetric.* To illustrate, suppose that a third of the workforce is composed of low-ability workers, a third is composed of medium-ability workers, and the remaining third is composed of high-ability workers. Furthermore, suppose all workers have the same rate of discount.

Figure 8.2 illustrates the investment decision for workers in each of the ability groups. The curve MRR_L gives the marginal rate of return schedule for low-ability workers. This group will acquire H_L efficiency units of human capital. Similarly, the curve MRR^* gives the schedule for average workers, who acquire H^* units; and the curve MRR_H gives the schedule for high-ability workers, who acquire H_H units. High-ability workers, therefore, have higher wages than low-ability workers for two distinct reasons. First, high-ability

TABLE 8.2 **Household Shares of Aggregate Income, by Fifths of the Income Distribution, 2001**

Source: U.S. Bureau of the Census, *Historical Income Inequality Tables*, Table IE-3: landview.census.gov/hhes/income/histinc/ineqtoc.html.

Quintile	Share of Income	Cumulative Share of Income
First	0.035	0.035
Second	0.087	0.122
Third	0.146	0.268
Fourth	0.230	0.498
Fifth	0.502	1.000

ror image of the letter L; it would lie flat along the horizontal axis, so that 0 percent of the income accrues to 80 percent of the households, and then shoot up so that 100 percent of the income accrues to 100 percent of the households.[4]

The intuition behind the construction of the Lorenz curve suggests that the area between the perfect-equality Lorenz curve and the actual Lorenz curve can be used to measure inequality. The **Gini coefficient** is defined as:

$$\text{Gini coefficient} = \frac{\text{Area between perfect-equality Lorenz curve and actual Lorenz curve}}{\text{Area under perfect-equality Lorenz curve}} \qquad 8.1$$

In terms of Figure 8.3, the Gini coefficient is given by the ratio of the shaded area to the triangle given by *ABC*.[5] This definition implies that the Gini coefficient would be 0 when the actual distribution of income exhibits perfect equality and would equal 1 when the distribution of income exhibits perfect inequality (that is, when all income goes to the highest quintile). By repeatedly calculating the areas of various triangles and rectangles in Figure 8.3 and then applying equation (8-1) it is easy to show that the Gini coefficient for household income is 0.43.

Although an increase in the Gini coefficient represents an increase in income inequality, there are subtleties that are being overlooked by summarizing the entire shape of the income distribution into a single number. Consider, for example, the impact of a shift in income from the bottom quintile to the top quintile. This shift obviously increases the Gini coefficient. It turns out that we can obtain a similar numerical increase in the Gini coefficient by transferring some amount of income from, say, the 2nd and 3rd quintiles to the top quintile. Although the numerical increase in the Gini coefficient is the same, the two redistributions are not identical.

Because of this ambiguity, many studies use additional measures of inequality. Two commonly used measures are the **90-10 wage gap** and the **50-10 wage gap.** The 90-10 wage gap gives the percent wage differential between the worker at the 90th percentile and the worker at the 10th percentile of the income distribution. The 90-10 wage gap thus provides a measure of the range of the income distribution. The 50-10 wage gap gives the percent

[4] It is possible for two "real-world" Lorenz curves to intersect. It would then be difficult to ascertain which distribution is more unequal.

[5] Note that the area of the triangle *ABC* must equal 0.5.

TABLE 8.3 Educational Composition of the Workforce

Source: David H. Autor, Lawrence F. Katz, and Alan B. Krueger, "Computing Inequality: How Computers Changed the Labor Market," *Quarterly Journal of Economics* 113 (November 1998): 1169–1213, Table I.

	Percent Distribution of Workers by Education			
Year	High School Dropouts	High School Graduates	Some College	College Graduates
1960	49.5%	27.7%	12.2%	10.6%
1970	35.9	34.7	15.6	13.8
1980	19.1	38.0	22.0	20.9
1990	12.7	36.2	25.1	26.1
1996	9.4	33.4	28.9	28.3

terms of the simple model in Figure 8.7, it must have been the case that the relative demand curve for skilled workers also shifted to the right, to D_1. If this demand shift is sufficiently large, the final equilibrium at point C is characterized by an increase in the fraction of skilled workers in the labor market *and* by a larger wage gap between skilled and unskilled workers.

The supply-demand framework clearly shows that any attempt to understand the rise in the relative wage of skilled workers must identify factors that increased the relative demand for skilled labor. Moreover, this rightward shift in the demand curve must have been sufficiently large to outweigh the impact of the increase in the relative supply of skilled workers. In a sense, the relative supply and demand curves for skilled workers were in a race in recent years—both curves were shifting to the right. The observed trend in wage inequality suggests that the demand curve "won" the race in the sense that the relative demand for skilled workers was rising at a faster rate than the relative supply of skilled workers.

Although there has been a lot of debate over which factors best explain these shifts in the labor market, the existing research has isolated a few key variables that have become the "usual suspects" in any analysis of the changes in the wage structure.

Supply Shifts

As noted above, there was a sizable increase in the relative number of skilled workers in the 1980s and 1990s. Table 8.3 shows how the educational composition of employment shifted between 1960 and 1996. In 1960, almost half the workforce lacked a high school diploma and only 11 percent were college graduates. By 1996, fewer than 10 percent of workers lacked a high school diploma and 28 percent were college graduates. These supply shifts toward a more skilled workforce clearly indicate that changes in the relative supply of skilled workers alone cannot explain the post-1979 rise in wage inequality. Such an increase in the relative supply of skilled workers should have narrowed, rather than widened, the wage gap between skilled and unskilled workers.

Nevertheless, some of the changes in wage inequality can be attributed to supply shifts.[9] As Table 8.3 shows, there was only a relatively slight change in the supply of educated workers in the 1960s, but there was a substantial change in the 1970s, with the

[9] Richard B. Freeman, *The Overeducated American,* New York: Academic Press, 1976; Finis Welch, "Effects of Cohort Size on Earnings: The Baby Boom Babies' Financial Bust," *Journal of Political Economy* 87 (October 1979, Part 2): S65–S97; and Katz and Murphy, "Changes in Relative Wages, 1963–1987."

TABLE 8.4
International Trends in Wage Inequality for Male Workers (90-10 percent wage gap)

Source: OECD, *Employment Outlook*, Paris: July 1996, Table 3.1.

Country	1984	1994
Australia	174.6	194.5
Canada	301.5	278.1
Finland	150.9	153.5
France	232.0	242.1
Germany	138.7	124.8
Italy	129.3	163.8
Japan	177.3	177.3
Netherlands	150.9	158.6
New Zealand	171.8	215.8
Norway	105.4	97.4
Sweden	103.4	120.3
United Kingdom	177.3	222.2
United States	266.9	326.3

there is a substantial impact of the minimum wage on wages at the very bottom of the distribution, but that the impact on the wage differential between high school graduates and college graduates is small (because few high school graduates get paid the minimum wage).[22]

Problems with the Existing Explanations

As the discussion suggests, each of the usual suspects (that is, changes in labor supply, the deunionization of the labor market, minimum wages, international trade, immigration, and skill-biased technological change) seems to be able to explain some part of the change in the U.S. wage structure. The main lesson provided by the literature is that no single "story" can explain all of the changes that occurred in the U.S. wage structure. Some of the variables (for example, immigration or trade) can explain the increasing wage gap between skilled and unskilled workers, but fail to easily explain why inequality increased within skill groups. Similarly, the stability of the minimum wage may explain why the real wage of low-skill workers fell, but cannot explain why the real wage of workers at the top of the skill distribution rose rapidly. And one of the leading explanations—skill-biased technological change—is not easy to quantify, so that one cannot be entirely confident that simply because the other variables fail to explain many of the changes in the wage structure, these changes must have been due to skill-biased technological change.

In the end, any truly complete accounting of what happened to the U.S. wage structure will have to explain both the timing of the changes in inequality as well as the structure of these changes throughout the entire labor market. As a result, labor economists have found it very difficult to reach a consensus on these issues. It is fair to conclude that we still do not have a good sense of why wage inequality increased so rapidly in the 1980s and 1990s.

Moreover, any story that we eventually develop must confront an additional empirical puzzle. As Table 8.4 shows, the wage structure of different developed countries did not evolve in similar ways over the past two decades. For example, in the United Kingdom, the

[22] John DiNardo, Nicole Fortin, and Thomas Lemieux, "Labor Market Institutions and the Distribution of Wages, 1973–1992: A Semi-Parametric Approach," *Econometrica* 64 (September 1996): 1001–1044; and David Lee, "Wage Inequality in the United States During the 1980s: Rising Dispersion or Falling Minimum Wage," *Quarterly Journal of Economics* 114 (August 1999): 977–1023.