Can Economists Speak of Justice?

In his provocative book *Aftershock,* Robert Reich investigates the role of US economic inequality in first causing the recent global financial meltdown and then preventing economic recovery. According to Reich, the richest 1% of American households received more than 23% of household income and own over half of American wealth. Because speculative income is taxed at a lower rate than labor earnings, the typical rich family pays only 15% of each additional dollar of income, which a typical middle-class may pay up to 43% of its additional income in income taxes (28%) and payroll taxes (15%). If you are rich – particularly if you are egoistic – this arrangement seems "fair" (more for me!), if you are a middle-class college professor, this seems unfair. But economists want to know if economic inequality is efficient or inefficient. At one extreme, if everybody gets the same income, regardless of how effort they contribute, then output per person would be low. This was one of the major problems of communism: "from each according to ability to each according to means" may work well for families, but it doesn't seem to work very well for society as a whole. As we will see later, there are only a few cases of countries whose economic *inequality* is actually too low.

What seems to be less appreciated is that too much inequality – the level of inequality Reich blames for the *Great Recession* – can also be bad for the economy. An *aristocracy* is an economic system in which wealth and power are concentrated in a few hands, and that one's parent's is much more important than effort in determining one's lot in life. Like communism, aristocracy also divorces one's pay from effort; the rich get more simply because they are rich. When political and economic power are inherited rather than earned, both the government and the economy tend toward mediocrity.

A *meritocracy* is the opposite of an aristocracy, wherein one's rewards depends on one's own efforts, not on one's *birthright.* In chapter eight we learned that a competitive labor market operates much like a meritocracy. Each person supplies that labor skill which brings them the most satisfaction; while a few people may seek to maximize money income, most people are willing to give up some money income for prestige, job satisfaction, or fringe benefits. Depending on the supply and demand for different labor skills, a person may receive a large or small income. In a meritocracy, if the demand for economists rises relative to, say, social workers, students with aptitude for both occupations may choose to major in economics instead of social work.

An aristocracy is more like the *Black Disciples* drug gang featured in chapter three of *Freakonomics.* The title of that chapter is "Why Do Drug Dealers Live with their Mothers?" The ironic answer is that the soldiers in that drug gang earned an average of $3.30 per hour (at a time when the minimum wage rate was $5.15); over half of all the income received by the drug gang went to the gang leader, JD. While we could argue that the drug sellers were willing to sacrifice $1.85 per hour for a chance to become the gang leader. At best, those soldiers were misinformed; what set JD apart from other gang members was just his luck, but also his MBA from Northwestern University. What was unfair about the lottery was that it was rigged against the uneducated gang members who faced a 1 in 4 chance of dying in pursuit of their occupation over the four years that Levitt and Dubner followed the gang.
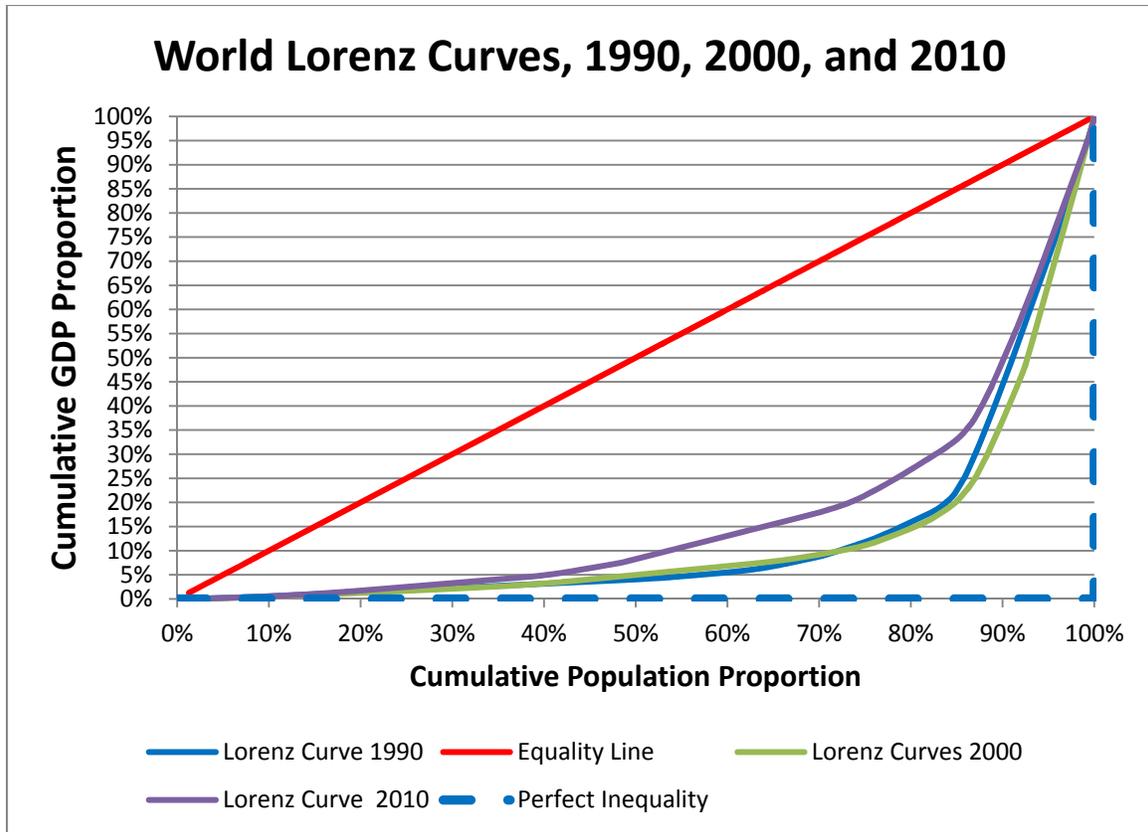
Measuring Inequality

When comparing income or wealth at different places or times, we require a **common denominator**. A useful metric is **per capita gross domestic product (GDP).** Gross domestic product is the market value of all goods and services produced within an economy in a given year. Per capita GDP is GDP divided by population. The table in the appendix to this chapter ranks the per capita GDP in current US dollars for 210 counties in 1990, 2000, and 2010. The data on GDP and population are taken from United Nations statistics.[1] In 1990, the USA constituted 4.83% of the world's population and produced 26.08% of world output. By 2000 (the last year of the Clinton Administration), the US share of world population had fallen to 4.65%, while its share of world output increased to 31.38%. In 2010, US population had fallen to 4.53% of world population, while its share of world output had fallen to 23.34%.

The country closest to the world's average is Mexico, which in 2010 produced 1.67 percent of world output with 1.66 percent of the world's population. Figure 10-1 presents a Lorenz curve, a graphical representation of the inequality among members of a group. In this case, we plot the **cumulative population distribution** on the horizontal axis, beginning at the origin (0,0), and proceeding from the country with the lowest per capita GDP (Vietnam in 1990, Democratic Republic of the Congo in 2000, and Somalia in 2010) to the country with the highest per capita GDP (Monaco). The red line from the origin to the termination point (100%, 100%) shows what the Lorenz curve would look like if there were total equality among countries. Consider the state of the "world" at the beginning of a Monopoly® game: each player has a token, $1500, no property, and an equal chance to win the game. The dashed blue line shows what the Lorenz curve would look like if there were perfect inequality; at the end of a monopoly game, one player has all the money and all the property. In all three years, the departure of the actual distribution of per capita GDP from the equality line is quite pronounced. In 1990, 73% of the world's population lived in countries which collectively produced just 10.2% of the world's output. There was little change between 1990 and 2000; with the poorest countries being above their level in 1990, but it still was the case that the poorest 70% of the world's population lived in countries which produced less than 10% of the world's output. In 2010, however, global economic inequality decreased markedly; the 2010 Lorenz curve (the purple line) is everywhere closer to the (red) equality line than either the green or blue lines are.

Note the dramatic statistics for the world's largest countries. In 1990, per capita GDP in China was just $359 ($0.98 per person per day). In 2000, per capita GDP had increased to $956.69 ($262 per person per day). In 2010, per capita GDP had risen to $4,354.03 ($11.92 per person per day). While still low compared to the US ($46,545.90, or $127.44 per person per day), the increase in Chinese production is impressive. In 1990 per capita GDP in India was approximately the same as in China ($374). Between 1990 and 2000, India's per capita GDP increased to $443.86, lagging far behind China. In 2010, per capita GDP in India $1,406.42) was approximately 1/3 of that of China.

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[1] http://unstats.un.org/unsd/snaama/dnllist.asp

World Lorenz Curves, 1990, 2000, and 2010

Legend:
- Lorenz Curve 1990
- Equality Line
- Lorenz Curves 2000
- Lorenz Curve 2010
- Perfect Inequality

Axes: Cumulative GDP Proportion (vertical), Cumulative Population Proportion (horizontal)

While the Lorenz curve provides a useful picture of income inequality, econo-mists prefer asingle number for describing phenomena like inequality. The **Gini coeffi-cient**, named for its inventor, Corrado Gini, is the percentage of the area under the 45° equality line that *is not* covered by the Lorenz curve. In Figure 10-1, the area under the 45^o(equality) line is ½ (100%)x(100%)/2^2 is indexed at 100. If the distribution of income were perfectly equal, then the Lorenz curve would lie along the 45^oline, and the value of the Gini coefficient would be 0. If only one person had all of a society's income, then the area under the Lorenz curve would approach 0 as the population approached infinity; the maximum Gini coefficient would be 1, or 100 percent. All actual distributions would fall between those extremes and we can compare them accordingly. The closer the Gini coef-ficient is to 1, the less equal the distribution of income; the closer the Gini coefficient to 0, the more equal the distribution.

Table 10-1 shows the calculation of the Gini coefficients for three hypothetical income distributions and one actual (empirical) income distribution. Per capita GDP is a measure of average output per person, useful for measuring average economic well-being across countries. Within countries however, economists typically use household income. The three mythical countries each have 200 residents and an average income of $100,000. In paradise[3] each household receives $100,000, which is sufficient to purchase eternal bliss.No matter how one sorts the data from Paradise, the cumulative population

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[2] Recall that the area of a triangle is one-half of the product of the height and the base of the triangle.
[3] Which could be the place of bliss for any of the world's monotheistic religions; others may wish to call it Nirvana, and skeptics may wish to call it Utopia.

distribution and the cumulative income distribution are identical.Since the difference between the Lorenz curve and the 45° line is zero, the Gini coefficient is also zero.

Table 10-1

Calculating Gini Coefficients for Alternative Economies

Population Percent	Paradise PCGDP Percent	Difference	Hades PCGDP Percent	Difference	Purgatory PCGDP Percent	Difference	USA 2009 HHINC	Difference
0%	0%	0%	0%	0%	0.00%	0.00%	0%	0.00%
5%	5%	0%	0%	5%	0.48%	4.75%	0.12%	4.88%
10%	10%	0%	0%	10%	1.43%	9.00%	0.45%	9.55%
15%	15%	0%	0%	15%	2.86%	12.75%	1.00%	14.00%
20%	20%	0%	0%	20%	4.76%	16.00%	1.80%	18.20%
25%	25%	0%	0%	25%	7.14%	18.75%	2.92%	22.08%
30%	30%	0%	0%	30%	10.00%	21.00%	4.32%	25.68%
35%	35%	0%	0%	35%	13.33%	22.75%	6.05%	28.95%
40%	40%	0%	0%	40%	17.14%	24.00%	8.09%	31.91%
45%	45%	0%	0%	45%	21.43%	24.75%	10.52%	34.48%
50%	50%	0%	0%	50%	26.19%	25.00%	13.47%	36.53%
55%	55%	0%	0%	55%	31.43%	24.75%	16.86%	38.14%
60%	60%	0%	0%	60%	37.14%	24.00%	20.84%	39.16%
65%	65%	0%	0%	65%	43.33%	22.75%	25.59%	39.41%
70%	70%	0%	0%	70%	50.00%	21.00%	30.91%	39.09%
75%	75%	0%	0%	75%	57.14%	18.75%	37.36%	37.64%
80%	80%	0%	0%	80%	64.76%	16.00%	44.77%	35.23%
85%	85%	0%	0%	85%	72.86%	12.75%	53.30%	31.70%
90%	90%	0%	0%	90%	81.43%	9.00%	63.39%	26.61%
95%	95%	0%	0%	95%	90.48%	4.75%	76.23%	18.77%
100%	100%	0%	100%	0%	100.00%	0.00%	100.00%	0.00%
Area		0%		90%		32%		51%
Gini Coefficient		0		0.95		0.32		0.51
Computer Gini		0		0.952381		0.31746		0.508293

At the other extreme is Hades, where the Greek god of the underworld not only names the place after himself, but also grabs all the income $20,000,000, and everyone else has nothing. As a result, the poorest 95 percent of the population has 0 percent of the income and the top 5 percent has 100 percent. So when we compute the Gini coefficient from the table, we obtain a value of 0.95. When the computer uses the raw data, it more accurately computes the Gini coefficient for Hades as 0.952.

Purgatory, as anyone brought up Roman Catholic should know, is a state between Heaven and Hell, where the souls of sinners reside until purged of their venial sins. In my Purgatory, the poorest soul has $1,000, and each household's income increases by $1,000. This generates an average income of $10,500. The poorest 5 percent of the population has only 0.48 percent of the income, and the richest 5 percent has nearly 10 percent. It turns out that Purgatory is closer to Paradise than Hades. The last two columns shows the distribution of household income according to the March 2010 *Current Popu-*

lation Survey. The Gini coefficient is 0.38 when computed by spreadsheet, or, more accurately, 0.426 when the computer crunches the numbers.
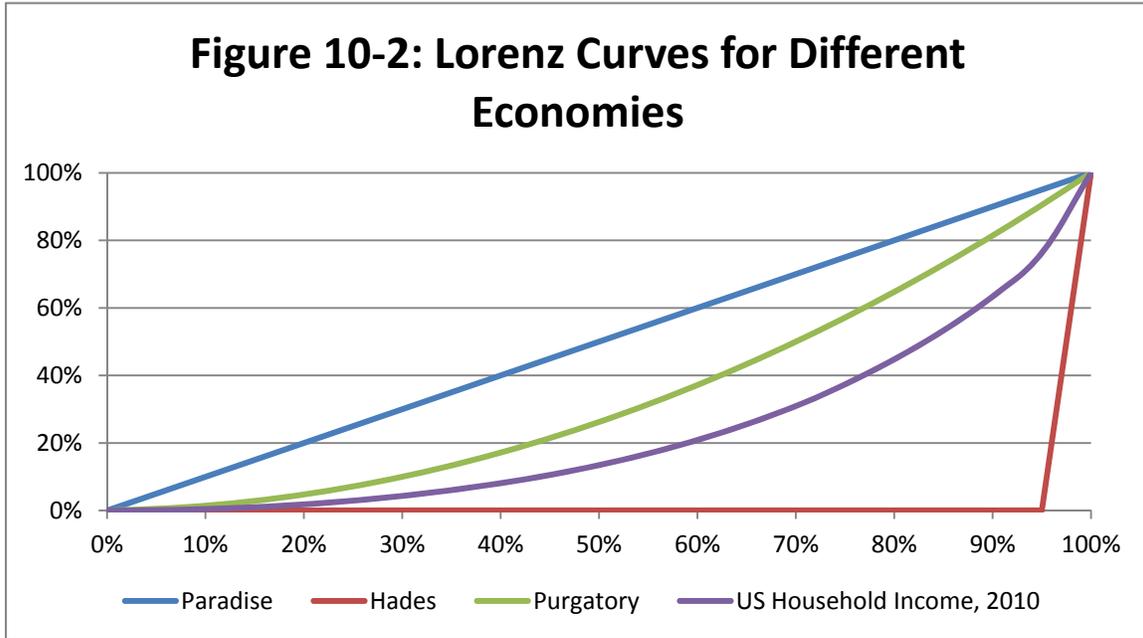

Figure 10-3 presents the Gini coefficients for the world from 1970 through 2010. Note that the international measure of economic inequality fluctuates around 0.6, which is approximately as large as that for any individual country.
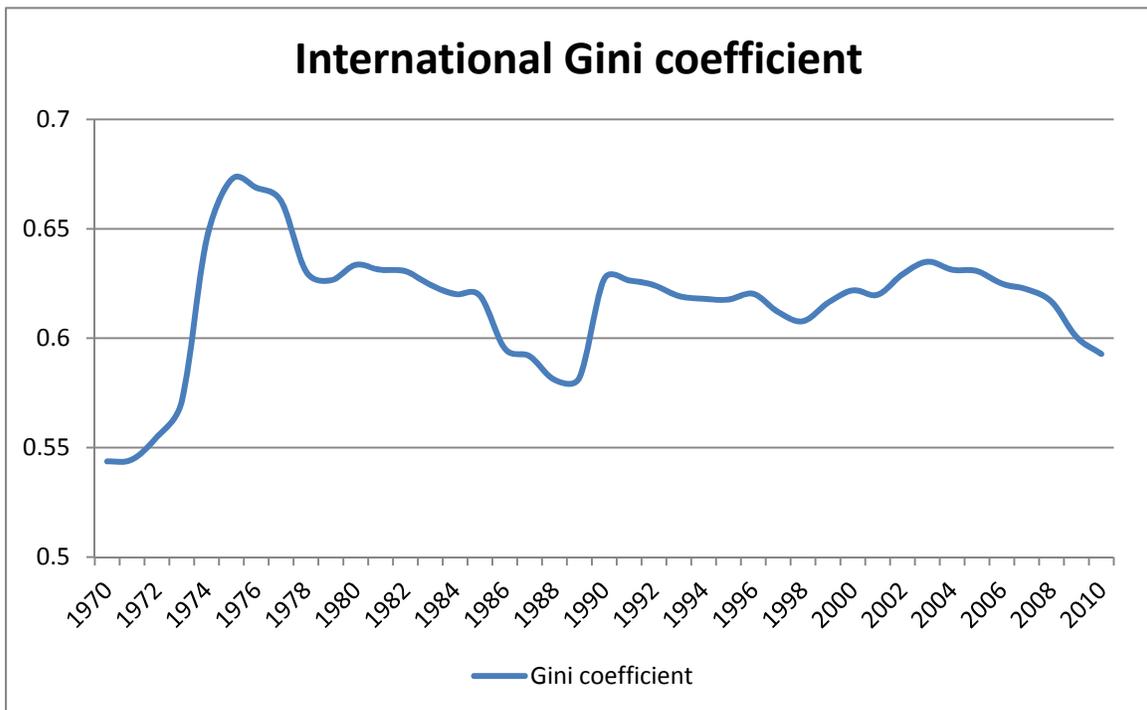
Figure 10-3

Figure 10-4 shows a histogram depicting the distribution of Gini coefficients for the 120 countries in the appendix for which Gini coefficients were reported. The Gini coeffi-

cients for countries range from a low of 19 (Seychelles[4]) to a maximum of 64.3 (Como-ros[5]), which slightly larger than the Gini coefficient for the world (62.1). Extremely large and extremely small values of the Gini coefficient are rare, with most countries falling within the midrange between 35 and 45.[6] Indeed, the histogram is well approximated by the well-known *normal* or bell curve, showing a concentration of moderate values and a rarity of extreme values.

Figure 10-4

An interesting pattern occurs when we combine contrast inequality and human development. The United Nations website defines human development as: the "process of enlarging people's choices. Their three essential choices are to lead a long and healthy life, to acquire knowledge and to have access to the resources needed for a decent stand-ard of living. Additional choices, highly valued by many people, range from political, economic and social freedom to opportunities for being creative and productive and en-joying personal self-respect and guaranteed human rights."[7]

Figure 10-3 plots the Gini coefficient on the horizontal axis (more inequality as we move to the right), and the United Nations' human development index on the vertical axis. While the pattern is far from perfect, we find that as economic inequality (the Gini coefficient) increases, human development decreases. While the USA (the green dot) has a high level of per capita GDP, it lags its peers (Western Europe, Canada, Japan and Isra-el) in non-economic indicators like life expectancy, female mortality, and the quality of K-12 education).[8]

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[4] Seychelles is a former colony of Great Britain , north of Madagascar, known as a tourist and tax haven.

[5] A former French colony, also located in the Indian Ocean near Madagascar.

[6] The skewness-kurtosis test for normality implies a 36.8 % probability that the population underlying Fig-ure 10-3 is normal.

[7] http://data.un.org/Glossary.aspx?q=Human+Development+Index+and+its+components+

[8] The equation underlying the red line is $\widehat{hdi} = -.037\,gini + .00032\,gini^2 + .302\,usa + 1.417$, which implies that the human development index for the USA is .302 higher than it would be based on the degree of economic inequality.

Figure 10-3

Human Development and Economic Inequality

Source: United Nations Statistics
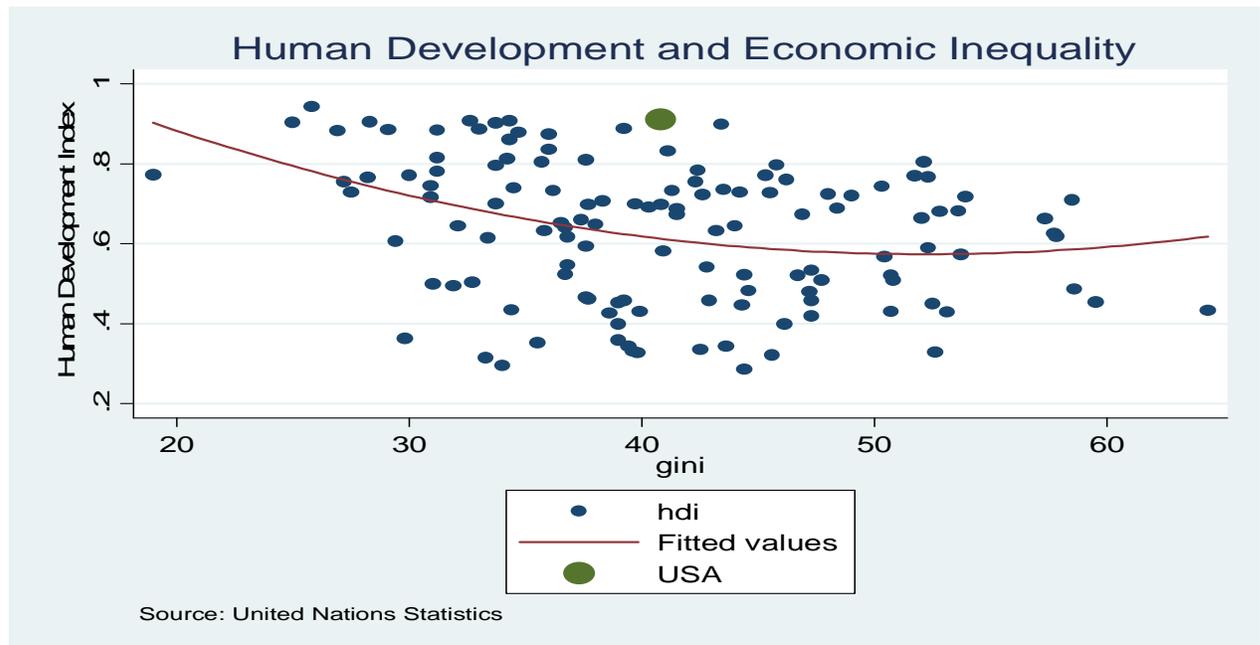
Republican politicians, particularly Mitt Romney, argue that economic equality discourages work hard and wealth accumulation. The classic Marxist dictum "From each according to ability, to each according to need" implies **moral hazard**. If everyone is entitled to the same income (consumption), regardless of his or her contribution to society, then one has little incentive to work, beyond the intrinsic enjoyment of work itself. Nevertheless, I argued in Chapter 7 that the Marxist slogan is a reasonable description of a functional family. Ideally, family members are motivated by altruism whereby each places the "needs of the many over the needs of the one."[9] Gary Becker even cites his *rotten kid theorem* in his *Treatise on the Family*, which states that parents and children will maximize the same utility function, even if some of the children are not altruistic (selfish = rotten). Knowing that each gets a share of the family's output, each will work to increase the "size of the pie," and will not try to grab an unwarranted share, lest parental retribution reduce the amount that goes to the rotten kid.

I find it fascinating to look at the behavior of individuals in the transition economies in Russia and China. Both lived under oppressive communist regimes, which in theory preached Marxism, but in practice benefited Communist Party hacks at the expense of the average citizens. Both economies stagnated under communism, as the elite became increasingly corrupt and the rank-and-file learned that connections were much more important than competence. After the fall of the USSR and the relaxation of anti-market institutions in China, we find that the Russian *oligarchs* have replaced the Communist bureaucrats, and that China itself has become startlingly polluted and lawless.

Less appreciated are the potential problems of excessive inequality. **Endowment problems** encourage jealousy and a sense of entitlement by the well-to-do, and envy and hopelessness by the have-nots. In monarchies like Saudi Arabia and theocracies like Af-

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[9]*Star Trek* fans will recognize the Vulcan equivalent of the Marxist slogan.

ghanistan under the Taliban, the economy comes to resemble a system of loot and pillage. There is little incentive to work hard if all output goes to the elite. Figure 10-4 implies that personal wellbeing decreases as economic inequality increases. Indeed, Figure 10-4 implies that the United States may have too much inequality, at least relative to other developed economies, to maximize its human potential. The perception of where the United States should be on Figure 10-4 is probably a major point of contention between political liberals, who would sacrifice some output to increase equality, and political conservatives, who would sacrifice some output to increase inequality. By this measure, the U.S. economy is a conservative economy, albeit an inefficient one. A reduction in economic inequality might actually increase per capita output.

Economic Inequality and Economic Accomplishments: Evidence from OECD

The Organization for Economic Cooperation and Development (OECD) is an association of developed and developing market economies. In 2009 the OECD presented a study of nine economic indicators for thirty member countries. Table 10-2 presents a summary of their findings.   The only category that ranks the USA in the top third is per-capital net national product[10], for which the USA ranks third.

Table 10-3 presents the correlations between the country's Gini coefficient and the other eight measures of economic performance. The second number is the significance of the correlation – the probability that there is a strong positive or negative relation between those measures. Those indicators that are not correlated with economic inequality are the gender wage gap (the percentage difference between the average wage rate earned by women and men), the male life expectancy at age 65, and crime victimization. Those measures that are positively correlated with the measure of economic inequality are (1) the share of students with insufficient reading and (2) infant mortality. Recall that correlation does not imply causation. It is equally plausible that poor reading skills reduce economic performance as it is that economic inequality leads to inferior education. Similarly, high infant mortality (reflecting poor access to medical care) reduces economic output, and economic inequality causes poor medical outcomes.

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[10] Net national product is gross national product minus depreciation. Gross national product is similar to gross domestic product in that the latter measures the economic output of citizens of a country and the former measures the economic activity of residents of a country.

Table 10-2: OECD Statistics

	Self-sufficiency				Equity				Health				Social cohesion				Income	
	Employment to population ratio, total		Share of students with insufficient reading		Gini coefficient of income inequality		Gender wage gap		Life expectancy at age 65, men		Infant mortality		Subjective well-being		Crime victimisation		NNI per capita, at USD PPPs	
	Levels 2007	rank	Levels 2006	Rank	Levels 2004-05	Rank	Levels 2006	Rank	Levels 2006	Rank	Levels 2006	Rank	Levels 2006	Rank	Levels 2005	Rank	Levels 2006	Rank
country	emp	emprank	ed	edranl	gini	giniranki	wagegap	wagerank	life	liferank	infant	infrank	wellbeing	wellrank	crime	crimerank	pcnni	pcnnirank
Australia	72.9	9	13.4	5	0.30	16	0.17	13	18.3	3	4.7	20	7.4	7	16.3	15	$28,578	14
Austria	71.4	12	21.5	19	0.27	4	0.22	22	17.2	14	3.6	9	7.1	13	11.6	5	$30,190	10
Belgium	61.6	23	19.4	15	0.27	10	0.11	5	17.0	18	3.7	11	7.4	9	17.7	18	$28,868	13
Cada	73.6	8	11.0	3	0.32	19	0.21	19	17.9	6	5.4	24	7.4	8	17.2	16	$31,811	5
Czech Republic	66.1	19	24.8	23	0.27	6	0.18	14	14.8	26	3.3	8	6.4	21			$16,926	24
Denmark	77.3	4	16.0	9	0.23	1	0.13	8	16.2	24	3.8	16	8.0	1	18.8	21	$30,282	9
Finland	70.5	14	4.8	1	0.27	8	0.19	15	16.9	20	2.8	5	7.6	2	12.7	9	$28,175	15
France	64.0	20	21.7	20	0.28	13	0.12	7	18.2	5	3.8	13	7.0	14	12.0	6	$27,379	17
Germany	69.0	15	20.0	16	0.30	15	0.23	24	17.2	15	3.8	15	6.6	19	13.1	11	$27,584	16
Greece	61.5	24	27.7	27	0.32	21	0.22	23	17.4	12	3.7	10	6.4	22	12.3	7	$23,798	21
Hungary	57.3	28	20.6	18	0.29	14	0.00	1	13.4	28	5.7	25	5.2	27	10.0	3	$14,312	26
Iceland	85.7	1	20.5	17	0.28	12	0.24	25	18.3	4	1.4	1	6.9	16	21.2	24	$29,382	12
Ireland	69.0	16	12.1	4	0.33	22	0.14	10	16.8	21	3.7	12	6.0	23	21.9	26	$30,775	8
Italy	58.7	27	26.4	26	0.35	25	0.14	9	17.5	11	3.9	17	5.0	29	12.6	8	$24,348	19
Japan	70.7	13	18.4	12	0.31	18	0.33	27	18.5	2	2.6	3	6.5	20	9.9	2	$25,847	18
Korea	63.9	21	5.8	2	0.31	17	0.38	28	16.1	25	5.3	23	5.7	25			$19,885	23
Luxembourg	63.0	22	22.9	22	0.26	3	0.11	4	17.0	17	2.5	2	6.8	17	12.7	10	$55,653	1
Mexico	61.1	25	47.0	30	0.47	30			17.2	16	18.1	29	6.7	18	18.7	20	$10,870	29
Netherlands	74.1	7	15.1	7	0.27	9	0.17	12	16.7	22	4.4	19	7.6	3	19.7	22	$31,790	6
New Zealand	75.4	6	14.5	6	0.34	23	0.10	2	17.8	8	5.2	22	7.4	6	21.5	25	$20,596	22
Norway	77.5	3	22.4	21	0.28	11	0.12	6	17.7	9	3.2	6	7.5	4	15.8	13	$45,552	2
Poland	57.0	29	16.2	10	0.37	26	0.10	3	14.5	27	6.0	26	5.9	24	15.0	12	$12,233	28
Portugal	67.8	17	24.9	24	0.42	28	0.21	21	16.6	23	3.3	7	5.4	26	10.4	4	$16,609	25
Slovakia	60.7	26	27.8	28	0.27	7	0.26	26	13.3	29	6.6	27	5.2	28			$13,599	27
Spain	66.6	18	25.7	25	0.32	20	0.21	20	17.9	7	3.8	14	7.1	12	9.1	1	$24,318	20
Sweden	75.7	5	15.3	8	0.23	2	0.15	11	17.6	10	2.8	4	7.4	10	16.1	14	$31,234	7
Switzerland	78.6	2	16.4	11	0.27	5	0.19	17	18.5	1	4.4	18	7.5	5	18.1	19	$34,536	4
Turkey	45.8	30	32.2	29	0.43	29			13.1	30	22.6	30	4.7	30			$10,805	30
United Kingdom	72.3	10	19.0	13	0.34	24	0.21	18	17.0	19	5.0	21	7.0	15	21.0	23	$30,003	11
United States	**71.8**	**11**	**19.4**	**14**	**0.38**	**27**	**0.19**	**16**	**17.2**	**13**	**6.9**	**28**	**7.3**	**11**	**17.5**	**17**	**$38,874**	**3**

Table 10-3: Correlation among OECD Indicators

Correlation Between	Gini coefficient of income inequality
employment to	–0.4547
populaiton ratio	0.0116
share of students with	0.5154
insufficient reading	0.0036
Gender wage gap	0.0978
	0.6206
male life	–0.1528
expectancy at age 65	0.4202
infant	0.6909
mortality	0
Subjective	–0.4629
well-being	0.01
crime	0.0229
victimization	0.9116
per capita	–0.4899
net national income	0.006

The negative correlations are even more telling. The countries with low employment to population ratios tend to have single-earner households, which tend to increase the Gini coefficient (the USA is the exception here). The USA is also the exception with respect to the correlation between per capita net national income and the Gini coefficient; as indicated in Figure 10-4, countries with high per capita income (or output) tend to have more equal income distribution (lower Gini coefficients) than the USA does. When asked to rate their subjective well-being, countries with low Gini coefficients tend to express more overall satisfaction than do countries – like the USA – that have high degrees of economic inequality.

Measuring Income Inequality within the United States

While I have argued that households attempt to maximize utility (or their standards of living) rather than income, we are left with the fact that neither utility nor standards of living are directly measurable. So, when we talk about **inequality** we typically mean **economicinequality**, and we typically measure economic inequality by contrasting the income of different households and individuals.

Income is a variable that differs from person to person at the same time, and differs over time for the same person. It is impossible to measure economic outcomes for everyone because such data do not exit.[11] Hence, statisticians base their estimates of unknown population characteristics (called **parameters)** on measured sample statistics. When measuring income, there are three measures of **central tendency**: the **mean** (the arithmetic average of all observations), the **median** (the middle number when all observations are sorted from largest to smallest, or vice-versa), and the **mode** (the most frequent observation or range of observations).

Table 10-4 presents the **descriptive statistics** for ten categories of household and personal income from the March 2012 Demographic Survey and the 2011 Monthly Earner Surveys from the *Current Population Survey*. We have already discussed the **mean**, which is computed by adding up all the observations for each category, then dividing by the number of observations, shown in column 2. A person cannot earn less than $0 per hour, and business losses (that can give households and individuals negative income) are *truncated* at -$9,999 for individuals (-$19,998 for families). Typically, the censored values show up as the *minimum* and the *maximum* value, but not always. There are a few people who make very high income; to protect their privacy, large incomes are *top-coded*. This truncation of the data distorts the computed mean or average. This is not the case with the median; the median is obtained by ranking all respondents and taking the middle number. Hence, it does not matter that very large and very small incomes are censured. Either the mean or the median gives us an alternative measure of what the *typical* person or household receives.

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[11] Recall again that *data* is the plural Latin noun for the singular "datum." When used as an adjective, it takes the plural form: e.g., a data set.

Table 10-4
Descriptive Statistics for Household[12] and Personal Income

Type of Income	Number	Mean	Median	Min	Max	Std. Dev.	Coefficient of variation	Gini
Household Income (Families)	52,594	$83,238	$63,900	-$12,999	$2,099,999	$87,904	1.0561	0.4365
Household Income (Singles)	21,745	$43,963	$30,000	-$19,998	$1,534,000	$57,485	1.3076	0.4935
Personal Income (Adults)	144,803	$30,280	$16,600	-$9,999	$1,350,000	$53,863	1.7788	0.6548
Hourly Earnings (All Workers)	99,083	$15.61	$12.95	$0.00	$99.99	$9.33	0.5981	0.2869
Weekly Earnings (All Workers)	166,479	$820.59	$654	$0	$2,885	$590.58	0.7197	0.3935
Weekly Earnings (Government)	28,855	$929.56	$808	$0	$2,885	$584.36	0.6286	0.3417
Weekly Earnings (For Profit)	124,434	$793.36	$601	$0	$2,885	$620.94	0.7827	0.4033
Weekly Earnings (Not For Profit)	13,190	$815.39	$692	$0	$2,885	$630.43	0.7732	0.3961
Non-Labor Income (Adults)	144,803	$6,487	$81	-$9,999	$839	$14,478	2.2318	0.8057
Social Security (Recipients)	25,742	$13,073	$12,545	$1	$50,000	$6,463	0.4944	0.2633
Public Assistance (Recipients)	1,520	$3,314	$2,575	$1	$25,000	$3,081	0.9296	0.4500

The standard deviation is a measure of the variability in the sample, which is typically computed by statistical programs. To obtain the standard deviation, the computer subtracts the sample mean ($\bar{x}$) from each observation (x_i), squares the result, and computes the square root of the average: $s = \sqrt{\dfrac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}$. Since the standard deviation is measured in the same units as the mean, we can compare the relative variation of different income and earnings distributions by computing the *coefficient of variation*, which is simply the ratio of the standard deviation to the mean. Since means could be negative and since the standard deviation can be greater than the mean, the range for the coefficient of variation is unbounded. By contrast, the Gini coefficient is bounded by 0 (perfect equality) and 1 (perfect inequality). In Table 10-4, the correlation between the coefficient of variation and the Gini coefficient is 0.985. This means that both measures increase with inequality, although not by precisely the same degree.

Causes of Income Inequality

There is considerable variability in actual income due to the interaction of many factors, some of which, like luck, honesty, and connections, are not measured by the statisticians collecting the information. In Chapter 9, we learned that the theory of **human capital** predicts that labor productivity, and hence earnings, tend to increase as educational attainment increases. Table 10-5 presents the average household income in 2011 by the educational attainment of the "head" of the household. Because of the high degree of correlation of the education of spouses, the education of the "head" of the household is a good proxy for the educational attainment of his or her spouse.

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[12] Household Income, Personal Income, Non-Labor Income, Social Security, and Public Assistance refer to 2011 income and are taken from the March 2012 Demographic Study of the *Current Population Survey*; Hourly and Weekly Earnings refer to 2011 earnings and are taken from the Monthly Earner Study, January–December 2011, *Current Population Survey*.

Table 10-5

Household Income by Educational Attainment of "Reference Person"				
From 2012 *Current Population Survey*				
	Sample	Sample	Sample	Percent of	Gini
Highest Grade Completed	Mean	Std. Dev.	Frequency	Sample	Coefficient
None	$38,192	$41,803	134	0.23%	0.4066
Nursery school to grade 4	$36,249	$28,425	412	0.82%	0.4291
Grade 5 or grade 6	$39,050	$38,154	863	1.62%	0.3904
Grade 7 or grade 8	$38,439	$33,709	1,091	2.09%	0.4182
Grade 9	$39,517	$36,624	993	1.99%	0.4087
Grade 10	$39,628	$32,865	1,149	2.24%	0.4294
Grade 11	$40,703	$39,988	1,498	2.70%	0.4259
Grade 12 no diploma	$47,580	$57,825	687	1.19%	0.4588
High school graduate	$60,263	$52,132	15,738	29.21%	0.4018
Some college but no degree	$70,709	$60,514	10,058	18.62%	0.3919
Vo/Tech/Bus school degree	$74,188	$53,167	2,668	4.86%	0.3726
Associate degree in college	$82,160	$66,054	2,841	4.90%	0.3719
Bachelor's degree	$110,169	$87,267	10,457	18.88%	0.3725
Master's degree	$130,782	$98,949	4,198	7.61%	0.3790
Professional school degree	$199,603	$163,979	824	1.65%	0.4226
Doctorate degree	$168,014	$125,385	837	1.40%	0.3915
All Households	$80,283	$76,955	54,448	100.00%	0.4365

Note that earnings tend to remain between $36,000 and $41,000 for households whose reference person has less than 12 years of schooling. Not until the reference person has more than 11 years of schooling do we find household income significantly above the income for a household with less than 12 years of schooling. The highest Gini coefficient, reflecting the greatest household income inequality, is among those with twelve years of schooling but no diploma. Generally, as education increases, the Gini coefficient decreases.[13] The major exception is among households with an adult who has a professional degree; this is because there is a large degree of variation within professions (e.g., attorneys and physicians), and especially between professions (e.g., clergy and veterinarians vs. lawyers and physicians).

As people get older, they generally gain experience and their income increases. However, at some point, income will peak as their health deteriorates, their education depreciates, and they work fewer hours. Figure 10-6 presents the **life-cycle** income pattern that plots the age of the reference person on the horizontal axis, and the corresponding average household income (blue) and median household income (red) on the vertical axis. Note that the blue trend linefits the data quite well, so that about 93 percent of the variation in average household income can be attributed to the age of the "reference person" of that household. This has greater explanatory power than education. People may be "stuck" with their level of education, based on the decisions they made when they were too young to realize the consequences of those decisions. But everyone blessed with a

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[13] The weighted correlation is -0.7005, which is significant at the 0.0025 level.

normal life span will tend to follow this life-cycle pattern. Hence, we borrow against future income increases when we are young and we save against the prospect of income decline when our earnings peak at about age 55. Young people who are impatient often have difficulty waiting until those earnings peak, and many middle-aged adults may suffer denial about the nearly inevitable decline in those earnings.
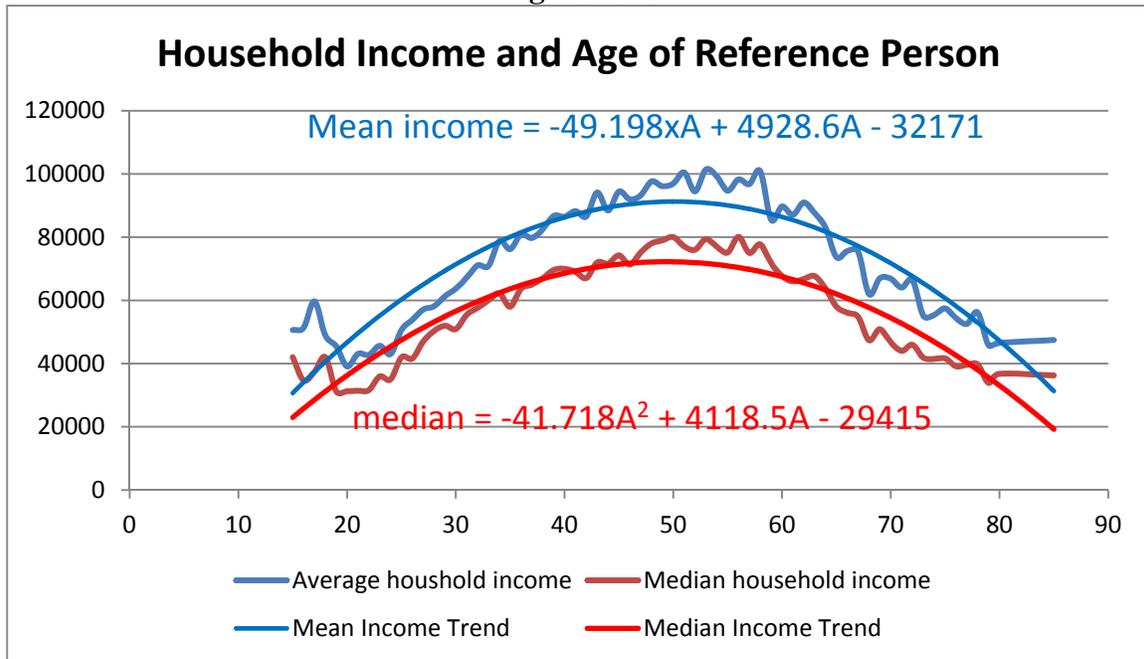
Figure 10-6

Household Income and Age of Reference Person

Mean income = $-49.198xA + 4928.6A - 32171$

median = $-41.718A^2 + 4118.5A - 29415$

— Average houshold income — Median household income
— Mean Income Trend — Median Income Trend

Table 10-6 shows the relation between average 2011 household income[14] by gender and the marital status of the household "reference person." As in Tables 11-2 and 11-3, we compute the 95-percent confidence interval for the population mean for each type of household. We note that the population mean for "male-respondent" households is significantly greater than the average income of "female-respondent" households. For married couples, who is designated as the "respondent" of household *is* a matter of choice, and the statistics indicate that those that specify male reference personshave slightly higher average income. Note that only households with married heads have average earnings above the likely population means. Part of the explanation is the potential for two earners, but another explanation is the specialization of labor between a spouse who works outside the home and one who specializes in household production at home.

Among one-earner households, we find that households headed by a single female are nearly three times as prevalent as single-male-headed households. Single-women-headed households average only 81.3 percent of the income of equivalent single-male-headed households. Income statistics reinforce information from popular literature. Households with husbands and wives consistently have higher incomes than households with single heads, regardless of whether the husband or the wife is designated as the "head." Households headed by single men have lower earnings than households headed by married couples. Households headed by single women also have lower earnings than

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[14] The data come from the March 2012 *Current Population Survey*, which reports 2011 annual income.

households headed by married couples. And furthermore, being an unmarried head of household has more severe economic consequences for women than for men. Finally, the lowest Gini coefficients occur among households headed by married couples. This reinforces Becker's theory of household formation. As household income rises, it is more likely that the husband or wife will specialize in household production, tending to equalize earnings with households with lower paid breadwinners.
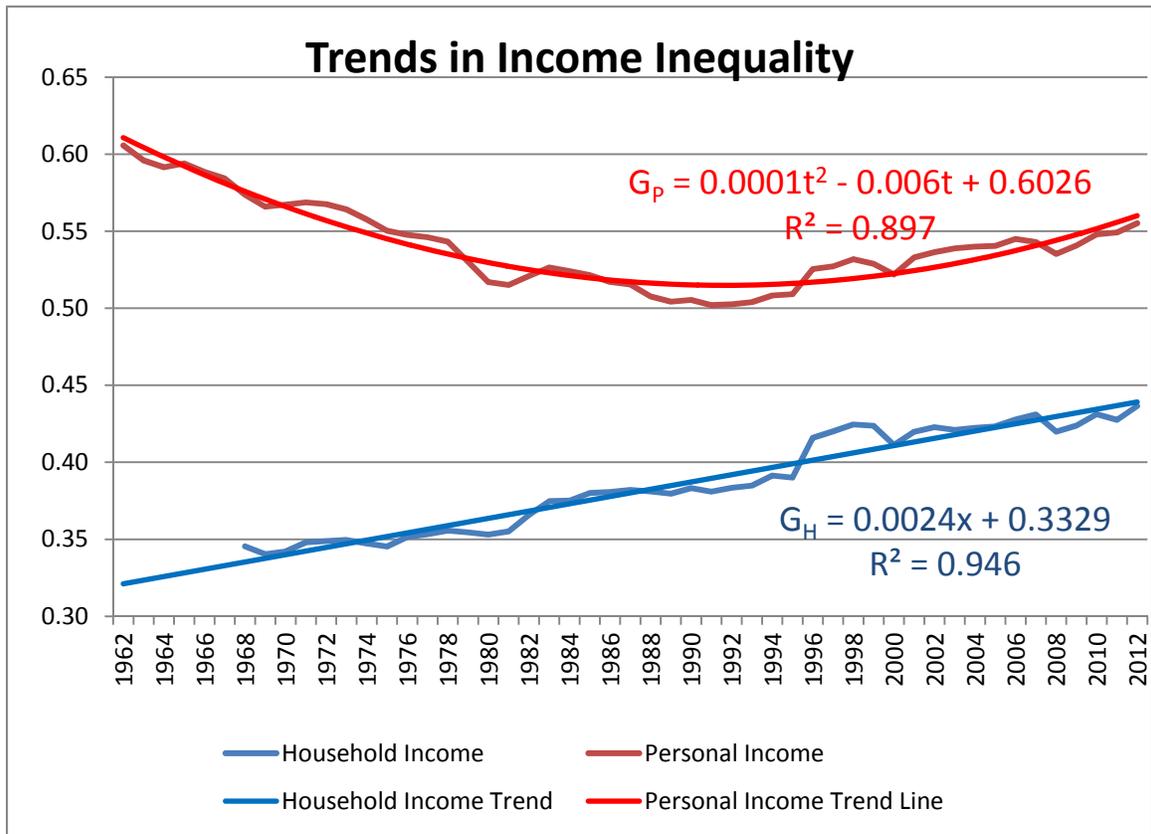
Table 10-6

Household Income Distribution by Marital Status and Gender						
Male Reference Person						
Marital	Sample		Sample	Population Mean		Gini
Status	Mean	Std Dev	Size	Minimum	Maximum	Coefficient
Married	$96,364	$93,133	22,991	$95,160	$97,568	0.4040
Widowed	$60,687	$52,454	307	$54,796	$66,578	0.4180
Divorced	$69,071	$75,057	1,301	$64,989	$73,154	0.4051
Separated	$52,256	$43,062	310	$47,444	$57,069	0.3912
Never married	$58,840	$62,864	1,866	$55,986	$61,695	0.4372
All unmarried	$63,851	$74,022	3,954	$61,543	$66,159	0.4227
Average	$91,593	$91,308	26,945	$90,502	$92,683	0.4125
Female Reference Person						
Marital	Sample		Sample	Population Mean		Gini
Status	Mean	Std Dev	Size	Minimum	Maximum	Coefficient
Married	$94,776	$94,765	15,119	$93,265	$96,287	0.4039
Widowed	$53,583	$58,035	1,396	$50,536	$56,630	0.4278
Divorced	$53,117	$56,060	3,628	$51,292	$54,942	0.4463
Separated	$33,898	$33,873	1,040	$31,837	$35,959	0.4734
Never married	$39,245	$45,198	4,020	$37,847	$40,643	0.4499
All unmarried	$45,292	$50,579	10,530	$44,326	$46,258	0.4499
Total	$74,461	$83,284	25,649	$73,441	$75,480	0.4512

Historical Trends in Inequality

Figure 10-7 shows the trend in inequality, as measured by the Gini coefficient, from 1968, the first year that household income is reported in the March *Current Population Survey*, until 2012. The Gini coefficients refer to income earned the previous calendar year. We find a consistent trend towards increasing economic inequality among households, beginning at 0.386 in 1968 and reaching 0.461 in 2010. By contrast, individual incomes (excluding children and others with zero earnings) tended to decline from 0.606 in 1962 to 0.502 in 1991, and then increasing to 0.548 in 2010. So while the evidence implies that the level of inequality in the USA is too high to maximize per capita GDP, and is associated with lower quality of life in general, we find that economic inequality is trending worse.

Figure 10-7

Trends in Income Inequality

$G_P = 0.0001t^2 - 0.006t + 0.6026$
$R^2 = 0.897$

$G_H = 0.0024x + 0.3329$
$R^2 = 0.946$

Household Income — Personal Income
Household Income Trend — Personal Income Trend Line

Remedying Inequality

Despite the evidence that there is an optimal level of inequality—a "Baby Bear" economy where inequality is not too small (discouraging work and risk taking) but also where inequality is not too large (creating persistent inter-generational inequality that leads to aristocracy) – the trend in the United States is to dismantle the three factors that would counteract the worsening inequality: truly competitive markets, the inheritance tax and the progressive income tax.

The inheritance tax[15] was intended to be a "reset button" for economic equality. Consider the Parker Brothers game Monopoly®. At the beginning of the game each player receives $1,500, a token to move about the monopoly board, and the right to throw dice in turn. The outcome of the game partly depends on luck (the ability to accumulate a monopoly of two or three related properties and build houses or hotels on them) and part-ly on skill (negotiating) and (perhaps) cheating. My point is that at the end of every game there is a 100% estate tax; the winner relinquishes claim on property and the game starts anew with players in equal, property-less condition. Being without an estate tax – which Congress phased out between 2001 and 2010[16] -- is like starting each game of monopoly while allowing the winners of the previous game to maintain their hotels.

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[15] See http://www.irs.gov/pub/irs-soi/ninetyestate.pdf.

[16] The repeal of the estate tax was extended through 2012 as part of the bi-partisan agreement to extend the economic stimulus during the "lame duck" session after Republicans captured the House of Representatives and reduced the Democratic majority in the Senate.

The same year that the Republican Congress repealed the estate tax, it also re-duced the tax rate on income above $373,651 (in 2011 dollars) from 39.6% (that had been established in the first Clinton budget of 1993) to 35%. The resulting tax cut turned the budget surplus – which funded job creation – to an investment-reducing budget defi-cit. There are, in fact, three different federal income tax systems. Payroll (labor) income is taxed at a flat 13.3% rate to support social security (with a cap of $106,800) and a graduated rate – from 10% to 35% to support the federal budget. However, capital gains income – that is, speculative income – is taxed at a maximum rate of 15%. Given that those who receive capital gains are concentrated at the richest 1% of the population, the middle class (those with income between $45,551 and $106,800 pay a *marginal* tax rate of 38.3%, which is higher than what the rich pay on "regular" income (35%) and substan-tially greater than what the rich pay on their capital gains (speculative) income. Table 10-7 shows the tax system for a head of household in 2011.

Table 10-7

Head of Household		Labor income			Capital Gains		
		income	payroll	total	income	payroll	total tax
From	to	tax rate	tax rate	tax rate	tax rate	rate	tax rate
$0	$11,950	10%	13.30%	23.30%	10%	0.00%	10.00%
$11,951	$45,550	15%	13.30%	28.30%	15%	0.00%	15.00%
$45,551	$106,800	25%	13.30%	38.30%	15%	0.00%	15.00%
$106,801	$117,650	25%	0.00%	25.00%	15%	0.00%	15.00%
$117,651	$190,550	28%	0%	28.00%	15%	0.00%	15.00%
$190,551	$373,650	33%	0%	33.00%	15%	0.00%	15.00%
$373,651	no limit	35%	0%	35.00%	15%	0.00%	15.00%

Figure 10-8 shows the relative size of the tax collections from the payroll tax – which is highly **regressive** – and the income tax which is modestly **progressive**.[17] Note the dramatic jump in personal tax rates in 1941, corresponding to the beginning of World War II and the end of the Great Depression. The average income tax rate remained near-ly constant at 10% of personal income until the Bush tax cuts of 2001. That year the pay-roll tax rate caught up with the income tax rate, although both declined with the Great Recession. As I write this President Obama and Speaker John Boehner are negotiating to avert the fiscal cliff, a term coined by Fed Chairman Ben Bernanke for the automatic tax increases and spending cuts the Republicans passed in 2011 to force a reduction in the

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[17] A regressive tax takes a smaller proportion of income as income rises; the payroll tax is regressive be-cause (1) it is levied only on labor income, (2) the employer's share of the tax is *shifted* to workers (em-ployers simply consider the payroll tax they pay as part of the worker's wage, and (3) there is a cutoff of $110,600. A progressive tax takes a larger share of income as income rises. The income tax is moderately progressive because the marginal tax rate rises as income does; the progressivity of the income taxes is mitigated by loopholes that reduce taxes, particularly for the rich, and the lower tax rate on capital gain.

deficit. Despite income taxes being at their lowest level since 1941, Republicans refused to raise tax rates even on incomes above $1 million.

Figure 10-8
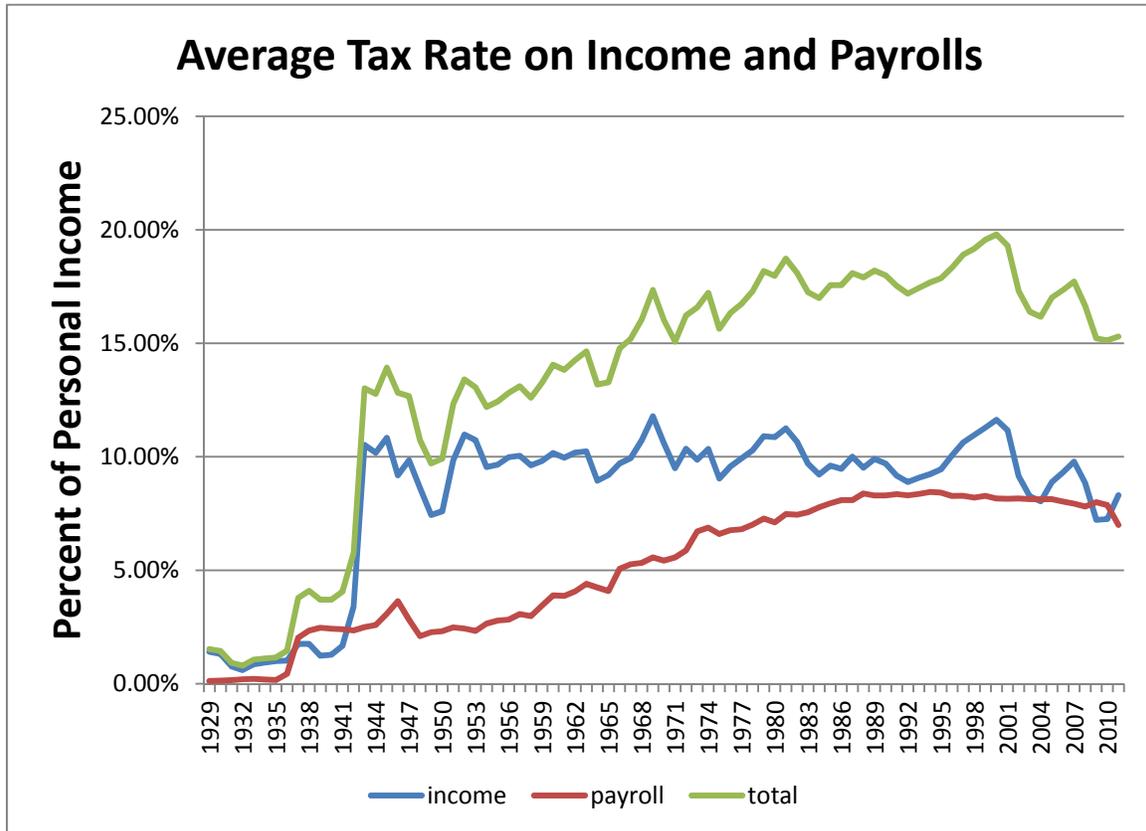
The third cause of economic inequality is the erosion of competitive markets. The Tea Party call for "free markets" is actually a call for the perpetuation of monopoly markets. Instead of allowing additional firms to enter competitive markets, "conservative" politicians seek to prevent market competition. While these policies ostensibly benefit those who have already made their fortunes, they are supported by lower-middle class voters whose hope of economic advance is precluded by the policies they support.

Ironically, not every rich person supports this conservative ideology which swept the country in the 2010 midterm elections. Warren Buffett, chairman of Berkshire Hathaway and the second richest person on earth, after Bill Gates, expresses this argument clearly. Buffett recently joined Gates in a program to give away most of his personal fortune, reputed to exceed $25 billion. Here is what Mr. Buffett told Barack Obama in the latter's book, *The Audacity of Hope*:

> The free market's the best mechanism ever devised to put resources to their most efficient and productive use. The government isn't particularly good at that. But the market isn't so good at making sure that the wealth that's produced is being distributed fairly or wisely. Some of that wealth has to be plowed back into education, so that the next generation has a fair chance, and to maintain our infrastructure, and provide

some sort of safety net from those who lose out in the market economy. And it just makes sense that those of us who've benefited most from the market should pay a bigger share.

When you get rid of the estate tax you're basically handing command of the country's resources to people who didn't earn it. It's like choosing the 2020 Olympic team by picking the children of the winners of the 2000 Games.[18]

When then-Senator Obama asked Mr. Buffett how many fellow billionaires shared this attitude, Buffett replied:

I'll tell you, not very many. They have this idea that it's "their money" and they deserve to keep every penny of it. What they don't factor in is all the public investment that lets us live the way we do. Take me as an example. I happen to have a talent for allocating capital. But my ability to use that talent is completely dependent on the society I was born into. If I'd been born into a tribe of hunters, this talent of mine would be pretty worthless. I can't run very fast. I'm not particularly strong. I'd probably end up as some wild animal's dinner.

But I was lucky enough to be born in a time and place where society values my talent, and gave me a good education to develop that talent, and set up the laws and the financial system to let me do what I love doing—and make a lot of money doing it.[19]

Where Do We Go From Here?

Earning inequality among individuals and households is inevitable in a market-driven economy in which incentives matter. People differ by their endowments, their talents, and their effort. However, when earnings differ systematically by geography, race, or gender, one can question the underlying justice—and efficiency—of the economic system. We have seen that 70 percent of the world's population lives in countries that together produce only 10 percent of the world's output. The United States has only 4.5 percent of the world's population but produces nearly one-third of the world's output. There is greater inequality between countries than there is within any country. Too much or too little inequality within a country appears to interfere with economic output. Among developed countries, the United States seems to have the greatest degree of inequality as measured by the Gini coefficient.

In November 2006 Democrats regained control of both houses of Congress, but their razor thin majority in the Senate and a Republican president thwarted social legislation. In November 2008, Illinois Senator Barack Obama defeated Republican John McCain in the election of the 44th president of the United States. The Democrats increased their majority in both houses of Congress, to votes in the Senate (a filibuster-proof majority they lost when Scott Brown replaced the late Senator Edward Kenney from Massachusetts) and at least 236 out of 435 seats in the House of Representatives. President Obama and many Democrats ran on a platform to stimulate the economy and

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[18] Quoted by Barack Obama, *The Audacity of Hope* (Crown Publishers, 2006), pp. 190–191.
[19] Ibid, page 191.

improve both health care and education, which would stimulate a more equal economic opportunity. But after two years, the US electorate – displeased at the slow pace of economic recovery – returned the Republicans to control of the House and reduced the Democratic Senate majority to two votes.

Summary

1. Our attitudes toward income inequality depend on whether we are **egoistic**, **altruistic,** or **malevolent.**

2. A **Lorenz curve** comparing per capita gross domestic product to population shows substantial economic inequality in the world. Seventy percent of the world's population lives in countries that together produce about 10 percent of world output, while 10 percent of the world's population live in countries that produce 70 percent of world's output. Residents of the United States make up 4.68 percent of the world's population and produce 32.77 percent of the world's output.

3. A **Gini coefficient** measures difference between the area covered by the equality line and the area under the Lorenz curve itself. A Gini coefficient of 0 indicates complete equality, while a Gini coefficient of 1 would indicate complete inequality. The Gini coefficient for per capita GDP across the world is 74.26 percent, greater than the Gini coefficient for any country.

4. The Gini coefficients for individual countries range from 8 to 62, on a scale of 100. Countries with very low Gini coefficients are former communist countries, although China's Gini coefficient (40.3) is roughly equivalent to that of the United States (40.8), and Russia's (48.7) is higher. Developed countries have Gini coefficients between 20 and 40, with the United States' Gini coefficient being the highest among comparable countries. Countries with very high Gini coefficients tend to be less developed.

5. Within the United States, we use statistics from *The Current Population Survey* to estimate average income and to compare Gini coefficients for alternative income sources. Household income, with an average value of $67,419 in 2002, is associated with a Gini coefficient of 39.77 percent among households. Income from labor tends to be slightly less equally distributed (Gini coefficients in the 40s), and property income is much less equally distributed (Gini coefficients in the 60s). Private and public transfers tend to be concentrated in the few households that qualify.

6. Ethnicity has a significant impact on the distribution of income among households. Households with white, non-Hispanic "heads" have significantly higher than average income, while African-American and Hispanic households have income significantly below average. In the middle are "other" households (Asian and Native American), whose average is not significantly different from that for all households.

7. As education of the head of household increases, household income also increases. Both labor income and household income grow very slowly for the first eleven years of schooling, and then grow rapidly with high school graduation and beyond.

8. Household income changes in the **lifecycle** of the head, growing with experience to the mid-40s, and then tending to decline as age increases.

9. Marriage is a crucial determinant of household income. Households with married men and women have a significantly higher income than households with single heads, regardless of whether the nominal head of the household is male or female. While they have lower average income than households with married heads, households with single-male heads have higher average income than comparable households with female heads.

10. Over time, the distribution of income, as measured by Gini coefficients, tended to become between 1947 and 1970 and has been increasing steadily since that time.

11. Attitudes toward inequality tend to differ between conservatives, who attribute inequality to individual choice or **effort**, and liberals, who attribute inequality largely to **endowment effects.**

12. The trend in the USA is toward greater economic inequality, as the Estate tax disappeared, the income tax became regressive, and markets became less competitive.

Glossary

Economic agents: Buyer and sellers in product or factor markets.

Egoist: The *default* economic assumption toward the welfare of others. An egoist is indifferent to the welfare of others, being willing to change someone else's welfare only if he or she personally benefits from that change.

Altruism, benevolence: The willingness to incur a personal cost to make someone else better off. Like any other good, the welfare improvement desired for another is inversely related to the price one pays.

Malevolence: The willingness to incur a personal cost to make some else worse off.

Common denominator: A basis of comparison common to the phenomena being compared.

Per capita gross domestic product: The market value of the total market value of output produced within a country during a year, divided by population. Per capita GDP, expressed in units of a single currency (e.g., dollars) is the common basis of comparing living standards in different countries.

Lorenz curve: A diagram used to depict economic inequality. The horizontal axis measures the cumulative population distribution from the poorest to the richest unit (person or household), and the vertical axis measures cumulative income. The $45°$ line depicts perfect inequality, and the deviation of the actual Lorenz curve from the 45° line measures the departure from equality.

Gini coefficient: The difference in area between the 45° equality line and the Lorenz curve, divided by the area under the $45°$ line. The Gini coefficient ranges from 0 (absolute equality) to 1 (absolute inequality).

Mean income: Depicted by μ, population mean income is the ratio of total income to the total number of households or people being compared. The sample mean, $\bar{X}$, is the ratio of total income for a statistical sample to the sample size, and is used to estimate the population mean.

Median income: The income at the 50th percentile for all households or people.

Modal income: The largest income class for a population or sample.

Standard deviation: The typical measure of variability of a sample (*s*) or population (σ), computed as the square root of the sum of the squared differences between each observation and the respective mean, divided by the sample size minus 1, or the population size. Using the sample mean and the sample standard deviation allows statisticians to compute the confidence interval for likely values of the population mean.

Statistical inference: The process of estimating population parameters (e.g., μ, σ) from sample statistics (i.e., $\bar{X}$, *s*).

Life-cycle income: The tendency for labor earnings to rise with age early in one's career, then to decline with age later in that career.

Equal opportunity: An ideal state of affairs where every person or household has an equal chance to succeed: a state of affairs with no economic discrimination or endowment effects.

Endowment effect: The advantages stemming from inherited wealth, talent, or social connections that increase the probability of economic success.

Fundamentalism: The resistance of beliefs to contradictory evidence, encountered in religion and political ideology.