

Handout 1: Empirics of Economic Growth

Welcome to 14.451, the introductory course of the macro sequence. The aim of this course is to familiarize you with the mechanics of growth models, and we anticipate that several of the models will provide knowledge spillovers into other courses you take here. It is difficult to say that you have been properly educated in growth theory without having come across the “Lucas quote” (although this statement might be a little dated). So let us begin with it.

Is there some action a government of India could take that would lead the Indian economy to grow like Indonesia’s or Egypt’s? If so, what, exactly? If not, what is it about the “nature of India” that makes it so? The consequences for human welfare involved in questions like these are simply staggering: once one starts to think about them, it is hard to think about anything else.

Lucas [JME 1988]

This is the fundamental question we are grappling with; but in order to shed light upon this question we need to try to understand the sources of sustained economic growth. That is the object of the course. The purpose of this handout is to explore in further detail some of the empirical aspects of growth covered in the first lecture.

1. Historical Comparisons of Growth Performance

The lecture notes highlighted the dispersion in incomes per capita and post-WWII growth rates. To provide further illustration, in Figure 1 below plots the real GNP per capita of several countries in 1992 against the historical performance of the US economy, using data from Maddison (1995). In 1992 Argentina’s income per capita was comparable to the US income per capita around World War II, and Pakistan’s income per capita in 1992 was below the US level of 1870. The differences are the product of many years of sustained growth.

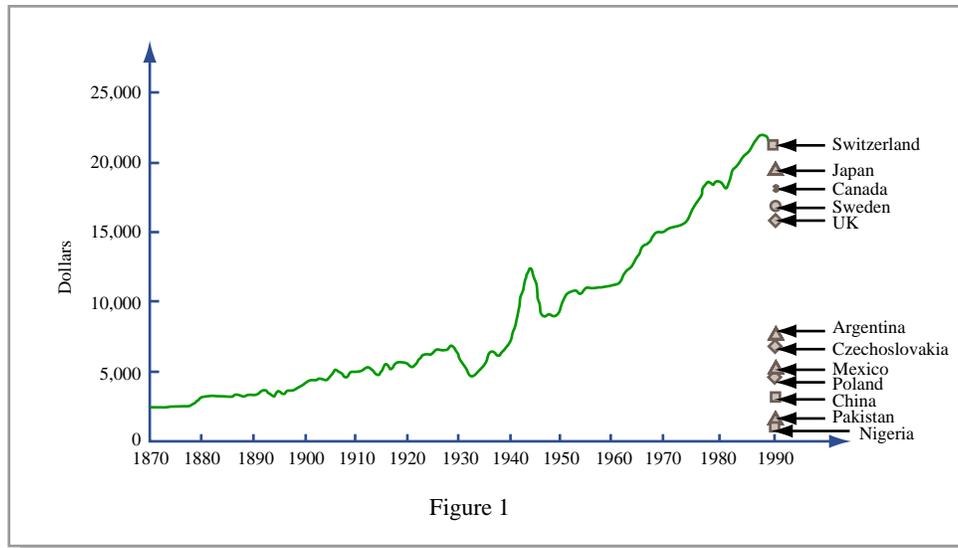


Figure 1

Figure by MIT OCW.

Figure 1: Data from Maddison (1995). Adapted from Figure 1.2, p. 3, in Helpman (2004).

How has the the performance of the world economy fared over time? The answer to this is in Figure 2. Clearly, world growth picked up momentum during the Industrial Revolution, and reached a peak of nearly 3 percent per annum during the 1950-1973 period, also known as the “Golden Age” of growth. Since 1998, world growth has been resurgent. Global output rose by 4.9% in 2004, led by China (9.1%), Russia (6.7%), and India (6.2%).

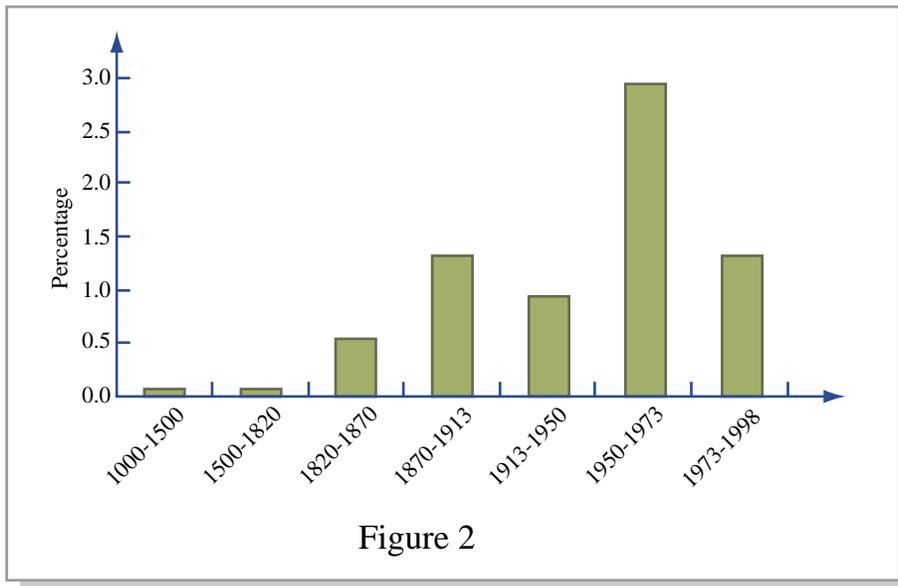


Figure by MIT OCW.

Figure 2: Data from Maddison (2001). Adapted from Figure 1.5, p. 7, in Helpman (2004).

2. Empirical Results on Convergence

Convergence in the unconditional distribution requires that poorer countries get relatively richer over time. As mentioned in the lecture notes, the world income distribution is remarkably persistent. Figure 3 below plots growth rates of countries over 1965-85 against their initial income level in 1965. Unconditional convergence implies a negative slope. On the contrary, the regression line is virtually flat and, if anything, gently upward sloping. Therefore those countries that are rich in 1965 have grown faster in the subsequent 20 year period.

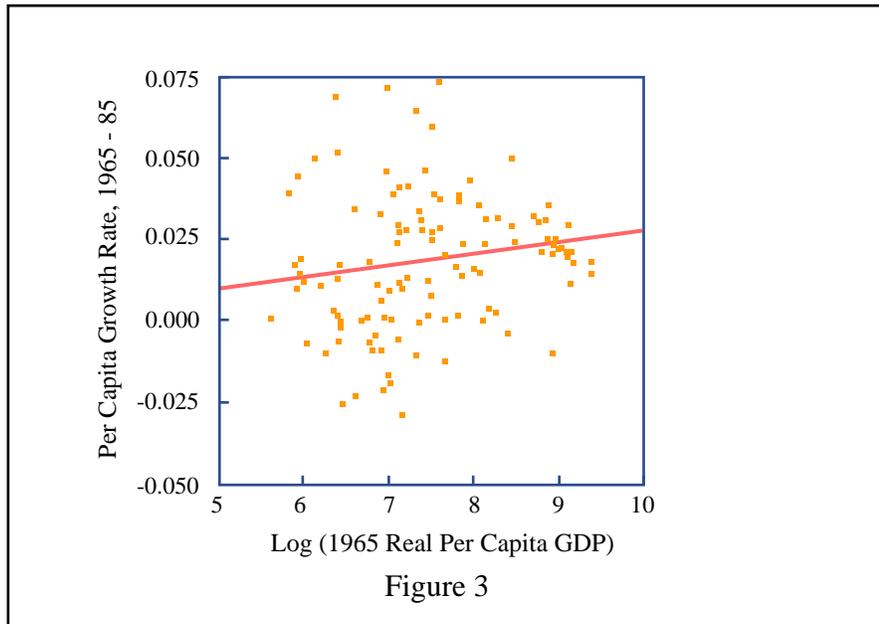


Figure by MIT OCW.

Figure 3: Data from Summers and Heston (1993). Adapted from Figure 12.2, p. 420, in Barro and Sala-i-Martin (1999).

At one level, this is not surprising. If a country differs from another along key parameters such as human capital and physical investment rates, there is little reason to expect them to converge. On the other hand, we would expect regions with very similar underlying characteristics to converge (conditional convergence). One method that has been used in an attempt to control for differences in steady states is to use “Barro” growth regressions. Another approach has been to restrict attention to countries or regions which are known to have similar characteristics. The restricted subset of countries tends to exhibit convergence. Examples include OECD countries, US states (Figure 4), European regions (Figure 5), and Japanese prefectures (Figure 6).

For more detail consult Barro and Sala-i-Martin (1999).

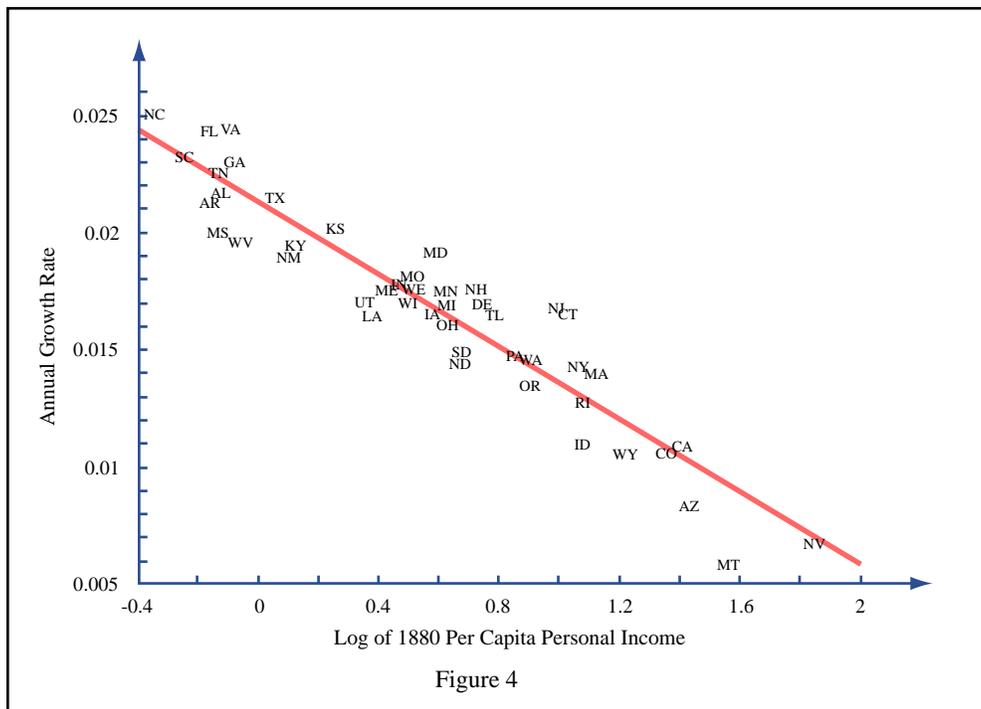


Figure 4

Figure by MIT OCW.

Figure 4: Adapted from Figure 11.2, p. 389, in Barro and Sala-i-Martin (1999).

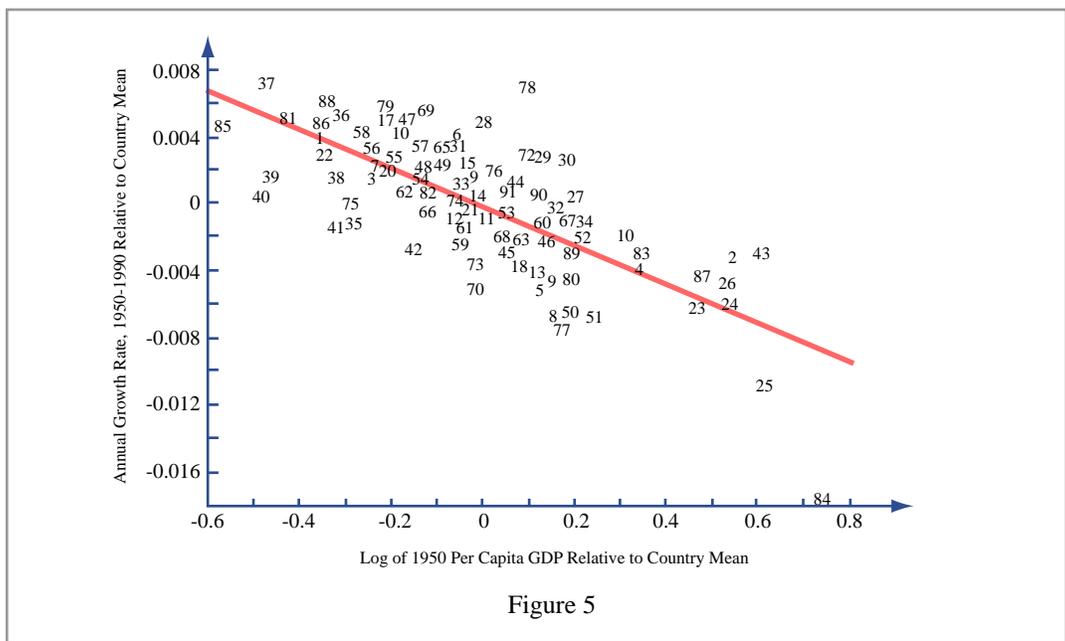


Figure 5

Figure by MIT OCW.

Figure 5: Adapted from Figure 11.8, p. 399, from Barro and Sala-i-Martin (1999).

3. Distribution of Income Between and Within Countries

Figure 7 below plots the distribution of GDP per worker relative to the United States in 1960 and 1990. In both periods, countries have been sorted in ascending order of productivity, and each country is treated as a single unit. It is true that the reordering of countries between periods (many countries have moved from one percentile of income to another) makes the figure easy to read but difficult to use in order to derive the dynamics of individual economies. Jones (1997) points out that there is a break in the 70th percentile of the distribution. Above this level of income, there has been a flattening of the income distribution. Below the threshold (i.e. for 2/3 to 3/4 of the distribution), there has been significant divergence.

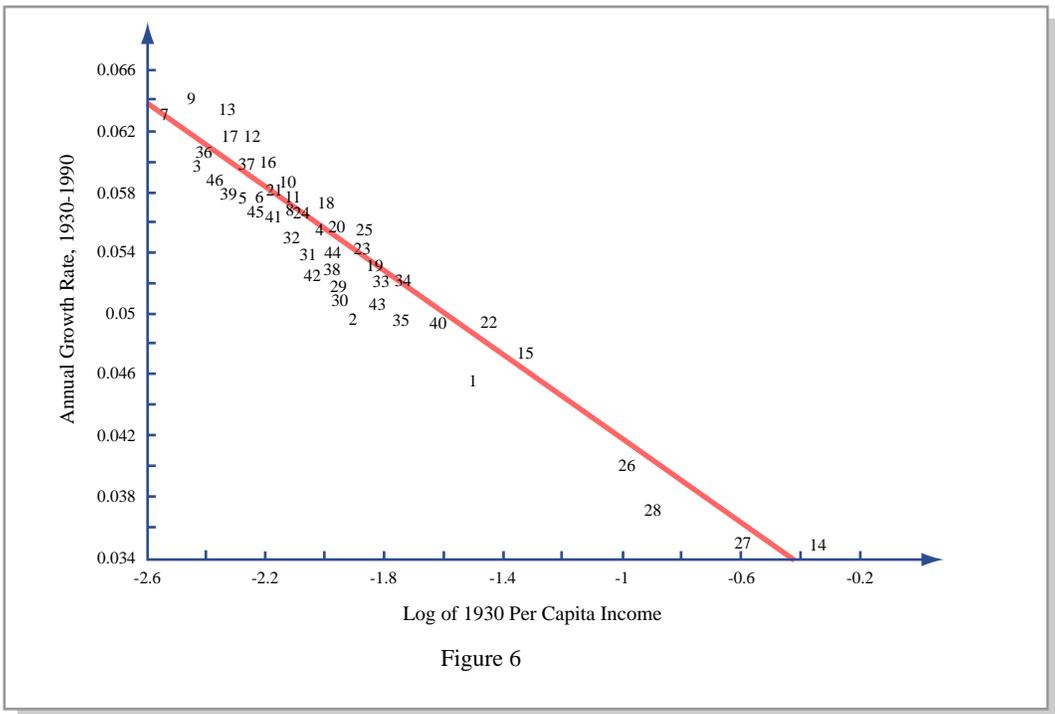


Figure 6

Figure by MIT OCW.

Figure 6: Adapted from Figure 11.5, p. 395, from Barro and Sala-i-Martin (1999).

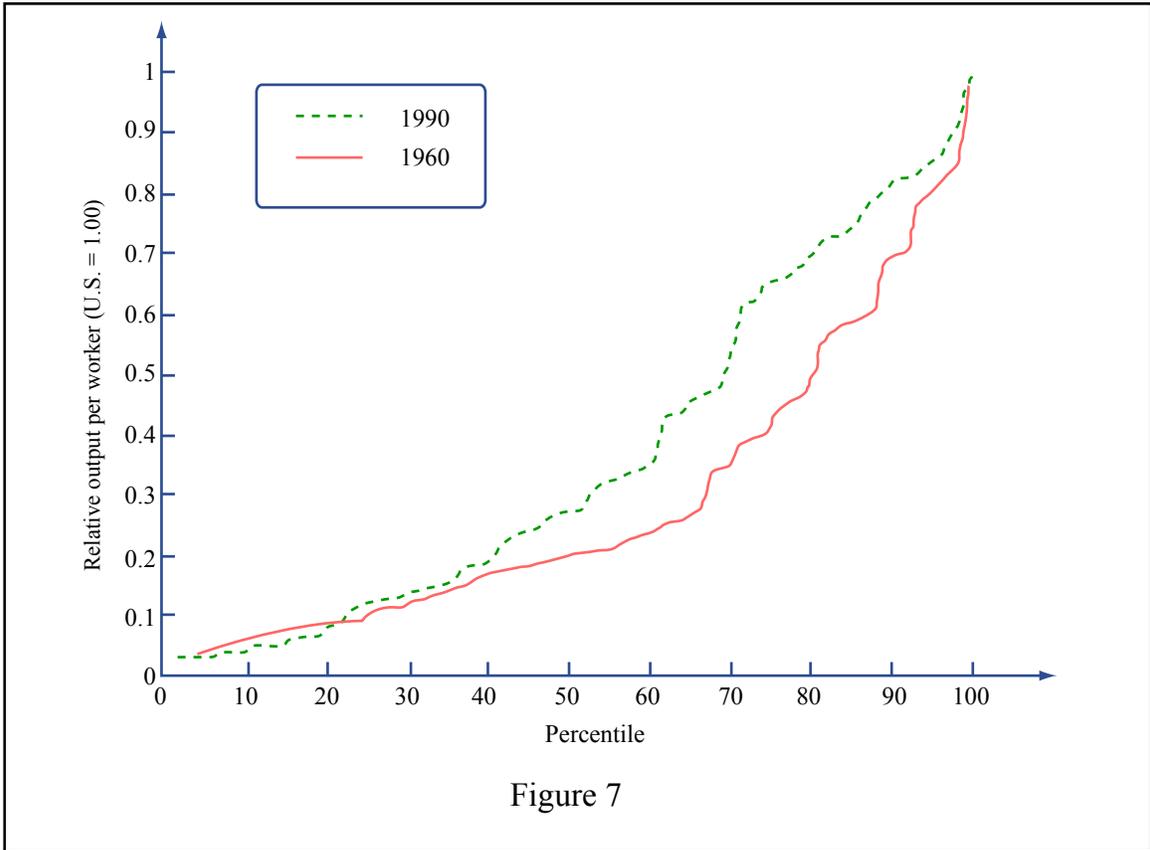


Figure 7

Figure 7: Adapted from Figure 1, p. 134, in Jones (1997)

Figure by MIT OCW.

An interesting issue is the level of inequality between and within countries. World income inequality can be measured by a variety of methods, but the Gini coefficient and the Theil index are most common. Both are equal to 0 when incomes are distributed equally, and rise to 1 as the income distribution gets more and more extreme. The Theil index can be decomposed into between and within contributions to world inequality, and this is the measure employed in the following diagrams (Figures 8 and 9). (Take the early 1800s numbers with a pinch of salt.)

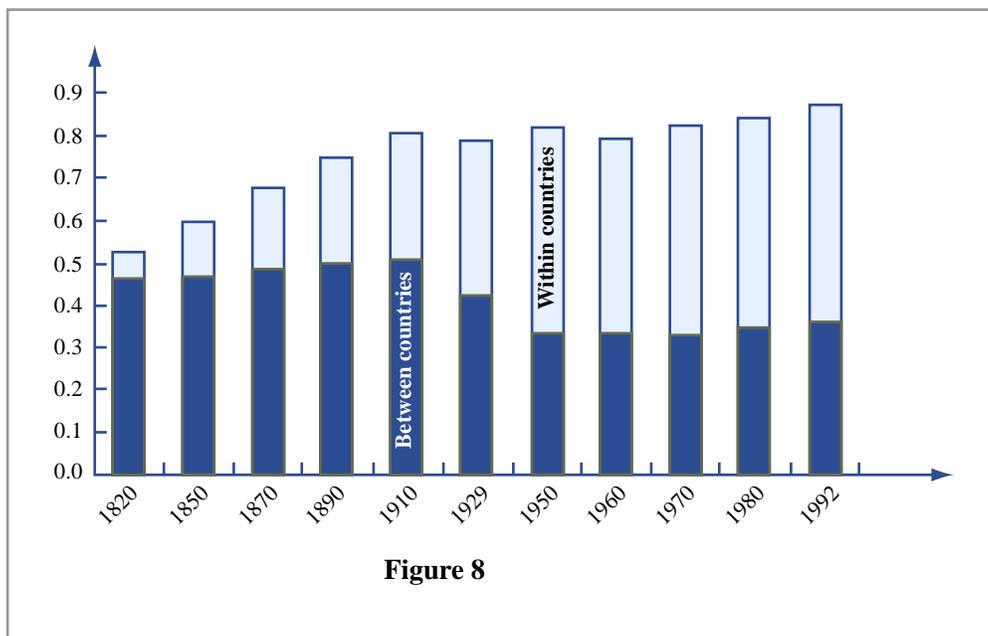


Figure by MIT OCW.

Figure 8: Data from Bourguignon and Morrisson (2002). Adapted from Figure 6.2, p. 89, in Helpman (2004).

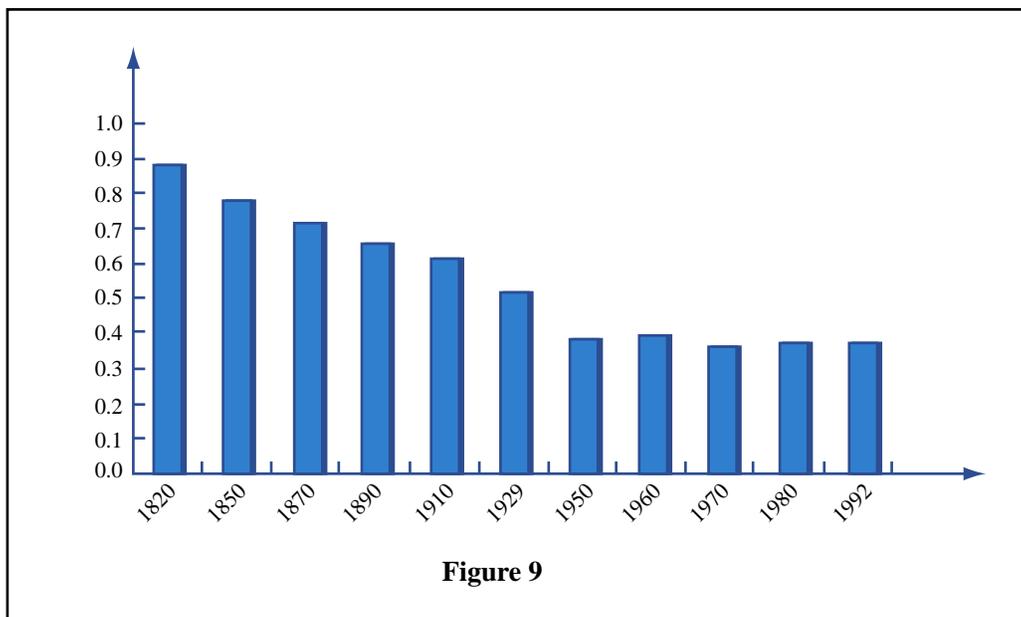


Figure 9: Data from Bourguignon and Morrisson (2002). Adapted from Figure 6.3, p. 90, in Helpman (2004).

Figure by MIT OCW.

On this measure, aggregate inequality rose during the nineteenth century, but not so much in the twentieth century. Within country inequality rose up to WWII, then fell until the 1970s before rising moderately. Inequality between countries did not diminish in the post-WWII period, a fact consistent with the empirical evidence presented earlier in this handout. The share of within country inequality in overall world income inequality was high in 1820, but fell sharply until WWII. Thereafter it stabilized, indicating that within and between trends were roughly in line with each other.

4. Does economic growth help the poor?

Economic growth figures usually deal with averages. In this section I will try to show that in general, economic growth matters at least in part for the poorest members of society as well. Figure 10 below shows that the share of the poorest in world personal income has shrunk over time, although the rate of decline was markedly lower after WWII. The Figure 11 comes from the work of Dollar and Kraay (2002), who showed that the average real income per capita of a country's poorest quintile moves almost one for one with the average real income per capita of the country's entire population. Of course, this is just a correlation rather than necessarily causation, but it is hard to argue that there is no "trickle down" effect at all. Thus, it is to be hoped that the recent high rates of economic growth in some developing countries should contribute to poverty reduction goals.

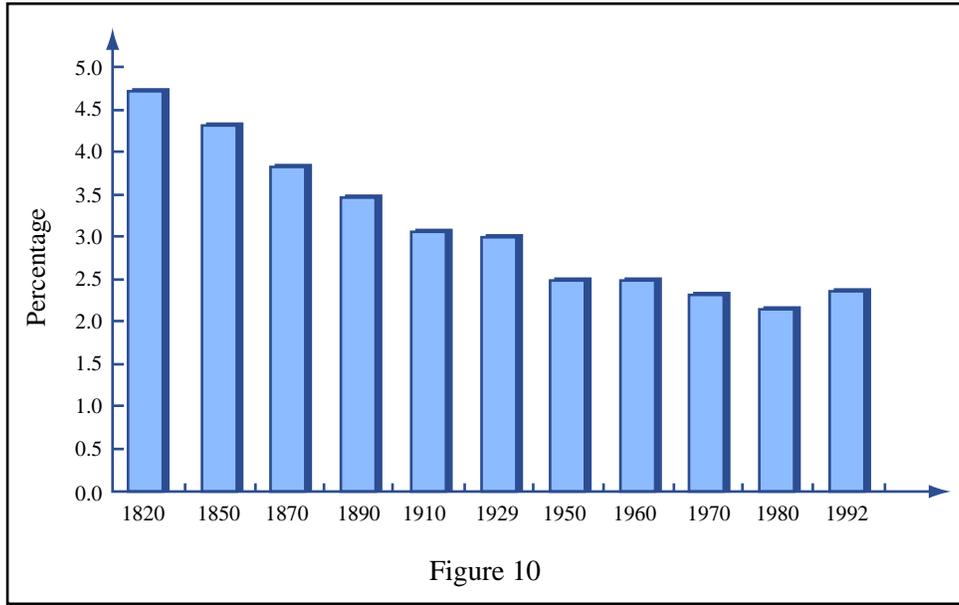


Figure by MIT OCW.

Figure 10: Data from Bourguignon and Morrisson (2002). Adapted from Figure 6.7, p. 106, in Helpman (2004).

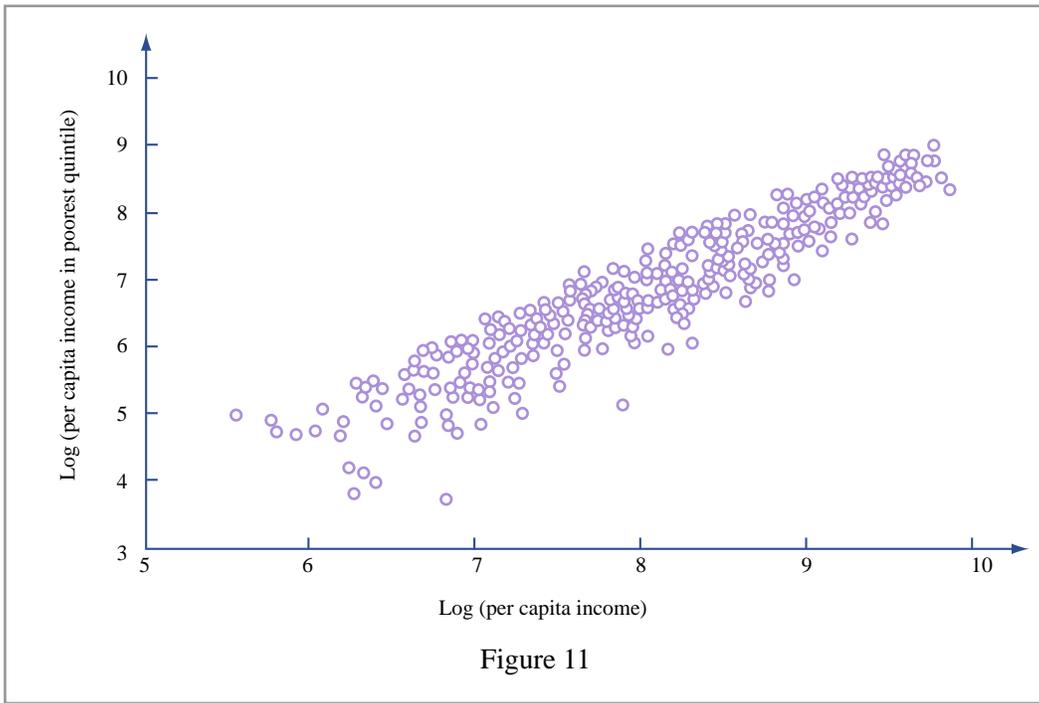


Figure by MIT OCW.

Figure 11: Data from Dollar and Kraay (2002). Adapted from Figure 6.9, p. 109, in Helpman (2004).

Bibliography

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