

Some growth facts

1. How is the world income distribution evolving?

Main points of Section I.1-I.2 in B & S are the following facts:

1. There are huge differences in income per capita across countries (order of magnitude is 1:70).
2. Even over long periods growth rates differ across the countries and regions in the world.
3. Small, but persistent differences in growth rates matter a lot in the long run.

Looking at the period after 1960 we can add the following observations:

4. At the global level there is not income convergence as measured by the standard deviation of the log of income per capita unweighted by population size. Rather there is a tendency to divergence (B & S, pp. 2-3).

5. But if the standard deviation is calculated using weights according to population size, then there is a (weak) tendency to income convergence (Sala-i-Martin, 2006). The very high growth rates in India and China the last 15 years are important in the explanation of this.

6. Looking at the world personal income distribution, the skewness, as measured by for example the Gini-index, seems slightly diminishing over the period 1980-2000 (B & S, p. 10).

7. The proportion of world population that is poor (income less than one 1985 dollar per day) has diminished from around 20 % in 1970 to around 7 % in 2000 (B & S, pp. 10-11).

The points 6 and 7 are based on microeconomic survey data for 126 countries, as analyzed in a study by Sala-i-Martin (2006). Because of the many uncertainties in the data, point 6 cannot yet be considered a firmly established fact. Actually, also the GDP and employment data are poor for

many of the countries in the B & S data set.

2. Economic long-run trends: Kaldor's stylized facts

Kaldor's "stylized facts" of economic growth (Kaldor 1961) in the most developed countries in the last century are listed in B & S, p. 12.¹

1. Real output per worker (in principle, per man-hour) grows at a more or less constant rate over fairly long periods of time. (Of course, there are short-run fluctuations superposed around this trend.)²
2. The stock of physical capital (crudely measured) grows at a more or less constant rate exceeding the rate of growth of the labour input.
3. The ratio of output to capital shows no systematic trend.
4. The rate of return to capital shows no systematic trend.
5. The income shares of labour and capital (broadly defined, including land and other natural resources), respectively, are nearly constant.
6. The growth rate of output per worker differs substantially across countries.

The figures 1 – 5 below illustrate, for USA, the first five "stylized facts".³ As Solow remarked in 1970 about Kaldor's stylized facts (see Solow 2000, p. 2): "There is no doubt that they are stylized, though it is possible to question whether they are facts. Facts or not, they are what most of the theory of economic growth actually explains ...". It turns out that the "facts" fit the development of the USA since 1870 somewhat better than that of other developed countries. For a sceptical view, see Ben-David and Papell (1995), who claim that economic growth after WWII has been almost doubled in most industrial countries compared to the period between 1870 and WWII (roughly).⁴

1 Kaldor (1961).

2 B & S, p. 12, refer to output per capita rather than output per worker, but Kaldor himself referred to "labour productivity" (Kaldor, p. 178). The statement is roughly valid for both, at least for the USA.

3 The figures have been provided by my former colleague, Jakob Brøchner Madsen, now at Monash University, Australia.

4 See also P. Romer (1989).

Figure 1. Output per Worker. USA

Logs

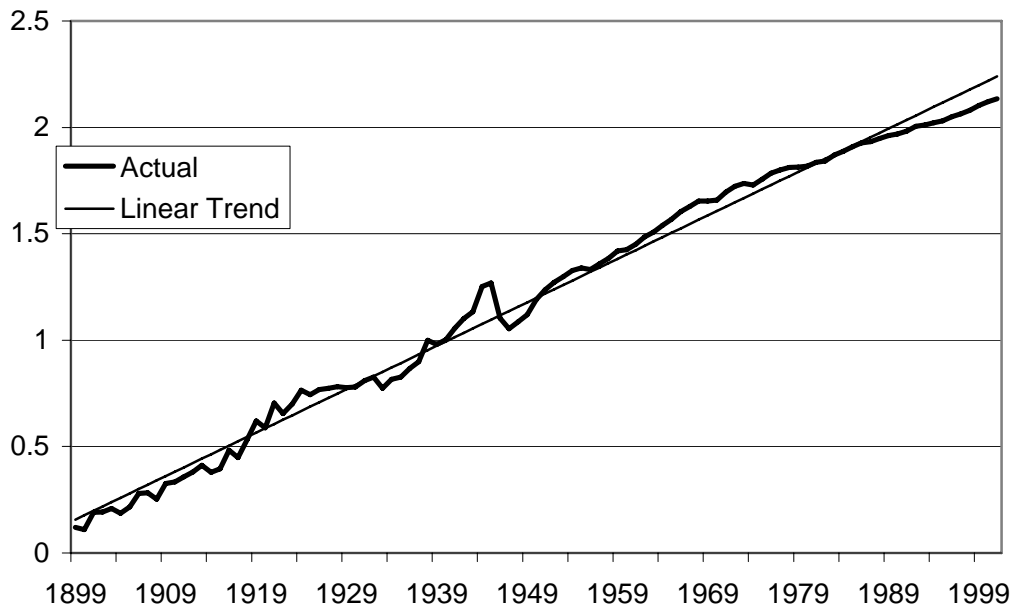


Figure 2. Capital per Worker. USA

Logs

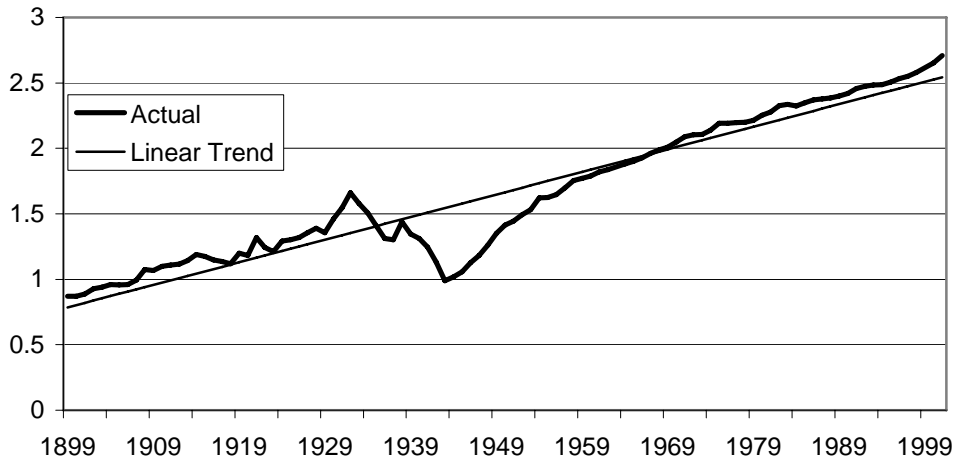


Figure 3. Output-Capital Ratio, USA

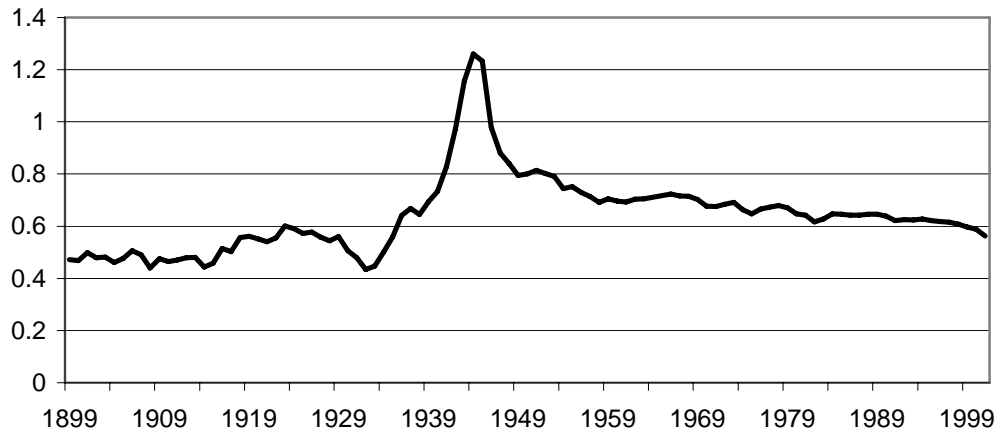
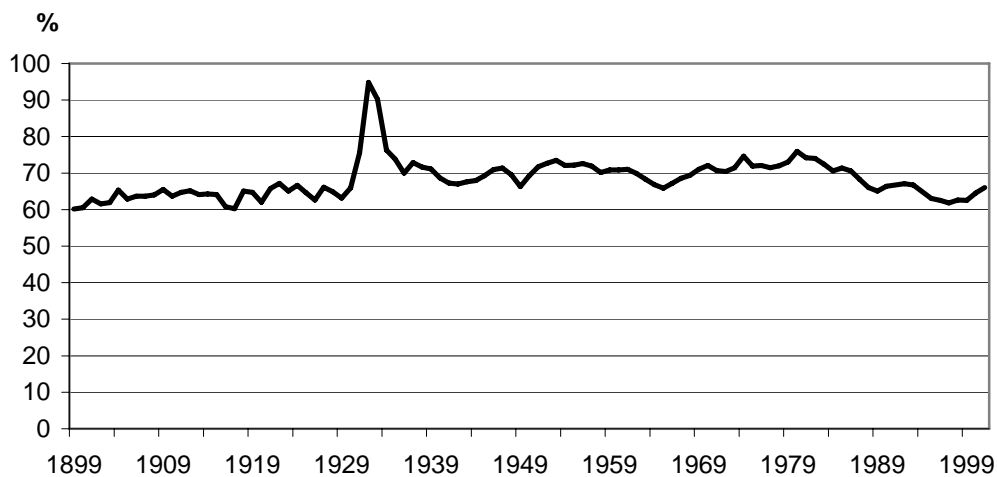


Figure 4. Labour's Income Share in Manufacturing, USA



If we think Figure 3 and 4 indicate a fairly constant capital output ratio and a fairly constant income share of labour, then Kaldor's fact no. 3 follows, namely that the rate of return to capital is fairly constant. Kaldor's sixth "fact", that the growth rate of output per capita differs substantially across countries, was mentioned as point 2 in the previous section and is documented for example in B & S, Figure I.3, p. 5.

2. Data on other aspects of economic development

2.1 Medium-term fluctuations

If we are interested also in *medium-run* facts, we could add that:

The rate of unemployment fluctuates a lot.

This is indicated by Figure 5 as far as the industrial leader, USA, is concerned.



2.2 The Kuznets facts

Another well-known characteristic of modern economic growth is structural change:

Unbalanced sectorial growth: there is a massive reallocation of labour from agriculture into manufacturing and further into services.

The two next figures illustrate this.⁵

⁵ The figures are taken from Kongsamut et al., *Beyond Balanced Growth*, *Review of Economic Studies*, vol. 68, Oct., 869-82.

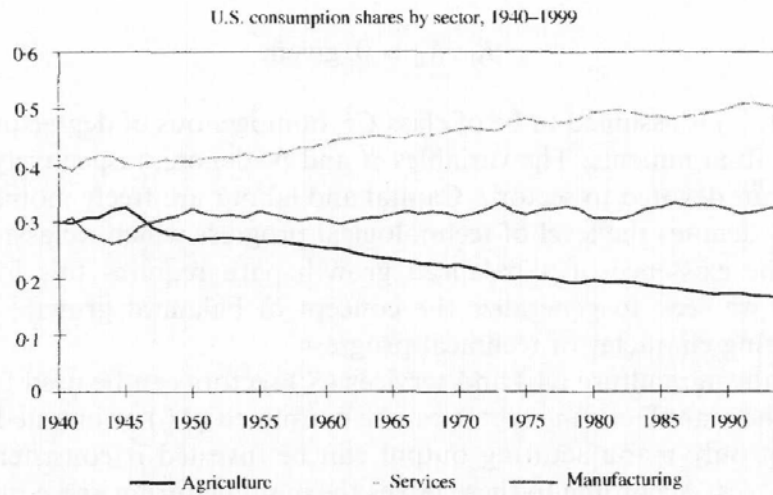
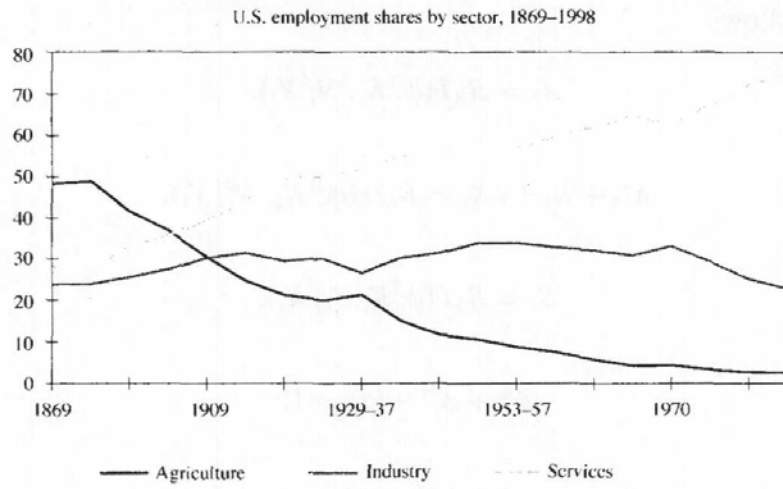


FIGURE 2
The Kuznets facts

2.3 Falling relative price of capital equipment, investment-specific technical change

Also the next graph is based on US data.

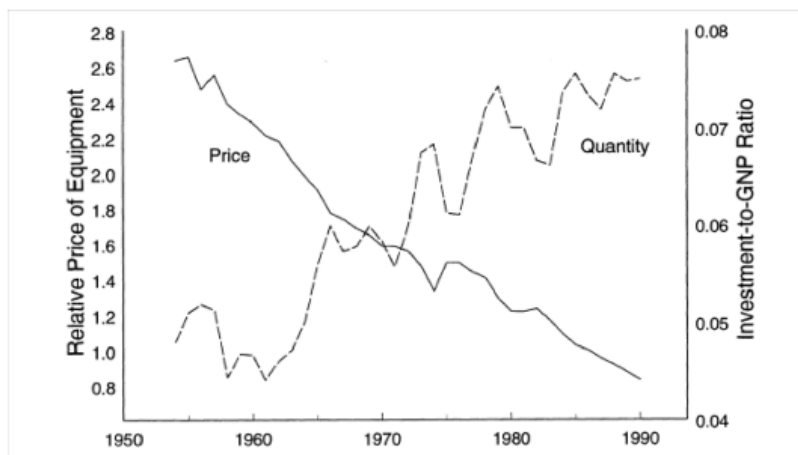


Figure 1: Relative price of equipment and investment in equipment.

Source: Greenwood, Hercowitz, and Krusell (AER 1997).

$g_p = -0.03$ per year.

Correlation between detrended p and detrended I/GDP is -0.46 .

Embodied technical change explains 60% of growth in output per man hour.

3. Jones and Romer's new Kaldor facts

1. **Increases in the extent of the market.** Increased flows of goods, ideas, finance, and people — via globalization as well as urbanization — have increased the extent of the market for all workers and consumers.
2. **Accelerating growth.** For thousands of years, growth in both population and per capita GDP has accelerated, rising from virtually zero to the relatively rapid rates observed in the last century.
3. **Variation in modern growth rates.** The variation in the rate of growth of per capita GDP increases with the distance from the technology frontier.
4. **Large income and TFP differences.** Differences in measured inputs explain less than half of the enormous cross country differences in per capita GDP.
5. **Increases in human capital per worker.** Human capital per worker is rising dramatically throughout the world.
6. **Long-run stability of relative wages.** The rising quantity of human capital relative to unskilled labor has not been matched by a sustained decline in its relative price.

4. Divergence. Big time.

Lance Pritchett (1997): Since the industrial revolution, in particular since 1870, and up to, say, 1990, there has at the global level been sizeable income divergence. Countries not taking part in the industrialization process lacked behind.

Table 2

Estimates of the Divergence of Per Capita Incomes Since 1870

	1870	1960	1990
USA (P\$)	2063	9895	18054
Poorest (P\$)	250	257	399
	(assumption)	(Ethiopia)	(Chad)
Ratio of GDP per capita of richest to poorest country	8.7	38.5	45.2
Average of seventeen "advanced capitalist" countries from Maddison (1995)	1757	6689	14845
Average LDCs from PWT3.6 for 1960, 1990 (imputed for 1870)	740	1579	3296
Average "advanced capitalist" to average of all other countries	2.4	4.2	4.5
Standard deviation of natural log of per capita incomes	.51	.88	1.06
Standard deviation of per capita incomes	P\$459	P\$2,112	P\$3,988
Average absolute income deficit from the leader	P\$1286	P\$7650	P\$12,662

Notes: The estimates in the columns for 1870 are based on backcasting GDP per capita for each country using the methods described in the text assuming a minimum of P\$250. If instead of that method, incomes in 1870 are backcast with truncation at P\$250, the 1870 standard deviation is .54 (as reported in Figure 1).

References

- Jones, C.I., and P. M. Romer, 2009, The new Kaldor facts: Ideas, institutions, population, and human capital, WP, June 2009.
- Kaldor, N., 1961,
- Kongsamut et al.,
- Pritchett, L., 1997, Divergence – big time, *Journal of Economic perspectives*, vol. 11, no. 3.
- Sala-i-Martin, X, 2006, The world distribution of income: Falling poverty and ... convergence, period, *Quarterly Journal of Economics* 121, No. 2, 351-397.
- Romer, P., 1989,

Appendix

The data for Figure 1-5 above were provided by my former colleague professor Jakob B. Madsen (now at Monash University, Australia), who describes the data sources this way: Unemployment. 1899-1930, C Romer, 1986, “Spurious Volatility in Historical Unemployment Data,” *Journal of Political Economy*, 94, 1-37. 1931-39: M R Darby, 1976, “Three and a Half Million US Employees have been Mislead: Or, and Explanation of Unemployment,” *Journal of Political Economy*, 84, 1-16. 1940-2001: BEA. Labour’s income Share. Manufacturing data are used except over the periods 1899-1918 and 1935-1959, where data for the corporate non-agricultural sector are used. 1899-1909 and 1935-49: Robert F Martin, 1939, *National Income in the United States: 1799-1938*, National Industrial Conference Board Studies No 241, NY. 1909-1919: George J Schuller, 1953, “The Secular Trend in Income Distribution By Type, 1869-1948: A Preliminary Estimate,” *Review of Economics and Statistics*, 302-324, based on King's estimates. 1919-34: Simon Kuznets, 1975, *National Income and Capital Formation 1919-1935*, NY: Arno Press. 1950-1950: Liesner, T, 1989, *One Hundred Years of Economic Statistics*, Oxford: The Economist, Table US. 6. Investment and capital stock. The capital stock is generated using the inventory perpetual method with 8% depreciation rate. The following sources are used for investment. 1834-1909: Paul W Rhode, 2002, “Gallman’s Annual Output Series for the United States, 1834-1909,” NBER Working Paper 8860. 1909-1970: Liesner (*op cit*). 1970-2001: OECD, *National Accounts*, Paris. Real GDP. Angus Maddison, 1995, *Monitoring the World Economy 1820-1992*, Paris: OECD. Updated using OECD, *National Accounts*, Vol. 2, Paris