Fletcher School, Tufts University

16. Key Facts about Long Run Economic Growth

E212 Macroeconomics

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How we Measure and Compare Living Standards

Living standards are usually measured by annual Gross National Income (GNI) per capita, or annual Gross Domestic Product (GDP) per capita.

However, in order to perform cross country comparisons, per capita income must be measured in comparable units. This requires the transformation of per capita incomes in a common currency, usually the US dollar, and common prices.

So, when we focus on comparing standards of living, we get more meaningful comparisons by correcting for the two effects we just discussed—variations in exchange rates, and systematic differences in prices across countries. The details of constructing these differences are complicated, but the principle is simple: The numbers for GNI and GDP—and hence for GNI and GDP per person— are constructed using a common set of prices for all countries. Such adjusted real GDP numbers, which you can think of as measures of purchasing power across time or across countries, are called *purchasing power parity* (PPP) numbers.

The Penn World Table project, the Maddison Project, the World Bank and other international organizations such as the IMF and the OECD compile and publish such internationally comparable measures of living standards based on PPPs.

The Penn World Tables and Maddison Project Data

The *Penn World Tables* (PWT) is a set of national-accounts data originally developed at the University of Pennsylvania and currently maintained by scholars at the University of California, Davis and the Groningen Growth Development Centre of the University of Groningen.

The objective is to measure internationally comparable real GNI, GDP and other aggregates across countries and over time. Successive updates have added countries (currently 167), years (1950-2014), and data on capital, productivity, employment and population.

The current version of the database, version 9, allows for comparisons of relative GDP per capita, as a measure of standard of living, the productive capacity of economies and their productivity level. Compared to other databases, such as the World Bank's World Development Indicators, the time period covered is larger and there is more data that is useful for comparing productivity across countries and over time.

The database gets its name from the original developers at the University of Pennsylvania, Robert Summers, Irving Kravis and Alan Heston.

The *Maddison Project*, also known as the Maddison Historical Statistics Project, is a project to collate historical economic statistics, such as GDP, GDP per capita, and labor productivity. It was launched in March 2010 to continue the work of the late economic historian Angus Maddison who started producing historical statistics in the 1980s. The project is under the Groningen Growth and Development Centre at the University of Groningen, which also hosts the Penn World Tables.

Cross Country Differences in per Capita Output and Income

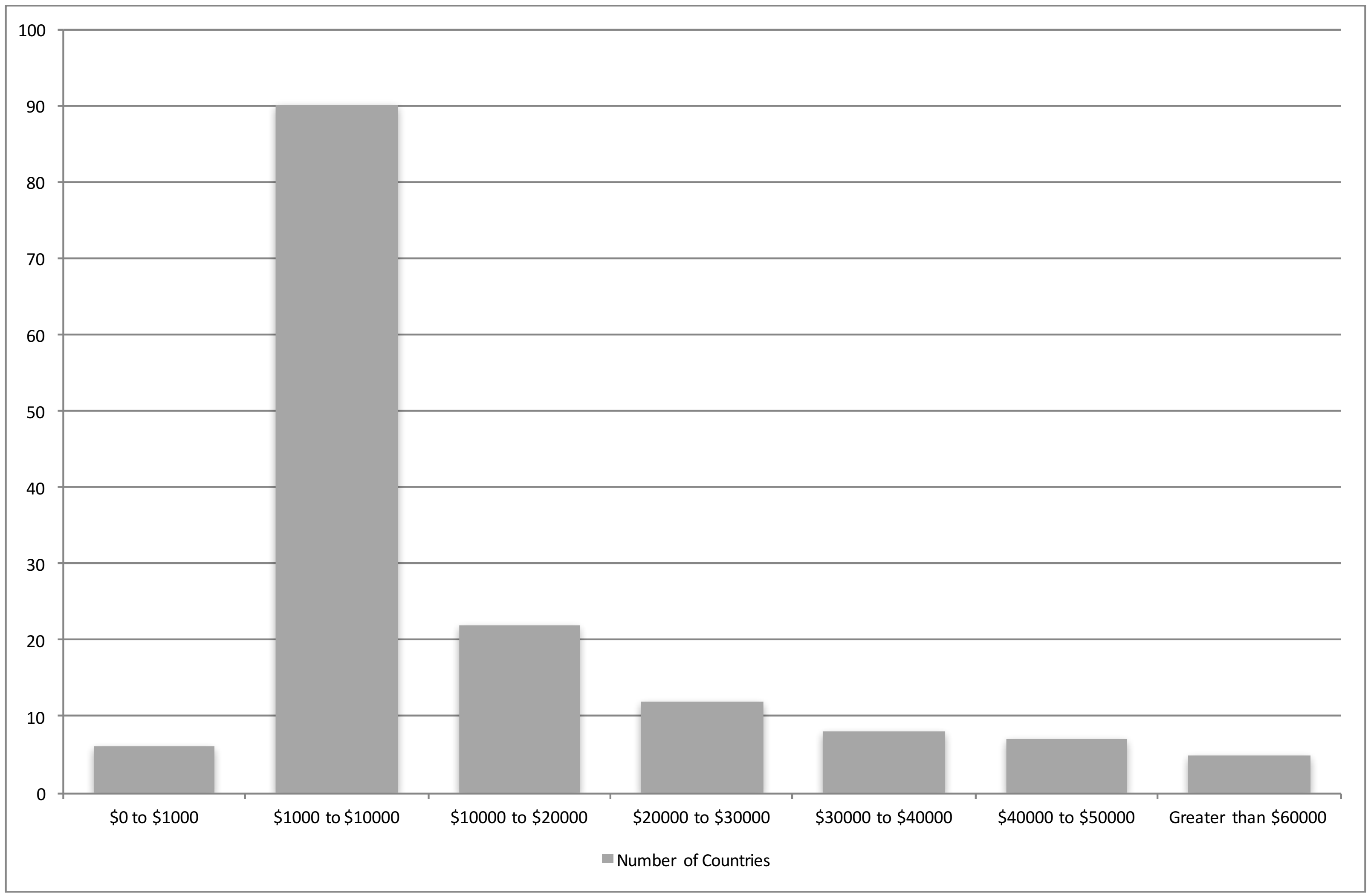
The world today consists of countries characterized by very large differences both in the standard of living of their inhabitants, and the rate of growth of their living standards.

The World Bank publishes comparable data, in international US dollars, measuring the per capita Gross National Income (GNI) of 214 countries of the world.

For 2012 the relevant data existed for 184 countries. The average per capita GNI of countries classified as *high income economies* was $39,903, while the average per capita GNI of *low income economies* was $1,870. Thus, the per capita income of high income (developed) economies was on average 20 times higher than that of low income, or least-developed economies.

The average per capita income of *middle income economies* was equal to $9,075. The per capita income of high income (developed) economies was thus on average 4 times higher than that of middle income economies, whose own per capita income was on average 5 times higher than the low income economies.

The Distribution of Countries according to per capita GNI 2012



The Distribution of Countries according to per capita GNI 2012

Five countries (Qatar, Macau, Singapore, Bermuda and Norway) had GNI per capita above $60,000.

Seven countries (United Arab Emirates, Luxembourg, Switzerland, Saudi Arabia, Oman, the USA and Hong Kong) had GNI per capita between $50,000 and $60,000.

Eight developed European economies, as well as Australia and Canada, had GNI per capita between $40,000 and $50,000.

Twelve countries (including France, Great Britain, Japan, Italy, N. Korea, Spain, New Zealand and Israel) had GNI per capita between $30,000 and $40,000.

Twenty-two countries (including Greece, Cyprus, and Russia) had GNI per capita between $20,000 and $30,000.

Forty countries (including Turkey, Brazil and China) had GNI per capita between $10,000 and $20,000.

Ninety countries, about half of the 184, had a GNI per capita between $1,000 and $10,000. These included India, with per capita GNI of $5,080.

Finally, six countries in sub-Saharan Africa, had per capita GNI of less than $1,000.

The Historical Evolution of per capita Output and Income: 1 AD to the 19th Century

Reliable data on the per capita output and income of various countries and their growth rates before 1820, is extremely rare.

The estimates of Maddison [1982], based on heroic assumptions, suggest that the average growth rate of real world GDP per capita in the two centuries between 1500-1700 AD was only 0.04% per annum. In the period 1700-1820 AD it was slightly higher, at just 0.07% per annum. Even in Western Europe, for which the period 1500-1820 was one of relative economic prosperity compared to other world regions, the average growth rate of GDP per capita did not exceed 0.14% per annum.

Before 1500, all indications suggest that the standard of living, despite large cyclical fluctuations, displayed no long-term trend.

A second feature of the period before 1820 was that income differences between countries were very small compared to today. According to the estimates of Bairoch [1993], the differences in living standards between the richest and the poorest countries did not exceed 1.5-2.0 to 1.

The Rise of Western Europe since 1500 AD

Bairoch estimates that there were no significant differences in living standards between Rome in the 1st century AD, the Arab caliphates in the 10th century AD, China in the 11th century, India in the 17th century and Europe in the early 18th century.

In the 15th century AD, before the economic boom in Europe, China, the Ottoman Empire, the Incas and the Aztecs seem to have had a higher standard of living than Western Europe. However, economic growth in Western Europe picked up after 1500 AD, while China entered a long period of economic decline.

The Modern Period of Economic Growth

The average growth rate of world per capita output increased between 1820 and 1870, reaching 0.5% per annum. Between 1870 and 1950 the average growth rate doubled to 1.1%, and since 1950 it doubled again to over 2%. Between 1950 and the early twenty-first century, many countries have seen their standard of living to more than triple.

As a result, in the high income countries of today, real per capita output and income is, depending on the country, between 10 and 30 times higher than it was two hundred years ago.

The increase in per capita output and income is not, and has not been uniform. After centuries of stagnation in the average standard of living of all countries of the world, the average growth rate began to rise in Europe and its former colonies, such as the USA, Canada and Australia, from the early 19th century. In other countries, such as Japan, the growth process started later, and in China and India even later.

The Uneven Growth Process, 1820-2017

In 1820, the more developed countries had a per capita GDP which was about three times the per capita GDP of less developed countries. In 2012, it was about twenty (20) times higher.

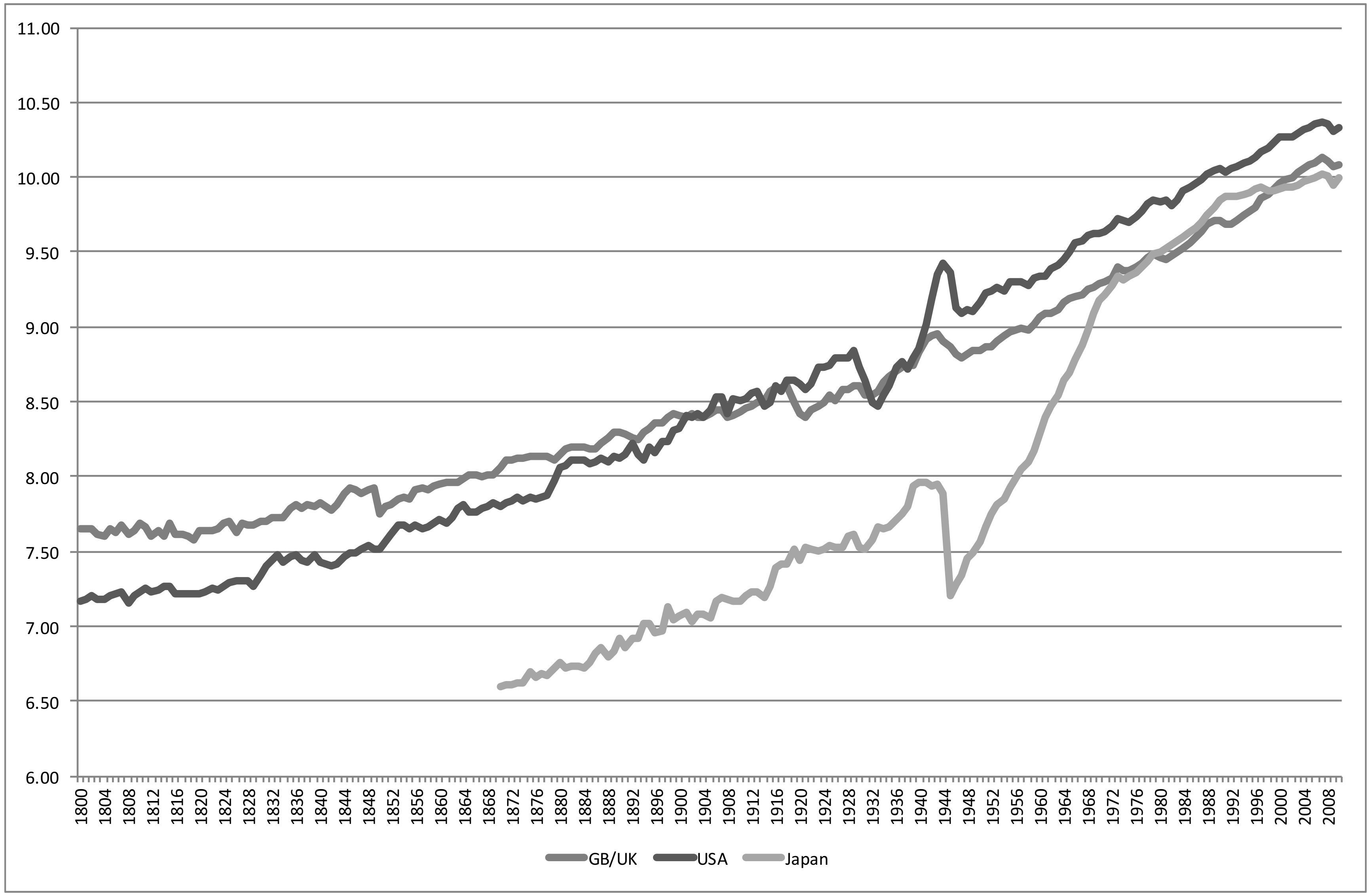
The former colonies of Western Europe (USA, Canada, Australia and New Zealand) in 1820 had a slightly lower standard of living compared to Western Europe itself. In 1950 they had twice the per capita income of Western Europe.

Japan surpassed the standard of living of Eastern Europe, Latin America, the former Soviet Union and Western Europe in the second half of the 20th century.

China, which had become one of the poorest countries in the world in 1950, in 2010 had a per capita income which was more than double the per capita income of India and Africa.

Latin America, parts of Asia and Africa have been generally left behind.

Long Run Growth in Britain, the USA and Japan (GDP per capita, log scale)



Long Run Growth in Britain and the USA

In 1800, British per capita GDP was more than 60% higher than in the USA.

At the beginning of the 20th century, per capita GDP in the USA had surpassed the corresponding British one, because of the higher growth rate in the USA during the 19th century.

The two World Wars led to a widening of the gap between the USA and Britain, despite the fact that the Great Depression of the 1930s was more severe in the USA.

After the Second World War, per capita output in the USA has remained consistently higher than in Britain and the other main industrial economies.

Long Run Growth in Japan

GDP per capita in Japan, for which continuous annual estimates exist only after 1870, has been consistently lower than the British and American one in the 19th century. In 1870, it was only 23% of the corresponding British one, and only 30% of the American one.

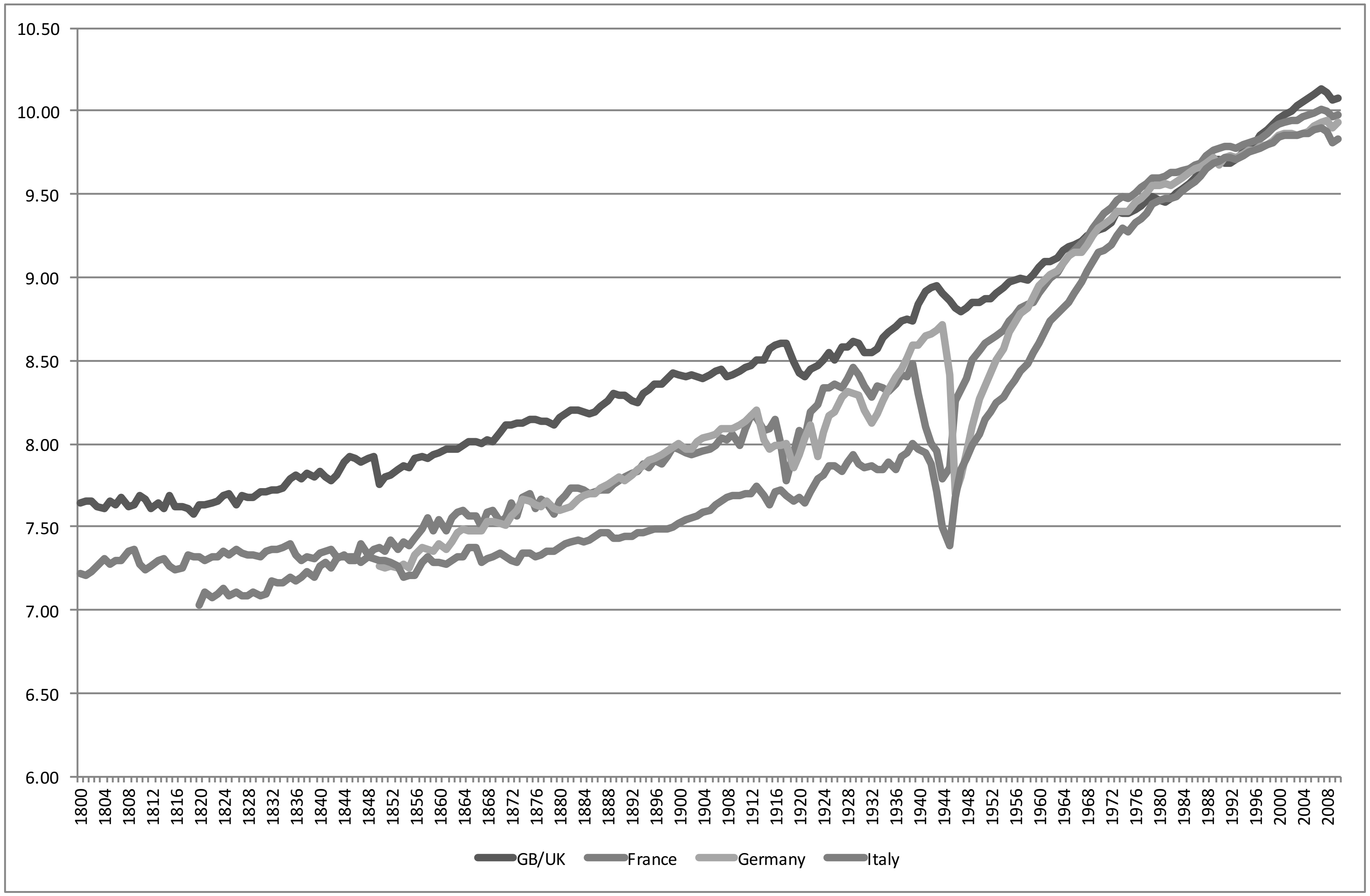
By 1913, on the eve of World War I, it had risen to 28% of the British per capita GDP, but had fallen to 26% of the US per capita GDP. Japan had experienced slightly higher growth than Britain, but lower growth that the USA.

By 1939, on the eve of World War II, GDP per capita in Japan had risen to 45% of the corresponding one in Britain, and to 43% of the corresponding one in the USA. Japan experienced much higher growth than Britain and the USA during World War I and the interwar years. Japanese per capita output fell precipitously in the aftermath of World War II, much more than in Britain and the USA.

However, since the end of the World War II, Japan has experienced extremely high growth, and, by the mid-1970s, the Japanese GDP per capita had converged to the British one. Since the early 1980s,

Japanese growth slowed down, and British growth picked up, with the result that Britain has again surpassed the living standard of Japan.

Long Run Growth in the Large European Economies (GDP per capita, log scale)



Long Run Growth in the Large European Economies (Germany, France, Italy and Britain)

France, Germany and Italy had lower per capita GDP than Britain throughout the 19th century and the first half of the 20th century.

For France and Germany there was a slow process of convergence until the eve of World War I, and faster convergence in the interwar period.

All the large European economies were devastated during World War II, which had a particularly negative impact on Germany, Italy and France, and less of an impact on the UK.

In the aftermath of World War II, convergence was much more rapid, and by the early 1970s, per capita GDP did not differ by much in these four economies.

Economic Growth since World War II

In the period after World War II there was a significant rise of the rate of economic growth throughout the world.

Between 1950 and 2010, i.e during the last 60 years, the real per capita GDP of the USA more than tripled. In fact it rose by about 3.2 times, from $9,561 (in 1990 prices) in 1950, to $30,491 in 2010. Its average annual growth rate was about 2% per annum. The major developed European economies displayed even higher growth. The average annual growth rates of real per capita GDP in Britain was 2.1%, slightly higher than in the USA. Italy achieved an average annual growth rate of 3.0%, Germany 2.8% and France 2.4%. As a result, there was significant convergence of the per capita GDP of the major European economies to that of the USA. The average annual growth rate of per capita income in Japan was 4.1% in the same period, significantly higher than in the USA and the major European economies.

However, even during the past 60 years, the less developed economies have not demonstrated a uniform tendency towards convergence with the per capita income of the developed economies. Some developing economies, particularly in the rest of Western Europe and Southeast Asia, have achieved impressive increases in per capita income compared to 1950, and significant convergence with the living standards of the developed economies. However, other economies, particularly in Latin America, the rest of Asia and Africa, have failed to display significant convergence, and in fact, some of them, have fallen dramatically behind.