1 Large Wealth Differences across Time and Nations

Large income and wealth differences across time and between nations are described. We start by presenting economic production and income measures indicating wealth. We will finish by showing limitations and possibilities for improvement.

Living conditions largely differ for people depending on when they were born and where they live. If a child is born in a modern, well-developed country, he or she will receive proficient health care, before, during and after birth and throughout childhood and youth. Many will grow up in large and well-constructed houses. Others in former times, and still in some regions of the world, grew up in huts, maybe in what appear to us as picturesque lodges, but many in dark and wretched shacks. Some will have access to clean and fresh running water, others regrettably not. Modern indoor plumbing, electricity, heating, air conditioning, refrigerators and stable doors and windows provide a comfortable, healthy and secure life. That is not a result of the merit of the individual child, but is given to him by parents, and the parents themselves are embedded in different neighbourhoods and societies providing very different opportunities.

1.1 Measures of Production, Income and Wealth

International comparative statistics show the above-mentioned differences in a systematic and largely comparable manner: *Gross national product* (GNP) describes the sum ('gross') of all the goods and services that are produced by a country (precisely by its citizens) during one calendar year. Products are those things and services that can be sold and bought on the market. Products are negotiable and have prices. *Gross domestic product* (GDP) represents the sum of a country's goods independent of the citizenship of the owners of enterprises. *Gross national income* (GNI) additionally considers all transfers coming from abroad (and subtracting everything going out) as foreign aid or remittances from relatives working overseas. Whereas GNI is a better indicator of consumable wealth, especially for smaller countries, GDP is a better indicator of what a society is capable of producing. GNP is less important or

clear because ownership and citizenship are rather arbitrary categories. Usually, GDP or GNI are used, but most data – for the most countries in contemporary or historical comparisons – are given for GDP.[1]

The distinctions between the mentioned variables are conceptually interesting; however, empirically the distinctions are less important: the variables are highly correlated across countries. To be precise, the *differences* between countries in these variables are highly correlated: countries that have higher values in GDP also have higher values in GNI. The main reason is that national income is largely based on produced goods.[2] The same is true for differences across time with respect to historical development. Countries that produced less in the past had poorer inhabitants.

More important is to distinguish between country and per capita measures to give a more accurate picture: if GDP was not scaled down to individuals, countries with larger populations would be perceived as being richer. They have larger markets and they are, all other things being equal, more powerful, but we do not know their average level of affluence. Therefore, we always and only use per capita ('/c') estimates. These per capita estimates represent the *annual* income.

The crucial problem to be dealt with is *comparability* across countries and time: first of all, comparisons across countries have to be based on one common scale, that is, currency. Usually US Dollars are chosen. But selecting one currency is not sufficient to achieve comparability. Cross-country differences in price levels are not adequately reflected by exchange rates: they are frequently fixed and influenced by politics, they are more volatile (varying between years) and they are too often based on small sets of goods (e.g. traded mineral resources). Therefore, all wealth indicators are adapted for 'purchasing power parity', in short 'ppp'.[3] Comparisons across time expressed in monetary units additionally need to be corrected for inflation and – though it is very difficult – for change in quality of goods.[4]

In their narrow meaning, GDP and GNI are indicators for *production* and *income*, but not for given wealth, which also comprises existing stocks and real

[1] These terms are not always used consistently by researchers and organisations. For example, GNP and GNI are often used synonymously.

[2] GDP presented by Penn and GNI by HDR correlate with $r = .95$ ($N = 197$ nations; GDP-Penn 2010, HDR-GNI 2010, both per capita and ppp; Heston, Summers & Aten, 2012; UNDP, 2010).

[3] Purchasing power parity adaptations reduce economic differences between developed and developing countries. They increase between twofold and nearly tenfold the economic estimates for developing countries (e.g. for China from 1,100 to 4,990 $US, for India from 530 to 2,880 $US, for Ethiopia from 90 to 710 $US; Komlos & Snowdon, 2005, pp. 7–8).

[4] 'Relative' correlational analyses (comparing country differences) including regressions and path analyses (if they present results in standardised units) do not need across-time corrections. Similarly, corrections are not necessary for present-day correlational comparisons, if, for example, GDP/c in US Dollar and GDP/c in international currency units are correlated.

estate and their quality. However, because income is based on production and given wealth on previously achieved production of wealth, it is not unusual to use GDP and GNI as proxies for *wealth*.

Current production, income and wealth are based on *past economic growth*. Wealth is the result of middle- and long-term growth based on all the positive factors discussed in economic science, such as economic freedom (e.g. trade and property rights), geography (e.g. mineral resources and proximity to markets), politics (e.g. rule of law and peace) and human capital (e.g. cognitive ability and conscientiousness). For research, wealth measures (from GDP to those wealth indicators in the narrow sense as provided by Credit Suisse) are more reliable criteria than growth measures: wealth measures are less volatile (short-term growth heavily depends on business cycles) and there is no negative effect of achieved wealth on present wealth as there is for wealth on present growth: Less developed countries can learn from more developed countries. Following cleared paths and avoiding others' mistakes is easier than exploring and clearing new paths. Catching up is faster than inventing new products and production processes. Imitation is easier than innovation. Economic growth at lower development levels is easier than at higher development levels – therefore, growth is usually higher in poorer countries, termed in economics as advantages of backwardness, beta or β-convergence.[5]

However, factors increasing wealth can work only via stimulating growth. Why did some countries in certain eras grow faster than others? In a longitudinal design we can control current for previous wealth. An analysis will show that the change of wealth is influenced by growth factors. Of course, the simple maintenance of wealth also needs production that depends on favourable economic, geographic, political and human capital factors. So growth as well as wealth are both useful criteria when studying economic factors.

Producing and obtaining income and wealth (GDP/c, GNI/c) is expressed in monetary units, usually in US Dollars. But numerically identical increases at different levels have a different meaning: a $5,000 income increase (or difference between countries) from $5,000 to $10,000 means much more improvement for standard of living and quality of life than a $5,000 income increase from $30,000 to $35,000. At the poorer level, the $5,000 increase has an essential impact on nutrition, health and housing quality. In some countries, education would be enabled, e.g. paying transport to school or school fees, and buying school uniforms and school books. And children would no longer form the necessary workforce at home and in the fields. At the richer level, income increase means something like a bigger house, more trips to more distant countries and the yearly update of smart phones. The increase at the lower

[5] Gerschenkron (1962), Cohen & Levinthal (1990).

level has much more impact on living quality. Therefore, we usually use the *logarithm* of wealth indicators (natural logarithm of GDP/c, GNI/c) in statistical analyses.[6] Numerically, this transformation reduces the increases at the upper levels. It transforms nonlinear, exponential increases in 'currency units' to linear increases in more realistic 'living quality units'. However, GDP-logs do not give understandable units. For communication of the meaning of certain income levels, straightforward numbers are more useful.

GDP per capita in raw numbers or logged is by far the most used indicator of production, productivity, income and wealth. Its economic meaning changes somewhat with its use: as a *dependent* variable, GDP/c stands for productivity and production – how much are people capable of producing? As an independent variable, GDP/c stands for wealth effects – what are the effects of prosperity on peoples' destiny, e.g. on democracy or human capital development? In its narrow sense in economics, GDP/c is merely a production indicator. However, this production leads to income being indicative of wealth. When we speak henceforth of production, income or in a broader sense of wealth, GDP per capita is the chosen indicator. If we more precisely compare production and income, GDP/c stands for production and GNI/c for income. And if we compare annually produced income with given wealth, GDP/c stands for the yearly income and wealth for existing assets.

1.2 Some Country Examples

Results from different historical epochs and different regions today show large wealth differences expressed in comparable monetary units. However, any categorisation, by centuries, by developed vs. emerging and developing countries, by regions according to geographical or cultural criteria and even by nations is somewhat arbitrary. Historical developments are continuous. There is large heterogeneity within continents, cultures and nations. Nevertheless, such rough categories provide the basis for all perceptions and, carefully used, they help to understand differences and developments.

Let us look first at different epochs and continents (see Table 1.1).

Around the year zero the majority of people lived from hunting and gathering, animal husbandry and/or subsistence farming. Their income was defined by Maddison (2007, 2008) as '$400 in 1990 international $'. Only a few regions, such as Rome and the Mediterranean coastal regions (today single countries), other ancient advanced civilisations and regions influenced by the advanced, achieved higher production, income and wealth shown in their equivalent current country divisions: Italy $809, Greece $550, Egypt $600,

[6] Natural logarithm is the logarithm to the base *e* (Euler's number, 2.71828 . . .).

Table 1.1 *Income differences across time and continents (annual per capita GDP and GNI in comparable units)*

	GDP 0001 Maddison	GDP 1500 Maddison	GDP 1820 Maddison	GDP 1913 Maddison	GDP 2010 Maddison	GDP 2010 Penn	GNI 2010 HDR
Africa (total/North)	472	414	420	637	1,934	3,468	3,873
Kenya	–	–	–	–	1,141	1,246	1,628
America (North)	400	400	1,081	4,874	27,716	39,243	42,881
USA	400	400	1,257	5,301	30,491	41,376	47,094
America (Centr-S)	400	416	691	1,494	7,324	11,848	10,109
Brazil	400	400	646	811	6,879	8,325	10,607
Asia	456	568	581	695	9,316	14,963	13,567
India	450	550	533	673	3,372	3,477	3,337
Australia-NZ	400	400	459	5,155	22,235	34,448	32,065
New Zealand	(400)	400	400	5,152	18,886	27,788	25,438
Europe	457	669	1,064	2,598	14,753	23,202	25,197
Germany	408	688	1,077	3,648	20,661	34,085	35,308

Notes: GDPs per capita per year from Maddison in 1990 international $ (Maddison, 2008; 2010 from Bolt & van Zanden, 2013). For non-Western countries only a small amount of data are available, e.g. for Africa 1820 no single country, 1913 only four countries, Egypt, Ghana, Morocco and South Africa, continental averages are based on estimations for larger country samples; GDP Penn 2010: in 2005 constant prices, ppp international dollar per capita, Laspeyres (Penn World Table V7.1, Heston, Summers & Aten, 2012); GNI 2010 HDR: in 2008 ppp, US dollar per capita, HDR: Human Development Report (UNDP, 2010, pp. 143–147); continental averages based on identical weighting of all countries (countries with larger populations do not have larger impact); Brazil 0001 estimated by taking the value from Mexico; New Zealand 0001 as Australia (NZ was first settled in the thirteenth century by Polynesians); Centr-S: Central-South.

Turkey $550, Iraq $500, Iran $500, India $450, China $450. The further away from those centres, the poorer were the people, e.g. Spain with $498, France with $473 or the Netherlands with $425. The comparatively high values in Table 1.1 for Africa and Asia are misleading, because they are based on selected regions (North African strips settled by Romans; China and India) for which data are provided by Maddison.

Around the year 1000 the situation was no different, except that formerly 'rich' regions in Europe had become poorer (see Maddison, 2007, 2008). However, by *1500* they had recovered. With $669 Europe is now the richest region in the world; within Europe, Italy again is the highest with $1,100 (within Italy the hot spots have moved up to the north) and then the future leading region, Western and Northern Europe (Belgium $875, here Flanders as hot spot, Netherlands $761, France $727 and Britain $714). Nevertheless, the average annual economic growth in Europe between 0 and 1500 reached only 0.025 per cent! China and India also improved with $600 and $550, respectively, and Japan achieved $500 (up from around $400), but these countries developed noticeably less.

In *1820* the pattern was more pronounced. Within Europe, the hot spots moved to the north west (Netherlands $1,838, Great Britain $1,706, Belgium [Flanders] $1,319, Denmark $1,274). This becomes obvious when changing the rather rough continental perspective to a more precise regional-cultural perspective (Table 1.2). North American income resembles that of its Northern and Western European ancestral roots (United States $1,257). China and India have not improved ($600 and $533), and Japan only slightly ($669).

This was the situation before the peak of the industrial revolution in the nineteenth century. By *1913* the gap between 'developed' and 'not developed' regions became much wider: within Europe there were large differences between Western, Northern and Central Europe on the one hand (see Table 1.2, these three regions simply averaged $3,455) and Eastern Europe ($1,783) or Southern Europe ($1,555) on the other hand. The regions settled by the British (North America, Trans-Tasman, averaged: $5,015) resemble Western, Northern and Central Europe, especially Great Britain ($4,921). Latin America ($1,494) is close to Southern Europe ($1,555) and the two mother countries Spain and Portugal ($2,056 and $1,250). Asia and Africa developed too ($695 and $637), especially Japan ($1,387). However, China and India even deteriorated or only weakly improved ($552 and $673). Their 1913 position was in sharp contrast to their past economic and cultural achievements.

This pattern seems to be repeated at a much higher level in the year 2010 (see also Figures 1.1 and 1.2): Western, Northern and Central Europe (all results simply averaged at the level of regions, GDP 2010 Penn: $39,900, GNI

Table 1.2 *Income differences across time and regions (annual per capita GDP and GNI in comparable units)*

	GDP 0001 Maddison	GDP 1500 Maddison	GDP 1820 Maddison	GDP 1913 Maddison	GDP 2010 Maddison	GDP 2010 Penn	GNI 2010 HDR
Africa (sub-Sahara)	418	414	420	637	1,436	2,989	3,352
Kenya	–	–	–	–	1,141	1,246	1,628
N-Africa M-East (ArM)	522	590	607	1,042	7,945	19,885	19,655
Egypt	600	475	475	902	4,267	4,853	5,889
America (North, Engl)	400	400	1,081	4,874	27,716	39,243	42,881
USA	400	400	1,257	5,301	30,491	41,376	47,094
America (Latin, C-S)	400	416	691	1,494	7,324	11,848	10,109
Mexico	400	425	759	1,732	7,716	11,940	13,971
Asia (Central-South)	450	500	469	783	4,254	4,296	3,743
India	450	550	533	673	3,372	3,477	3,337
East Asia	425	525	644	1,016	27,847	27,847	24,035
China	450	600	600	552	8,032	7,746	7,258
Southeast Asia, Pacific	420	565	621	935	8,845	9,756	9,386
Philippines	–	–	584	988	3,024	3,194	4,002
Australia-NZ (English)	400	400	459	5,155	22,235	34,448	32,065
New Zealand	(400)	400	400	5,152	18,886	27,788	25,438
Western Europe	599	797	1,234	3,687	23,025	34,843	35,607
United Kingdom	400	714	1,706	4,921	23,777	34,267	35,087
Scandinavia	400	613	919	2,886	25,024	37,796	37,788
Norway	400	610	801	2,447	27,987	50,491	58,810

Table 1.2 *(cont.)*

	GDP 0001 Maddison	GDP 1500 Maddison	GDP 1820 Maddison	GDP 1913 Maddison	GDP 2010 Maddison	GDP 2010 Penn	GNI 2010 HDR
Central Europe	419	676	1,128	3,793	23,263	47,062	48,867
Germany	408	688	1,077	3,648	20,661	34,085	35,308
Eastern Europe	400	499	769	1,783	10,290	13,906	14,698
Russia	400	499	688	1,488	8,660	15,062	15,258
Southern Europe	577	700	922	1,555	11,146	16,923	20,565
Italy	809	1,100	1,117	2,564	18,520	28,381	29,619

Notes: Wealth indicators, see Table 1.1; regions due to culture and evolutionary background of people; within regions retaining heterogeneity such as Israel in the Middle East or 1913 South Africa in sub-Saharan Africa; N-Africa M-East: North Africa, Middle East; ArM = Arab-Muslim; North, Engl: North, English; C-S: Central-South; identical weighting of all countries; for Maddison, if not given, regional data calculations based on single country reports and averaging (East Asia: China, Japan, Korea, Taiwan, Hong Kong, Singapore; Maddison, Singapore 1820 obvious error '83' corrected as '830'); Penn, Romania missing year numbers assigned; minor deviations between Maddison's and my country-region-classifications and averages (e.g. considering the size of populations).

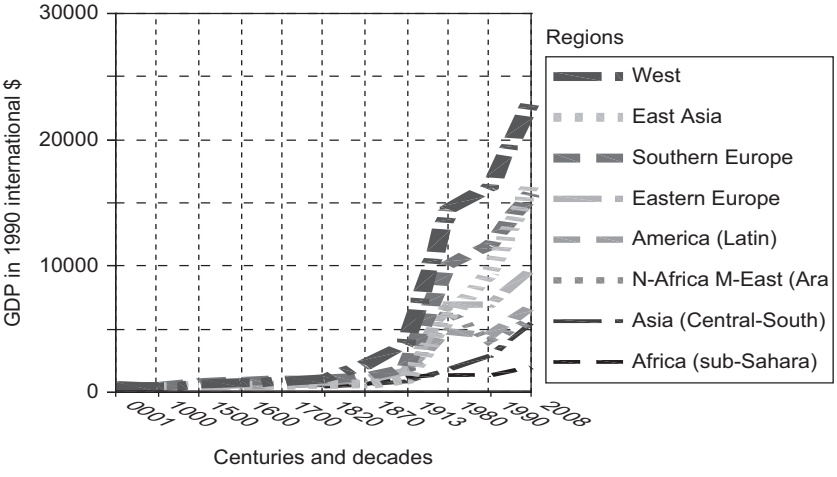

Figure 1.1 Income (annual GDP/c) development in different regions from 0001 to 2008 (data from Maddison, 2008)
We finished the depiction with the year 2008, because the Maddison project published data for fewer countries for 2010 than for 2008 (N_{2008} = 159 vs. N_{2010} = 117). Southeast Europe is included in Eastern Europe.

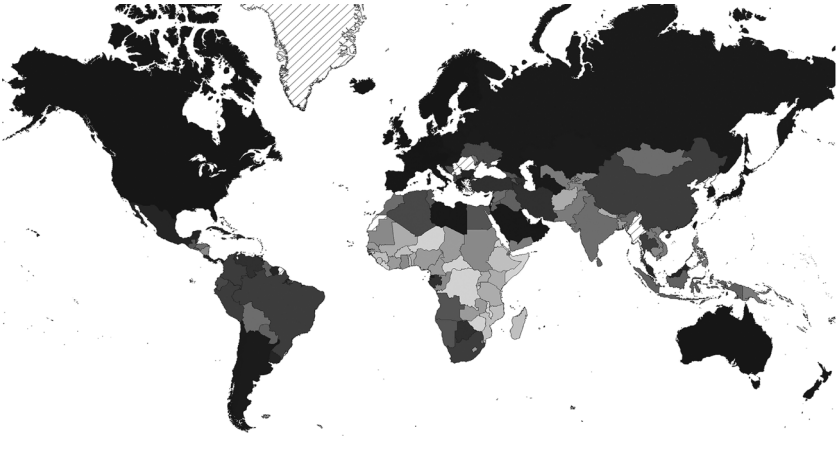

Figure 1.2 Wealth around the world (annual GDP 2010, Penn V7.1, per capita ppp, N = 188 countries), darker means higher, shading accentuates differences at the poorer levels (similar to using logarithm)

2010 HDR: $40,754) and the former British colonies, North America and Trans-Tasman (GDP 2010 Penn: $36,846, GNI 2010 HDR: $37,473) are the richest regions. But East Asia was catching up: first Japan and Korea, and then smaller Chinese-populated offshoots, Hong Kong, Macau, Taiwan and Singapore, then later China and to a lesser extent countries in Southeast Asia. The largest gap between West and East occurred around 1980 and has since decreased (see Figure 1.1). And there are very rich Arabian Gulf economies, based on mineral resources (oil and gas), with smaller populations. As a result of such mineral resources, large differences exist among Arabian-Muslim countries.

Within Europe, there are still gaps between Western-North-Central and Southern and Eastern Europe. Scandinavia caught up with Western-Central Europe in the twentieth century. Within the Western world North America is leading. The gap between Latin America and the two mother countries, Spain and Portugal, compared to 1913 is now clearly larger (Latin America GNI 2010: $10,109; Spain and Portugal: $29,661 and $22,105). However, since the 1990s the gaps have been narrowing.

All regions in the world improved in terms of income and wealth during the twentieth century, as did those Arabian-Muslim countries without mineral resources, South and Central Asia and sub-Saharan Africa. For sub-Saharan Africa, average GDP in 2010 was *five times* that of 1913. In Maddison's 2008 statistics (in 1990 international $, 2008: $2,272, in his own Africa average $1,780) it is three to four times. And as will be shown below, these monetary income units underrate real wealth and living standard increases as indicated by life expectancy.

1.3 Problems of Current GDP and GNI Approaches – and Possible Solutions

The older the Maddison data and the less developed a country and its statistics the more shaky are the GDP estimations. Angus Maddison (2001, p. 191ff.) always explicitly expressed this; he wrote in his reports, for instance: 'It was assumed', 'proxy element', 'the available estimates are speculative', 'assumed that African per capita income did not change from 1500 to 1700'. Frequently, mere urbanisation ratios were used as a rough indicator for economic production. But even for newer data there are problems.

1.3.1 Differences between Various Sources of the Same Indicator

We have presented only one result for each measure (GDP or GNI, both annually and per capita) and historical era. However, there are different data pools, for example, the already introduced Maddison and the Penn statistical