

# Wealthier - older - taller : measuring the standard of living in Switzerland since the 19th century

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Objektyp: **Article**

Zeitschrift: **Schweizerische Zeitschrift für Geschichte = Revue suisse d'histoire = Rivista storica svizzera**

Band (Jahr): **69 (2019)**

Heft 2

PDF erstellt am: **23.05.2024**

Persistenter Link: <https://doi.org/10.5169/seals-842291>

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# Wealthier – older – taller: Measuring the standard of living in Switzerland since the 19<sup>th</sup> century

*Joël Floris, François Höpflinger, Christian Stohr, Roman Studer, Kaspar Staub*

## Abstract

This article provides an overview of research on the standard of living in Switzerland from the 19th century to the present. After a general introduction on measuring the standard of living, recent research results on four different indicators of well-being are presented: GDP per capita, real wages, life expectancy and average adult height. The discussion of these various indicators in the concluding part of the article aims to broaden the discussion about the standard of living and enhance the understanding of what “well-being” has meant in Switzerland in the last 200 years, both in terms of levels and changes.

This article gives an overview of the research on the standard of living in Switzerland since the 19th century.<sup>1</sup> After a general introduction on measuring living standards, own research results of the authors on four indicators of well-being are presented: gross domestic product (GDP) per capita, real wages, life expectancy and average height. Most of the data presented here have been analysed by the authors themselves and have previously been published elsewhere. All data have been updated, complemented as well as newly compiled for this article and slightly adapted. To our knowledge this is the first time that those four indicators of well-being are brought together and compared in a systematic way and over time for Switzerland. The discussion of those indicators in the concluding part of the article aims to broaden the view on the standard of living and to enhance the understanding of changes in well-being in Switzerland in the last 200 years. It challenges once more the overemphasis on GDP per capita and economic growth although without saying that these concepts are valueless. In addition, the referenced literature, which is comprehensive but inevitably selective, shows that the literature on well-being has grown steadily over the last few decades. Finally, the article is a country-specific supplement to the concept of the *OECD “How was life?”* publication that compared people’s living conditions beyond GDP in a global perspective since 1820, but in which data on Switzerland are incomplete.<sup>2</sup>

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<sup>1</sup> The authors wish to thank the session participants and organisers of the 3rd Swiss Congress of Historical Sciences in Fribourg 2013. The work was funded by the Mäxi Foundation and the Swiss National Science Foundation (Project No. 109802, 146713, 156683, 159160, 159160).

<sup>2</sup> Jan Luiten van Zanden [et al.] (Eds.), *How was life? Global well-being since 1820*, Paris 2014.

## Measuring living standards

And yet the idea is full of contrast, conflicts and even contradictions. Within the general notion of the living standard, divergent and rival views of the goodness of life co-exist in an unsorted bundle. There are many fundamentally different ways of seeing the quality of living, and quite a few of them have some immediate plausibility. You could be well off, without being well. You could be well, without being able to lead the life you wanted. You could have got the life you wanted, without being happy. You could be happy, without having much freedom. You could have a good deal of freedom, without achieving much. We can go on.<sup>3</sup>

Standard of living usually refers to income, wealth as well as the consumption of goods and services.<sup>4</sup> Quality of life, in contrast, includes objective factors of well-being such as command of material resources, health, work status, living conditions as well as the subjective perception of those factors.<sup>5</sup> Both terms can reflect the living conditions of an individual or that of a group.

Access to goods and services, wealth, health, education, inequality, and political freedom are uncontroversial factors of the standard of living. However, the validity of the measurements that are used for stating the level and the weight of the factors is debated.<sup>6</sup> Ideally all indicators should be compared. But this is a time-consuming task and it is difficult to reach an overall conclusion when the indicators are not weighted.<sup>7</sup> In addition the focus can be, for instance, on measuring absolute poverty or on relative poverty. Moreover, what is considered a decent life changes over time. Therefore, some indicators are more useful than others depending on the circumstances.<sup>8</sup> It is, however, equally difficult to give more weight to some indicators and to construct indices.<sup>9</sup> Aggregated indi-

3 Amartya Sen, The standard of living. Lecture I, concepts and critiques, in: Geoffrey Hawthorn (Ed.), The standard of living. Cambridge 1987 (The Tanner lectures), p. 1.

4 François Höpflinger, Lebensstandard, in: Historisches Lexikon der Schweiz (HLS), [www.hls-dhs-dss.ch/textes/d/D15994.php](http://www.hls-dhs-dss.ch/textes/d/D15994.php) (08.2.2015).

5 Eurostat, Statistics explained. Quality of life indicators – measuring quality of life, [http://ec.europa.eu/eurostat/statistics-explained/index.php/Quality\\_of\\_life\\_indicators](http://ec.europa.eu/eurostat/statistics-explained/index.php/Quality_of_life_indicators) (08.2.2018).

6 Richard H. Steckel, Standard of living (historical trends), in: Steven N. Durlauf, Lawrence E. Blume (Eds.), The New Palgrave Dictionary of Economics. Basingstoke 2008 (2nd ed.), pp. 1–8; Robert C. Allen, Tommy Bengtson, Martin Dribe, Introduction, in: id. (Eds.), Living standards in the past. New perspective on well-being in Asia and Europe, Oxford 2005, pp. 6–10; Stanley L. Engerman, The standard of living debate in international perspective. Measures and Indicators, in: Richard H. Steckel, Roderick Floud (Eds.), Health and Welfare during Industrialization. Chicago 1997, pp. 17–46.

7 Richard H. Steckel, Roderick Floud, Introduction, in: id. (Eds.), Health and Welfare during Industrialization. Chicago 1997, pp. 1–16.

8 François Höpflinger, Lebensstandard; Sen, The standard of living, pp. 17–19.

9 Richard H. Steckel, What can be learned from skeletons that might interest economist, historians, and other social scientist?, in: American Economic Review 93/2 (2003), pp. 213–220. Satya R. Chakravarty, Amita Majumder, Measuring human poverty. A generalized index and an application using basic dimensions of life and some anthropometric indicators, in: Journal of Human Develop-

cators make it difficult to show differences between subgroups, while disaggregated indicators are hard to generalise. Therefore, indicators and indices on different levels need to be considered.<sup>10</sup>

GDP per capita and real wages are widely used indicators of the standard of living.<sup>11</sup> In addition, scientists describe living conditions with life expectancy, morbidity and mortality.<sup>12</sup> Since the 1970s height, body mass index and birth weight have been analysed to assess the standard of living.<sup>13</sup> These demographic and anthropometric indicators measure health, a key issue in the standard of living that is inadequately taken into account by monetary indicators.<sup>14</sup> Health is not only influenced by diet but also by access to clean water, sanitary conditions, public health services, health care, prevalence of diseases and workload. Finally, human capital and political indicators of human well-being complement existing indicators.<sup>15</sup>

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ment 6/3 (2005), pp. 275–299; United Nations Development Programme (Ed.), *Human Development Report 2016. Human development for everyone*, New York 2016.

<sup>10</sup> Allen, Bengtsson, Dribe, Introduction, pp. 6–10.

<sup>11</sup> Robert C. Allen, Real wages in Europe and Asia. A first look at the long-term patterns, in: Robert C. Allen, Tommy Bengtsson, Martin Dribe (Eds.), *Living standards in the past. New perspective on well-being in Asia and Europe*, Oxford 2005, pp. 111–130; Robert C. Allen, The great divergence in European wages and prices from the Middle Ages to the First World War, in: *Explorations in Economic History* 38 (2001), pp. 411–447; Jeffrey G. Williamson, The evolution of global labor markets since 1830. Background evidence and hypotheses, in: *Explorations in Economic History* 32 (1995), pp. 141–196; Jutta Bolt, Jan Luiten van Zanden, The Maddison project. Collaborative research on historical national accounts, in: *Economic History Review* 67/3 (2014), pp. 627–651.

<sup>12</sup> James C. Riley, Estimates of regional and global life expectancy. In: *Population and Development Review* 31/3 (2005), pp. 537–543; Angus Deaton, Health in an age of globalization, in: Susan M. Collins, Carol L. Graham (Eds.), *Brookings Trade Forum*. Washington DC 2004, pp. 83–130; Massimo Livi-Bacci, *A concise history of world population*. Cambridge 1994; Thomas McKeown, *The modern rise of population*. London 1976; Samuel H. Preston, The changing relation between mortality and level of economic development, in: *Population Studies* 29/2 (1975), pp. 231–248; Tommy Bengtsson, Cameron Campbell, James Z. Lee (Eds.), *Life under pressure. Mortality and living standards in Europe and Asia, 1700–1900*, Cambridge 2004.

<sup>13</sup> Roderick Floud [et al.], *The changing body. Health, nutrition, and human development in the western world since 1700*, Cambridge 2011; Richard H. Steckel, Heights and human welfare. Recent developments and new directions, in: *Explorations in Economic History* 46 (2009), pp. 1–23; John Komlos, Anthropometric history. An overview of a quarter century of research, in: *Anthropologischer Anzeiger* 67/4 (2009), pp. 341–356; John Komlos, Anthropometric history, in: Steven N. Durlauf, Lawrence E. Blume (Eds.), *The New Palgrave Dictionary of Economics*, Basingstoke 2008 (2nd ed.), pp. 163–167.

<sup>14</sup> Richard H. Steckel, Biological measures of the standard of living, in: *Journal of Economic Perspectives* 22/1 (2008), pp. 129–152; Michael R. Haines, Richard H. Steckel, Childhood mortality & nutritional status as indicators of standard of living. Evidence from World War I recruits in the United States, in: *Jahrbuch für Wirtschaftsgeschichte* 41/1 (2000), pp. 43–59.

<sup>15</sup> Bas van Leeuwen, Jeli van Leeuwen-Li, Education since 1820, in: Jan Luiten van Zanden [et al.] (Eds.), *How was life? Global well-being since 1820*, Paris 2014, pp. 87–100; Peter Foldvari, Katalin Buzasi, Political institutions since 1820, in: Jan Luiten van Zanden [et al.] (Eds.), *How was life? Global well-being since 1820*, Paris 2014, pp. 161–180.



Different indicators measure different but interrelated aspects of the standard of living. They are often, but not always, positively correlated. The relationship between average height and income, for instance, is not stable as has been shown for a worldwide sample of female average height between 1950 and 1980.<sup>16</sup> The relationship between different indicators of the standard of living is therefore not self-evident and needs time and space specific clarification. And indicators of the standard of living should be used as supplements to each other rather than as substitutes.<sup>17</sup>

Besides the issues of using the right indicator (and using it the right way) the simplification of well-being in a compact characterisation – a single number – can be misleading if it remains unclear under which circumstances statistical data was produced. Simon Kuznets aptly summed up the problem in 1934 in a report on national income:<sup>18</sup>

With quantitative measurements especially, the definiteness of the results suggests, often misleadingly, a precision and simplicity in the outlines of the object measured. Measurements of national income are subject to this type of illusion and resulting abuse, especially since they deal with matters that are the center of conflict of opposing social groups where the effectiveness of an argument is often contingent upon oversimplification.

This is true for any kind of measurement and an exclusive focus on quantification is certainly wrong. Many authors have rightly pointed out that statistical data are by no means objective measures and sometimes the result of conflicting interests.<sup>19</sup> We fully acknowledge that it is important to include the political, technical or social context which have induced the collection of statistical data.<sup>20</sup> However, the intention of this article is first and foremost to analytically com-

<sup>16</sup> Angus Deaton, Height, health, and development. In: PNAS 104/33 (2007), pp.13232–13237.

<sup>17</sup> Komlos, Anthropometric history, pp. 354.

<sup>18</sup> Simon Kuznets, National income, 1929–32. Letter from the acting secretary of commerce transmitting in response to senate resolution No. 220 (72d cong.), a report on national income, 1929–32, Washington 1934, pp. 5–6.

<sup>19</sup> Rebecca Searle, Is there anything real about real wages? A history of the official British cost of living index, 1914–62, in: *The Economic History Review* 68/1 (2015), pp. 145–166; Daniel Speich Chassé, *Die Erfindung des Bruttosozialprodukts. Globale Ungleichheit in der Wissensgeschichte der Ökonomie*, Göttingen 2013; Libby Schweber, *Disciplining statistics. Demography and vital statistics in France and England, 1830–1885*, Durham 2006; Laurent Heybergger, *La révolution des corps. Décroissance et croissance staturale des habitants des villes et des campagnes en France, 1780–1940*, Strassbourg 2005; Theodore M. Porter, *Trust in numbers. The pursuit of objectivity in science and public life*, Princeton 1995; Jakob Tanner, *Der Tatsachenblick auf die “reale Wirklichkeit”. Zur Entwicklung der Sozial- und Konsumstatistik in der Schweiz*, in: *Schweizerische Zeitschrift für Geschichte* 45 (1995), pp. 94–108; Alain Desrosières, *La politique des grands nombres. Histoire de la raison statistique*, Paris 1993; Ian Hacking, *The taming of chance*, Cambridge 1990; Theodore M. Porter, *The rise of statistical thinking, 1820–1900*. Princeton 1986.

<sup>20</sup> Tobias Schoch, Kaspar Staub, *Statistik*, Kap. 2: Die amtliche Statistik in der Schweiz, in: *Historiesches Lexikon der Schweiz (HLS)*, [www.hls-dhs-dss.ch/textes/d/D13798.php](http://www.hls-dhs-dss.ch/textes/d/D13798.php) (10.1.2013).

pare the four indicators of the standard of living at hand and not primarily to critically examine the context in which these indicators and data sources originated. Of course, this comparative approach does not erase the weaknesses and embeddedness of each indicator. But it helps to get a nuanced picture of the standard of living in the last two hundred years and it weakens the flaws of each indicator at hand.

### **GDP per capita: taking account of relative price changes is crucial**

GDP is a measure of the market value of all final goods produced in an economy during a certain time period. GDP per capita is often used as an indicator of the living standard as it measures the average income, expenditure, or production per person. The general weaknesses are that it does not account for negative externalities (e.g. pollution), sustainability (e.g. depletion of resources), non-market transactions (e.g. unpaid work), the introduction of new goods, and the distribution of wealth and income. Nor does it take account of differences in life expectancy, health, happiness, political rights, or freedom of choice in general, which arguably have an effect on welfare.<sup>21</sup>

For comparisons over time, nominal GDP per capita must be deflated with an appropriate price index. The standard measure of real GDP per capita relies on a double deflation procedure, which holds not only the general price level but also the relative price structure constant. Thereby it includes only changes in production value arising from factor accumulation or increased productivity excluding all changes originating from alterations of the price level or structure. However, changes of the relative price structure have a “real” effect on the economy and increase welfare. An improvement of the terms of trade or an appreciation of the real exchange rate increases the amount of goods available even if trade remains balanced. By treating changes of the price structure as pure price effects, real GDP per capita “deflates these gains away”. Hence, real GDP per capita is above all a measure of the evolution of productive capacity, not the living standard.<sup>22</sup>

21 Joseph E. Stiglitz, Amartya Sen, Jean-Paul Fitoussi, Report by the commission on the measurement of economic performance and social progress. Paris 2010; Tim Leunig, Measuring Economic Performance and Social Progress, in: *European Review of Economic History* 15/2 (2011), pp. 357–363; Jean Gadrey, PIB (Produit Intérieur Brut), in: Dominique Bourg, Alain Papaux (Eds.), *Dictionnaire de La Pensée Écologique*, Paris 2015.

22 W. Erwin Diewert, Catherine J. Morrison, Adjusting output and productivity indexes for changes in the terms of trade, in: *The Economic Journal* 96/383 (1986), pp. 659–679; Ulrich Kohli, Real GDP, real domestic income, and terms-of-trade changes, in: *Journal of International Economics* 62/1 (2004), pp. 83–106.

Alternative deflation procedures, which include gains from relative price changes, are better suitable for measuring the evolution of the living standard. The national accounting literature has suggested different indices for that purpose. These adjustments are particularly important in the case of Switzerland, because extremely important relative price shifts have occurred between 1930 and 1990. Thus, the following discussion of Swiss GDP per capita relies on a series that includes these gains.<sup>23</sup>

Table 1 compares Swiss GDP per capita with a sample of six Western European countries and the USA. The table provides also the ranking of Swiss GDP per capita within this seven-country sample. Swiss GDP per capita was multiplied by almost 16 since the 1850s (compared to 12 for the Western European average).

In 1851, Switzerland was still among the poorest countries. Swiss GDP per capita was 37.4 per cent lower than that of the leading UK economy. But thereafter Swiss economic growth was particularly dynamic. Already in the 1850s, Switzerland caught up with the Western European average and by the 1910s it laid more than 50 per cent ahead. Switzerland had overtaken the UK and was only slightly behind the USA. This convergence to the level of the leading nations occurred in a context of rapid integration of international markets and fast structural change.<sup>24</sup>

Between 1910 and 1945 Switzerland's ranking position fluctuated in the medium term but remained roughly stable over the 35 years. The crises after World War I and the Great Depression were particularly harsh and long in Switzerland, as monetary policy subscribed to inflexible gold standard mentality.<sup>25</sup>

<sup>23</sup> For a detailed discussion of deflation methods and their impact on the measurement of Swiss growth and historical GDP levels see: Christian Stohr, Trading gains. New estimates of Swiss GDP, 1851–2008, in: LSE Economic History Working Papers 245 (2016). The reported numbers rely on the compromise estimate in Stohr, which is a geometric average of single deflated value added and nominal GDP by expenditure deflated with the price index of aggregate demand. Both series are projected from the 1990 benchmark of the Maddison database: Bolt, van Zanden, The Maddison project.

<sup>24</sup> Christian Stohr, Spatial dynamics of Economic growth in Switzerland from 1860 to 2000. Genève 2014 (Thèse de doctorat Université de Genève). Agriculture accounted for 46.9 per cent of the workforce in 1860 compared to only 30.4 per cent in 1910.

<sup>25</sup> On Switzerland's monetary policy and its effects on growth during the interwar period see: Michael Bordo, Harold James, From 1907 to 1946. A happy childhood or a troubled adolescence?, in: Swiss National Bank (Ed.), Die Schweizerische Nationalbank 1907–2007, Zurich 2007, pp. 29–107; Patrick Halbeisen, Tobias Straumann, Die Wirtschaftspolitik im internationalen Kontext, in: Patrick Halbeisen, Magrit Müller, Béatrice Véyrassat (Eds.), Wirtschaftsgeschichte der Schweiz im 20. Jahrhundert, Basel 2012, pp. 977–1075; Peter Rosenkranz, Tobias Straumann, Ulrich Woitek, A Small open economy in the Great Depression. The case of Switzerland, in: University of Zurich Department of Economics Working Paper Series 164 (2014); Michael Bordo, Thomas Helbling, Harold James, Swiss exchange rate policy in the 1930s. Was the delay in devaluation too high a price to pay for conservatism?, in: Open Economies Review 18/1 (2007), pp. 1–25.

| Decades | Switzer-<br>land | Western<br>Europe | GBR   | NLD   | FRA   | GER   | ITA   | ESP   | SWE   | USA   | Ranking<br>Switzer-<br>land |
|---------|------------------|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-----------------------------|
| 1820s   |                  | 1226              | 2074  | 1874  | 1135  |       | 1511  |       | 888   | 1361  |                             |
| 1830s   |                  | 1344              | 2227  | 1893  | 1191  |       | 1507  |       | 921   | 1547  |                             |
| 1840s   |                  | 1522              | 2521  | 2257  | 1428  |       | 1537  |       | 984   | 1690  |                             |
| 1850s   | 1595             | 1589              | 2330  | 2355  | 1597  | 1428  | 1481  | 1079  | 1076  | 1849  | 5                           |
| 1860s   | 1811             | 1823              | 2830  | 2392  | 1892  | 1639  | 1459  | 1236  | 1218  | 2241  | 5                           |
| 1870s   | 2127             | 1976              | 3190  | 2755  | 1876  | 1839  | 1542  | 1207  | 1345  | 2445  | 4                           |
| 1880s   | 2875             | 2190              | 3477  | 2927  | 2120  | 1991  | 1589  | 1646  | 1480  | 3184  | 4                           |
| 1890s   | 3567             | 2506              | 4009  | 3186  | 2376  | 2428  | 1690  | 1624  | 1635  | 3392  | 2                           |
| 1900s   | 4432             | 2912              | 4492  | 3329  | 2876  | 2985  | 1855  | 1786  | 2083  | 4091  | 2                           |
| 1910s   | 4861             | 3172              | 4611  | 3783  | 2965  | 3348  | 2176  | 1895  | 2543  | 4964  | 2                           |
| 1920s   | 5167             | 3070              | 4548  | 4220  | 3227  | 2796  | 2153  | 2177  | 3004  | 5552  | 2                           |
| 1930s   | 6157             | 4006              | 5441  | 5603  | 4532  | 3973  | 2631  | 2620  | 4238  | 6213  | 2                           |
| 1940s   | 6163             | 4472              | 6856  | 4831  | 4042  | 5403  | 2897  | 2080  | 4855  | 7010  | 3                           |
| 1950s   | 8437             | 4518              | 6939  | 5996  | 5186  | 3881  | 3172  | 2189  | 6739  | 9561  | 2                           |
| 1960s   | 12155            | 6825              | 8645  | 8287  | 7398  | 7705  | 5456  | 3072  | 8688  | 11328 | 1                           |
| 1970s   | 15855            | 10108             | 10767 | 11967 | 11410 | 10839 | 9367  | 6319  | 12716 | 15030 | 1                           |
| 1980s   | 18647            | 13127             | 12931 | 14705 | 14766 | 14114 | 12927 | 9203  | 14937 | 18577 | 1                           |
| 1990s   | 21817            | 15919             | 16430 | 17262 | 17647 | 15929 | 16313 | 12055 | 17609 | 23201 | 2                           |
| 2000s   | 25110            | 19315             | 21046 | 22148 | 20392 | 18944 | 18761 | 15724 | 20871 | 28702 | 2                           |

Tab. 1: Swiss GDP per capita in international comparison.

Source: Western Europe countries plus USA: Jutta Bolt, Marcel Timmer, Jan Luiten van Zanden, GDP per capita since 1820, in: Jan Luiten van Zanden [et al.] (Eds.), *How was life? Global well-being since 1820*, Paris 2014, pp. 65–67; Switzerland: Christian Stohr, *Trading gains. New estimates of Swiss GDP, 1851 to 2008*, in: LSE Economic History Working Paper 245 (2016).

The 1920s and World War II saw partial recovery of the advance of Switzerland over the Western European average.

During the post-war growth miracle, Switzerland participated in a general movement of convergence of European economies toward the US level of GDP per capita. By the 1960s Switzerland even enjoyed the highest GDP per capita of the sample. But between 1975 and 2000 the Swiss economy suffered from a serious growth slack. Switzerland lost more than half of its advance over Western Europe and fell 12 per cent behind the US. Contrary to the first wave of globalization at the end of the 19th century, globalization at the end of the 20th century went together with a mitigated growth performance of the Swiss economy.

It is during the second half of the 20th century that the effect of relative price changes was important in Switzerland. Strict monetary policy, corporatism, and increasing specialization in high-quality niche exports led to an enormous appreciation of the real exchange rate (in 1990 domestic goods were worth twice as many imported goods as in 1948) and a substantial improvement of terms of trade (a given amount of export goods was worth 60 per cent more import

goods in 1990 than in 1948). These relative price shifts decreased the international competitiveness of Swiss goods and depressed consumption of domestic goods, but they also had a partially compensating positive welfare effect, which stemmed from the relative cheapness of imported intermediate goods.<sup>26</sup>

Early assessments of the Swiss post-war growth trajectory have relied on double-deflated GDP per capita and thus failed to account for the substantial gains that arose from relative price shifts. Hence, Switzerland appeared as a slow grower during the post-war golden age.<sup>27</sup> But if these gains are included, Swiss growth is comparable to that of Western Europe as a whole. Much ink has been spilled on the Swiss growth slack between 1973 and 2000,<sup>28</sup> which is truly astonishing if gains from relative prices are not included. If relative price gains are accounted for, as in Table 1, the growth slack is still a reality but it looks much less dramatic.<sup>29</sup>

Recent estimates of regional GDP per worker allow for an analysis of regional disparities of living standards within Switzerland.<sup>30</sup> At the highest geographical level,<sup>31</sup> regional inequality was generally weak: until 1920 GDP per worker of the alpine region was 30 to 40 per cent lower than that of the two regions of the flat country, thereafter the three regions converged to almost the same level. But at the micro regional level<sup>32</sup> disparities were considerable and increasing until 1910, when the GDP per worker of the richest region (Zurich und Limmattal) was three times higher than that of the poorest region (Sierre). After 1930, convergence was also rapid among these regions so that the ratio between the richest and the poorest regions' GDP per worker was only 1.5 at the end of the 20th century. This bell-shaped pattern of regional inequality (first

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<sup>26</sup> Stohr, Trading Gains.

<sup>27</sup> Nicholas F. R. Crafts, Gianni Toniolo, *Economic Growth in Europe since 1945*. Cambridge 1996; Nicholas F. R. Crafts, Gianni Toniolo, *Aggregate Growth, 1950–2005*, in: Stephen N. Broadberry, Kevin H. O'Rourke (Eds.), *The Cambridge economic history of modern Europe*, Cambridge 2010 (Vol. 2), pp. 296–332.

<sup>28</sup> Timothy J. Kehoe, Kim J. Ruhl, *Is Switzerland in a Great Depression?*, In: *Review of Economic Dynamics* 8/3 (2005), pp. 759–775; Silvio Borner, *Wohlstand ohne Wachstum – Eine Schweizer Illusion*. Zurich 2004 (2nd ed.).

<sup>29</sup> Ulrich Kohli, *Veränderung der terms of trade und reales BIP*, in: *SNB Quartalsheft* 2 (2002), pp. 54–63.

<sup>30</sup> Christian Stohr, *Multiple core regions. Regional inequality in Switzerland 1860 to 2008*, in: *Research in Economic History*, 34 (2018), pp. 135–198. Because of widespread commuting from peripheral to central regions GDP per capita is a less suitable indicator for the analysis of regional inequality than GDP per worker.

<sup>31</sup> This regionalization separates Switzerland into three regions: Eastern and Western flat country and the alpine region comprising the cantons of Valais, Ticino, and Graubünden.

<sup>32</sup> This regionalization is a reconstruction of the MS-regions provided by the Federal statistical office since the 1980s. It separates Switzerland into 97 functional micro regions that can be organized along a centre-periphery structure.



rising, then falling) is typical of an economy that undergoes fast growth and structural change.<sup>33</sup>

## **Real wages: the most widely available historical data on living standards**

Real wages relate the income of an average person (the “nominal” wage or “nominal” income more broadly) to the amount of money she needs to spend for the kind of goods the average person consumes (represented by the consumer price index). Thus, the average nominal wage is divided by the total cost of a representative consumer basket and the resulting number – the “real” wage – is used to assess how much an average person can afford at one place and point in time.

In contrast to GDP per capita real wages are less data-demanding and can take distributional issues into account. A specific advantage for historical analyses is that wages and prices of consumer goods are among the most widely available historical data.<sup>34</sup> Data can be biased, however, as wages got predominantly recorded for employees in a formal employment contract, thus mostly excluding the self-employed and women.<sup>35</sup> Using the consumer price index to deflate nominal wages comes with two methodological problems, namely that the “typical” consumer basket is changing over time and that the quality of the items included in this basket is changing. The mere price of the consumer basket does not appropriately account for these two changes. Thus, as the range of goods included and the quality of these goods are normally increasing, real wage increases over time tend to underestimate the real gains in terms of living standards.<sup>36</sup>

In Switzerland, an official countrywide index of average real wages is available back to 1939, while the consumer price index goes back to 1914. Before that no large-scale data collection or surveys on income and consumer prices are available from which to compute average wages and the cost of an average consumption basket. However, thanks to the richness of historical wage and price data mentioned above, it is possible to construct rough approximations for both

<sup>33</sup> Jeffrey G. Williamson, Regional inequality and the process of national development. A description of the patterns, in: *Economic Development and Cultural Change* 13/4 (1965), pp. 1–84.

<sup>34</sup> E.g. Moritz J. Elsas, *Umriss einer Geschichte der Preise und Löhne in Deutschland vom ausgehenden Mittelalter bis zum Beginn des neunzehnten Jahrhunderts*, Leiden 1936–1949. A wealth of data is now available online: <http://www.iisg.nl/hpw/> or <http://gpih.ucdavis.edu/index.html> (26.4.2019).

<sup>35</sup> In Switzerland, detailed national tax statistics that record all sorts of income range back to 1933. All that data is available on the websites of the Federal Statistical Office at <https://www.bfs.admin.ch/bfs/de/home.html> (26.4.2019).

<sup>36</sup> Roman Studer, Pascal Schuppli, Deflating Swiss Prices of the Past Five Centuries., in: *Historical Methods* 41/3 (2008), pp. 137–153.



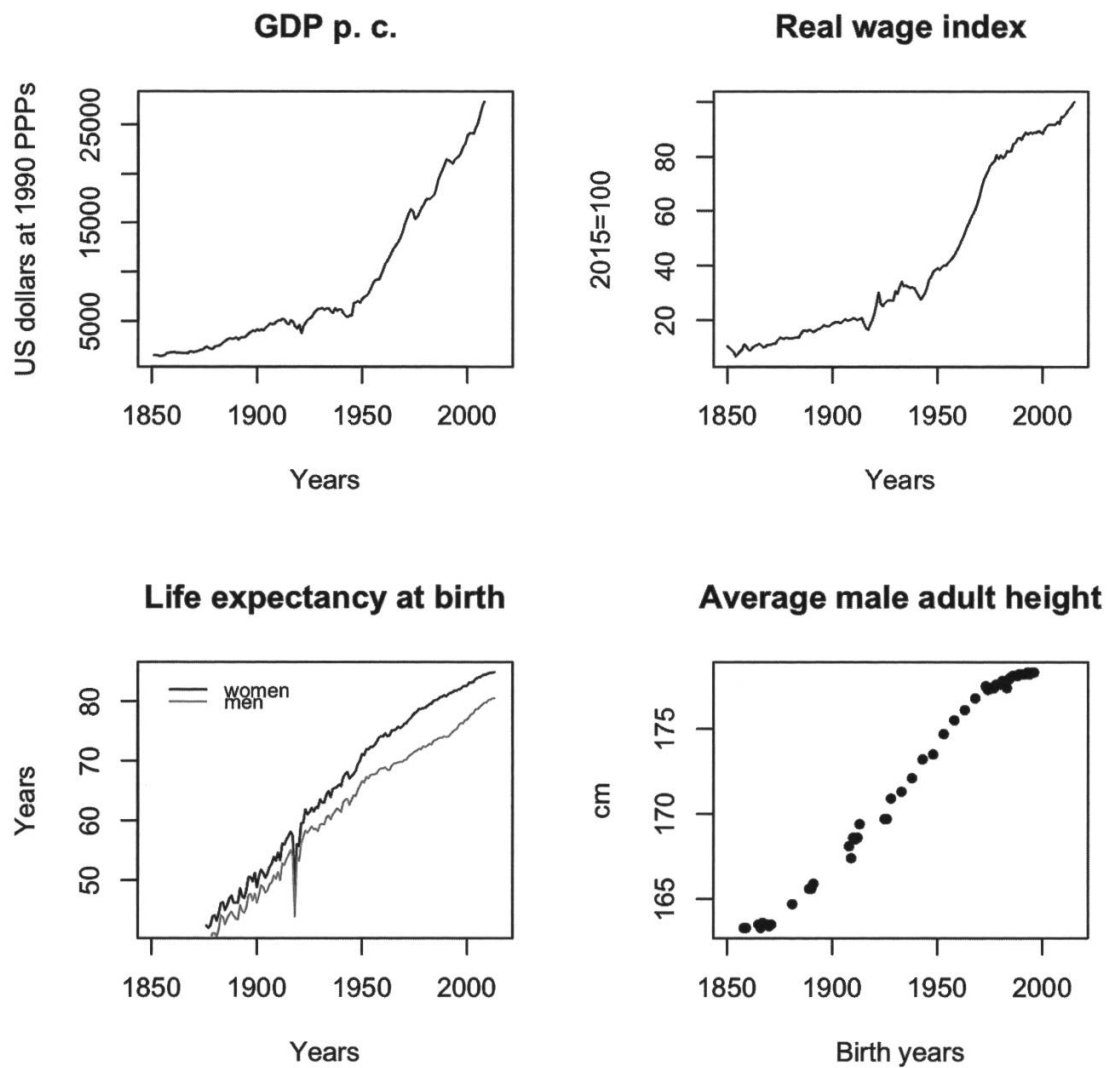


Fig. 1: Swiss indicators of living standards, 1850–2015.

Data source: see appendix Table A5 to A8.

measures. This gets, of course, more difficult the further back in time we want to go. To date the annual indicator going back the furthest starts in 1800.<sup>37</sup>

When linking the reconstructed real wage index to the official index to get an overview of real wages since 1800, the overall picture is as impressive as it is monotonous (see Figure 1): Real wages over the last 200 years knew essentially only one way – up – so that they increased sixteen-fold overall, which corresponds to a 1500 per cent increase from 1800 to today.

This rise was however far from uniform, and we may distinguish four time periods. The first half of the 19th century witnessed slow real wage growth (below 1 per cent), which by historical standards, however, is still remarkably

<sup>37</sup> Ibid.

good. Once the industrialisation really took off in Switzerland, real wages also started to increase faster and more consistently (the big exceptions being the two world wars), with an average annual real wage increase of 1.6 per cent between 1870 and 1950. However, the truly exceptional period was the post-war period, which saw big and uninterrupted increases in real wages of nearly 3 per cent per year over a quarter of a century right up to the second oil price shock in 1979. Such exceptional growth was enabled by the one-time structural change away from agrarian activities to industry and services, by post-war reconstruction and catch-up growth, and by a benign international economic and political environment. These exceptional growth rates were not specific to Switzerland but shared by many other advanced economies, as the naming of that period in our neighbouring countries – *Wirtschaftswunder*, *Trente Glorieuses*, or *Miracolo Economico* – attests.<sup>38</sup> However, such a growth spurt remains the exception, as the time after 1980 proved distinctly less glorious in terms of real wage growth, reaching “only” 0.6 per cent per year up to 2015. However, this negative interpretation is somewhat misleading as these mere numbers fail to adequately account for the introduction of new goods and for increases in the quality of goods – both developments that in itself constitute increases in material well-being and that have occurred at a fast rate in the latest couple of decades.<sup>39</sup>

While overall growth in real wages since 1800 is mirrored in most advanced economies, it is noteworthy that Switzerland has been exceptionally successful in that period (Table 2).

In pre-industrial times, Swiss citizens were not particularly wealthy compared to their European neighbours, and their real wages in the 19th century were still considerably lower than in leading economies such as England, the Netherlands, or Belgium. In the 20th century, however, Switzerland gradually caught up so that by the 1950s, Switzerland’s real wages were higher than in almost every other country – a situation that has endured up to the present. This evolution from a relatively poor country with no natural resources and net emigration in the early 1800s to one of the richest countries of the world two hundred years later thus seems to fully merit the widely used term “Swiss Miracle”.<sup>40</sup>

<sup>38</sup> GPD growth rates mirror these exceptional trends. Barry Eichengreen, *The European economy since 1945. Coordinated capitalism and beyond*, Princeton 2007, Chapters 3, 4 and 7; Peter Temin, *The golden age of European growth reconsidered*, in: *European Review of Economic History* 6 (2002), pp. 3–22.

<sup>39</sup> This underestimation is not very problematic when looking at short periods but of big relevance when trying to compare living standards over several decades.

<sup>40</sup> Beatrice Weder, Rolf Weder, *Switzerland’s rise to a wealthy nation*. UNO-WIDER Working Paper 25 (2009); Roman Studer, *When did the Swiss get so rich? Comparing living standards in Switzerland and Europe, 1800–1913*, in: *Journal of European Economic History* 2 (2008), pp. 405–452.

| Decades | Switzerland | Western Europe | GBR | NLD | FRA | GER | ITA | ESP | Ranking Switzerland |
|---------|-------------|----------------|-----|-----|-----|-----|-----|-----|---------------------|
| 1820s   | 8           | 12.6           | 16  | 16  | 17  | 10  | 4   | 17  | 6                   |
| 1830s   | 8           | 11.2           | 17  | 12  | 14  | 9   | 4   | 15  | 6                   |
| 1840s   | 9           | 11.2           | 16  | 11  | 15  | 10  | 4   | 17  | 6                   |
| 1850s   | 9           | 11.0           | 17  | 11  | 14  | 11  | 3   | 18  | 6                   |
| 1860s   | 10          | 11.5           | 17  | 10  | 16  | 12  | 4   | 16  | 6                   |
| 1870s   | 12          | 12.5           | 21  | 12  | 16  | 13  | 4   | 16  | 5                   |
| 1880s   | 17          | 14.7           | 25  | 15  | 21  | 16  | 6   | 15  | 3                   |
| 1890s   | 22          | 17.8           | 28  | 20  | 28  | 20  | 7   | 15  | 3                   |
| 1900s   | 25          | 19.0           | 28  | 23  | 29  | 22  | 8   | 16  | 3                   |
| 1910s   | 27          | 16.9           | 23  | 26  | 27  | 27  | 9   | 22  | 3                   |
| 1920s   |             | 18.7           | 30  | 31  | 13  | 22  | 13  | 14  |                     |
| 1930s   | 41          | 24.8           | 37  | 38  | 19  | 27  | 15  | 18  | 1                   |
| 1940s   | 29          | 26.2           | 41  | 27  | 15  |     | 10  |     |                     |
| 1950s   | 36          | 21.3           | 36  | 23  | 12  | 23  | 13  | 9   | 1                   |
| 1960s   | 56          | 31.8           | 49  | 24  |     | 41  | 25  | 16  |                     |
| 1970s   | 81          | 49.4           | 62  | 46  | 31  | 72  | 43  | 26  | 1                   |
| 1980s   | 89          | 64.8           | 78  | 68  |     | 124 | 89  |     |                     |

Tab. 2: Swiss real wages in international comparison (Number of subsistence baskets that a daily wage buys).

Source: Western Europe countries plus USA: Zwart, van Leeuwen, van Leeuwen-Li, Real wages since 1820, in: Jan Luiten van Zanden [et al.] (Eds.), *How was life?* pp. 80–81 (building labourers); Switzerland: Data 1820s–1910s: Studer, *When did the Swiss get so rich*, pp. 405–452; Switzerland Data 1930s–1980s: Pim de Zwart, Bas van Leeuwen, Jiel van Leeuwen-Li, *Labourers Real Wage*. <http://hdl.handle.net/10622/QK8VRF>, (6.5.2019).

## Life expectancy: one important measure of mortality

Similar to other European regions, Switzerland was until the 19th century characterized by low life expectancies and high infant mortality. In some politically well-organized urban parts of Switzerland – like Geneva – rising life expectancies have been observed during the late 18th century.<sup>41</sup> However, in general life expectancies of women and men only began to increase during the second part of the 19th century, in a first stage primarily due to reduced child mortality. Infant mortality remained longer at a high level and decreased substantially only after 1900. As in other European regions, a better nutritional status of broader parts of the population was an important determinant for lower mortality rates

<sup>41</sup> Alfred Perrenoud, *La population de Genève du seizième au début du dix-neuvième siècle. Etude démographique*, Genève 1979; Reto Schumacher, *Structures et comportements en transition. La reproduction démographique à Genève au 19e siècle*, Bern 2010; Reto Schumacher, Michel Oris, *Différentiels sociaux de mortalité à Genève. Un parcours à travers quatre siècles (1625–2004)*, in: *Schweizerische Gesellschaft für Wirtschafts- und Sozialgeschichte* 24 (2010), pp. 103–119.

among younger adults.<sup>42</sup> The development of proto-industrial work forms (decentralized textile work at home) reinforced this trend and the decline of mortality rates started in Swiss regions with high proportions of industrial work at home.<sup>43</sup> The gradual dissemination of new norms on hygiene and sanitation reduced infant and child mortality. In 1848, Switzerland became a democratic and economically liberal nation. Despite a strong federalist structure, the political domination of liberal forces was associated with rapid economic progress and better sewage and waste management (an important determinant of lower mortality risks due to infectious diseases). The development of a national army to defend the independence of the nation was – like in France and later in Germany – associated with an increased emphasis on a healthy (male) population and healthy family structures.<sup>44</sup> As a federalist country health-campaigns remained in the competence of cantons and during the 19th century infant mortality and life expectancies varied between protestant and catholic regions or between rural and urban regions.<sup>45</sup>

From 1876 to 1900, the mean life expectancy at birth of men increased from 39 to 46 years. For women, the mean life expectancy increased in this period from 42 to 49 years; a similar development as seen in other European regions (Table 3).<sup>46</sup>

These increases were primarily due to a slightly reduced infant and substantially lower mortality rates among younger adults. The life expectancy of the older population did not change much during this period. For men aged 65 the mean life expectancy increased only marginally, from 9.3 to 9.9 years (and for women from 9.5 to 9.8 years). The rising life expectancy between 1880 and 1910 is visible in all cantons.<sup>47</sup> However, it also shows that the relative regional ranking is changing.<sup>48</sup> At the beginning of the period, life expectancy is higher and infant mortality lower in rural, agrarian and alpine regions; towards the end of the period, urban areas have an advantage.

In the first decades of the 20th century, the life expectancies particularly among older men and women started to increase. After World War II the intro-

<sup>42</sup> Robert W. Fogel, *The escape from hunger and premature death, 1700–2100*. Cambridge 2004.

<sup>43</sup> Markus Mattmüller, *Das Einsetzen der Bevölkerungswelle in der Schweiz*, in: *Vierteljahresschrift für Sozial- und Wirtschaftsgeschichte*, 63/3 (1976), pp. 390–405.

<sup>44</sup> Jan Sundin, *Vom Sterberisiko zur Lebenschance. Der abendländische Weg zum längeren Leben*, in: Arthur E. Imhof, Rita Weinknecht (Eds.), *Erfüllt leben – in Gelassenheit sterben. Geschichte und Gegenwart*, Berlin 1994, pp. 113–128.

<sup>45</sup> Luigi Lorenzetti, Alfred Perrenoud, *Infant and child mortality in Switzerland in 19th and 20th centuries*. Mimeo Università della Svizzera Italiana 1999.

<sup>46</sup> Riley, *Estimates of regional and global life expectancy, 1800–2001*.

<sup>47</sup> Joël Floris [et al.], *Changes in Mortality in Switzerland 1880–1910*, in: Juan Flores [et al.] (Eds.), *Schweizerisches Jahrbuch für Wirtschaftsgeschichte 2018* (forthcoming).

<sup>48</sup> *Ibid.*; Luigi Lorenzetti, Véronique Meffre, *La transition sanitaire dans les Alpes suisses (1880–1920)*.

| Decades | Switzerland | Western Europe | GBR  | NLD  | FRA  | GER  | ITA  | ESP  | SWE  | USA  | Ranking Switzerland |
|---------|-------------|----------------|------|------|------|------|------|------|------|------|---------------------|
| 1820s   |             |                | 41.0 |      | 38.9 |      |      |      | 41.6 |      |                     |
| 1830s   |             | 33.4           | 40.7 |      | 39.0 |      |      |      | 41.3 |      |                     |
| 1840s   |             | 34.7           | 40.3 |      | 40.5 |      |      |      | 43.6 |      |                     |
| 1850s   |             | 35.5           | 40.8 | 37.0 | 39.7 |      |      |      | 42.0 |      |                     |
| 1860s   |             | 36.9           | 41.1 | 37.5 | 41.6 |      |      |      | 44.8 |      |                     |
| 1870s   | 41.2        | 38.3           | 42.3 | 39.1 | 41.3 | 38.4 | 32.7 |      | 46.8 |      |                     |
| 1880s   | 44.3        | 40.4           | 44.6 | 42.9 | 43.5 | 39.4 | 35.7 | 29.5 | 49.8 | 39.4 | 3                   |
| 1890s   | 47.1        | 42.9           | 45.7 | 46.8 | 45.1 | 42.4 | 40.5 | 32.1 | 52.3 | 45.2 | 2                   |
| 1900s   | 50.2        | 46.3           | 49.1 | 51.6 | 48.0 | 45.5 | 43.8 | 39.0 | 55.3 | 50.6 | 4                   |
| 1910s   | 53.8        | 46.7           | 52.7 | 55.1 | 44.3 | 44.8 | 42.7 | 41.0 | 57.1 | 53.3 | 3                   |
| 1920s   | 59.1        | 54.7           | 58.4 | 61.7 | 54.2 | 57.4 | 50.7 | 45.7 | 61.7 | 58.0 | 3                   |
| 1930s   | 62.5        | 58.7           | 61.6 | 66.2 | 58.2 | 61.5 | 56.0 | 49.9 | 64.6 | 61.0 | 3                   |
| 1940s   | 65.8        | 60.1           | 65.0 | 65.6 | 57.7 | 60.5 | 56.9 | 55.6 | 68.8 | 65.4 | 2                   |
| 1950s   | 70.0        | 68.2           | 69.9 | 72.3 | 68.1 | 68.2 | 67.3 | 65.8 | 72.3 | 69.1 | 3                   |
| 1960s   | 72.1        | 70.7           | 71.3 | 73.5 | 71.0 | 70.2 | 70.2 | 70.5 | 73.7 | 70.2 | 3                   |
| 1970s   | 74.5        | 72.6           | 72.5 | 74.5 | 73.0 | 71.6 | 72.8 | 73.3 | 75.0 | 72.2 | 2                   |
| 1980s   | 76.7        | 75.1           | 74.6 | 76.4 | 75.3 | 74.2 | 75.5 | 76.3 | 76.7 | 74.6 | 1                   |
| 1990s   | 78.6        | 77.2           | 76.6 | 77.5 | 77.8 | 76.6 | 78.0 | 78.0 | 78.6 | 76.0 | 1                   |
| 2000s   | 81.1        | 79.7           | 78.9 | 79.3 | 80.2 | 79.2 | 80.8 | 80.3 | 80.5 | 77.6 | 1                   |

Tab. 3: Swiss life expectancy at birth in international comparison.

Source: Western Europe countries plus USA: Richard L. Zijdeman, Filipa Ribeiro de Silva, *Life expectancy since 1820.*, in: Jan Luiten van Zanden [et al.] (Eds.), *How was life?* pp. 108–109; Switzerland: Heiner Ritzmann-Blickenstorfer (Ed.), *Historische Statistik der Schweiz*. Zürich 1996; Swiss Federal Statistical Office (Ed.), *Bevölkerungsbewegung in der Schweiz, Bern 1878–2000*; Swiss Federal Statistical Office (Ed.), *Schweizerische Statistik der natürlichen Bevölkerungsbewegung (BEVNAT)*, Berne und Neuchâtel.

duction of welfare policies, rapid increasing general economic prosperity and the development of a modern health system resulted not only in high life expectancies but also in a substantial extension of healthy life expectancies. With exception of the year of the Spanish influenza (1918), the life expectancies of men and women have continuously increased after 1900. In recent decades, this resulted in rapidly rising numbers of nonagenarians and centenarians.<sup>49</sup>

<sup>49</sup> Jean-Marie Robine, Fred Paccaud, Nonagenarians and centenarians in Switzerland, 1860–2001. A Demographic analysis, in: *Journal of Epidemiology & Community Health* 51/1 (2005), pp. 31–37.

## Human growth, height and body shape as a mirror of the nutritional status

Anthropometric history asks how the human body changed in its socioeconomic and epidemiological environment.<sup>50</sup> Endemic malnutrition, the coexistence of undernutrition along with overweight and the obesity pandemic show how poverty and wealth affect the human body.<sup>51</sup> It is striking how average height of the population has grown by 10 to 19 cm in almost all European countries since the 19th century (Table 4).<sup>52</sup>

Differences in human body size between individuals within a population result from genetic differences and the interaction of those individual genetic blueprints with the environment. The influence of genetic variation on average differences between populations, however, remains unclear.<sup>53</sup> The secular trends in average height and average age at menarche indicate that changes in living conditions are important in explaining the changes in the human body.<sup>54</sup> Average height, for instance, is seen as a mirror of the net nutritional status of the population.<sup>55</sup>

The net nutritional status results from the nutrient intake (quality and quantity) and the energy spent on basic metabolic work, efforts to overcome diseases, and physical activities.<sup>56</sup> If it is unbalanced less energy can be spent on growth. Serious negative environmental impacts on growth are best and immediately seen in children being underweight and shorter than average for their age. However, the impact depends on the strength, duration and timing of the effect and a later compensation through catch-up growth or prolonged growth is possible.<sup>57</sup> Therefore adult height reflects the whole history of net nutritional status during growth years.<sup>58</sup> It has been shown, however, that the secular trend in

50 Floud [et al.], *The changing body*, p. 1; Komlos, *Anthropometric history*.

51 World Health Organization (Ed.), *Obesity. Preventing and managing the global epidemic*, Geneva 2000; World Health Organization (Ed.), *Physical status. The use and interpretation of anthropometry*, Geneva 1995.

52 NCD Risk Factor Collaboration (Ed.), *A century of trends in adult human height*, in: *eLife* 2016 (5e13410); Brian P. McEvoy, Peter M. Vischer, *Genetics of human height*, in: *Economics and Human Biology* 7/3 (2009), pp. 294–306.

53 McEvoy, Vischer, *Genetics of human height*, pp. 300–301.

54 Barry Bogin, *Patterns of Human Growth*. Cambridge 1999, pp. 225–267.

55 James M. Tanner, *Introduction. Growth in height as a mirror of the standard of living*, in: John Komlos (Ed.), *Stature, living standards, and economic development. Essays in anthropometric history*, Chicago and London 1994, pp. 1–6.

56 Floud [et al.], *The changing body*, p. 11.

57 Noël Cameron, *The human growth curve, canalization and catch-up growth*, in: Noël Cameron, Barry Bogin (Eds.), *Human growth and development*, Amsterdam 2012, pp. 1–22.

58 Komlos, *Anthropometric history*.



| Birth<br>decades | Switzer-<br>land | Western<br>Europe | GBR   | NLD   | FRA   | GER   | ITA   | ESP   | SWE   | USA   | Ranking<br>Switzer-<br>land |
|------------------|------------------|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-----------------------------|
| 1820s            |                  | 165.6             | 169.1 | 165.1 | 163.9 | 167.3 | 165.8 |       |       | 172.2 |                             |
| 1830s            |                  | 165.2             | 166.7 | 164.2 | 164.0 | 166.8 | 164.1 | 161.0 | 168.1 | 173.5 |                             |
| 1840s            |                  | 164.8             | 166.5 | 164.5 | 164.3 | 166.6 | 162.0 | 163.7 | 167.9 | 172.2 |                             |
| 1850s            | 163.3            | 164.6             | 165.5 | 165.3 | 165.2 | 163.8 | 162.9 | 162.5 | 168.4 | 171.1 | 7                           |
| 1860s            | 163.5            | 165.3             | 166.6 | 166.5 | 165.4 | 165.5 | 163.1 | 162.7 | 169.3 | 170.6 | 7                           |
| 1870s            | 163.5            | 165.9             | 167.2 | 167.1 | 165.5 | 166.9 | 163.5 | 162.6 | 170.3 | 171.1 | 7                           |
| 1880s            | 165.2            | 166.6             | 167.9 | 168.5 | 165.9 | 167.9 | 163.9 | 163.9 | 171.2 | 169.5 | 7                           |
| 1890s            | 165.8            | 167.0             | 167.4 | 169.4 | 166.1 | 168.6 | 164.7 | 164.0 | 172.4 | 169.1 | 7                           |
| 1900s            | 167.8            | 168.0             | 169.4 | 170.9 | 166.8 | 169.2 | 165.6 | 164.6 | 172.8 | 170.0 | 6                           |
| 1910s            | 168.8            | 169.0             | 170.9 | 172.6 | 167.8 | 170.5 | 166.3 | 165.1 | 173.2 | 172.1 | 6                           |
| 1920s            | 170.1            | 170.1             | 171.0 | 173.5 | 168.5 | 173.3 | 167.3 | 165.6 | 168.3 | 173.1 | 5                           |
| 1930s            | 171.7            | 171.3             | 173.9 | 174.1 | 169.9 | 174.0 | 168.1 | 165.2 | 175.5 | 173.4 | 6                           |
| 1940s            | 173.4            | 172.6             | 174.9 | 177.5 | 171.7 | 175.2 | 169.3 | 166.3 | 178.5 | 176.1 | 6                           |
| 1950s            | 175.1            | 174.5             | 176.0 | 178.7 | 173.2 | 176.8 | 171.3 | 170.8 | 179.3 | 177.1 | 6                           |
| 1960s            | 176.5            | 176.3             | 176.9 | 182.2 | 174.9 | 178.9 | 173.0 | 174.2 | 180.1 | 177.3 | 6                           |
| 1970s            | 177.4            | 176.8             | 177.1 | 182.3 | 175.1 | 179.4 | 174.1 | 175.2 | 180.0 | 178.3 | 5                           |
| 1980s            | 177.9            | 177.5             | 176.8 | 182.7 | 176.5 | 180.5 | 174.5 | 175.6 | 180.4 | 179.0 | 5                           |

Tab. 4: Swiss male adult average height in international comparison. The birth decade's figures for Switzerland are not based on complete yearly data (exception the 1980s), see Table A8 in the Appendix for the available years.

Source: Western Europe countries plus USA: Joerg Baten, Matthias Blum, Human height since 1820. In: Jan Luiten van Zanden [et al.] (Eds.), *How was life?* pp. 126–127; Switzerland: Kaspar Staub [et al.] *From left-skewness to symmetry. How body-height distribution among Swiss conscripts has changed since the late 19th century*, in: *Annals of Human Biology* 42/3 (2015), pp. 262–269; Joël Floris [et al.], *Der Body-Mass-Index der Schweizer Stellungspflichtigen 2015. Bericht zu Handen des Bundesamtes für Gesundheit, Zürich 2016.*

average height can already be seen at the age of two years.<sup>59</sup> Hence studies on average adult height focus on the living conditions around birth years. Nevertheless, this focus was recently questioned by arguing that living conditions around puberty are at least as equally important.<sup>60</sup>

In almost all societies, in past and present populations, there is a noticeable social gradient in average height: to put it simple wealthy people tend to be taller than poor people. One important socioeconomic determinant of stature is income. More income means, especially for past societies, usually better quality and more abundance of food, less physical workload, better housing conditions, more favourable disease environment and better medical care. Stature is a func-

<sup>59</sup> Tim J. Cole, The secular trend in human physical growth. A biological view, in: *Economics and Human Biology* 1/2 (2003), pp. 161–168.

<sup>60</sup> Ewout Depauw, Deborah Oxley, Toddlers, teenagers and terminal heights. The importance of puberty for male adult stature, Flanders, 1800–76, in: *The Economic History Review* (2018), doi: 10.1111/ehr.12745.

tion of access to resources and an output measure on how resources were used.<sup>61</sup> Therefore height can be used as a social inequality measure. But it has been shown that the relationship between income and height in particular and health in general is not stable and not self-evident.<sup>62</sup> Height is a good indicator of the standard of living in times of deprivation but it is not in times of abundance.

Conscription data are the best sources for anthropometric data in Switzerland because of their reliability and coverage.<sup>63</sup> The medical examination at recruitment has been standardised countrywide since 1875. The anthropometric records cover 90 to 100 per cent of the 18 to 21 years old Swiss men of each birth cohort since the end of the 19th century. Height, upper arm circumference and breast circumference and for certain time frames also weight are available. Other sources are passport registers, prisoners lists, school children examinations, since the 1950s health surveys, and records of maternity hospitals.

The relationship between standard of living, diet, workload, and growth has been known for a long time. Eduard Mallet published a first study on average height of Swiss conscripts from Geneva in 1835.<sup>64</sup> Pierre-Louis Dunant published a similar study in 1867.<sup>65</sup> A vast amount of literature on height emerged later among military doctors, school physicians, anthropologists, and physicians analysing goitre between 1888 and 1950.<sup>66</sup> Thereafter paediatricians have followed with large longitudinal growth studies.<sup>67</sup> Since 2002 the changing morphology of the human body in Switzerland during the last 200 years is studied in the context of anthropometric history.<sup>68</sup>

<sup>61</sup> Richard H. Steckel, Stature and the standard of living, in: *Journal of Economic Literature* XXXIII (1995), pp. 1903–1940.

<sup>62</sup> Angus Deaton, Height, health, and inequality. The distribution of adult heights in India, in: *American Economic Review Papers & Proceedings* 98/2 (2008), pp. 468–474.

<sup>63</sup> Kaspar Staub, *Der biologische Lebensstandard in der Schweiz seit 1800. Historisch-anthropometrische Untersuchung der Körperhöhe (und des Körpergewichts) in der Schweiz seit 1800, differenziert nach Geschlecht, sozioökonomischem und regionalem Hintergrund*, Berne 2010.

<sup>64</sup> Eduard Mallet, *De la taille moyenne de l'homme dans le Canton de Genève. Genève 1835*; Kaspar Staub [et al.], *Edouard Mallet's early and almost forgotten study of the average height of Genevan conscripts in 1835*, in: *Economics and Human Biology* 9/4 (2011), pp. 438–442.

<sup>65</sup> Pierre-Louis Dunant, *De la taille moyenne des habitants du Canton de Genève pour servir à la détermination de la taille moyenne en Suisse. Genève 1867*.

<sup>66</sup> Staub, *Der biologische Lebensstandard*, pp. 89–134.

<sup>67</sup> Ibid.

<sup>68</sup> Kaspar Staub [et al.], *From undernutrition to overnutrition. The evolution of overweight and obesity among young men in Switzerland since the 19th century*, in: *Obesity Facts* 9/4 (2016), pp. 259–272; Joël Floris, *Körpergrösse, Body-Mass-Index und Geburtsgewichte. Lebensstandard und Anthropometrie in Zürich und Basel 1904–1951*, Zürich 2016 (E-Dissertation); Kaspar Staub [et al.], *Überblick über zehn Jahre historisch-anthropometrische Forschung in der Schweiz. Säkularer Trend, soziale und regionale Unterschiede in der mittleren Körperhöhe und -form seit Beginn des 19. Jahrhunderts*, in: *Bulletin der Schweizerischen Gesellschaft für Anthropologie* 18/2 (2012), pp. 37–50; Staub, *Der biologische Lebensstandard*; Frank J. Rühli, Maciej Henneberg, Ulrich Woitek, *Variability of height, weight, and body mass index in a Swiss armed forces 2005 census*, in: *American Journal of Physical Anthropology* 137/4 (2008), pp. 286–291.

Average height of 19-year-old Swiss conscripts has increased by 15 cm in 131 years (163 cm birth year 1859, 178 cm birth year 1990).<sup>69</sup> The take-off started in the 1870s during the transition from an uncertain supply environment in an agricultural society to a more stable supply environment in an industrial society.<sup>70</sup> A higher material standard of living, a more affordable diet, improved sanitary conditions and better medical care as well as debates on the right diet and hygiene measures have added their benefits.<sup>71</sup> The rate of growth in average height was strong from the 1870s until WWI as well as in the interwar period and after World War II. In both world wars the rate was moderate. Since the 1970s average height seems to have reached a plateau.<sup>72</sup> There is a marked switch from growth in height to growth in breadth.<sup>73</sup> From an evolutionary perspective it was positive to store body fat and energy in good times to survive during hunger crises in a notoriously unstable environment. Nowadays this benefit has turned to be a disadvantage.<sup>74</sup>

Most studies in historical anthropometry have analysed male average height. Sources with anthropometric measures of women are scarcer and therefore such studies are underrepresented in the literature.<sup>75</sup> The only study to date on average adult height of women in Switzerland in the 19th century indicates that the secular trend among women probably began in the 1850s and thus earlier than among men.<sup>76</sup>

The Swiss were on average as tall as Italians or Spaniards at the beginning of the secular trend in the 1870s (Table 4, above).<sup>77</sup> They were short compared with men from other Western and Central European countries. By World War I the Swiss belonged then to the medium tall Europeans, on average as tall as the French or Belgians. The secular trend in average height was fast and strong for Switzerland compared with the development in other European countries. Aver-

<sup>69</sup> Kaspar Staub [et al.], The average height of 18- and 19-year-old conscripts (N=458,322) in Switzerland from 1992 to 2009, and the secular height trend since 1878, in: *Swiss Medical Weekly* 141 (2011), pp. 1–7; Staub, *Der biologische Lebensstandard*.

<sup>70</sup> Christian Pfister, *Ernährungslandschaften vor dem Zeitalter der Eisenbahn*, in: Bundesamt für Gesundheitswesen (Ed.), *Dritter schweizerischer Ernährungsbericht*, Bern 1991, pp. 354–364.

<sup>71</sup> Joël Floris, Kaspar Staub. Water, sanitation and mortality in Swiss towns in the context of urban renewal in the late nineteenth century, in: *The History of the Family*. DOI: 10.1080/1081602X.2019.1598460.

<sup>72</sup> Linda Vinci [et al.], Have Swiss adult males and females stopped growing taller? Evidence from the population-based nutrition survey menuCH, 2014/2015, in: *Economics & Human Biology* 33 (2019), pp. 201–210.

<sup>73</sup> Kaspar Staub, Frank J. Rühli, From growth in height to growth in breadth. The changing body shape of Swiss conscripts since the last 19th century and possible endocrine explanations, in: *General and Comparative Endocrinology* 188 (2013), pp. 9–15.

<sup>74</sup> Kaspar Staub [et al.], *From undernutrition to overnutrition*.

<sup>75</sup> Richard Steckel, *Heights and human welfare*, pp. 1–23.

<sup>76</sup> Nikola Koepke [et al.], Ladies first. Female and male adult height in Switzerland, 1770–1930, in: *Economics and Human Biology* 29 (2018), pp. 76–87.

<sup>77</sup> Staub, *Der biologische Lebensstandard*, pp. 155.

age height, however, varies a lot within countries.<sup>78</sup> In Switzerland at the end of the 19th century, for instance, tall people lived in the western (between Geneva and Basle) and in the central part of Switzerland as well as in the cities.<sup>79</sup> Eastern Swiss and people from the Bernese Highlands were comparatively short. Swiss with a higher socioeconomic status were on average taller than Swiss with a low socioeconomic status.<sup>80</sup> Swiss students in the city of Zurich were on average 6 to 7 cm taller than day labourers in 1904.<sup>81</sup> This difference, however, decreased to 3 to 4 cm in 1951.<sup>82</sup>

## Discussion

Although there is some evidence that the standard of living was rising in some regions of Switzerland in the 18th and early 19th century, the average living standard was low in international comparison by the middle of the 19th century. Switzerland can be ranked fifth among nine Western European countries (plus the USA) according to GDP per capita. Real wages were considerably lower than in leading European economies. It was characterized by low life expectancies and high infant mortality as in other European regions. And the Swiss were on average as short as Spaniards or Italians.

The marked improvement in living standards started in the last quarter of the 19th century. By World War I the Swiss were notably richer, older and taller. Although the progress in all four indicators is clearly visible between 1870 and 1914, important differences remain when the indicators are compared to other European countries. Switzerland shows an above average increase in GDP per capita and belongs to the three richest countries in our sample by World War I. This movement towards the top of the distribution is not one-to-one paralleled by the other three indicators. The increase in real wages and the take-off in average height is evident, but by World War I the Swiss are not at the top of the European distribution. The increase in nominal wages was extraordinary in Switzerland between 1885 and 1910; it was only surpassed by the development in Germany. Switzerland was no longer the low-wage country that it has been in the 19th century. But at the same time extraordinary price inflation lowered Swiss purchasing power relative to other places in Europe. Thus, by World War

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<sup>78</sup> Marie Claude Chamla, L'accroissement de la stature en France de 1880 à 1960. Comparaison avec les pays d'Europe occidentale, in: *Bulletins et Mémoires de la Société d'anthropologie de Paris* 6/2 (1964), pp. 201–278.

<sup>79</sup> Staub, *Der biologische Lebensstandard*, pp. 169.

<sup>80</sup> Tobias Schoch, Kaspar Staub, Christian Pfister. Social inequality and the biological standard of living. An anthropometric analysis of Swiss conscription data, 1875–1950, in: *Economics and Human Biology* 10 (2012), pp. 154–173.

<sup>81</sup> Floris, *Körpergrösse*, pp. 87–92.

<sup>82</sup> *Ibid.*



I Swiss real wages could still not compete with those abroad. At that time, the Swiss were on average as tall as the French. This means that they had grown above average and caught up to a middle position in Europe. Life expectancy at birth shows a similar development as in other European regions, i.e. a strong increase but one that is just average compared with abroad. High inequality and high living costs in Switzerland (there is some evidence for an early so-called island of high prices: “*Hochpreisinsel*”) or data problems with macro indicators are potential explanations for these differences in movements. That production did not “trickle down” fast seems to be corroborated by migration flows. Switzerland remained an emigration country throughout the second half of the 19th century and only became a typical immigration country after the world wars, although the net migration rate was positive since 1888.

Living standards increased steadily during the interwar period until 1950, with the exception of – unsurprisingly – the two World Wars and the Great Depression. Switzerland remained in the top three of the GDP per capita distribution. Real wages continued to increase with an average annual increase of 1.6 per cent from 1870 to 1950. The rate of growth in average height was strong until the 1970s and life expectancy at birth continuously increased. Average height seems to have reached a plateau since the 1970s. At the same time the exceptional growth rates in real wages after World War II, nearly 3 per cent per year for a quarter century, ended in 1979. Since then the real wage increase reached only 0.6 per cent per year up to 2015 and the Swiss switched from growth in height to growth in breadth in accordance with the worldwide obesity pandemic. In terms of GDP per capita, however, Switzerland remains at the top of the distribution until nowadays. The same is true for average life expectancy at birth.

According to all indicators, the increase of Swiss living standards in the last two hundred years was a success story. The differences in timing and the international comparison, however, highlight that the different indicators should not be used as substitutes for each other. Which indicator is to be used or whether several indicators are to be considered together, depends on the respective observational level. Even though this is not a particularly surprising finding, some would even deem it trivial, we argue that it is crucial to think seriously and carefully about the different dimensions of well-being.

Average height and life expectancy show how resources were used (output measure), while real wages and GDP per capita show which resources were available (input measure). Short-term economic shocks are better and more directly visible in real wages and GDP per capita than in the average body size of an adult. In children or newborns, on the other hand, the influence of short-term crises can also be seen in annual growth rates. This difference between children and adults shows that it is not only important to distinguish between aggregated measures such as GDP per capita and individual-level measures such as

human stature, but the sample structure of individual-level measures must also be reflected. This does not, of course, concern only the differentiation according to age groups, but also other variables (e.g. classes, strata, nationality, sex and gender).

The level of development of a society must also be considered. The average adult height is no longer an adequate measure of the standard of living in a rich country, because most people reach their genetic growth potential. For example, average adult height in Europe has plateaued since the 1970s. Analogously, there might also be a biological maximum to life expectancy.<sup>83</sup> In either case, the debate has not yet reached a consensus. Whether the monetary indicators are also subject to an upper limit is even less clear. Since the famous study *The Limits to Growth* by the Club of Rome, the issue has been debated not only in the sciences but also in a broader public. The level achieved also determines how difficult it is to continue to raise the standard of living: the higher the level, the more difficult it is to raise it further.<sup>84</sup> For example, raising the life expectancy at birth from 70 to 75 years is more difficult to achieve than increasing it from 45 to 50 years. The relationship between level and increase in living standards is therefore not linear and must be considered when comparing levels.<sup>85</sup>

Another issue is the focus on different levels. Wages, life expectancy and anthropometric measures capture living standards at the individual level, while GDP per capita focuses at the aggregate level. Of course, individual-level indicators measure the standard of living more directly than GDP. And, of course, there is a direct individual relationship between behaviour and living standards or quality of life, which as such does not directly exist for aggregated measures. However, approaches that try to connect different levels of aggregation are particularly promising. Multi-level approaches increase our chances to explain and understand these improvements. No single cause explains the increase of living standards, and the relations between different components are complex. Increasing income and better nutrition played certainly a role for rising life expectancy.<sup>86</sup> But different public health measures such as clean water and sanitation as well as medical care were also important,<sup>87</sup> not to forget education and institu-

<sup>83</sup> James W. Vaupel, Biodemography of human ageing, in: *Nature* 464 (2010), pp. 536–542; Xiao Dong, Brandon Milholland, Jan Vijg, Evidence for a limit to human lifespan, in: *Nature* 538 (2016), pp. 257–259.

<sup>84</sup> Hyun Hwa Son, *Equity and well-being. Measurement and policy practice*, Oxon 2011.

<sup>85</sup> Ibid.

<sup>86</sup> Robert Millward, Frances N. Bell, Economic factors in the decline of mortality in late nineteenth century Britain, in: *European Review of Economic History* 2 (1998), pp. 263–288; Bernard Harris, Public health, nutrition, and the decline of mortality. The McKeown thesis revisited, in: *Social History of Medicine* 17 (2004), pp. 379–407; McKeown, *The modern rise of population*; Thomas McKeown, *The role of medicine. Dream, mirage, or nemesis?* Princeton 1979; Fogel, *The escape*.

<sup>87</sup> Samuel H. Preston, *American longevity. Past, present, and future*, Center for Policy Research 7 (1996), pp. 3–18; Angus Deaton, *The great escape. A review of Robert Fogel's The escape from hun-*



tional quality.<sup>88</sup> In turn, life history theory offers an analytical framework within evolutionary theory. The available scarce energy and time resources are allocated over the life span to competing functions of the human body (maintenance, growth, reproduction, defence), in view of maximizing chances of survival and reproduction and in face of challenges posed by the environment.<sup>89</sup> One explanation for the increase in average height and longevity could then be that the human body was able to invest more in these factors as soon as the socio-economic and epidemiological conditions became more stable.

Aggregate and individual-level measures should therefore not be played off against each other, even if the measuring of the standard of living at the individual level remains central. But this is an insight, which, perhaps surprisingly, only gained acceptance in recent decades:

Another key idea is the distinction between individuals and aggregates, what the committee refers to as “consumption, great and small.” Aggregation needs to be seen, not as a nuisance, but as a hallmark of seriousness, as well as a source of hypotheses and understanding. The link between behavior and wellbeing, when it holds at all, holds for individuals, not for aggregates. While we often must focus on aggregates for macroeconomic policy, it is impossible to think coherently about national wellbeing while ignoring inequality and poverty, neither of which is visible in aggregate data. Indeed, and except in exceptional cases, macroeconomic aggregates themselves depend on distribution. These arguments are much more widely accepted today than they were thirty years ago.<sup>90</sup>

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ger and premature death, 1700–2011, in: *Journal of Economic Literature* 41 (2006), pp. 106–114; David Cutler, Angus Deaton, Adriana Lleras-Muney, The determinants of mortality, in: *Journal of Economic Perspectives* 20 (2006), pp. 97–120; Angus Deaton, *The great escape. Health, wealth, and the origins of inequality*, Princeton 2013.

<sup>88</sup> Partha Dasgupta, Martin Weale, On measuring the quality of life., in: *World Development* 20 (1992), pp. 119–131; Sudhir Anand, Martin Ravallion, Human development in poor countries. On the role of private incomes and public services, in: *Journal of Economic Perspectives* 7 (1993), pp. 133–150.

<sup>89</sup> Stephen C. Stearns, *The evolution of life histories*. Oxford 1992.

<sup>90</sup> Angus Deaton, Measuring and understanding behaviour, welfare, and poverty. Prize Lecture 8th December 2015 (The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2015).

## Appendix

| Year | GDP p. c. | Year | GDP p. c. | Year | GDP p. c. | Year | GDP p. c. |
|------|-----------|------|-----------|------|-----------|------|-----------|
| 1851 | 1535      | 1891 | 3100      | 1931 | 6314      | 1971 | 15376     |
| 1852 | 1536      | 1892 | 3309      | 1932 | 6124      | 1972 | 15923     |
| 1853 | 1494      | 1893 | 3353      | 1933 | 6285      | 1973 | 16329     |
| 1854 | 1422      | 1894 | 3352      | 1934 | 6278      | 1974 | 16150     |
| 1855 | 1490      | 1895 | 3537      | 1935 | 5952      | 1975 | 15365     |
| 1856 | 1519      | 1896 | 3747      | 1936 | 5841      | 1976 | 15543     |
| 1857 | 1749      | 1897 | 3920      | 1937 | 6304      | 1977 | 15969     |
| 1858 | 1797      | 1898 | 4036      | 1938 | 6034      | 1978 | 16426     |
| 1859 | 1817      | 1899 | 3979      | 1939 | 6177      | 1979 | 16729     |
| 1860 | 1842      | 1900 | 4152      | 1940 | 6155      | 1980 | 17209     |
| 1861 | 1851      | 1901 | 4018      | 1941 | 5788      | 1981 | 17413     |
| 1862 | 1772      | 1902 | 4155      | 1942 | 5488      | 1982 | 17370     |
| 1863 | 1808      | 1903 | 4064      | 1943 | 5427      | 1983 | 17588     |
| 1864 | 1763      | 1904 | 4320      | 1944 | 5583      | 1984 | 17780     |
| 1865 | 1753      | 1905 | 4512      | 1945 | 5551      | 1985 | 18472     |
| 1866 | 1767      | 1906 | 4762      | 1946 | 6823      | 1986 | 19371     |
| 1867 | 1724      | 1907 | 4688      | 1947 | 6921      | 1987 | 19953     |
| 1868 | 1917      | 1908 | 4714      | 1948 | 7026      | 1988 | 20397     |
| 1869 | 1910      | 1909 | 4935      | 1949 | 6872      | 1989 | 20920     |
| 1870 | 1855      | 1910 | 5054      | 1950 | 7247      | 1990 | 21487     |
| 1871 | 1924      | 1911 | 5051      | 1951 | 7459      | 1991 | 21381     |
| 1872 | 1972      | 1912 | 5219      | 1952 | 7546      | 1992 | 21217     |
| 1873 | 2085      | 1913 | 5132      | 1953 | 7831      | 1993 | 21070     |
| 1874 | 2086      | 1914 | 4769      | 1954 | 8271      | 1994 | 21478     |
| 1875 | 2260      | 1915 | 4684      | 1955 | 8791      | 1995 | 21643     |
| 1876 | 2419      | 1916 | 5073      | 1956 | 9110      | 1996 | 21819     |
| 1877 | 2280      | 1917 | 4924      | 1957 | 9210      | 1997 | 22210     |
| 1878 | 2189      | 1918 | 4468      | 1958 | 9196      | 1998 | 22779     |
| 1879 | 2204      | 1919 | 4237      | 1959 | 9714      | 1999 | 23084     |
| 1880 | 2430      | 1920 | 4624      | 1960 | 10272     | 2000 | 23841     |
| 1881 | 2476      | 1921 | 3767      | 1961 | 10868     | 2001 | 24114     |
| 1882 | 2511      | 1922 | 4510      | 1962 | 11174     | 2002 | 24108     |
| 1883 | 2634      | 1923 | 4816      | 1963 | 11578     | 2003 | 24092     |
| 1884 | 2852      | 1924 | 5146      | 1964 | 12054     | 2004 | 24663     |
| 1885 | 2997      | 1925 | 5265      | 1965 | 12435     | 2005 | 25125     |
| 1886 | 3163      | 1926 | 5436      | 1966 | 12700     | 2006 | 25955     |
| 1887 | 3248      | 1927 | 5815      | 1967 | 13025     | 2007 | 26808     |
| 1888 | 3214      | 1928 | 6065      | 1968 | 13435     | 2008 | 27285     |
| 1889 | 3226      | 1929 | 6229      | 1969 | 14008     |      |           |
| 1890 | 3334      | 1930 | 6260      | 1970 | 14743     |      |           |

Tab. A5: Swiss GDP per capita.

Source: Christian Stohr, Trading gains. New estimates of Swiss GDP, 1851 to 2008, in: LSE Economic History Working Paper 245 (2016).

| Year | Index | Year | Index | Year | Index | Year | Index | Year | Index | Year | Index  |
|------|-------|------|-------|------|-------|------|-------|------|-------|------|--------|
| 1800 | 6.08  | 1840 | 9.93  | 1880 | 13.26 | 1920 | 22.50 | 1960 | 46.67 | 2000 | 88.57  |
| 1801 | 7.60  | 1841 | 9.65  | 1881 | 13.45 | 1921 | 25.94 | 1961 | 48.57 | 2001 | 90.16  |
| 1802 | 7.35  | 1842 | 9.55  | 1882 | 13.58 | 1922 | 30.14 | 1962 | 50.16 | 2002 | 91.11  |
| 1803 | 7.51  | 1843 | 9.16  | 1883 | 13.71 | 1923 | 25.95 | 1963 | 52.06 | 2003 | 91.75  |
| 1804 | 8.25  | 1844 | 8.68  | 1884 | 13.71 | 1924 | 25.18 | 1964 | 54.29 | 2004 | 91.75  |
| 1805 | 7.68  | 1845 | 8.80  | 1885 | 15.15 | 1925 | 26.19 | 1965 | 55.87 | 2005 | 91.75  |
| 1806 | 7.51  | 1846 | 7.82  | 1886 | 16.19 | 1926 | 27.01 | 1966 | 57.78 | 2006 | 91.75  |
| 1807 | 8.36  | 1847 | 7.10  | 1887 | 16.28 | 1927 | 27.33 | 1967 | 59.05 | 2007 | 92.70  |
| 1808 | 9.28  | 1848 | 9.75  | 1888 | 15.97 | 1928 | 27.21 | 1968 | 60.63 | 2008 | 92.06  |
| 1809 | 9.55  | 1849 | 10.61 | 1889 | 16.46 | 1929 | 27.18 | 1969 | 62.86 | 2009 | 94.60  |
| 1810 | 8.91  | 1850 | 10.50 | 1890 | 16.15 | 1930 | 30.58 | 1970 | 65.71 | 2010 | 94.60  |
| 1811 | 8.91  | 1851 | 9.79  | 1891 | 15.66 | 1931 | 29.68 | 1971 | 69.21 | 2011 | 95.56  |
| 1812 | 7.43  | 1852 | 9.16  | 1892 | 16.22 | 1932 | 32.19 | 1972 | 71.75 | 2012 | 96.83  |
| 1813 | 7.96  | 1853 | 8.45  | 1893 | 16.74 | 1933 | 33.93 | 1973 | 73.33 | 2013 | 97.78  |
| 1814 | 8.36  | 1854 | 6.70  | 1894 | 16.87 | 1934 | 32.41 | 1974 | 74.92 | 2014 | 98.73  |
| 1815 | 7.60  | 1855 | 7.67  | 1895 | 17.44 | 1935 | 32.74 | 1975 | 76.83 | 2015 | 100.00 |
| 1816 | 6.13  | 1856 | 8.60  | 1896 | 18.14 | 1936 | 32.18 | 1976 | 77.78 |      |        |
| 1817 | 4.58  | 1857 | 9.25  | 1897 | 17.81 | 1937 | 31.83 | 1977 | 78.41 |      |        |
| 1818 | 7.11  | 1858 | 11.19 | 1898 | 17.73 | 1938 | 31.98 | 1978 | 80.63 |      |        |
| 1819 | 9.42  | 1859 | 10.44 | 1899 | 18.12 | 1939 | 31.75 | 1979 | 79.37 |      |        |
| 1820 | 10.28 | 1860 | 9.24  | 1900 | 18.74 | 1940 | 30.37 | 1980 | 80.63 |      |        |
| 1821 | 9.83  | 1861 | 8.96  | 1901 | 19.24 | 1941 | 28.99 | 1981 | 79.68 |      |        |
| 1822 | 10.28 | 1862 | 10.08 | 1902 | 19.25 | 1942 | 27.62 | 1982 | 80.32 |      |        |
| 1823 | 11.33 | 1863 | 10.54 | 1903 | 19.21 | 1943 | 28.57 | 1983 | 82.22 |      |        |
| 1824 | 10.78 | 1864 | 10.88 | 1904 | 18.93 | 1944 | 29.84 | 1984 | 81.90 |      |        |
| 1825 | 10.61 | 1865 | 11.32 | 1905 | 19.70 | 1945 | 32.06 | 1985 | 82.22 |      |        |
| 1826 | 10.96 | 1866 | 10.97 | 1906 | 20.34 | 1946 | 34.92 | 1986 | 84.76 |      |        |
| 1827 | 11.33 | 1867 | 10.03 | 1907 | 19.79 | 1947 | 35.87 | 1987 | 85.08 |      |        |
| 1828 | 10.28 | 1868 | 10.23 | 1908 | 19.92 | 1948 | 37.78 | 1988 | 86.67 |      |        |
| 1829 | 10.45 | 1869 | 11.01 | 1909 | 20.35 | 1949 | 38.41 | 1989 | 86.98 |      |        |
| 1830 | 9.83  | 1870 | 10.96 | 1910 | 20.80 | 1950 | 39.05 | 1990 | 86.35 |      |        |
| 1831 | 8.80  | 1871 | 11.12 | 1911 | 20.40 | 1951 | 38.41 | 1991 | 87.94 |      |        |
| 1832 | 7.96  | 1872 | 11.49 | 1912 | 20.00 | 1952 | 39.37 | 1992 | 88.89 |      |        |
| 1833 | 10.08 | 1873 | 11.48 | 1913 | 20.47 | 1953 | 40.00 | 1993 | 88.25 |      |        |
| 1834 | 10.66 | 1874 | 12.75 | 1914 | 20.81 | 1954 | 40.00 | 1994 | 88.89 |      |        |
| 1835 | 11.37 | 1875 | 13.64 | 1915 | 18.67 | 1955 | 40.95 | 1995 | 88.57 |      |        |
| 1836 | 11.00 | 1876 | 13.34 | 1916 | 17.06 | 1956 | 41.90 | 1996 | 88.89 |      |        |
| 1837 | 10.83 | 1877 | 13.16 | 1917 | 16.45 | 1957 | 42.86 | 1997 | 88.89 |      |        |
| 1838 | 9.75  | 1878 | 13.58 | 1918 | 18.33 | 1958 | 43.81 | 1998 | 89.52 |      |        |
| 1839 | 9.89  | 1879 | 13.45 | 1919 | 20.08 | 1959 | 45.40 | 1999 | 88.89 |      |        |

Tab. A6: Swiss real wage index (2015=100).

Source: Nominal wages 1800–1939 and consumer price index 1800–1914: Roman Studer, Pascal Schuppli, Deflating Swiss prices over the past five centuries, in: *Historical Methods* 41/3 (2008), pp. 137–153; 1914–1939: Swiss Federal Statistical Office (Landesindex der Konsumentenpreise, LIK); 1939–2015: Swiss Federal Statistical Office (Reallohnindex). The missing 1940 and 1941 value were interpolated.

| Year           | Men  | Women | Year | Men  | Women | Year | Men  | Women | Year | Men  | Women |
|----------------|------|-------|------|------|-------|------|------|-------|------|------|-------|
| 1751–1800 (GE) | 31.9 | 37.0  | 1913 | 52.5 | 55.9  | 1953 | 67.0 | 71.9  | 1993 | 74.9 | 81.5  |
| 1801–1813 (GE) | 35.1 | 41.5  | 1914 | 53.5 | 56.8  | 1954 | 67.6 | 72.3  | 1994 | 75.2 | 81.8  |
| 1814–1833 (GE) | 38.5 | 42.7  | 1915 | 54.2 | 57.4  | 1955 | 67.7 | 72.3  | 1995 | 75.3 | 81.8  |
| 1876           | 39.1 | 42.4  | 1916 | 55.0 | 58.1  | 1956 | 67.7 | 72.6  | 1996 | 76.0 | 82.0  |
| 1877           | 39.1 | 42.0  | 1917 | 54.0 | 57.4  | 1957 | 67.9 | 73.2  | 1997 | 76.3 | 82.1  |
| 1878           | 39.8 | 42.4  | 1918 | 43.9 | 49.0  | 1958 | 68.5 | 73.9  | 1998 | 76.3 | 82.5  |
| 1879           | 41.1 | 43.9  | 1919 | 53.9 | 56.0  | 1959 | 68.7 | 74.1  | 1999 | 76.8 | 82.5  |
| 1880           | 41.1 | 44.1  | 1920 | 53.2 | 55.7  | 1960 | 68.7 | 74.1  | 2000 | 76.9 | 82.6  |
| 1881           | 40.6 | 43.2  | 1921 | 56.1 | 59.5  | 1961 | 68.9 | 74.6  | 2001 | 77.4 | 83.1  |
| 1882           | 41.7 | 44.4  | 1922 | 57.2 | 59.6  | 1962 | 68.5 | 74.1  | 2002 | 77.8 | 83.1  |
| 1883           | 44.1 | 46.1  | 1923 | 58.3 | 61.8  | 1963 | 68.4 | 74.3  | 2003 | 78.0 | 83.2  |
| 1884           | 43.8 | 46.3  | 1924 | 57.9 | 61.0  | 1964 | 69.2 | 75.1  | 2004 | 78.6 | 83.7  |
| 1885           | 42.6 | 45.0  | 1925 | 58.4 | 61.4  | 1965 | 69.5 | 75.1  | 2005 | 78.7 | 83.9  |
| 1886           | 43.6 | 45.8  | 1926 | 59.0 | 62.1  | 1966 | 69.6 | 75.3  | 2006 | 79.1 | 84.0  |
| 1887           | 44.3 | 46.9  | 1927 | 58.5 | 61.5  | 1967 | 69.7 | 75.7  | 2007 | 79.4 | 84.2  |
| 1888           | 44.7 | 47.4  | 1928 | 58.6 | 62.2  | 1968 | 69.8 | 75.5  | 2008 | 79.7 | 84.4  |
| 1889           | 44.0 | 46.2  | 1929 | 58.2 | 62.1  | 1969 | 69.8 | 75.7  | 2009 | 79.8 | 84.4  |
| 1890           | 43.5 | 46.2  | 1930 | 59.3 | 63.5  | 1970 | 70.1 | 76.2  | 2010 | 80.2 | 84.6  |
| 1891           | 43.4 | 46.2  | 1931 | 59.4 | 63.0  | 1971 | 70.2 | 76.3  | 2011 | 80.3 | 84.7  |
| 1892           | 45.8 | 48.6  | 1932 | 59.3 | 63.0  | 1972 | 70.7 | 76.8  | 2012 | 80.5 | 84.7  |
| 1893           | 44.8 | 47.3  | 1933 | 60.5 | 64.3  | 1973 | 71.0 | 77.1  | 2013 | 80.5 | 84.8  |
| 1894           | 44.5 | 47.0  | 1934 | 60.8 | 64.9  | 1974 | 71.2 | 77.6  |      |      |       |
| 1895           | 45.4 | 48.3  | 1935 | 60.2 | 63.9  | 1975 | 71.5 | 78.0  |      |      |       |
| 1896           | 47.5 | 50.5  | 1936 | 61.0 | 65.3  | 1976 | 71.7 | 78.2  |      |      |       |
| 1897           | 47.7 | 50.5  | 1937 | 61.5 | 65.4  | 1977 | 72.0 | 78.7  |      |      |       |
| 1898           | 46.6 | 49.8  | 1938 | 62.0 | 65.6  | 1978 | 71.9 | 78.7  |      |      |       |
| 1899           | 47.7 | 51.2  | 1939 | 61.8 | 66.0  | 1979 | 72.4 | 78.8  |      |      |       |
| 1900           | 46.2 | 48.8  | 1940 | 61.4 | 65.7  | 1980 | 72.3 | 78.9  |      |      |       |
| 1901           | 47.4 | 50.6  | 1941 | 63.0 | 67.2  | 1981 | 72.5 | 79.2  |      |      |       |
| 1902           | 49.1 | 51.7  | 1942 | 63.5 | 67.8  | 1982 | 72.8 | 79.5  |      |      |       |
| 1903           | 48.8 | 51.2  | 1943 | 63.6 | 68.1  | 1983 | 72.7 | 79.6  |      |      |       |
| 1904           | 47.9 | 50.4  | 1944 | 62.6 | 67.0  | 1984 | 73.4 | 80.1  |      |      |       |
| 1905           | 48.3 | 51.1  | 1945 | 63.4 | 67.4  | 1985 | 73.5 | 80.2  |      |      |       |
| 1906           | 49.3 | 52.2  | 1946 | 64.2 | 67.8  | 1986 | 73.7 | 80.3  |      |      |       |
| 1907           | 49.6 | 52.7  | 1947 | 64.1 | 68.3  | 1987 | 73.9 | 80.7  |      |      |       |
| 1908           | 50.8 | 53.9  | 1948 | 65.1 | 69.4  | 1988 | 73.9 | 80.8  |      |      |       |
| 1909           | 50.2 | 53.2  | 1949 | 65.8 | 70.0  | 1989 | 74.1 | 81.0  |      |      |       |
| 1910           | 51.3 | 54.6  | 1950 | 66.6 | 71.1  | 1990 | 74.0 | 80.8  |      |      |       |
| 1911           | 50.0 | 53.3  | 1951 | 66.3 | 70.9  | 1991 | 74.1 | 81.2  |      |      |       |
| 1912           | 52.8 | 56.1  | 1952 | 67.3 | 71.9  | 1992 | 74.5 | 81.4  |      |      |       |

Tab. A7: Swiss life expectancy at birth.

Source: Geneva (GE): Alfred Perrenoud, *La population de Genève du seizième au début du dix-neuvième siècle. Étude démographique*, Genève 1979; Switzerland: Heiner Ritzmann-Blickenstorfer (Ed.), *Historische Statistik der Schweiz*. Zürich 1996; Swiss Federal Statistical Office (Ed.), *Bevölkerungsbewegung in der Schweiz Bern 1878–2000*; Swiss Federal Statistical Office (Ed.), *Schweizerische Statistik der natürlichen Bevölkerungsbewegung (BEVNAT)*, Berne und Neuchâtel.

| Birth year | Male height | Birth year | Male height | Birth year | Male height | Birth year | Male height |
|------------|-------------|------------|-------------|------------|-------------|------------|-------------|
| 1858       | 163.3       | 1909       | 167.4       | 1963       | 176.1       | 1985       | 178.0       |
| 1859       | 163.3       | 1910       | 168.6       | 1968       | 176.8       | 1986       | 178.1       |
| 1865       | 163.5       | 1911       | 168.5       | 1973       | 177.5       | 1987       | 178.1       |
| 1866       | 163.3       | 1912       | 168.6       | 1974       | 177.3       | 1988       | 178.1       |
| 1867       | 163.6       | 1913       | 169.4       | 1975       | 177.4       | 1989       | 178.2       |
| 1868       | 163.5       | 1925       | 169.7       | 1976       | 177.4       | 1990       | 178.2       |
| 1869       | 163.5       | 1926       | 169.7       | 1977       | 177.4       | 1991       | 178.2       |
| 1870       | 163.4       | 1928       | 170.9       | 1978       | 177.6       | 1992       | 178.2       |
| 1871       | 163.5       | 1933       | 171.3       | 1979       | 177.6       | 1993       | 178.3       |
| 1881       | 164.7       | 1938       | 172.1       | 1980       | 177.6       | 1994       | 178.2       |
| 1889       | 165.6       | 1943       | 173.2       | 1981       | 177.8       | 1995       | 178.3       |
| 1890       | 165.6       | 1948       | 173.5       | 1982       | 177.6       | 1996       | 178.3       |
| 1891       | 165.9       | 1953       | 174.7       | 1983       | 177.4       |            |             |
| 1908       | 168.1       | 1958       | 175.5       | 1984       | 177.9       |            |             |

Tab. A8: Average adult male height.

Source: Kaspar Staub [et al.], From left-skewness to symmetry. How body-height distribution among Swiss conscripts has changed since the late nineteenth century, in: *Annals of Human Biology* 42/3 (2015), p. 262–269; Joël Floris [et al.], *Der Body-Mass-Index der Schweizer Stellungspflichtigen 2015, Bericht zu Handen des Bundesamtes für Gesundheit, Zürich 2016.*

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