RESH Discussion Papers

No. 2 / 2020

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A Happiness Economics-Based Human Development Index for Germany (1920-1960)

Universität Regensburg
FAKULTÄT FÜR PHILOSOPHIE,
KUNST-, GESCHICHTS- UND
GESELLSCHAFTSWISSENSCHAFTEN

REGENSBURG ECONOMIC AND SOCIAL HISTORY (RESH)

Discussion Paper Series

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A Happiness Economics-Based Human Development Index for Germany (1920-1960)*

Tobias A. Jopp+

Abstract: The United Nations' *Human Development Index* (HDI) has become an important tool for measuring and comparing living standards between countries and regions. However, the HDI has also attracted a fair share of conceptual criticism. Starting from Andrea Wagner's historical estimations of a HDI for Germany in the interwar and early post-war period, we take up part of that criticism by implementing three essential modifications to the mode of calculation. We test how far they alter our picture of the relative living standard in the Weimar Republic, the Third Reich, and the Federal Republic of Germany. First, we replace the arithmetic mean by the geometric mean, which is said to solve the problem of perfect substitutability; second, we extend the HDI by an additional fourth dimension measuring economic and political freedom – an important, though neglected, dimension; and third, as the perhaps most crucial conceptual intervention, we develop weighting schemes for the partial indices that are theoretically backed by happiness economic research. Thus, we challenge the common, but arbitrary fundamental assumption that all partial indices receive equal weights. Our results show that the HDI for Germany reacts very sensitively to conceptual interventions, making it difficult to use it for the intertemporal and international comparison of living standards. We also find that the proposed modified HDIs allow for a re-evaluation of the living standard in interwar Germany; and in contrast to what the reference estimations on the HDI for Germany say, there is a profound discontinuity between the Third Reich and post-war Germany in terms of living standards.

Keywords: Germany, freedom, weighting, happiness research, happiness economics, Human Development Index, living standard

JEL classification: I31, N34, N94, O11

Acknowledgements: I am deeply indebted to Mark Spoerer, Jochen Streb, and two anonymous referees for their invaluable comments on the original manuscript.

* This discussion paper is a translation of a journal article originally written in German. Possible revisions to the original version (inclusion of new literature and/or new evidence) are indicated as such. The original publication is: Tobias A. Jopp (2017): Ein glücksökonomisch modifizierter Human Development Index für Deutschland (1920-1960), in: *Jahrbuch für Wirtschaftsgeschichte / Economic History Yearbook* 58: 239-278. Please cite the original publication along with this discussion paper.

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A Happiness Economics-Based Human Development Index for Germany (1920-1960)

1. Objective

What standard of living did societies maintain at different times depending on geographical, institutional and cultural parameters? How did some societies succeed in generating sustainable economic growth and broad-based prosperity, and why did others not? How do we measure living standards in the first place, and are the measures that prove suitable for describing today's societies also applicable to earlier societies? Monetary indicators such as domestic product per capita or real wages still play a central role in answering these core questions of economic history. What is unsatisfactory, however, is that their application draws attention to the material dimension of living standards, while other important dimensions are not – or at best indirectly – captured (e.g. Landes 1999; Pierenkemper 2005: 41-7; Maddison 2008; Allen 2011; Acemoglu/Robinson 2012; Hesse 2013: 41; and Broadberry et al. 2015).

To compensate for this weakness, further measures have been established in the literature on economic history, and social sciences, in general. The indicators for the biological standard of living or psychological measures, but also multidimensional welfare indices, are of particular interest here. The latter include, for example, the Human Development Index (HDI), which has been regularly calculated by the United Nations since 1990 (e.g. Dasgupta/Weale 1992; Steckel/Floud 1997; Baten 2003; Pierenkemper 2005: 48-50; Steckel 2008; Fleurbaey 2009; Deaton 2013; aus dem Moore/Schmidt 2013; Craig 2016). Constructed in its original form as a measure of deprivation of essential freedoms and opportunities improving individual welfare, it measures living standards in the dimensions of health, education and access to material resources (or lack thereof). These sub-dimensions were measured by the variables life expectancy at birth (LE), adult literacy rate (AR) and logarithmic per capita income (PKE). For the purpose of aggregation, the values observed for any country *i* were normalized to the interval from zero to one. To do so, the minimum and maximum values (i.e. the worst and best values) of the variables to be observed in the country cross-section for the corresponding year *t* were used; expressed in a formula (Rao 1991; Anand/Sen 1994):

$$(1)\quad HDI_{it}^{1990} = 1 - \left[\left(\frac{Max(LE)_t - LE_{it}}{Max(LE)_t - Min(LE)_t} \right) + \left(\frac{Max(AR)_t - AR_{it}}{Max(AR)_t - Min(AR)_t} \right) + \left(\frac{Max(PKE)_t - PKE_{it}}{Max(PKE)_t - Min(PKE)_t} \right) \Big/ 3 \right].$$

This formula has prompted a lively discussion of the HDI's pros and cons. The conceptual criticism was particularly directed at the following problem areas (Raworth/Stewart 2005; ul Haq 2005: 135-6; Stanton 2007; Herrero et al. 2010: 4-5; Herrero et al. 2012): First, the selection of the sub-dimensions covered (e.g. Dasgupta/Weale 1992: 119; Desai 1991; Streeten 1994: 236; Salas-Bourgoin 2014; Ray 2014); for example, are political freedom(s) and civil rights or sustainability aspects not missing in the consideration? Second, the choice of appropriate indicators (e.g. Dasgupta/Weale 1992: 119; Streeten 1994: 236); are the chosen variables really the best proxy variables? Third, the choice of minimum and maximum values as the basis for normalization (e.g. Trabold-Nübler 1991: 239); instead of varying in the corresponding cross section of countries, should they not better be constant and represent goalposts?[1] Fourth, the additive linking of the sub-indices via the arithmetic mean (e.g. Hopkins 1991: 1471; Desai 1991: 356; Sagar/Najam 1998: 251-2; Mazumdar 2003: 540); is the assumption of perfect substitutability between very different sub-dimensions implicit in the simple arithmetic mean theoretically really viable? Fifth, the equal weighting of the sub-dimensions with one-third each (e.g. Kelley 1991: 318-9; Srinivasan 1994; Chowdury/Squire 2006; Ravallion 2012: 9); is it theoretically justifiable that all sub-dimensions have the same significance for human development, or do we have simply to accept the normative dictum that this should be the case? Sixth, the inclusion of distributional issues (e.g. Sagar/Najam 1998: 263; Trabold-Nübler 1991; Hicks 1997; Martinez 2012: 533); should greater inequality in income, health and education not have a negative impact on the level of a country's HDI and ranking across countries? Seventh, treatment of the income variable (e.g. Sagar/Najam 1998: 263); should we not "write off" income according to the idea of diminishing marginal returns? If so, how we should we do that? Finally, eighth, the overarching question related to the weighting procedure whether a multidimensional welfare index offers surplus value over the dashboard approach, according to which as many individual indicators as possible are interpreted separately, albeit comparatively (e.g. McGillivray 1991: 1467; Fleurbaey 2009: 1055; Ravallion 2012: 6-10).

The United Nations had already reacted to some criticisms at an early stage (Jahan 2004: 155; Stanton 2007: 16-20). The following modifications had already been implemented when economic history finally discovered the HDI in 1997: on the one hand, there had been

[1] A change in the HDI from one year to the next can thus be generated solely by varying minimum and maximum values, which makes interpretation difficult.

a change of perspective; since 1991 human development had no longer been evaluated from the point of view of "deprivation" but rather from that of "achievement". On the other hand, the education sub-dimension was covered by another variable, namely, from 1991 onwards, first by the number of years of intermediate school attendance and then, from 1995 onwards, by the gross enrolment rates in primary, secondary and tertiary educational institutions. Moreover, from 1991 onwards, no longer was logarithmic income used over the entire range of values observed, but it was depreciated in sections beyond a threshold of $5,000 – a kind of minimum standard – using a special formula. Finally, from 1995 onwards, the observed values were standardized on the basis of fixed minimum and maximum values instead of minimum and maximum values that changed from year to year (Jahan 2004: 155-6).

Historical HDI studies published since 1997 provide a good indication of the extent to which the HDI has been developed since and of the weaknesses still critically discussed. The first four were published in a collective volume edited by Robert Steckel and Roderick Floud (1997) on the question of what effect industrialization has had on the extended standard of living. Investigated were the United States of America in the period 1800-1970 (Costa/Steckel 1997), Great Britain 1700-1980 (Floud/Harris 1997), Sweden 1820-1965 (Dandberg/Steckel 1997), and Germany 1871-1950 (Twarog 1997). The studies' main challenges were to adjust the minimum and maximum values to historical conditions and to select appropriate indicators given the difficult data situation. In addition to the classic components of the HDI, the variables height and infant mortality were also used as indicators of health, while the education index had to be reduced to the literacy rate in all cases (Costa/Steckel 1997: 71; Floud/Harris 1997: 115; Sandberg/Steckel 1997: 148-9; Twarog 1997: 322-324). Following Costa and Steckel's assessment, the historian's benefit of using the HDI precisely results from the fact that the HDI is a "distance measure", while the growth rate of per capita income is a "measure of the speed" of an adjustment process; i.e., both measures principally are complementary (Costa/Steckel 1997).

Since then further historical studies applying the HDI have been published: Besides the traditional HDI, Crafts (1997a) calculated HDIs for Great Britain between 1760 and 1850 that included distributional and gender aspects and also the Dasgupta-Weale Index as an alternative multidimensional measure of welfare that explicitly takes into account political freedoms and civil rights. Crafts (1997b, 2002) also calculated the classic HDI for five years (1870,

1913, 1950, 1973, 1992/1999) and a cross-section of countries that essentially covers the western states but also a few selected Latin American and Asian countries. His recalculation of the historical HDI values from 2002 served to incorporate the return to logarithmic income over the entire value range. Wagner (2003, 2007, 2008) calculated and discussed four HDI variants for Germany in the period 1920 to 1960, namely the classical HDI, a Germany-specific Development Index (DDI) expanded by additional variables such as the unemployment rate and infant mortality, a Gender-related Development Index and a HDI at the regional level for the analysis of regional differences in living standards. It is particularly noteworthy that Wagner calculated the DDI for all years between 1920 and 1939 as well as 1949 and 1960 and was thus able to draw a detailed picture of the development of living standards, particularly in the turbulent interwar period. Astorga, Berges and Fitzgerald (2005) estimated the classic HDI (education index reduced to the literacy rate) for Latin America and the years 1900, 1950 and 2000, and Escudero and Pérez Castroviejo (2010) presented estimates of the classic HDI for a specific social group, namely Spanish miners (1876-1936).[2] With Prados de la Escosura (2010, 2013, 2015a, 2015b), there are also four studies that take up and elaborate on Crafts' approach. Specifically, Prados de la Escosura's estimates covered almost all countries of the world and the period from 1870 to 2007 (in ten-year steps). Unlike all previous studies, Prados de la Escosura calculated the HDI based on the multiplicative linkage of the sub-indices, i.e. as a geometric mean. This corresponds to the United Nations' modification of the HDI of 2010 in response to the ongoing discussion on the problem of the additive linking of the sub-indices. Another special feature is the application of a convex achievement function to the sub-indices for health and education. As a result, a change in the corresponding variables has greater weight the higher the already achieved level.[3] Finally, Felice and Vasta (2015) calculated the classical HDI, also based on the geometric mean, for the Italian regions between 1871 and 2007 using four variables. But like Prados de la Escosura (and therefore for reasons of data availability) the authors continued to use literacy and school attendance rates in the education index. It should be noted that in 2010 the United Nations began measuring education through the variables average years of schooling and expected years of schooling.

[2] It remains unclear whether the authors already use the geometric mean instead of the arithmetic mean, as done by the United Nations since 2010.

[3] This reflects the view that highly developed countries may have lower marginal returns on health goods than less developed ones, making it more difficult for them to further improve once a high level is achieved.

This cursory overview shows that the classic HDI as an alternative measure of the standard of living has raised economic historians' interest. However, it has also shown that, in addition to the desire to derive estimates of historical HDIs as far as possible in accordance with the latest conceptual standards, economic historical research can provide methodological suggestions as to how the HDI can be improved in application (e.g. with regard to the choice of variables, the regional concept and the weighting of achievements). This is the starting point of this article: The aim is to modify Wagner's (2003, 2006) detailed estimates of a Germany-specific Development Index (DDI) for the period 1920-1960 in three points and to examine to what extent this changes the picture of the development of the extended standard of living in Germany. The first modification is to apply the geometric mean to the DDI, since the multiplicative linkage of the sub-indices is now accepted as the more theoretically meaningful. The two other modifications – on the one hand, adding the sub-dimension of political and economic freedom to the DDI and, on the other hand, implementing a weighting scheme rooted in happiness economics – take up two points that are still controversial, namely the selection of sub-dimensions and the theoretically problematic one-third or equal weighting of the sub-indices. With the latter two modifications, an attempt is made to react to the fundamental criticism of the HDI concept, also expressed by economic historians themselves. Wagner (2003: 181) herself conceded: "It would be desirable to derive individual welfare components and their weights from the preferences of individuals as determined by surveys. However, no such data exist for the period under study."[4] The approach proposed in this study shows how, despite the lack of adequate data, a preference-oriented weighting scheme can be derived by drawing on current findings of happiness economics research. Wahl's (2013) recent study on the standard of living in the Third Reich shows that happiness economics have potential for application in economic history research.

The following section briefly discusses Wagner's DDI, which forms the starting point for this study; in the third section, the proposed modifications are discussed or, respectively, made plausible on a formal level. The empirical results are presented in the fourth section. The fifth section concludes.

[4] Author's translation of the German original: *"Wünschenswert wäre es, die Auswahl der einzelnen Wohlfahrtskomponenten und deren Gewichtungen aus den Präferenzen der Individuen abzuleiten, die aus Umfragen ermittelt werden. Solche Daten liegen aber für den Untersuchungszeitraum nicht vor."*

2. Point of departure: Wagner's Germany-specific development Index

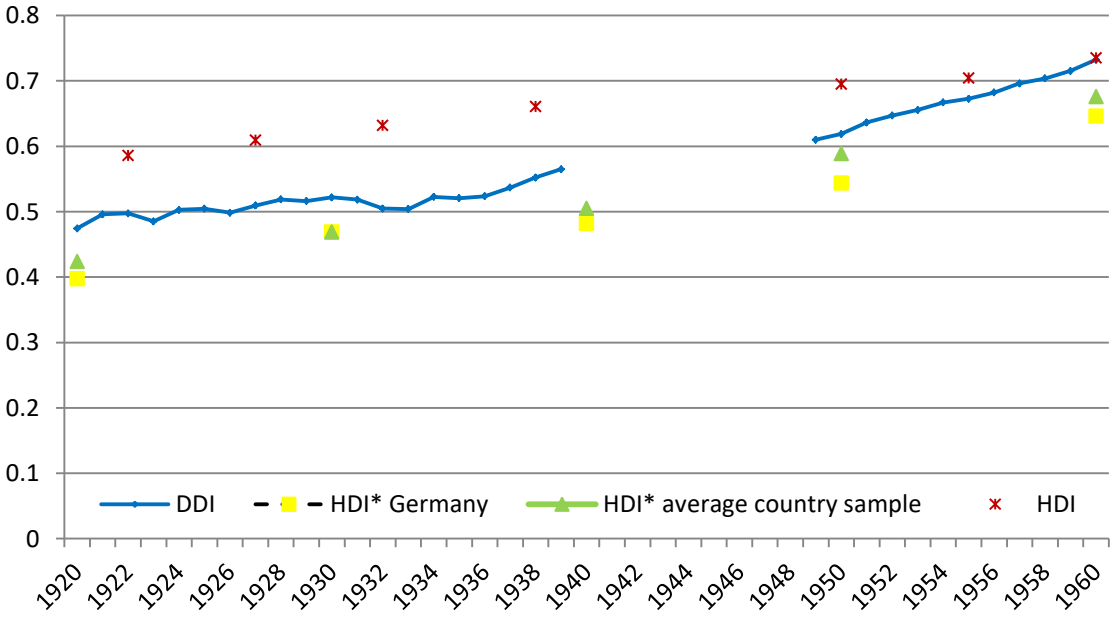
Wagner's DDI was constructed to serve as a basis for a detailed intertemporal analysis of the standard of living in Germany between 1920 and 1960; compared to Wagner's classic HDI, it was enriched by additional indicators in the indices of material well-being and health, namely the unemployment rate, life expectancy at the age of five (instead of life expectancy at birth), and infant, child and maternal mortality. Table 1 shows the minimum and maximum values for these and all other variables applied by Wagner (2008: 39-47) and which are subsequently retained.

Table 1: Components of Wagner's DDI and their standardization

Component	Lower bound	Upper bound
(1) Gross domestic product per capita (1990 PPP $)	log(100)	log(40.000)
(2) Unemployment rate	100	0
(3) Life expectancy at birth	25	85
(4) Life expectancy at age 5	45	75
(5) Infant mortality	280	0
(6) Child mortality	28	0
(7) Maternal mortality	100	0
(8) Tertiary enrolment rate (among the 20 to 25 year old)	0	100

Sources: Wagner (2008: 260, 270).

Figure 1: The development of the standard of living in Germany according to Wagner, 1920-1960



Sources: Wagner 2008: 259, 261-3, 271.

Figure 1 shows the development over time of the HDI measures designed by Wagner for Germany as a whole. The DDI starts at an index value of about 0.48 in 1920 and rises to an index value of about 0.74 in 1960. With regard to the increase in the trend, two phases can be distinguished, namely the phases 1920 to 1935 and 1936 to 1960; in the latter, the standard of living in Germany rose more strongly than before and also increased evenly. According to Wagner, the marked increase in the DDI between 1936 and 1939 was due to the strong growth in per capita income, which more than compensated for losses in the areas of health and education. This shows that the National Socialist economic miracle, as widely accepted, was a "de-formed economic miracle". In comparison, however, 1923 (peak of inflation and Franco-German tensions), 1926 (stabilization crisis of the "Golden Twenties"), 1929 (beginning of the Great Depression) and 1932/1933 (peak of the Great Depression and regime change/normalization shock) can be identified as years in the first phase in which the DDI even temporarily declined, but never fell below the initial level of 1920. The standard of living in the Weimar Republic peaked in 1930; and, after 1933, the HDI never fell below the level of approx. 0.53 index points.

In addition to the DDI, Wagner also calculated the classic HDI with four variables (life expectancy at birth, literacy rate, gross school attendance rate, per capita income) and the HDI*, which, for reasons of data availability, only includes the rate of university attendance (i.e. students as a percentage of the 20 to 25-year-olds) as a measure of education. The latter serves as the basis for a comparison of Germany with selected European countries, namely Denmark, France, Great Britain, Italy, the Netherlands, Norway, Sweden and Switzerland. Wagner calculated both measures for selected reference years. Compared with the DDI, the traditional HDI implies a much faster increase in living standards during the interwar period and a slower increase after 1949, while the trend in the HDI* is in line with that of the DDI. In an international comparison, the standard of living in Germany ranged slightly below the European average until 1930 (Wagner 2008: 60-62 and Appendix 1). It should also be noted that for all three measures the gap between 1939 and 1949/50 is relatively small (about 0.05 index points each), so that it can be concluded that in terms of extended living standards there would have been continuity between the Third Reich and the Federal Republic rather than between the Weimar Republic and the Federal Republic. A brief review of the data used to measure the extent of economic and political freedom as the basis of an

additional freedom index, taken from work by Prados de la Escosura and Marshall, Gurr and Jaggers (Prados de la Escosura 2016; Marshall et al. 2014), is done in Section 4.

Among other things, I will show that the HDI/DDI generally reacts very sensitively to subtle changes in the calculation rules, rendering its use as a measure of intertemporal and international welfare comparison problematic from a purely technical perspective. However, if one does not want to dispense with the HDI/DDI in the (economic history) discussion, one must at least be aware of its sensitivity to both minor and major modifications. Subject to this aspect, it is demonstrated that, on the basis of the justified modifications, a reassessment of the development of living standards in detail, especially before 1939, is indeed in order.

3. Proposed modifications of the Germany-specific Development Index

3.1. Modification one: Use of the geometric mean

Since 2010, the United Nations have calculated the HDI as the geometric mean of the partial indices, i.e. formally as

$$(2)\quad HDI_{it}^{2010} = \sqrt[3]{\prod_{j=1}^{3}\left[\frac{X_{ijt} - \min X_j}{\max X_j - \min X_j}\right]},$$

where index *j* denotes the sub-indices (*J* = 1, 2, 3) and indices *i* and *t* are already known (see above). In addition to switching to the geometric mean, the most recent modifications of 2010 also include the use of Gross National Product per capita instead of the Gross Domestic Product per capita; partially adjusted goalposts; the use of the variables *mean completed school years* and *expected completed school years* as substitutes for the literacy rate and school attendance rate in the education index; and a version of the HDI extended by inequality in all three sub-dimensions and published separately (Beja 2014: 29; Martinez 2012: 533; Ray 2014: 308).

Switching to the geometric mean was a reaction to the recurring criticism that the additive linkage of the sub-indices via the simple arithmetic mean implied perfect substitutability between the sub-dimensions. This aspect can be illustrated by simple example. Table 2

reports five hypothetical constellations of sub-index values (Ravallion 2012: 202-3; Tofallis 2013: 1329).

If all sub-indices take on the same value, the arithmetic (AM) and geometric mean (GM) do not differ (see constellation A). If, however, the index values are unequal, the geometrically averaged HDI (as in principle the geometric mean of any series) is always lower than the arithmetically averaged HDI (see constellations B to E). In particular, the greater the dispersion of the index values, the smaller the geometric mean is in comparison to the arithmetic mean (compare constellations B and C). The use of the arithmetic mean – i.e. the additive linkage – tacitly introduces a certain baseline assumption, namely that, for example, a loss in life expectancy can be fully compensated by a corresponding gain in educational attainment or per capita income. This can be traced in Table 2 by comparing the change in HDI from constellation C to constellation D – an increase of 0.1 index points in sub-index 3 – and from constellation C to constellation E – an increase of 0.1 index points in sub-index 1. While the arithmetic mean "values" both developments identically (AM equals 0.467 each), the geometric mean "values" the same change that occurs from C towards D more positively, as the change occurs from a lower starting point (GM increases by 0.083 compared to 0.013) and reduces dispersion. In other words, in a sense the geometric mean punishes an improvement in an already strongly positive partial dimension.

Table 2: Does the arithmetic mean even out unequal HDI developments?

Set-up	Partial index 1	Partial index 2	Partial index 3	AM	GM	Difference
A	0.500	0.500	0.500	0.500	0.500	0.000
B	0.800	0.800	0.200	0.600	0.504	0.096
C	0.800	0.400	0.100	0.433	0.317	0.116
D	0.800	0.400	0.200	0.467	0.400	0.067
E	0.900	0.400	0.100	0.467	0.330	0.136

Sources: Author's own depiction.

The switch in mean is therefore not just a statistical gimmick, as one might think. Overall, the geometric mean makes it easier to assess the balance of development in the sub-areas of human development covered. However, it should be noted that the difference between the arithmetic and geometric mean, as it occurs in constellations B to E, does not automatically imply a lower standard of living. Rather, the difference must be taken to mean that the ap-

plication of the geometric mean reveals a characteristic of the development process that is simply ignored when the arithmetic mean is applied.

3.2. Modification Two: Addition of the "freedom" dimension

Since the HDI's introduction, the question has repeatedly been raised as to whether there are other dimensions that should be taken into account in addition to the elementary sub-dimensions of health, education and material prosperity. According to many critics, freedom – both political and economic – is such a further elementary but so far missing sub-dimension (Desai 1991; Dasgupta/Weale 1992:112; Streeten 1994: 236; ul Haq 2005: 135; Salas-Bourgoin 2014: 36-8). According to Desai (1991: 356), although the HDI indirectly covers positive freedoms, this is not enough, especially since negative freedoms are addressed neither directly nor indirectly. Positive freedom means having the formal, and also material, possibility to do something (access to resources!); negative freedom, in contrast, means enjoying protection from restriction or third parties' (i.e., the state or other individuals) arbitrary behavior (Chauffeur 2011: 4; MacMahon/Dowd 2014: 66).

The corresponding entry in the Encyclopedia of Public Choice can serve as a starting point for a critical discussion of both concepts of freedom. There it reads (Wu/Davis 2004: 163-4):

> *"Economic freedom refers to the quality of a free private market in which individuals voluntarily carry out exchanges in their own interests. Political freedom means freedom from coercions by arbitrary power including the power exercised by the government. Political freedom consists of two basic elements: political rights and civil liberties. Sufficient political rights allow people to choose their rulers and the way in which they are ruled. The essence of civil liberties is that people are free to make their own decisions as long as they do not violate others' identical rights."*

It is certainly undisputed that both concepts are fundamentally interwoven and also have a value for the individual and social standard of living per se (Wu/Davis 2004: 164; Stroup 2007: 52). It is undisputed too, however, that a major challenge is to support these state-

ments empirically. Especially with regard to the operationalization of freedom, several problem areas arise, which will be outlined in the following.

The literature emphasizes that economic and political freedom are multidimensional concepts that can only be described in terms of content by whole bundles of variables - i.e. in the form of freedom indices (Chauffeur 2011: 5-6; Caudill et al. 2000). Apart from variable selection in detail, it is often critically pointed out that freedom indices basically mix two groups of variables, namely on the one hand the group by which the structures or the existence and design of rules (settings/rules of the game) are measured; and on the other hand the group by which the results of action and the degree of enforcement are grasped. Mixing these groups makes the comparative interpretation of the sub-indices or the interpretation of the freedom index itself more difficult (Desai 2005: 190).

Besides, it must also be taken into account that the concept of economic freedom, as used in the relevant literature, is based on the "paradigm of the (free) market economy", which usually implies strong property protection, stable (i.e. expectation-stabilizing) prices, little or no trade or transaction restrictions and generally a low level of regulation (Wu/Davis 2004: 164; Berggren 2003; De Haan et al. 206: 158). Similarly, the state form of democracy usually serves as a foil for the definition of political freedom; political freedom means being able to freely found and join already existing organizations; to enjoy freedom of opinion, faith and the press as well as the rule of law (subsumed under civil rights/civil liberties); and to be able to participate voluntarily and without restrictions in the political decision-making process, for example by exercising voting rights or seeking public office in the context of an election (subsumed under political liberties) (Wu/Davis 2004: 167; Fabro/Aixalá 2012: 1060; Desai 2004: 192). With regard to history in general, the question arises as to what extent historical societies, which were rather autocratically shaped and/or possibly heavily regulated, can be meaningfully grasped by freedom indices that are based on the superiority of the (free) market economy and democracy over all other forms of economic and social organization.

Finally, with regard to a comprehensive concept of freedom, it is not clear what the exact empirical relationship is between economic freedom, political freedom and civil rights on the one hand and freedom and economic growth or individual/societal welfare on the other (Fabro/Aixalá 2012: 1061-3; de Haan/Sturm 2000; Sturm/de Haan 2001; Xu/Li 2008). Following the Encyclopedia of Public Choice once again, but also positions formulated else-

where, there are good reasons to assume that the realization of a high degree of economic freedom presupposes the existence of civil rights, but not necessarily the existence of political freedom. Rather, we may assume with Friedman „[that] political freedom, once established, has a tendency to destroy economic freedom“ (Wu/Davis 2004: 164).[5] Especially with regard to historical applications, this leads to the question of how regimes that offer little or no political freedom actually perform on this point. Did such regimes, and do they generally, offer economic freedom to a degree anyway (Fabro/Aixalá 2012: 1061-3; Aixalá/Fabro 2009)? Moreover, the question of the relationship between freedom of any kind and living standards is by no means trivial, since it is imaginable both that individual/societal welfare has a strictly linear relationship with a particular variable or the freedom index as a whole and that individual/societal welfare is at its maximum when the variable is at an average level (i.e. when there is a non-linear relationship). Could certain state interventions, e.g. to correct for a market failure or to provide a public good, not even be welfare enhancing individually or collectively (Stroup 2007: 52-54)? In short: What degree of economic and political freedom maximizes welfare with regard to the individual and to society as a whole?

Subject to these problematic points, a freedom index should definitely be considered as an additional component of the DDI, not only against the background of the fundamental criticism of the HDI, but especially against the background of the far-reaching political and economic upheavals during the period under study. This would allow drawing a more accurate picture of the development of living standards. With the aim of implementing a concept of freedom that is as comprehensive as possible, two indices for economic and political freedom available in the literature will be used in the following. One is the recently published Historical Index of Economic Liberty (HIEL) by Prados de la Escosura (2016 2016: 6), which covers the period between 1850 and 2007 and all OECD countries;[6] and the other is the Index of Political Freedom, or Combined POLITY Score (CPS), estimated by the Polity IV Project for the period between 1800 and 2013 (Marshall/Gurr/Jaggers 2014: 16-7).

[5] This statement is attributed to Milton Friedman. It is based on the idea that politicians are fixated on maximizing votes and securing re-election in the short term and therefore tend to pursue policies that benefit their voters by redistributing economic/political privileges (rent-seeking). One could also extend the causal chain by arguing that a high degree of economic freedom promotes (financial) inequality to an extreme degree, which in turn perverts the political decision-making process to such an extent that economic freedoms are reduced for certain groups and further expanded for others.

[6] See also pages 6 to 22 for an in-depth discussion of the components of the HIEL. The Economic Freedom Index of the Fraser Institute, which serves as a starting point for Prados de la Escosura, “only” goes back to 1970.

Prados de la Escosura (2016: 2-3, 13-4) addressed the above-mentioned problematic points in detail when developing the HIEL. As a result, the HIEL combines four dimensions of economic freedom, namely the quality of the legal system (legal structure and property rights), the stability of the monetary system (money), the unrestricted mobility of goods and capital (international trade) and the degree of regulation; it follows the dictum that a country can be regarded as economically free "[...] insofar as privately owned property is securely protected, contracts enforced, prices stable, barriers to trade small, and resources mainly allocated through the market" (Prados de la Escosura 2016: 2, 11). Table 3 reports the HIEL values for Germany. As can be seen from the table, the HIEL takes on values between zero and ten, with higher values implying a greater degree of economic freedom.

Table 3: The values of the *Historical Index of Economic Liberty* for Germany

Quin-quennial	1910/14	1925/29	1930/34	1935/39	1950/54	1955/59	1960/64
HIEL	8.6	7.4	7.0	5.9	7.9	8.9	9.2

Sources: Prados de la Escosura (2016: 23-4).

While Germany ranks in the middle of the distribution before the First World War (mean value over 20 countries: 8.6), it is at the bottom of the distribution in the interwar period and in the upper distribution after 1945; in the period 1930/34 only Italy (6.9) and Portugal (6.5) are behind Germany, and in the period 1935/39 only Italy (5.9) and Spain (3.0) (Prados de la Escosura 2016: 23-4).

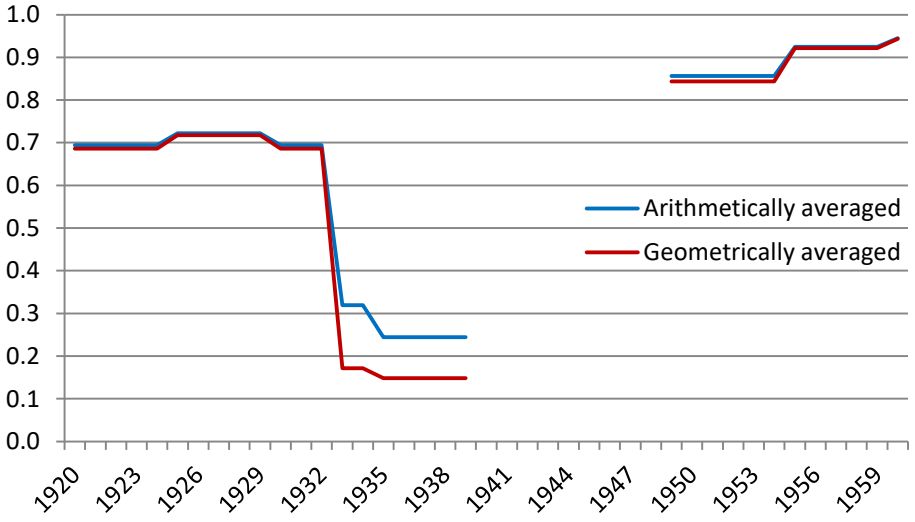
The Center for Systemic Peace' CPS is a combination of two sub-indices, namely an index measuring the degree of institutionalized democracy and an index measuring the degree of institutionalized autocracy. Among other things, it measures whether the general population has the institutionalized opportunity to express preferences for alternative political approaches or to participate in the political sphere. While the former index takes on values between zero and plus ten (low to high democracy), the latter ranges from minus ten to zero (high to low autocracy). Thus the CPS ranges between minus ten and plus ten, with changes in integer steps (Marshall/Gurr/Jaggers 2014: 14-18). In order to establish comparability with the HIEL, the CPS was rescaled to the interval from zero to ten (with changes in steps of 0.5). Table 4 presents the adjusted values of the CPS used below.

Table 4: The *Combined POLITY Score*'s values for Germany

Year	Score	Year	Score	Year	Score	Year	Score
1920	8	1928	8	1936	0.5	1953	10
1921	8	1929	8	1937	0.5	1954	10
1922	8	1930	8	1938	0.5	1955	10
1923	8	1931	8	1939	0.5	1956	10
1924	8	1932	8	1949	10	1957	10
1925	8	1933	0.5	1950	10	1958	10
1926	8	1934	0.5	1951	10	1959	10
1927	8	1935	0.5	1952	10	1960	10

Sources: http://www.systemicpeace.org/inscr/p4v2014.xls, 11.11.2015.

Figure 2: A proposal for an unweighted freedom index as part of the DDI



Sources: Author's own depiction. For the data sources, see Tables 3 and 4.

In order to arrive at a historical freedom index, the HIEL and the CPS were first linked using the simple – i.e. unweighted – arithmetic mean.[7] Figure 3 shows the course of the freedom index in its basic form. The basic rule is that only if both dimensions of freedom are equally pronounced we can speak of a high degree of freedom overall. Of course, the HIEL and the CPS can also be linked via the geometric mean and, in principle, can be weighted unequally (see also Figure 3 and Section 4.2).[8]

[7] The following goalposts were used: 0 and 10 (political freedom), 2.7 and 10 (economic freedom).

[8] The problem of the lack of data for the HIEL for the period 1920 to 1923 was solved as follows: Against the background of the crisis-ridden immediate post-war years (including hyperinflation, foreign trade restrictions), it makes no sense to take the mean value for the phases 1910/14 and 1925/29. Instead, a value of 7.0 was applied, as Prados de la Escosura calculated for the phase in which the world economic crisis occurred.

3.3. Modification three: A weighting scheme based on happiness economics

This section focuses on the question of how to calculate the HDI or DDI as a *weighted* average, i.e. how to arrive at theoretically sound weights for the sub-indices.[9] Especially the agnostic equal weighting of the three sub-indices with one third each has stimulated much criticism, but also advocacy.[10] In the absence of a theory with an empirical basis from which a weighting scheme could be deduced, the assumption of equal weights therefore seems to be a reasonable middle course.[11] In the following, it is shown that this can also be handled differently by drawing on happiness economics.

In fact, some attempts have been made to substantiate the weights in the HDI theoretically as well as statistically. These include, for example, Principal Components Analysis. This is a method of multivariate statistics based on the idea that it is possible to reduce a multidimensional relationship of any kind, which by definition is expressed by the fact that many variables interact, to a few basic variables – the principal components. The main components, in turn, significantly determine the multidimensional relationship by their respective share in the total observed variance. In various cases, the application of this method has led to results that support the assumption of equal weights (Noorbakhsh 1998: 593; Biswas/Caliendo 2002; Nguefack-Tsague/Klasen/Zucchini 2011). A further approach consists of a two-stage procedure in which, at the first stage, the most advantageous weighting scheme for each country is determined on the basis of non-parametric Data Envelopment Analysis (DEA), and, at the second stage, the country-specific weights are condensed into a universally applicable weighting scheme by means of a regression analysis. Tofallis (2013: 1333-6), for example, thus generated a weighting scheme that attributes by far the greatest weight to life expectancy with 0.732 (education: 0.056; income: 0.074).[12] What is problematic about both approaches is that they generate intrinsic weights, i.e. they derive weights from the information – and only from the information – that is already contained in the HDI by definition or calculation rule. Thus, these approaches do not really address the theoretical

[9] Note that the choice of goalposts alone – i.e., the way in which observations are normalized for aggregation purposes – is one way of weighting the sub-indices. Wagner (2008: 44, 159) carries out some sensitivity analyses in this regard. For criticism of the standardization procedure, see e.g. Noorbakhsh (1998: 591).

[10] See Anand and Sen (1994) for the normative dictum that all three dimensions were equally important. Stapleton and Garrod (2007) argue in favour of maintaining equal weights.

[11] On the HDI's lacking theoretical backing, cf. Fleurbaey (2015: 1055).

[12] These weights result from standardized data. For non-standardized data, the weights are 0.59 (long life), 0.025 (knowledge), 0.289 (income). It should be noted that for technical reasons the weights do not add up to one when this approach is used.

problem of weighting according to individuals' preferences. Chowdury and Squire (2006: 766) took a step in this direction by proposing a procedure that derives weights from the results of opinion polls among experts on (supposed) individuals' preferences, i.e. they formally use an additional set of information. In principle, this procedure thus generates extrinsic weights. However, to the advantage of the advocates of the status quo, this concrete approach also leads to a weighting scheme that does not fundamentally deviate from the equal weights assumption.

The modification proposed here is similar to the latter approach in that additional information from research on the determinants of life satisfaction is used to derive extrinsic weights for the components of the HDI. The concept of the HDI and happiness economics align in one thing: they are based on the view that purely economic, monetary indicators such as per capita income cannot provide a comprehensive view of the standard of living (Bruni/Comim/Pugno 2008: 4; Kesebir/Diener 2008: 61-2). So far, there has not been made an attempt at a synthesis of the two concepts, but the view dominates that both concepts are incompatible due to their ultimately very different basic assumptions.[13] While the concept of HDI is largely based on a normative notion of what is essential for a decent standard of living or human development, happiness economics is essentially positive, since it asks what determinants of well-being are directly identified as such by individuals. Accordingly, the primary sources of information differ. In calculating the HDI, one relies on objective indicators and sub-concepts – determined in public, political discourse and therefore more filtered – to calculate the HDI. By contrast, happiness economics draws its conclusions directly from subjective survey data (Bruni/Comim/Pugno 2008: 5-6).[14]

At its core, happiness economics challenges the basic assumption of modern microeconomics that economic subjects showed – and showed alone – which good is more useful to them than another through their decisions. According to the prevailing microeconomic doctrine, it is action that reveals preferences, and utility is accessible to an ordinal, but not cardinal, measurement and is not comparable intersubjectively. In contrast, happiness economics takes the approach of making utility measurable via the happiness function and thus

[13] If the two are linked, it is in the form of the question of whether the two concepts have the same implications with regard to the standard of living in a country. For example, Blanchflower/Oswald (2005) state that Australians are astonishingly unhappy, even though they are among the best-developed societies in terms of HDI. Leigh and Wolfers (2006) offer a critique of this interpretation.

[14] An importtant proponent of the capability approach underlying the HDI is Sen (2008); an important proponent of happiness economics is, for example, Easterlin (2008).

comparable intersubjectively. It is precisely subjective opinions and surveys that are used as the authoritative source (Ng 1997; Diener/Seligman 2004; Frey/Stutzer 2005: 208-10). Especially in the economic literature, the terms happiness, well-being and life satisfaction are usually used synonymously, whereas in psychology and sociology the terms are differentiated more precisely (Tichy 2014: 334). According to Helliwell and Barrington-Leigh (2010: 733), one of the characteristics of happiness is that it implies a short-term time horizon for the respondent and is based more on emotions and moods. In contrast, life satisfaction implies a long-term time horizon and a more rational evaluation of one's own life to date.[15]

The determinants of life satisfaction, as the phenomenon relevant for the happiness economics-based weighting scheme presented here, are determined in happiness economic approaches via a happiness equation, i.e. by means of statistical regression analyses. To understand the further procedure, one should know that three approaches of regression analyses can be distinguished. The predominantly used approach estimates microeconomic equations of happiness on the basis of individual survey data (e.g. the World Values Survey), in which life satisfaction regularly recorded on a scale of zero to ten is regressed on the respondents' socio-economic characteristics (e.g. employment status). In a second approach, individually surveyed life satisfaction is first aggregated into a national average and then regressed on macroeconomic or social variables (e.g. per capita income). Finally, there are also such approaches regressing individually surveyed life satisfaction on a mix of micro- and macroeconomic variables (Bjørnskov/Dreher/Fischer 2008: 120; Frey/Frey Marti 2010).

Among the important economic determinants of life satisfaction are, for example, absolute and relative income, unemployment, inflation and social transfers. Individual determinants include, for example, health status and fulfilling family life. Institutional determinants such as the structure of the health system, personal freedom and opportunities to participate in political and social life have also been identified as relevant (Tichy 2014: 336-40). For the purpose of deriving economically sound weights for the individual components in the DDI, in principle all approaches that measure the influence of macro-economic or so-

[15] Graafland and Compen (2012: 2) and Tichy (2014: 335) put that similarly. Kesebir and Diener (2008: 66-7) have the following definition: "The term ‚subjective well-being'(SWB) refers to people's evaluations of their lives, and comprises both cognitive judgments of satisfaction and affective appraisals of moods and emotions. It would be accurate to conceptualize subjective well-being as an umbrella term, consisting of a number of interrelated yet separable components, such as life satisfaction (global judgments of one's life), satisfaction with important life domains (e.g. marriage or work satisfaction), positive affect (prevalence of positive emotions and moods), and low levels of negative affect (prevalence of unpleasant emotions and moods)."

cial variables on life satisfaction are of interest. All sub-dimensions of human development discussed in this article and almost all variables used to operationalize them are also found in happiness economic studies as potential determinants of life satisfaction. Thus, it is in principle possible to derive a weighting scheme from the regression results that is based on the implicit values that individuals attribute to the determinants of life satisfaction ().[16]

For this purpose, the two studies by Ovaska and Takashima (2006) and Bjørnskov, Dreher and Fischer (2008) have been selected from the relevant studies on the economics of happiness (e.g., Di Tella(MacCulloch/Oswald 2003; Helliwell 2003; Böhnke 2008; Malesevic-Perovic/Golem 2010; Gropper/Lawson/Thome 2011; Verme 2011; Knoll/pitli/Rode 2013; Zagorski et al. 2014). They are among the few studies that generally consider a large number of control variables and especially those that relate to the sub-dimensions of human development relevant to this article.

Table 5: On the derivation of happiness economics-based weights

Study	Independent variable (a), period (b), countries included (c)	Macro variables of interest	Point elasticity	Weights
Ovaska/Takashima	(a) Life satisfaction (10-point-scale) (b) 1990-2001 (c) 68	Income per capita	+0.0646	5.57 %
		Unemployment	–0.0164	1.41 %
		Life expectancy	+0.6907	59.55 %
		Secondary education	–0.0930	8.06 %
		Economic freedom	+0.1560	13.45 %
		Political freedom	+0.1388	11.96 %
Bjørnskov et al.	(a) Life satisfaction (10-point-scale) (b) 1997-2000 (c) >70	Income per capita	+0.0165	14.73 %
		Unemployment	–0.0004	0.36 %
		Life expectancy	+0.0662	59.10 %
		Child mortality	–0.0038	3.40 %
		Primary education	–0.0159	14.20 %
		Secondary education	–0.0013	1.16 %
		Regulatory quality	–0.0037	3.30 %
		Political freedom (Polity IV)	–0.0042	3.75 %

Notes: Point elasticities have been calculated on the basis of the reported regression results and descriptive statistics and have been evaluated at the mean. The following applies: Point elasticity = $(\partial y/\partial x) * (\bar{x}/\bar{y})$. Note that Ovaska and Takashima (2006) provide several models from which, firstly, average marginal effects were calculated.

Sources: Ovaska/Takashima (2006) and Bjørnskov/Dreher/Fischer (2008); author's own calculations.

[16] For the "regression approach", cf. Slottje (1991).

The advantage of using these two studies is that the estimators come from a single source; compiling the estimators from many different studies poses methodological problems in that the data sources, the set and circle of control variables and the estimation methods can differ, which can lead to inconsistent results. Table 5 provides some information on the two studies. The third column shows which variables relevant to this study can be found in these two studies as control variables.

The approach pursued here is based on the idea that weighting the sub-indices based on happiness economics could result from relating the strength of the influence of variable X1 on life satisfaction to the effect that variables X2, X3, etc., in turn exert. In order to compare effect strengths, it is in principle useful to consider either elasticities or standardized coefficients; the former ask by how much Y changes when X increases by one percent, and the latter ask by how much standard deviations Y changes when X increases by one standard deviation.

In this study, the comparison is made using the (point) elasticities shown in the fourth column of Table 5. As the sign is not relevant for the weighting, elasticities are valued at their absolute amount. In a first step, the effect of each variable was related to the effect of per capita income as the reference effect. The effect of the unemployment rate in terms of absolute amount is, for example, more than forty times lower than that of per capita income in Bjørnskov, Dreher and Fischer (2008) (|0,0165|/|0,0004| = 41.25) and only about four times lower in Ovaska and Takashima (2006) (|0,0646|/|0,0164| = 3.94). In a second step, all relative effect sizes calculated this way were inserted into a simple system of equations, which in turn was solved according to the reference weight (0.0557 and 0.1473; see Table 5). In a third step, the weight of per capita income was used to determine the weights of the other variables. These are shown in the fifth column of Table 5.[17] It can be seen, for example, that both studies give a comparably large weight to life expectancy – similar to Tofallis's approach mentioned above – but with regard to the other weights, which together still account for about one third, there are differences. On the basis of the initial weights thus determined for the individual variables, the weights to be applied in practice at the first stage of the weighted mean – i.e. within the sub-indices – and at the second stage (mean of the sub-indices themselves) were determined in a fourth step; the corresponding weights are shown

[17] In the case of weighting scheme 1, for example, the following equation was solved according to x - the weight of per capita income: 1 = x + 0.25x + 10.69x + 1.44x + 2.41x +2.15x.

in Table 6. In the following I will simply refer to weighting scheme one (Ovaska/Takashima data) and weighting scheme two (Bjørnskov et al. data).[18]

Table 6: Weights applied on the first and second stages of the mean

Sub-indices and variables	Stage 1: Within sub-indices		Stage 2: Freedom included (excluded)	
	Ovaska/ Takashima	Bjornskov	Ovaska/ Takashima	Bjornskov
Material living standard			0.070 (0.094)	0.151 (0.162)
Income	0.797	0.976		
Unemployment	0.203	0.024		
Education	1.000	1.000	0.081 (0.107)	0.154 (0.166)
Health			0.595 (0.799)	0.625 (0.672)
Life expectancy	0.250	0.853		
Infant mortality	0.250	0.049		
Child mortality	0.250	0.049		
Maternal mortality	0.250	0.049		
Freedom			0.254 (0.000)	0.070 (0.000)
Economic freedom	0.529	0.468		
Political freedom	0.471	0.532		

Sources: See Table 5; author's own calculations.

A critical aspect of this approach certainly is the implicit basic assumption that the findings of happiness economics can easily be applied to the past. It is by no means clear that people's life satisfaction at the time of the Weimar Republic, the Third Reich and the early Federal Republic was determined by the same macroeconomic variables that determine life satisfaction in today's societies. And even if there were reason to assume that the same determinants were at work, people at that time could at least have attributed different subjective weights to them – which brings us back to the point that no subjective survey data on preferences at that time is available (see the Wagner quote in Section I). The procedure chosen here can be checked for plausibility by reference to Wahl (2013: 97). In his study on living standards in the Third Reich he pointed out that among the countries examined in happiness economic studies there are usually those for which it holds that the level of development measured by per capita income and other variables is comparable with that of Germany in

[18] Life expectancy's large weight could be interpreted as a strong preference for health, which is specific to highly developed societies, once more basic needs – e.g. for decent material well-being – are met. The level of development of the social insurance and especially the health care system would presumably be an important determinant. There is no doubt that the German social insurance system before 1960, and especially before 1945, was of a different quality.

the interwar period. In this respect, it is not unreasonable to assume stable and comparable preferences in the long term.

4. Discussing the variants of the Germany-specific Development Index

4.1. Influence of the mean concept on the construction of the standard of living

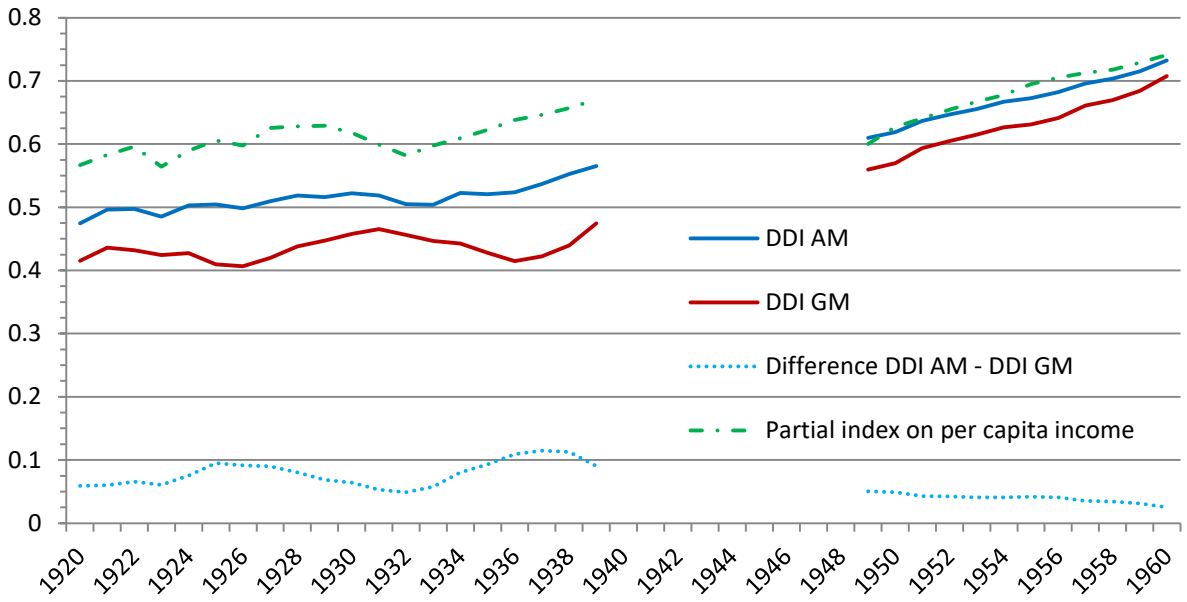
How much does our picture of the development of the standard of living in Germany change in comparison to Wagner's estimation, if the geometric mean is used instead of the arithmetic mean, but with the same data? A first look at Figure 3 immediately shows that the picture of a monotonically rising standard of living does not change after 1948, if one disregards the fact that the geometrically averaged DDI – subsequently abbreviated as DDI^{GM} – grows somewhat faster on average.[19] The case is quite different when looking at the interwar period. First, the mere fact that the DDI^{GM} is lower than the DDI^{AM} does not per se indicate a lower level of prosperity. In formal terms, for any given year the difference itself merely indicates that the index values are scattered (see Section 3.1). However, meaningful statements can be derived from the change in the difference over time, and thus from the fluctuation pattern of the DDI^{GM}. Thus, the following deviations can be recorded: First, the level of prosperity rises only marginally from the local minimum in 1923 to 1924 (from 0.424 to 0.427 or by 0.7 percent compared to 3.6 percent for the DDI^{AM}). Second, the DDI^{GM} falls in 1926 to a level even below the initial level of 1920 (0.407 compared to 0.415), so that 1926 marks the absolute minimum in prosperity in the entire interwar period (according to the DDI^{AM}, this is 1920); compared to the DDI^{AM}, the increased unemployment here reflects much more clearly the stabilization crisis of the early "Golden Twenties" as well as the minimum in university participation.[20] Third, according to the DDI^{GM}, prosperity grows more strongly after 1926 and also until 1931, not 1930 (2.2 versus 0.7 percent p.a. over 1926-1930 and 2.7 versus 0.8 percent p.a. over 1926-1931); the DDI^{GM} also shows no dent in 1929. Fourth, between 1931, the Weimar prosperity maximum (0.466), and 1936 prosperity falls steadily and significantly (by 2.3 per cent p.a.) to a level that corresponds at best to the

[19] Between 1949 and 1960, the DDI^{AM} increases by an average of 1.68 percent and the DDI^{GM} by 2.15 percent.

[20] According to Wagner's data, the unemployment rate jumped from 3.4 % in 1925 to 10 % in 1926. For the unemployment sub-index, this means a decline from 0.966 to 0.900 and for the combined sub-index of material prosperity (plus per capita income) a decline from 0.765 to 0.733. In addition, the education sub-index fell from 0.180 in 1924 to 0.150 in 1925 and in 1926, the minimum in the Weimar Republic.

worst years of the Weimar Republic – 1920, 1925 and 1926. The year 1936, i.e. the end of the first phase of the National Socialist regime, when full employment was achieved, turns out to be the actual minimum in the development of prosperity during the pre-war phase of the Third Reich, and not 1933 as suggested by the DDI^{AM}. Fifth, the DDI^{GM} implies a stronger and apparently catching-up growth in prosperity after 1936 until 1939 (4.6 percent p.a. versus 2.6 percent p.a. based on the DDI^{AM}), the absolute maximum level of prosperity (0.474) in the interwar period; however, the increase in prosperity beyond the level finally achieved in the Weimar Republic, at 0.008 index points, is more than moderate compared to what the DDI^{AM} states (1930: 0.522; 1939: 0.565).[21] Sixth, finally, the prosperity gap is greater between 1939 and 1949 when considering the DDI^{GM}.

Figure 3: Classic DDI – arithmetic versus geometric mean



Notes: Indices equally weighted; no freedom index included.
Sources: See Figure 1, Table 1 and Table A.1; author's own calculations.

From the temporal development of the difference between DDI^{AM} and DDI^{GM} (see the series at the bottom edge in Fig. 3), an interesting periodization of the interwar period follows: Two phases can be identified in which the sub-indices per capita income, education and health grow in an increasingly balanced manner – i.e. the dispersion between the dimensions decreases –, namely between 1926 and 1932 and between 1938 and 1939. In contrast,

[21] Note that the correlation between the two series (1920-1939), measured by Pearson's correlation coefficient, is moderately positive at 0.49. Moreover, the DDI^{AM} is growing by 0.9 percent p.a. overall over the interwar period, while the DDI^{GM} is growing by 0.7 percent p.a.

an increasingly unbalanced development of prosperity characterizes the phases 1920 to 1925 (ignoring the 1922/23 kink) and 1933 to 1937. The DDI^{GM} makes the deformation of the National Socialist economic miracle immediately apparent. In comparison to Wagner's DDI, "the DDI^{GM} [the author] does [not; the author] attest that the National Socialists significantly increased the prosperity of the German population compared to Weimar."[22]

The comparison of standardized per capita income with the DDI^{GM}, as shown in Figure 3, shows that it is very important for the assessment of the development of prosperity in the interwar period whether one relies on the DDI^{AM} or the DDI^{GM} favored here. Spoerer and Streb (2013: 137) engaged in the analogous graphical comparison of the sub-index per capita income with Wagner's DDI. This comparison is important insofar as the fundamental criticism of the HDI is also grounded in the observation of a high positive correlation of the HDI with per capita income. And indeed, the correlation between per-capita income and the DDI^{AM} is highly positive at 0.93 (1949-1960: 0.99; 1920-1960: 0.90) in the period 1920 to 1939, so that one may get the impression that the information content of the DDI as an alternative measure of propserity is more than limited. Here, too, the picture for the interwar period is significantly different if the DDI^{GM} is used. It is striking that the marked slump in economic activity in 1923 is not reflected in the DDI^{GM} in the same way, but in the DDI^{AM} (see Figure 3). On the other hand, per capita income and the DDI^{GM} largely follow opposite paths, for instance from 1922 to 1923, 1925 to 1926 and especially 1930 to 1936. It is therefore not surprising that Pearson's correlation coefficient of the two series is only 0.25, suggesting a merely weakly positive correlation. For the post-war period (0.98) and the period 1920 to 1960 as a whole (0.83), however, we can still speak of a high positive correlation.

According to DDI^{GM}, was the overall level of prosperity lower or higher compared to Wagner's DDI^{AM}? This question can only be answered meaningfully within the framework of an international comparison. Such a comparison is possible on the basis of Table 7. For both mean value concepts the average HDI* (see Section 2) for the eight European comparison countries is shown using Wagner's approach; the absolute and the percentage difference of the HDI* for Germany to the European average is shown.

Reviewing the arithmetically averaged HDI*, the level of prosperity in the Weimar Republic around 1920 is initially below the European average. This shortfall is completely made

[22] Here, the modified assessment of Spoerer/Streb (2013: 137) on the DDI^{AM}.

up for by 1930, but appears again in the period thereafter.[23] A different picture emerges if the geometrically averaged HDI* is taken as a basis. While prosperity in Weimar around 1920 was only slightly below the European average, it was actually above the average around 1930. In the Third Reich, the level of prosperity also fell more clearly below the European average, and the picture again did not change for the post-war period. It can therefore be concluded that the geometrically averaged HDI* rates the level of prosperity in Weimar better than the arithmetically averaged HDI*, even in international comparison; and that it rates the level achieved in the Third Reich even worse.[24]

Table 7: Comparative living standard – arithmetic versus geometric mean

Year	HDI* – *arithmetic* mean			HDI* – *geometric* mean		
	Ø Europe-8	Germany	Difference	Ø Europe-8	Germany	Difference
1920	0.427	0.397	+0.030 (–7.0 %)	0.365	0.360	+0.005 (–1.4 %)
1930	0.469	0.469	+0.000 (0.0 %)	0.403	0.417	–0.014 (+3.5 %)
1940	0.508	0.482	+0.026 (–5.1 %)	0.459	0.398	+0.061 (–13.3 %)
1950	0.594	0.544	+0.050 (–8.4 %)	0.564	0.513	+0.051 (–9.1 %)
1960	0.680	0.646	+0.034 (–5.0 %)	0.664	0.631	+0.033 (–5.0 %)

Notes: The HDI* of Germany as a percentage of the European average.
Sources: See Table 1; author's own calculations.

4.2. Standard of living taking into account freedom and happiness economic-based weights

Up to this point, the remarks on the geometrically averaged DDI have suggested that the level of prosperity achieved around 1926 even marked the lowest point in Weimar, but especially in the entire interwar period; that the increase in the level of prosperity over the late 1920s up to the Great Depression must be rated correspondingly higher; finally, that the level of prosperity under the National Socialists did not experience any significant increase over what had already been achieved in Weimar, whereby the "de-formed economic miracle" shows itself directly in the DDI^{GM} and not only, as with Wagner, in the detail, i.e. in the sub-indices, but not in the DDI^{AM} as the overall picture. In the following we will have to ask

[23] Looking only at the position in the HDI* ranking, in 1920, 1930, and so on, six, six, five, seven and four countries, respectively, are ahead of Germany.

[24] According to the geometrically averaged HDI*, Germany was surpassed in 1920, 1930, and so on by four, four, seven, eight and four countries, respectively.

to what extent this picture of the extended standard of living in the inter-war period, which has been corrected in essential points, will hold up if, in addition to the now undisputed application of the simple geometric mean, the freedom index and in particular the happiness economics-based weights are also taken into account, two modifications that can certainly be controversially discussed.

On the basis of Figure 2 (Section 3.2) in conjunction with Table 6 (Section 3.3), one can guessed that the further modified DDI^{GM} will show a clear structural break in the transition from 1932 to 1933; and it will also show that the very strong weighting of the health indicators, three of which improved steadily, especially until 1932,[25] makes the dent in the DDI^{GM} around 1926 disappear. And this is exactly what Figure 4 shows. Shown are the simple DDI^{GM} as well as the two versions of the further modified DDI^{GM}, which can be distinguished according to the respective weighting scheme, hereinafter referred to as $DDI^{GM,F,1}$ and $DDI^{GM,F,2}$.[26] In comparison to the DDI^{GM}, both extended indices up to 1932 and from 1949 onwards predominantly and clearly range at a higher level. Between 1933 and 1939, all three indices roughly show the same level. If we first look at the course of the $DDI^{GM,F,1}$ and $DDI^{GM,F,2}$ in the Weimar period, we see that the strong happiness economics-based weighting of the health sub-dimension in both cases means that the pronounced dent in the DDI^{GM} around 1926 disappears – although the level of prosperity in 1922 and 1923 continues to stagnate. In fact, both indices show a marked growth in prosperity up to and including 1932. Disregarding the short-term stagnation in 1929, the $DDI^{GM,F,1}$ grows by no less than 1.5 percent p.a. over 1924 to 1932 and the $DDI^{GM,F,2}$ even by 2.0 percent; in the same period the DDI^{AM} and the DDI^{GM} grow by an average of only 0.4 and 0.8 percent, respectively. So while the simple DDI^{GM} for the late inflation years and the early "Golden Twenties" offers a more pessimistic view than Wagner's DDI, $DDI^{GM,F,1}$ and $DDI^{GM,F,2}$ go into the other extreme and draw an even more positive picture of the development of the extended standard of living during the "Golden Twenties" and also, unlike Wagner, during the world economic crisis.

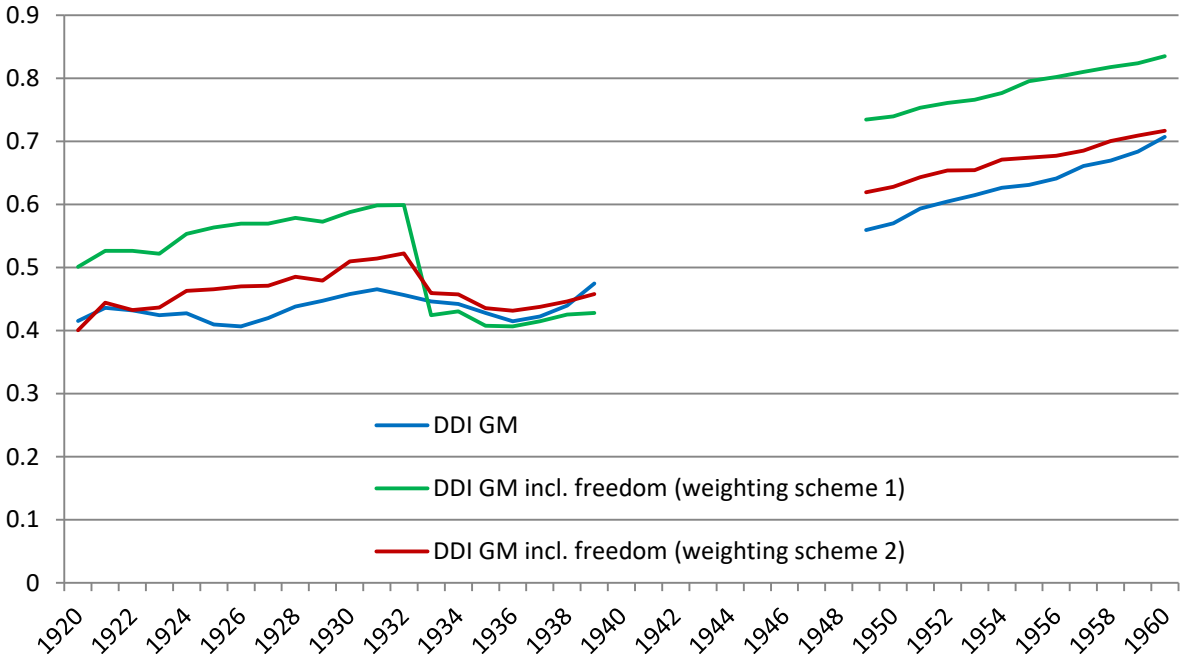
Focusing on the pre-war years of the Third Reich, the living standard initially fell significantly from 1932 to 1933, due to the restriction of political freedom. From 1934 to 1935, greater restrictions on economic freedom were added. All in all, the $DDI^{GM,F,1}$ thus falls to a

[25] While life expectancy at birth, infant mortality and child mortality increased, maternal mortality stagnated until 1933 (Wagner 2008: 272).

[26] The superscript "F" stands for "freedom index inclusive" and the superscript number indicates the weighting scheme ("1" for the scheme according to Ovaska/Takashima, "2" for that according to Bjørnskov et al.).

level of 0.407 in 1936, which is far below the level of 1920; even if the living standard con, analogous to the DDI^{AM} and DDI^{GM}, continues to rise or, respectively, rises again until 1939, this increase is not nearly comparable to the development in Weimar. The verdict is less harsh in the case of $DDI^{GM,F,2}$. Although the pattern of fluctuation is almost identical to that of DDI^{GM} and $DDI^{GM,F,1}$, prosperity falls in comparison to Weimar at most below the level of 1921 and in 1939 is at least at the level of 1924. If the post-war period is added, it becomes even clearer that the Third Reich represents a striking discontinuity in the long-term development of the extended standard of living in Germany.

Figure 4: DDI^{GM} extended for freedom and happiness economics-based weights



Notes: Indices equally weighted; AM and GM denote the arithmetic and geometric mean.
Sources: See Figure 1, Table 1 and Table A.1; author's own calculations.

Table 8 summarizes how strongly the different DDI variants correlate with each other and with normalized per capita income. Splitting the interwar period, the two fully modified DDI measures correlate highly positively with Wagner's DDI in the period from 1920 to 1932, but there is basically no correlation in the period between 1933 and 1939 – and this without the structural break in 1932/1933 even being recorded. So while the correlation of the $DDI^{GM,F,1}$ and the $DDI^{GM,F,2}$ with per capita income is moderately positive, it is zero or even negative in the period between 1933 and 1939. So formally it does make a difference which variant is used.

Table 8: How strongly do the variants of the DDI correlate with each other and with income per capita?

Period	(1) $DDI^{GM} - DDI^{AM}$	(2) $DDI^{GM} - DDI^{GM, F, 1}$	(3) $DDI^{GM} - DDI^{GM, F, 2}$	(4) $DDI^{GM, F, 1} - DDI^{AM}$	(5) $DDI^{GM, F, 2} - DDI^{AM}$
A) Correlation among the variants of the DDI					
1920-1932	0.61	0.57	0.69	0.86	0.84
1933-1939	0.48	0.78	0.94	0.32	0.08
1920-1939	0.49	0.07	0.56	–0.45	0.17
1949-1960	0.99	0.98	0.99	0.99	0.99
1920-1960	0.98	0.91	0.98	0.86	0.96
	DDI^{AM} – PKE	DDI^{GM} – PKE	$DDI^{GM, F, 1}$ – PKE	$DDI^{GM, F, 2}$ – PKE	
B) Correlation with income per capita					
1920-1932	0.83	–0.67	0.60	0.49	
1933-1939	0.94	0.05	0.02	–0.20	
1920-1939	0.93	0.25	–0.44	0.03	
1949-1960	0.99	0.98	0.99	0.98	
1920-1960	0.90	0.83	0.63	0.77	

Notes: Given are the correlation coefficients according to Pearson.
Sources: Author's own calculations.

Table 9: Comparative living standard – freedom and preferences taken into account

Year	HDI* – geometric mean, freedom included, weighting scheme1			HDI* – geometric mean, freedom included, weighting scheme2		
	Ø Europe-8	Germany	Difference	Ø Europe-8	Germany	Difference
1920	0.548	0.479	+ 0.069 (–12.6 %)	0.463	0.415	+ 0.048 (–10.5 %)
1930	0.577	0.563	+ 0.014 (–2.4 %)	0.506	0.508	– 0.002 (+0.4 %)
1940	0.505	0.395	+ 0.110 (–22.8 %)	0.509	0.457	+ 0.052 (–10.0 %)
1950	0.713	0.677	+ 0.036 (–5.0 %)	0.654	0.613	+ 0.041 (–6.3 %)
1960	0.769	0.756	+ 0.013 (–1.7 %)	0.727	0.699	+ 0.028 (–3.9 %)

Notes: The HDI* of Germany as a percentage of the European average.
Sources: See Table 1; author's own calculations.

Finally, on the basis of Table 9 and analogous to the explanations in the previous section, the level of prosperity in Germany can be determined in a European comparison if political and economic freedoms and preferences are included in the analysis. If weighting scheme two is used, the picture is broadly similar to that obtained on the basis of the DDI^{AM} (see above)

with the exception of 1940. If, on the other hand, weighting scheme one is used, the living standard in Germany in 1920 and especially in 1940 is even more clearly below the European average. However, the 1960 level is only marginally lower. A comparison with the European average also shows that the choice of the DDI measure is particularly important, since no two variants allow drawing the exact same conclusions about the development of the extended standard of living.

5. Conclusion

In their recent textbook on German economic history, Mark Spoerer and Jochen Streb (2013: 138-9) criticized the HDI/DDI; they state: "Wagner herself emphasizes that the result of the prosperity analysis using development indices depends largely on the indicators chosen and their weighting. We would like to formulate this correct insight more clearly here: As long as there is no theoretical and empirical basis for a particular variant of the HDI, anyone can manipulate the value of the measure of prosperity according to his or her own objectives by skilfully selecting indicators and weights." The approach to the modification of the Germany-specific Development Index presented in this article directly addresses Spoerer and Streb's fundamental criticism. Although it was certainly not possible to present a conclusive solution to the problem of selection and weighting, the approach does show how one can arrive at a theoretically and empirically better founded variant of the DDI – and ultimately of the HDI. There is no doubt that the DDI should be recalculated using the geometric mean, thereby only following the United Nations' and the scientific community's current practice. Beyond that, adding political and economic freedom and, in particular, considering weights rooted in happiness economics and based on subjective preferences should is debatable.

The analysis has shown that the HDI/DDI actually reacts very sensitively to changes in the way of calculating. Since the interested (economic) historian now has several variants of the DDI at hand, the decision for or against one of these variants is of particular importance as part of her own argumentation. And this is all the more true as the variants differ not only on a formal level but also, and especially, on a content-wise. By providing a menu of alternative measures, the future use of the DDI for intertemporal and international comparisons of living standards will ultimately be more difficult than it will be easier. It should be noted that all three variants of the DDI based on the geometric mean are fundamentally more pessimis-

tic about the development of living standards in the Third Reich than Wagner's reference DDI is. As to the question of how much the standard of living in the Third Reich lagged behind that of Weimar, it is the concrete selection that matters. The most pessimistic picture is drawn by $DDI^{GM,F,1}$, the most optimistic by DDI^{AM}. It is also clear that on the basis of the geometrically averaged DDI variants, it is no longer possible to argue convincingly that there is a clear continuity between the Third Reich and the Federal Republic in terms of the extended standard of living. In particular, it can be argued on the basis of this article that even the stronger, albeit deformed, economic growth under National Socialism could not in fact overcompensate for the progress in education and living standards already achieved in the Weimar Republic. This result is also relevant to the broader economic-historical debate on socioeconomic continuities and discontinuities between the Weimar Republic, the Third Reich and the Federal Republic, in so far as the advocates of continuity between Weimar and the Federal Republic can now draw on a further argument (Ritschl 2005; Spoerer 2016). All in all, if one wishes to discuss the development of living standards in Germany on the basis of a theoretically and empirically better founded variant of the DDI, one cannot avoid dealing more intensively with the happiness economics-based variants presented in this article. If, however, one cannot accept the extension of the DDI for the aspect of freedom in combination with a preference-oriented weighting anchored in the present, the simple geometrically averaged DDI still remains. Its time pattern, just like the weighted variants, invites us to reassess the development of the living standard in the interwar period.

For other readers, the incorporated modifications may not go far enough. Future work on the historical HDI/DDI could, for example, address the question of whether the weighting of the sub-dimensions should not rather be varying over time. Instead of looking at the determinants of life satisfaction, the determinants of happiness in the more narrow sense of the word could be used. In the first case, the determinants can be regarded as basically stable over a longer period of time, which justifies static weights. However, if one looks at happiness in the more narrow sense of the word, one should consider dynamic weights, since the feeling happy is primarily influenced by emotions and suggests a short time horizon for the respondent (see Section 4.3). Regarding the first years of the Nazi regime, it could be argued, for example, that under the impression of the economic upheavals caused by the Great Depression, people may have attached greater weight to the significant decline in un-

employment from 1933 onwards than to other determinants (e.g. freedom). This is presumably due to the distinction between life satisfaction and happiness.

A further possibility for modifying the DDI arises in the field of social inequality. There is no doubt that inequality plays – and has played – an important role in all areas of life (Spree 1981; Kaelble 1983; Gruen/Klasen 2013). Here it would be appropriate to use the United Nations approach – the inequality-adjusted HDI – as a starting point for correcting the DDI for inequality. However, since this approach raises all kinds of questions with regard to the measurement of inequality, data availability and formal implementation using the DDI formula, no attempt has been made here. Rather, I leave this to future research.[27]

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[27] To name but a few questions that inevitably arise: is "the less inequality the better"? Or is there an optimal level of inequality other than zero? And how should one formally deal with the fact that inequality in education and health also depends on income inequality?

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Appendix: DDI data

Tab. A.1: Variants of the DDI (equal weighting kept)

Year	Variant 1	Variant 2	Variant 3	Year	Variant 1	Variant 2	Variant 3
1920	0.415	0.556	0.485	1936	0.415	0.460	0.320
1921	0.436	0.572	0.503	1937	0.422	0.470	0.325
1922	0.432	0.573	0.499	1938	0.439	0.481	0.335
1923	0.424	0.564	0.493	1939	0.474	0.491	0.355
1924	0.427	0.578	0.496	1949	0.560	0.676	0.620
1925	0.410	0.571	0.475	1950	0.570	0.682	0.629
1926	0.407	0.565	0.472	1951	0.594	0.695	0.648
1927	0.420	0.574	0.484	1952	0.605	0.703	0.657
1928	0.438	0.582	0.499	1953	0.615	0.709	0.665
1929	0.447	0.579	0.507	1954	0.627	0.718	0.675
1930	0.458	0.572	0.508	1955	0.631	0.739	0.694
1931	0.466	0.569	0.515	1956	0.641	0.746	0.702
1932	0.456	0.558	0.507	1957	0.661	0.757	0.718
1933	0.446	0.464	0.353	1958	0.670	0.762	0.725
1934	0.442	0.480	0.350	1959	0.684	0.771	0.737
1935	0.428	0.458	0.328	1960	0.707	0.789	0.760

Notes: Variant 1: Geometrically averaged, excluding freedom index; variant 2: Arithmetically averaged, including freedom index; variant 3: Geometrically averaged, including freedom index.
Source: See text.

Tab. A.2: Variants of the DDI (weighted average, weighting schemes 1 and 2)

Year	Variant 4	Variant 5	Jahr	Variant 4	Variant 5
1920	0.517	0.404	1936	0.407	0.431
1921	0.543	0.447	1937	0.415	0.438
1922	0.543	0.436	1938	0.425	0.446
1923	0.539	0.440	1939	0.428	0.458
1924	0.571	0.467	1949	0.734	0.619
1925	0.568	0.467	1950	0.740	0.628
1926	0.575	0.471	1951	0.753	0.643
1927	0.574	0.472	1952	0.761	0.654
1928	0.583	0.486	1953	0.766	0.654
1929	0.577	0.480	1954	0.777	0.671
1930	0.590	0.510	1955	0.795	0.674
1931	0.601	0.515	1956	0.802	0.678
1932	0.601	0.523	1957	0.810	0.685
1933	0.425	0.460	1958	0.818	0.701
1934	0.432	0.458	1959	0.824	0.709
1935	0.408	0.435	1960	0.835	0.717

Notes: Variant 4: Geometrically averaged, including freedom, weighted average, weighting scheme 1; Variant 5: Geometrically averaged, including freedom, weighted average, weighting scheme 2. Scheme according to Ovaska/Takashima-data and scheme 2 according to Bjørnskov et al.-data.
Source: See text.

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DOI 10.2583/epub.43435 RESH Papers – ISSN 2701-2050