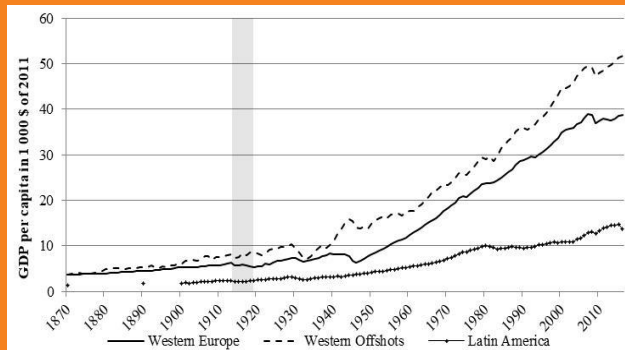


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Tobias A. Jopp/Mark Spoerer

Teaching Historical Statistics: Source-Critical
Mediation of Aims and Methods of Statistical
Approaches in History



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Teaching Historical Statistics: Source-Critical Mediation of Aims and Methods of Statistical Approaches in Historiography*

Tobias A. Jopp / Mark Spoerer⁺

Abstract: This monograph helps historians design a low-threshold introductory course on historical statistics. The course aims at providing students with elementary knowledge enabling them to understand historical studies that apply statistical methods. Elementary is meant to include the tools of descriptive statistics and correlation analysis in the first place. We develop the course along these core themes: Objective and target groups; statistical reasoning; basic knowledge; pitfalls; the typical quantifying research approach; and course design.

Keywords: Historical statistics, teaching

JEL classification: C00, N01

* This discussion paper is a translation of a short monograph 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/Mark Spoerer (2017): Historische Statistik lehren. Quellenkritische Vermittlung von Zielen und Methoden statistischen Arbeitens in der Geschichtswissenschaft. Please cite the original publication along with this discussion paper.

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Teaching Historical Statistics: Source-Critical Mediation of Aims and Methods of Statistical Approaches in Historiography

1. Introduction

"More", "less", "some" etcetera – historiographic narratives are plentiful with indefinite numerical words indicating an implicit numerical comparison of two sets. In many cases (such a word, too!) only such comparisons allow placing a certain set of facts in one's argument. Often(!) author and reader are satisfied with such a rather vague comparison. But sentences like "Many newborns died soon after birth" will leave some(!) readers somewhat(!) perplexed: how long is "soon after birth"? And what does "many" mean in the context of a time period when only, say, 3.2 per thousand (i.e. three out of a thousand) of the babies born alive die in the first twelve months after birth? Ten percent? A quarter? Half? Or even more? Many readers would certainly prefer a more precise statement, such as "36.4 percent of babies born alive died within the first twelve months after birth in 1853". But more critical readers would subject this statement to a thorough review of sources and methods: is the source reliable? Is 1853 a normal year or an outlier? Which factors may distort the result (e.g. practice of making entries in the church register)? And, in general, does not the saying apply which is (very probably wrongly) attributed to Winston Churchill: "The only statistics you can trust are those you falsified yourself" (Barke 2011: 7, 11)?

Statistics for historians?

Is it possible to work seriously with statistics as a source- and method-critical historian, at all? In our opinion, it is indeed; and this is precisely why we have written this introduction. It is true that numbers-intensive historical studies sometimes leave a bland aftertaste in the minds of readers who are inexperienced as regards statistics. This is especially true if such studies do not remain on the level of description, but investigate cause-effect relationships mathematically or in terms of probability theory. Of course, every source must be critically scrutinized, especially since statistical data are not collected just like that, but always for a specific purpose – but this applies to almost all sources. The choice of statistical tools, i.e. the methodology, must also be made comprehensible to informed readers. If sceptics continue to categorically reject the methods of historical statistics, we think two things are at work: ignorance and resentment (Kaelble 1990; Jarausch 1990). With this guide we can

counter the former to a certain extent and hopefully alleviate the latter at least somewhat. Two examples will illustrate the potential of historical statistics.

Two examples

How many "witches" were actually burned in Europe? And who was the typical voter of the NSDAP who helped it to achieve the high election results of 1932 and 1933? These are just two (arbitrarily selected) questions out of a whole series of important questions that have been occupying historical research for a long time and for which it is hardly possible to find answers without the collection and analysis of statistical data.

Nine million witches?

In the first case, historians have devoted themselves to the deconstruction of the "myth of the nine million witches" executed in total – a persistent myth that originated in the late 18th century and has been regularly re-fed for political purposes ever since. Today, on the basis of thorough research that allows plausible estimates, a number of witch executions in the order of 30,000-50,000 seems much more likely (Behringer 1998: 683).

The typical National Socialist voter?

In the second case, historical electoral research has advanced the "demystifying of 'electoral historical folklore' about National Socialism" (Falter 1979: 3) and fundamentally revised our idea of the profile of the typical NSDAP voter. Contrary to an opinion that had prevailed for decades, "[...] the NSDAP [succeeded] in mobilizing members of all social strata in such large numbers that, despite the overrepresentation of the Protestant middle class, it had a more popular party character than any other political grouping of those years" (Falter 1979: 19).

These examples suggest that it is also worthwhile for a historian to have statistical knowledge; be it in order to pursue certain research questions herself, or simply to be able to critically read and understand relevant studies.

This book's objective

This book is primarily intended to help historians teaching at universities to design a low-threshold course on historical statistics. It is intended to provide students with elementary knowledge for a better understanding of historical studies that use statistical methods. With

the exception of the sub-discipline "economic history" – the sub-discipline that relies most heavily on statistics and especially inferential statistics for the analysis of cause-and-effect relationships – "elementary knowledge" primarily includes knowledge of the tools of descriptive statistics, with which the central characteristics of an existing data set can be worked out, and of correlation analysis.

In addition to the question of what content a basic course should cover (Chapter 4), we also provide you as a lecturer with arguments that help convince students of the usefulness of a course on historical statistics (Chapter 3). However, we like to start by placing the term.

2. Definitions

Statistics

"Statistics" refers to "[...] a science that provides methods for extracting data and learning from data". Irrespective of the concrete field of application, statistics essentially is always based on the same work steps, namely the "collection of data", the "description and visualisation of the collected data", the "identification of anomalies in the data" and the "derivation of conclusions that clearly go beyond the available data" (Mittag 2016: 7). Apart from referring to a science with its special canon of methods, the term "statistics" also refers to a self-created, mostly tabulated dataset, an official or semi-official data compilation, or a parameter derived from the data (e.g. a mean value).

Historical statistics

But what is "historical statistics"? Is there content specifically tailored to historiography that distinguishes historical statistics from statistics in general or economic statistics, medical statistics, etcetera? Or does the addition merely imply that identical content is conveyed in the best language for the respective discipline? There is no doubt that formula language and jargon are significantly downscaled in relevant introductions (Hudson/Ishizu 2017). Apart from this aspect, however, a distinguishing feature of historical statistics precisely is the fact that greater importance must be attached to the step of "collecting data", quite simply in order to take into account the nature and contextuality of historical sources for statistical data (Tilly 1976: 48). The training of historians should therefore also raise awareness of the special sources of historical statistics. However, despite the fact that computer software is

now very powerful, there is no such thing as a standardised procedure in historical statistics; each question requires an individual approach.

In addition to the term "historical statistics", other terms with similar meanings are in use, such as "quantitative methods in historiography", "quantitative history", "quantification in historiography" and "cliometrics" (for another term – "historical social research" – cf. e.g. Schröder 1994). Basically, Jürgen Kocka's definition of "quantification" can be understood equally as a definition of all other terms; in his words: "Quantification in historiography – that means the systematic processing of identical source information (or data) that can be numerically summarized with the help of diverse arithmetic and statistical methods for the purpose of describing and analysing historical reality" (Kocka 1977: 4; similar Jarausch 1976: 12).

Cliometrics

The term "cliometrics" – a combination of "clio", the muse of historiography, and the suffix "-metry" for "measurement" – requires a separate explanation. Even if the relevant *Duden* entry – cliometrics is the "development of historical sources with the help of quantifying methods" (retrieved at www.duden.de/suchen/dudenonline/cliometrics; 4 Aug 2016, 16:55h) – makes sense literally, the term is specifically connoted in the relevant literature with economic history, which draws on social science methods, and is sometimes equated with "econometrics", which stands for quantitative methods in the economic sciences. In this sense, working cliometrically means in particular "[...] the formulation of working hypotheses through the explicit use of theoretical models (mostly from economics, but also from other disciplines such as sociology, demography or biology)" (Komlos/Eddie 1999: 20).

In the following we use the adjectives "statistical" and "quantitative" synonymously. When we speak of "historical statistics", we mean the toolbox – that is, the sum of all relevant statistical methods including the possibilities of source criticism. In this sense, we also use the formulations "historical statistics", "cliometrics", "quantification in historiography" and "statistical work in historiography" synonymously.

3. Historiography and statistics

3.1 Statistical sources

Critical source analysis is the basis of the historian's work. It is common practice to divide sources into real relics, and oral and written testimonies that directly or indirectly represent a historical phenomenon. Of particular importance as basis for a quantitative analysis are written, mostly non-narrative testimonies (for a counter-example, cf. "quantitative vs. qualitative sources"), and among these the "legal sources" and the "administrative documents" ("social documents") (Howell/Prevenier 2004: 24-26).

Historical statistics presupposes the existence of masses of uniform observations. An observation exists when, for a unit of investigation (the "feature carrier"; e.g. a country; cf. below), a certain amount of information (a "feature"; e.g. the number of infants that died in 1853 per thousand live births) is gathered by determining a numerical value (the "feature value"; e.g. 10 per 1,000). A single unit of investigation with the information gathered on that unit constitutes a case. Each specific piece of information is considered a variable, and the total number of cases constitutes the dataset (Hudson/Ishizu 2017: 50).

Case no.	Observational unit	Point in time of observation	Mortality	...
1	Prussia	1853	44	...
2	Bavaria	1853	42	...
3	Prussia	1863	42	...
4	Bavaria	1863	45	...
...

Types of datasets

In general, three types of data records can be distinguished:

- Cross-sectional dataset: infant mortality is collected for a uniform period in different regions, i.e. observations are only collected across space (cases 1 and 2).
- Longitudinal dataset: infant mortality is collected for a uniform region over a certain period of time with several sub-periods (monthly, annually, 5 years), i.e. observations only are collected across time (cases 1 and 3).
- Panel dataset: infant mortality in different regions and over a certain period of time with several sub-periods is collected, i.e. the observations are collected across space and time (cases 1 to 4) (Note that while in the classical panel the cross-sectional dimension is larger

than the time dimension, the time series cross-section has few units of investigation which, however, have been recorded for a very large number of points in time; Feinstein/Thomas 2002: 8-9).

Types of sources

In addition, four types of statistical sources can be distinguished, the first three of which have a time component, either directly or by combining one another:

Type 1 (serial source in the sense of the term): a type of source that has been deliberately designed by the author (authorities, church, private institution) as continuous and (more or less) standardised in its appearance (e.g. publications of official statistics; church books/accounting books).

Type 2 (serial source in the broadest sense): one that was not consciously created as part of a series, but was nevertheless produced regularly in a (more or less) standardised form (e.g. wills). The series only emerges from the historian's perspective when linking comparable documents to a dataset.

Type 3 (quasi-serial source): one that is basically non-serial, i.e. that has not been consciously designed as continuous and not standardised in appearance, but which could also serve as a starting point for the historian to work out a series; this could, for example, be a dissertation from a certain academic discipline which is examined as to see whether its formal composition has been subject to changes over time.

Type 4 (non-serial source): A source that only contains data at a specific point in time (keyword "cross-sectional data set").

Whether a source can be described as a serial source of type 2 or 3 depends very much on the historian's concrete epistemological interest or, respectively, the specific question posed, i.e. ultimately on the individual case.

Quantitative versus qualitative sources

Statistical sources can be both quantitative and qualitative sources, i.e. they can report rather numerical (e.g. statistics of the German Reich) or rather non-numerical news (e.g. birth certificate). The former often occur in the form of lists, tables, or figures, but sometimes also as continuous text. If a table is available, this makes the data gathering easier in principle; if necessary, one simply records a value taken from a table and repeats

this process year-by-year, for example. In comparison, the extraction of observations from qualitative sources involves considerably more effort, especially with regard to classification, categorisation and coding – i.e., the translation of qualitative information into a numerical value. A good example of this "translation service" is provided by Morris (1999), who, among other things, examines the social structure of the British middle class on the basis of the parliamentary poll books of the city of Leeds for the year 1832. Before the introduction of the secret ballot, the poll books explicitly noted for which candidate an eligible voter, recorded by name and profession, voted. Similarly, Kruedener (1975) and Grabas (2011) carried out qualitative economic analyses based on "narrative" annual reports from the Preußische Bank, on the one hand, and the Saarbrücken Chamber of Commerce, on the other. Likewise innovative is the volume by Aly (2006) on the measurement of public opinion in the Third Reich (On the development of archives, official statistics and statistical thinking – important topics that we will leave out in the following, however –, cf. e.g. Pitz 1976; Schneider 2013; and Reininghaus 2014).

Source criticism on statistical sources

No source that has come down to us, whether it is textual or statistical, has been designed specifically for the purposes of the historian in the future. In order to work out, on the one hand, the view of the source's author on the historical reality which he or she witnessed and, on the other hand, the author's agenda, a critical analysis of the source is necessary (cf. for the common principles Howell/Prevenier 2004: 76-78). For the historian trained in the criticism of qualitative, textual sources, the criticism of quantitative sources will certainly be unusual. How does one criticize a source that reports a lot of numbers?

First of all, by asking certain questions about the source that one would ask about any other source in a similar way: who exactly is the author? Out of which interest, for what purpose and how were the raw data originally collected? What categorisation schemes or demarcations were once used to condense the raw data and the information contained therein? Which information was lost or deliberately "destroyed" in the course of the aggregation process? Which "administrative will" can be reconstructed from the source? Ultimately, and this is what makes source criticism so difficult, the questions that one should ask depend very much on the nature of the source and the quantitative data reported there, but also on the questions one wants to ask oneself (Tilly 1976: 46; de Vries 1980: 434; and

Hudson/Ishizu 2017: 13-15). It is crucial that the historian gets an idea of the context in which the source was created.

Gaining information by losing information

The goal of source criticism must be to assess the selectivity of the statistical information conveyed as it is initially available to the historian. This is the basis for the following steps – data selection and further processing – and also the basic prerequisite for assessing the representativeness of the constructed dataset. The historian should always be aware of the tension inherent in quantitative work between information gain, on the one hand, and information loss, on the other. More pointedly: in the course of identifying, categorising, classifying, and coding news, information must inevitably get lost in order to open up new perspectives on the object of research. The historian certainly has a greater influence on this loss of information when she begins to construct a dataset from a qualitative source than when she uses statistics that are themselves the result of processing on the part of the source's author (cf. for some examples Rohlinger 1982: 43).

Representativeness

One example may help: Referring to the US, Sharpless and Shortridge (1975) and Conk (1981) discuss the general weaknesses of census data and occupation censuses of the 19th and 20th centuries. Distortions result, among other things, from the fact that "never all the people who should actually be counted are counted", which may be related to the fact that respondents answer incorrectly or the capacities of the census authorities to conduct thorough and comprehensive surveys are insufficient. This underestimation can be particularly problematic if it occurs systematically (due to institutional racism or a change in the coding scheme, for example) because this means that certain groups of individuals are non-randomly wrongly described or under- or over-represented. Other interesting examples are discussed by Tilly (1976) and De Vries (1980).

Source criticism using statistical methods

Criticism of one's own quantitative sources can also rely on statistical methods. A good example from the field of population statistics is the phenomenon of the so-called digit preference: people may not report their age correctly, for example when they are

interviewed in a population census. Perhaps, this is rooted in cultural or religious beliefs; perhaps, respondents simply do not know their true age. As a result, single-year-of-age data, and analytical tools based on them such as the population pyramid, may be biased in that some ages are extremely common and others are under-reported. For example, there is a common preference for ages ending in 0 and 5, and their clustering is seen as a sign of low educational attainment in a population. An example of cultural/religious numerical preference in East Asia is the accumulation of ages ending in 3 and the insufficient occurrence of those ending in 4. These distortions may also be present in historical population data. In order to determine their extent, historians can calculate the so-called Whipple index and similar indices – statistical measures that determine the quality of the data based on the distribution of reported individual ages (Poston 2005: 25, 34-36; Tollnek/Baten 2016).

A further example comes from the numerous approaches of anthropometric history dealing with the analysis of body height in a community in order to derive statements about the so-called biological standard of living. Traditionally, conclusions about the living standard of a population are mainly drawn on the basis of the heights of soldiers (partly also of prisoners). Statistical methods illustrate that the recording of heights was subject to certain rules (e.g. minimum height for conscripts) which can distort a data set and reduce its representativeness (Bodenhorn et al. 2017).

3.2 Potentials and limits

In addition to the availability of a set of similar observations, further prerequisites must be met in order to use historical statistics profitably: the phenomenon to be explained must be intrinsically quantifiable and variance in the data must be relevant for the argumentation. Moreover, the higher the number of cases considered and the more complex the chosen explanatory approach, the more worthwhile quantification is (Tilly 1987: 22; and Jarausch 1976: 14). We want to address these points by first naming the arguments usually put forward against quantification and then briefly turning to its advantages or, respectively, potential (Jarausch 1976: 15-16; Stone 1979; Clubb 1980; Aydelotte 1984; Botz 1984: 58-60; Monkkonen 1984: 90-91; Kaelble 1990: 76-78; Schröder 1994: 8-9; Sewell 2005: 6-8; Hudson/Ishizu 2017: 1-3):

Contra quantification

1a. Non-descriptive language: the formal language of quantification does not match the style in the humanities and the linguistic diversity of expression that a good historian's narrative should be showing.

2a. Illusion of precision: the use of numbers suggests a precision or certainty in the description and explanation of historical phenomena which is inappropriate. By generating statistical data and analysing them, the historian creates a distorted and/or incomplete picture of historical reality.

3a. Lack of representativeness: since the collection of data in the past was the result of interest-led action, its evaluation by historians will only in exceptional cases really provide a representative picture.

4a. Non-historical results: the results of statistical analysis are established ex post and were not available to contemporaries; therefore they cannot have influenced their actions.

5a. Methodological fetishism: quantitative works regularly get lost in mathematical-statistical questions of detail; the fine-tuning of models and calculation methods only obscures the view of the "number juggler" as well as the reader for the historical context and the historical phenomenon that actually needs explaining.

6a. Quantification promotes a change in research strategy – not to say in researcher mentality: instead of addressing the big, important questions of history – no matter how laborious finding answer might be – the quantifier picks out the objects and questions of research that can be statistically assessed; often the dataset, which was collected just because it could be collected, is established first, and only then is the research question matched to it.

7a. Trivial findings: the results to be obtained by quantification do not justify the necessary effort since they have no (significant) surplus value beyond findings obtained on the basis of the classical, historical-hermeneutic method.

8a. No sense of historical singularity/wrong understanding of time: quantifiers underestimate or even ignore the historical events' "boundedness in time and culture" (Jarausch 1976: 15) and thus their uniqueness; this makes the assumption of time-invariant regularities appear absurd and thus sets limits to any attempt at generalisation. If a historian

works quantitatively, she inevitably adopts a false understanding of the "temporalities of social life" (Sewell 2005: 6).

Pro quantification

1b. Standardized *modus communicandi*: quantification in the form of formulas, tables, and graphs is a standardized, effective way of gaining and illustrating knowledge that facilitates expert discussion. Being able to follow this path also enables the historian to engage in interdisciplinary dialogue with the social sciences.

2b. Genre-specific analysis tool/analysis of mass phenomena: quantification is a suitable method for processing the many existing serial sources and the data to be obtained from them. This inevitably comes with a focus on structural relationships and groups of individuals belonging to the anonymous mass of ordinary people; both provide the basis for an average view, which is the main focus of quantitative work.

3b. Universalization: the nature of the sources corresponds to the fact that (usually) it is not a particular unit of investigation with its particularities – a certain individual or a certain entity from a set of individuals or entities – that is of interest, but rather the commonalities connecting all units of investigation, the accumulation of which can only be assessed through statistical analysis ("group characteristics"; Jarausch 1976: 16). Only the description of a historical phenomenon using statistical data can improve our level of knowledge. In addition, quantification can serve to test theoretical, social science-based statements about human or group behaviour and to uncover behavioural laws (influence of framework conditions) or identify deviations in need of an explanation (proximity to the nomothetic understanding of knowledge). This requires variance in the data – in other words: a diversity of (groups of) individuals reflected in the sources.

4b. Special form of comparison: considering the fact that in historical narratives implicit numerical comparisons occur regularly, quantification merely is a form of comparison in which the quantities to be compared are made explicitly visible.

5b. Analysis of "natural experiments": the essence of (natural) scientific work is "the controlled and repeatable experiment" which is used to "establish chains of cause and effect" by isolating the crucial variables. Such experiments are understandably not possible when dealing with the past. An approximate solution to this problem is the so-called "natural experiment": "One searches for and finds natural situations that differ in the one

variable whose influence one seeks to determine". Provided that the historian "finds" such a situation, historical statistics are a helpful tool for its analysis (Diamond/Robinson 2010: 1-2).

Pragmatic plea

What is our conclusion of the debate about the sense and nonsense of quantification? To put the criticisms two and three into perspective, one might object that the same can be said about the use of qualitative methods. Nevertheless, the question of the representativeness or precision of statistical data is central to historical statistics so that the criticism is justified in any case. We will therefore go into this point in detail later. Whether it is necessary to calculate many models or whether the results are really trivial is, in our opinion, primarily a question of communication.

We believe that two things are crucial: firstly, to be able to acknowledge that there are types of historical sources which, because of their internal structure and the nature of the messages contained in them, can only be meaningfully evaluated by using quantitative methods. And even if the application of qualitative methods alone already provides valuable insights, quantitative methods open up additional perspectives that qualitative methods simply cannot. It is true that recourse to quantitative methods inevitably entails a change of perspective – away from single prominent individuals and historical singularities and towards structures and frameworks within which statesmen and thinkers as well as the innumerable nameless members of a society acted and possibly showed recurring (behavioral) patterns. Secondly, any historical phenomenon has to be dealt with in a reasonable way; if possible all available sources – i.e. quantifiable as well as non-quantifiable sources – have to be analyzed in combination (cf. Carus/Ogilvie 2009). Qualitative and quantitative historical methods are not mutually exclusive, but ideally complement and stimulate each other.

3.3 The history of quantification in historiography

Following the abstract discussion of the pros and cons, we now want to outline how quantitative methods entered into (German) historiography.

Historicism

In the long term, the movement of historicism in 19th and early 20th century Germany has been the determining factor for the attitude of historians towards statistics. Following Kocka

(1975: 5), the historical-critical method, the core of this influential movement, aims at the "hermeneutic interpretation" of the source material. According to the nature of the method, this interpretation rather is "literary-linguistic" and should provide information about the "traditional motivations, attitudes and actions of the great actors", and not about the "supra-individual structures and processes" as they become visible especially through the evaluation of quantitative sources. This notion by no means only dominated German historiography, but rather that of the 19th century in general. With their nation-state orientation, their representatives saw no reason to argue with statistical data when the major topics of interest were those of political and diplomatic history and the history of great ideas of individual historical figures.

The Historical School versus Marginalism

An important exception is connected with the Historical School of Economics: the methodological dispute between its representatives (such as Roscher, von Schmoller, and Wagner) and the followers of Marginalism – the abstract theorists around C. Menger – led to an empirical interest in the social environment for the first time in the last third of the 19th century. The preference of the followers of the Historical School of Economics for empirical, historical facts (and historical phase models for describing the history of humanity and its economic actions) brought them close to the historians, among whom above all Karl Lamprecht, under the influence of Roscher, called for an empirically saturated cultural history (Söllner 2001: 271-273). So inspired, historiographical works (also) based on numbers were written in the late 19th century (e.g. von Schmoller 1898).

Annales School

The Annales School in France provided a first and lasting impulse to quantification in the interwar period; its followers (such as Bloch, Febvre, Furet, later Braudel, and Le Roy Ladurie) turned away from the event- and person-oriented historiography that had hitherto dominated there, and focused their efforts on the identification of long-term structures and processes (*longue durée* and *histoire totale*) (Jarausch 1990: 49; Lengwiler 2011: 159). Economic and socio-historical questions that focused on population, settlement, and occupational or economic structures gained importance, and with them new objects or collective phenomena – such as prices, the family, or mentality (Lengwiler 2011: 159). While

in a first phase (until about 1945) the followers of the *Annales* basically pursued "qualitative structural history", in a second phase (until about the beginning of the 1970s) they devoted themselves specifically to "quantitative economic history" (Labrousse et al. 1970; for the quotations Botz 1984: 55-56).

Pioneer North America

The United States can be considered a pioneer in terms of quantification in the strict sense. Methodological advances in statistics after the Second World War led to an increasing number of authors of economic studies using inferential statistical (econometric) methods; authors included those whose approaches were to found cliometrics (e.g. Robert W. Fogel). However, methods of descriptive statistics also found their way into historiography itself in the 1950s and 1960s – as the core of "new social history" and "new political history", for example (Bogue 1981: 141; Jarausch 1990: 46-47). As part of the former, questions about the social stratification of societies and demographic developments were asked and groups of people were brought into the focus of historiography that were previously uninteresting; as part of the latter, for example, systematic, data-based research into voter behaviour and the social structure of the electorate and political elites made its mark (e.g. Fogel 1975: 332-333; Tilly 1987: 22-23; Sewell 2005: 26-27) (Note that new journals such as *Comparative Studies in Society and History* (1958), *Journal of Social History* (1967), *Historical Methods Newsletter*/*Historical Methods: A Journal of Quantitative and Interdisciplinary History* (1967), *Journal of Interdisciplinary History* (1970) and *Social Science History* (1976) bear witness to this change).

Adoption in Germany

In Germany, quantitative methods were applied much more hesitantly than in the Anglo-Saxon world and France because the reservations against any attempts at quantification were more deeply rooted. Taking the angle of the sociology of science, this was due to pride in the historiographical tradition of the profession, but also to the conviction that the complexity and time-bound nature of historical reality was not suitable for a quantifying access, especially since the data basis was inadequate due to poor tradition, and thus a glaring disproportion between costs and benefits was to be expected (Kocka 1977: 7-9).

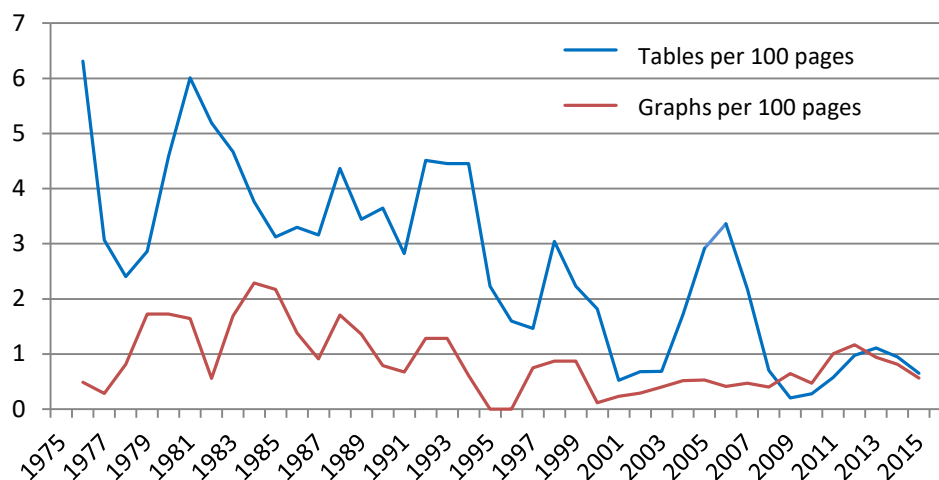
Historical social sciences

Quantitative methods did not make a lasting impact on German historical scholarship until the first half of the 1970s with the emergence of historical social science, which is closely linked to the Bielefeld School centring on its founders Hans-Ulrich Wehler and Jürgen Kocka, as well as with the founding of the Centre for Historical Social Research at the University of Cologne and the establishment of the working group for quantification and methods in historical social science research, QUANTUM (Jarausch 1976: 24; Iggers 2007: 32-34). History and Society (since 1975) and Historical Social Research (since 1976, initially under the title QUANTUM Information) were advanced and became the two most important publication organs of a social science and quantitatively informed historiography. As before in the United States, and with a stronger theoretical orientation than, for example, in France, the focus of research shifted to social or societal history with its interest in groups of (anonymous) individuals and in the persistence or even mutability of supra-individual social structures (cf. Jarausch 1976: 19ff; Jarausch 1990: 50). In the context of political history, research into public opinion and political voting behaviour has been promoted by the use of social science methods (cf. Jarausch 1976: 17-19; Falter 2015; for thematic focuses Oberwittler 1993: 91).

Cultural turn

The "cultural turn" of the late 1980s, which relied on "dense description" and the supporters of which were not interested in quantification (cf. Iggers 2007: 61-62), presumably stopped a further diffusion of the application of quantitative methods on a broad scale. If all tables and graphs of statistical data published in *Geschichte und Gesellschaft* since 1975 are counted, the following picture emerges that is entirely consistent with this assessment (cf. Figure 1): The frequency of both tables and figures per 100 pages was meanwhile six or just over two, respectively, and has declined in the long term. This can probably be explained by a change in the range of topics and methods as a result of the culturalist and linguistic turnaround.

Figure 1: Tables and graphs per 100 pages in *Geschichte und Gesellschaft*



Notes: Depicted is a three-year centred moving average.

Source: Own presentation based on a total survey of the journal *Geschichte und Gesellschaft* in the period 1975-2016 (research articles plus discussion forum).

In our opinion, however, many historians' fears of "statistics" have eased in recent years. Contemporary historians, in particular, are increasingly working with social statistical data that can be used to illustrate phenomena such as the change in social values (cf. Dietz et al. 2014; Raphael/Wagner 2015). A very important point here is the much simpler processing of data today by standard computer programs.

4. Planning and implementation of a course

Hopefully, we were able to make clear that quantification can in principle contribute to the progress of knowledge in historiography, but that this potential has so far been insufficiently exploited. In order to prevent the existing relevant approaches from sooner or later disappearing in the Bermuda Triangle of historiography or, at best, from being noticed in very specialized discourses among researchers themselves, historians' education should also include training in reading comprehension and judgment in the field of statistical analysis. In this section, we want to provide assistance in defining the learning goals and teaching content of a basic course starting at this point. We assume that attending the course will be on a voluntary basis, which is why the participants will be sufficiently motivated to work on historical statistics – also and especially because they can see the value added for their further studies and professional life (cf. Best/Schröder 1981; Schuler 1981).

4.1 Objectives and groups

Course's objective

A course following our proposal has two primary objectives: on the one hand, to transform a rather diffuse initial student interest in historical statistics into a concrete idea of its possible applications; and, on the other hand, to encourage the participants' willingness to continue their education in this field independently, if necessary. At the end of the course, students should at least be able to (better) assess the value of quantifying studies and to refer to those studies' results in their own work; in the best case, they should even feel inspired to carry out a quantitative analysis in the context of a seminar or qualification thesis.

Reading to comprehend

In our opinion, these primary course objectives can be achieved by providing participants with the basic knowledge for "reading to comprehend" quantitative work on a practical level, so that they can answer the following questions to a typical study: what research question is the study going to answer? What is the author's methodological approach to answering it? Why this particular approach, and not a different one? What are the pitfalls of the chosen methodological approach in connection with the source base? Are the results illustrated and interpreted in a comprehensible way, especially with regard to the question? What are the consequences for our understanding of the historical phenomenon under consideration? In order to visualize this goal, relevant tables and graphs of varying degrees of difficulty could be presented to the students at the beginning of the course and discussed with regard to the supposedly correct reading (cf. for many examples Feinstein/Thomas 2002; Hudson/Ishizu 2017). The same materials (and possibly others to test the ability to transfer) could be used again as a basis for a final learning objectives check.

Preconditions and prior knowledge

Where should the addressees of this course stand in their studies of history? And what previous knowledge should they have? In our opinion, an upper limit does not make sense, but a lower limit is useful. The course should be addressed to all those who are already somewhat trained in the application of the classical tools of the historian, i.e. the hermeneutic and comprehensible interpretation of source material or, more generally

speaking, qualitative methods. In the normal course of studies, we think that fourth- and higher semesters are the appropriate addressees.

A word on the problematic subject of "mathematics": having a basic knowledge of mathematics is undoubtedly beneficial for successfully participating in this course. In fact, one only needs to have basic arithmetic knowledge, needs to know the rule of three and percentage calculation, and has to understand probability theory to be able to master a text such as Feinstein and Thomas (2002).

Two target groups – one approach?

Yes, this course is equally suitable for prospective history teachers as well as all other prospective historians – regardless of the occupation they are aiming for. Whenever dealing with historical source material, a basic knowledge of historical statistics can only be beneficial. In addition, general statistical knowledge can be used as a key competence in many areas of the economy – if it is not even part of the everyday knowledge of the responsible citizen, who to "raise" is also the task of history teaching. The didactic significance of statistics in school lessons should be explicitly addressed when student that become teachers participate (cf. Mayer 1999; Sauer 2007: 255-256).

4.2 Statistical thinking

Representativeness

Statistics is based on certain basic insights about its subject matter – insights which one needs to get familiar with. To a certain extent, it is necessary to learn how to "think statistically". In this section, we will briefly address the basic insights that seem most important to us. They are as follows: the aim is to gain knowledge about the characteristics of a basic population of interest (which is sometimes a challenge to define correctly; cf. de Vries 1980: 437-438). However, this population cannot be grasped in its entirety, but only in part. Conclusions about the characteristics of the population are to be drawn on the basis of a section – the so-called sample. The conclusion on the population drawn from the sample is subject to uncertainty because the statistical characteristics of the sample and the population will generally not coincide. This raises the central question of representativeness (of the sample for the population).

Sample and population

From this uncertainty the probabilistic foundations of statistics follow directly: it is possible that the characteristics of the sample and those of the population will coincide completely, only a little, or not at all. In short, there is an *ex ante* range of possibilities of how the sample will position itself vis-à-vis the population; formally speaking, this range represents a so-called (probability) distribution of characteristic values over all possible values. For an intuitive understanding, it is important to remember at this point that there are three distributions we should distinguish: firstly, the unknown distribution of the characteristic in the population (e.g. infant mortality in the Prussian communities in 1853); secondly, the distribution of that characteristic in the available sample (e.g. containing 10% of all Prussian communities); and, thirdly, the distribution of a key figure of interest – e.g. the sample mean value (cf. below) – over all possible samples to be drawn from the population. The first two distributions are empirical distributions that result from the data at hand (the distribution in the population cannot be observed, however); the latter is a theoretical distribution that follows certain formal considerations or, respectively, assumptions.

The fact that the latter distribution is a theoretical – one could also say: hypothetical – distribution follows from the basic insight that the population is not completely ascertainable: simply not all samples that would have to be collected for complete coverage can in fact be collected. Ultimately, statistical tools are designed to help answer the following question: how large is the probability that the statements derived from the present sample would have followed in exactly the same way from other samples? If a high probability can be expected, the present sample would be representative (cf. Jarausch/Hardy 1991: 63-65; Feinstein/Thomas 2002: 117-119).

4.3 Basic knowledge

In this section, we will briefly discuss those statistical concepts that a basic course in historical statistics should definitely deal with (cf. also Section 4.6).

Classification of characteristics

We will start with a few obligatory remarks on the classification of characteristics. Their properties determine which arithmetic operations are possible – i.e. which tools are applicable – in the context of a statistical analysis. Figure 2 shows which properties are to be

distinguished in this sense. Formally, it is a matter of the data's level of measurement; we can generally distinguish between four measurement levels, whereby the information content of the data increases with the transition from level (1) to level (4) because the range of applicable tools is widening. Basically, qualitative sources tend to yield categorical data, whereas quantitative sources yield primarily metrically scaled data.

A further classification of characteristics results if one asks for the range of expressions or numerical values that it can assume in principle (cf. Mittag 2016: 18-19): a so-called discrete characteristic can only assume a finite number of values; counting data, for example, are always discrete (e.g. the number of cars one owns or of babies who died in year x etcetera) – and also assume integer values. In contrast, a so-called continuous characteristic can, in principle, take on all conceivable values in an interval (such as age or prices). Continuous characteristics can easily be converted into discrete characteristics by creating classes or, respectively, groups to improve on visualizing them in graphs or tables.

Figure 2: Level of measurement of observations

Scale	Description of the information	Possible mathematical operations			
		Counting	Ordering	Differencing	Dividing
(1) Nominal scale	<ul style="list-style-type: none"> Qualitative E.g. person-specific characteristics (name, profession, sex, ...) 	yes	no	no	no
(2) Ordinal scale	<ul style="list-style-type: none"> Qualitative "Better" vs. "worse" (hierarchy) E.g. grades in school, social classes 	yes	yes	no	no
(3) Interval scale	<ul style="list-style-type: none"> Numerical Differences reasonably interpretable E.g. periods of time, temperature 	yes	yes	yes	no
(4) Ratio scale	<ul style="list-style-type: none"> Numerical Data have natural zero point E.g. prices, wages, age 	yes	yes	yes	yes

(1) and (2): Categorical scale / (3) and (4) Cardinal- or, respectively, metric scale

Source: Authors' own depiction following Hudson/Ishizu (2017: 45-46) and Mittag (2016: 20).

Dummy variables

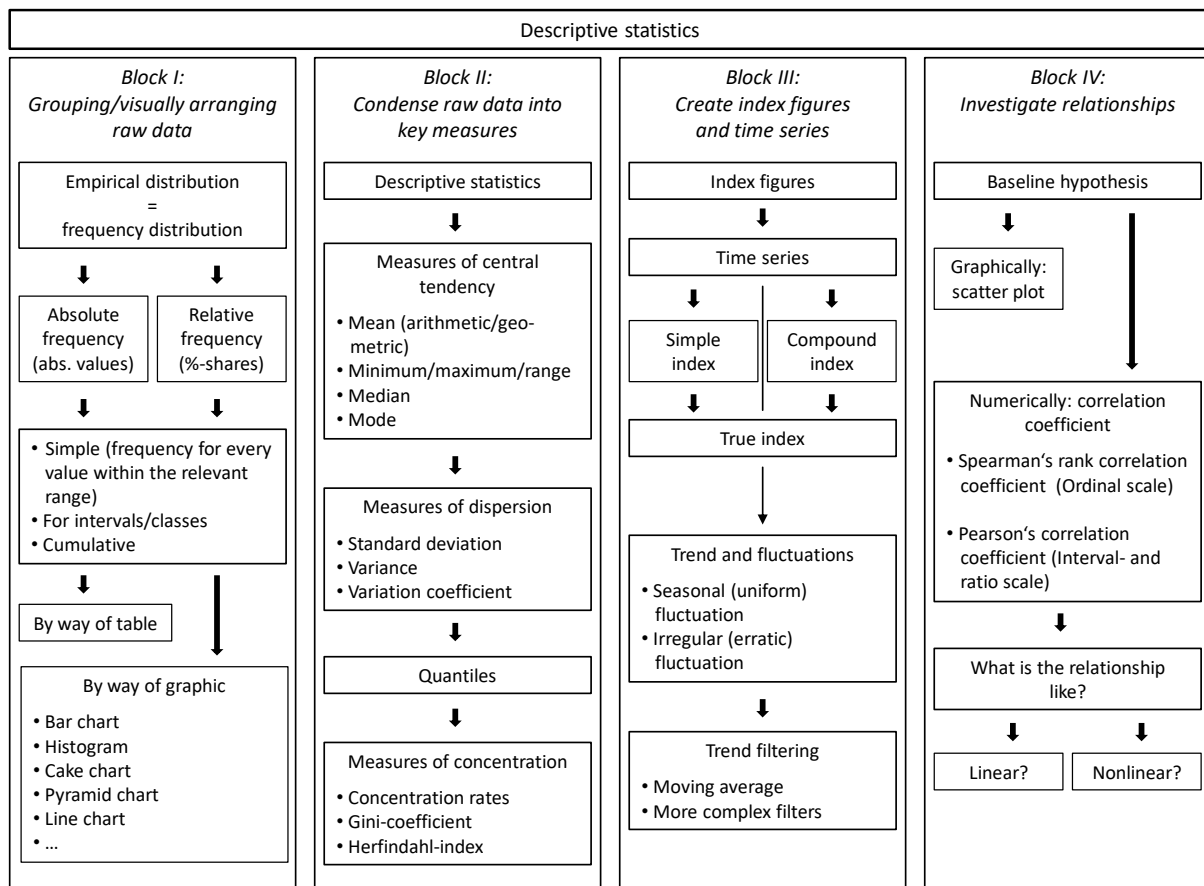
For the purpose of quantitative analysis, categorical data can be converted into dummy variables. The typical dummy variable takes one of two values, 0 or 1, whenever a particular characteristic is present or absent in a unit of investigation (Is a person male? Is he a baker? Is an elevated administrative district lying in Prussia?), dummy variables can be constructed. In principle, however, they can also be used to code characteristics with more than two categories, such as professions or social classes (cf. Feinstein/Thomas 2002: 11-12, 280-281). Dummy variables are helpful because they allow qualitative characteristics to be incorporated into a regression (cf. below).

Descriptive statistics

We now want to point out the many ways of describing a data set concisely – graphically and numerically. In many cases, even the application of simple statistical tools will lead to revealing findings on the basis of which the historian can design her narrative more precisely. In addition, the description also serves to prepare for an inferential statistical analysis; more on the latter, however, in the next subsection.

Figure 3 summarises at a glance – and in four blocks – what we consider to be the important tools of descriptive statistics (including correlation analysis) that students should be familiarised with.

Figure 3: Basic tools of descriptive statistics



Source: Authors' own depiction following Hudson/Ishizu (2017: 45-47) and Mittag (2012: 41-43).

Empirical distributions

Block I includes tools to illustrate the empirical distribution of the characteristic values of an observed variable. The crucial question at the beginning is: with regard to a particular variable, how often do which values – in absolute or relative (percentage) terms – occur? This question can be answered by counting and visualising in several ways, either graphically or in a table; the frequency of the values occurring can be determined for each scale (however, a cumulative frequency distribution makes no sense when a variable is nominally scaled due to the lack of hierarchy in the data). The wider the range of values, the more useful it is to form classes (with classes of equal width if possible!) instead of calculating the frequency for each individual value. The empirical frequency distribution is usually illustrated graphically in the form of a bar chart. Helpful examples of this and of alternative forms of representation can be found in Hudson/Ishizu (2017: 54-56).

Measures of central tendency and measures of dispersion

The tools of Block II serve to condense the information contained in the data and ultimately help assess a variable's empirical distribution. Measures of central tendency such as the arithmetic mean, the median, and the mode (or modal value) describe the centre of a distribution and provide an answer to the question of whether the distribution is symmetrical or skewed (for illustrations, cf. Jarausch/Hardy 1991: 90-92; Hudson/Ishizu 2017: 95-97). The geometric mean is suitable a tool when growth rates are under focus. The question of how "bulbous" the distribution is – i.e. how far the observed values are, on average, on both sides of the mean – is answered by means of dispersion measures. The variance and the standard deviation (square root of the variance) are common. All measures discussed so far have the dimension of the original data (e.g. monetary units, years). This does not apply to the coefficient of variation: it is calculated by dividing the standard deviation by the arithmetic mean, so it is a percentage. The coefficient of variation is particularly useful when comparing distributions having different dimensions (e.g. age vs. monetary units). Quantiles and measures of concentration certainly also belong to the canon of a basic course, but we will not go into detail here (cf. Hudson/Ishizu 2017: 101-103).

Index figures and time series

Block III covers the area of index formation and time series representation. A time series consists of consecutive values of a variable (cf. Figure 1) and can, but does not have to, be available without gaps. It may be helpful to not take the actual values chronologically, but to convert the time series into an index with base year t (several individual indices for the same base year can also be linked to form a new index. The weighting of the sub-indices is very important here (cf. Hudson/Ishizu 2017: 135-137). A further transformation occurs in the context of trend adjustment: a time series can be broken down into a trend – its long-term pattern – on the one hand and seasonal or recurrent as well as extraordinary or punctual fluctuations on the other; Hudson and Ishizu (2017: 144-146) and Feinstein and Thomas (2002: 22-24) discuss the simple breakdown using a few examples. This simple decomposition based on a moving average alone will tell the historian a lot about patterns in the data.

Measures of correlation

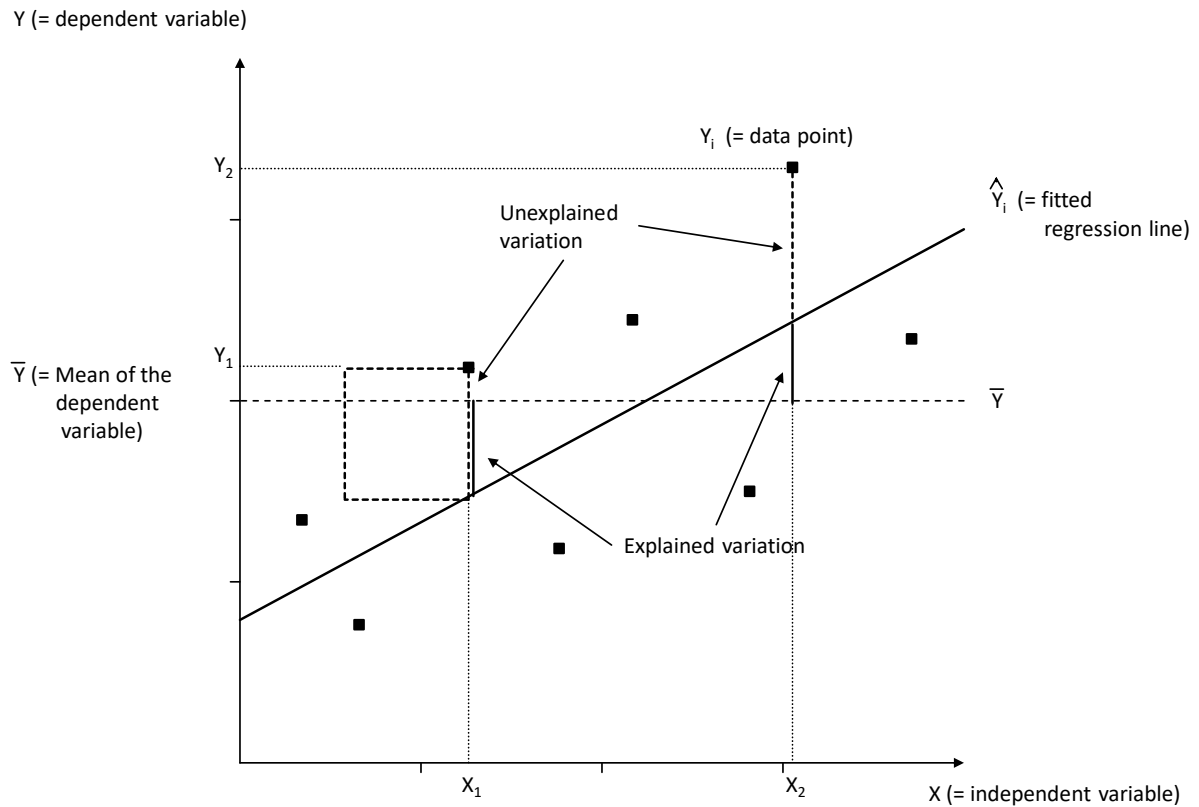
Finally, Block IV deals with correlation measures, the most important of which we have listed in Figure 3. For the sake of clarity, we should point out that correlation analysis is, in a sense, the link between descriptive and inferential statistics. In contrast to the tools in Blocks I to III, correlation analysis requires two variables, i.e. it is bivariate. It is important to note that, firstly, a possible correlation between two variables can also be non-linear (e.g. U-shaped); secondly, a scatter diagram can provide information about the exact functional form of the correlation; and, thirdly, correlation is not synonymous with causality (cf. also the section "Pitfalls").

Regression analysis

To present the basic idea of single or multiple linear regressions should be the final point of a basic course on historical statistics. In any case, the participants should be familiarised with the basic principle so that they are at least passively able to interpret the mostly tabular regression outputs in relevant historical analyses.

With the classical linear single regression, the relationship between a dependent variable, or variable to be explained, and exactly one independent, or explanatory, variable is to be determined – in other words: on the basis of the dataset collected, the function $Y = a + b \cdot X$ is estimated (this is also referred to as describing the data generating process); "a" denotes the axis intercept and "b" the slope parameter by which the influence of X on Y can be measured (by how many units does Y rise or fall when X changes by one unit?). Graphically, estimating the above function means to draw a straight line through the point cloud of all the collected X-Y observations (cf. Fig. 4). The position of the straight line in the point cloud is determined in such a way that the sum of the squared deviations of the observed values from the estimated values is minimized (least squares method; cf. Feinstein/Thomas 2002: 93-95, 231-233).

Figure 4: Linear regression



Source: Authors' own depiction following Feinstein/Thomas (2002: 104).

Regression output

The typical regression output, which is usually presented in tabular form, includes a number of quantities or measures, such as the sample size, the estimates on the intercept and the slope parameter, the standard errors of the estimated parameters, measures of the statistical significance of the estimated parameters (t-statistic or p-value), and finally a measure of the quality of the regression. The latter is referred to as R^2 (or alternatively: coefficient of determination) and expresses what percentage of the dispersion (cf. Fig. 4) is explained by the estimated model. The higher the R^2 in the interval from 0 to 1, the higher the percentage of the explained variation in the total variation is. Regularly, regressions are not only estimated with one explanatory variable, but with several (multiple regression) – this is precisely the strength of the approach. However, the basic idea is the same as for the single regression (cf. Hudson/Ishizu 2017: 183-185).

Violations of basic assumptions

The classical regression model as shown above is based on a whole series of assumptions that should not be violated, but may nonetheless be, and which can be divided into three groups: those concerning (1) the model specification, (2) the error specification, and (3) the variable specification. Three terms appear regularly in this context and should therefore at least be mentioned (cf. Hudson/Ishizu 2017: 194-196): heteroskedasticity (concerns (2): the residuals do not vary randomly around the regression line, but become systematically larger (or smaller) along the x-axis; the standard error of the affected coefficient would thus be very high, and the coefficient itself may subsequently be non-significant); autocorrelation in time series analyses (concerns (2): the residual in one period is not independent of the residual in the previous period(s); the regression coefficient is estimated incorrectly); multicollinearity (concerns (3): the explanatory variables correlate strongly with each other, so that one variable can be represented as a linear combination of the other variables; the explanatory content of the estimation model appears higher than it actually is). Much of what may appear to the reader of a quantitative study using a regression approach to be mere technical gimmick concerns testing for these and other violations of important assumptions, and correcting for these violations. Only if the statistical model is free of such violations, the findings will be statistically valid. In turn, statistically valid findings are the basic prerequisite for their historically plausible interpretation.

4.4 Pitfalls

In this section we want to point out some pitfalls of empirical work of which one should be aware – whether author or reader. For the reader, the following considerations offer initial starting points for a critical examination of a quantitative text: has the author considered the possible pitfalls? How does he deal with them? Is the procedure comprehensibly explained? Are there any source or methodological problems that the author neglects?

Biased samples

Historians often work with a sample instead of the basic population from which it originates. (In individual cases, it may indeed be possible to capture the basic population but, ultimately, this depends on how the population was defined); either the data are rather meagre, or (in rare cases) it provides so much data that a complete survey would be too

costly. This sample can be distorted in many ways; distortions can be caused by incomplete transmission or insufficient knowledge about the origin of the source, or they may be introduced through the sample selection process (cf. Hudson/Ishizu 2017: 205-207). The so-called selection effect (selection bias) is one possible distortion to be reckoned with (cf. the discussion about the problems with census data); the survivorship effect (survivorship bias) is another (e.g. surviving companies are better recorded than companies that failed). Finally, it may be that a non-random sample was drawn, e.g. by collecting data only for all eastern administrative districts of Prussia in 1853, in order to determine the infant mortality rate of Prussia as a whole in 1853. In all cases, certain units of investigation with certain characteristics are systematically over- or under-represented, so that the representativeness of the dataset as a whole must be questioned – and thus also the validity of the statements derived from it (cf. Hudson/Ishizu 2017: 210-212; Jarausch/Hardy 1991: 73).

Correlation and causality

The existence of a correlation relationship is not the same as the existence of a cause-and-effect relationship. A high correlation can be pure coincidence or be caused by a latent, third variable. A causal relationship may indeed exist, especially if it is based on a plausible theoretical assumption. In any case, correlation analysis is not the appropriate method for testing statements about causal relationships. Rather, it is a suitable preparation for a regression analysis (cf. Feinstein/Thomas 2002: 74).

Historical and statistical plausibility

Historical and statistical plausibility are two pairs of shoes! A quantitative finding – e.g. a highly significant regression coefficient – implies a statistically plausible finding about a historical phenomenon. However, this does not absolve the historian from making the statistical result historically plausible in a broader sense by at least suggesting how it fits into a historical narrative. This involves, for example, thinking about the size of the coefficients and, thus, about their relative importance (cf. McCloskey 1986). To put it clearly: what is at stake here is the coherence and empirical relevance of the argumentation (cf. Feinstein/Thomas 2002: 160). For example, a comparison of men's and women's wages may show that women's wages are highly significantly lower – but nonetheless only lower by one

percent. This is statistically clear, but from a factual and historical point of view it is not particularly interesting.

Explained versus unexplained variation

We have mentioned R^2 as a measure of the quality of a regression model; a high explained variation implies (for an overall valid model) that the available information contained in the variables is sufficient to explain the historical phenomenon (statistically plausible!). Usually, however, the focus is not on maximizing R^2 , but on the question of whether a few selected variables are causal. The crucial point here is: it regularly happens that a good part of the variation of the dependent variable remains unexplained, and this part is usually neglected in the interpretation of the findings (cf. Smith 1984: 143-144). Statistically speaking, the procedure is okay, but it will certainly cause a many historians stomach ache who are concerned with completeness.

Limits of replication

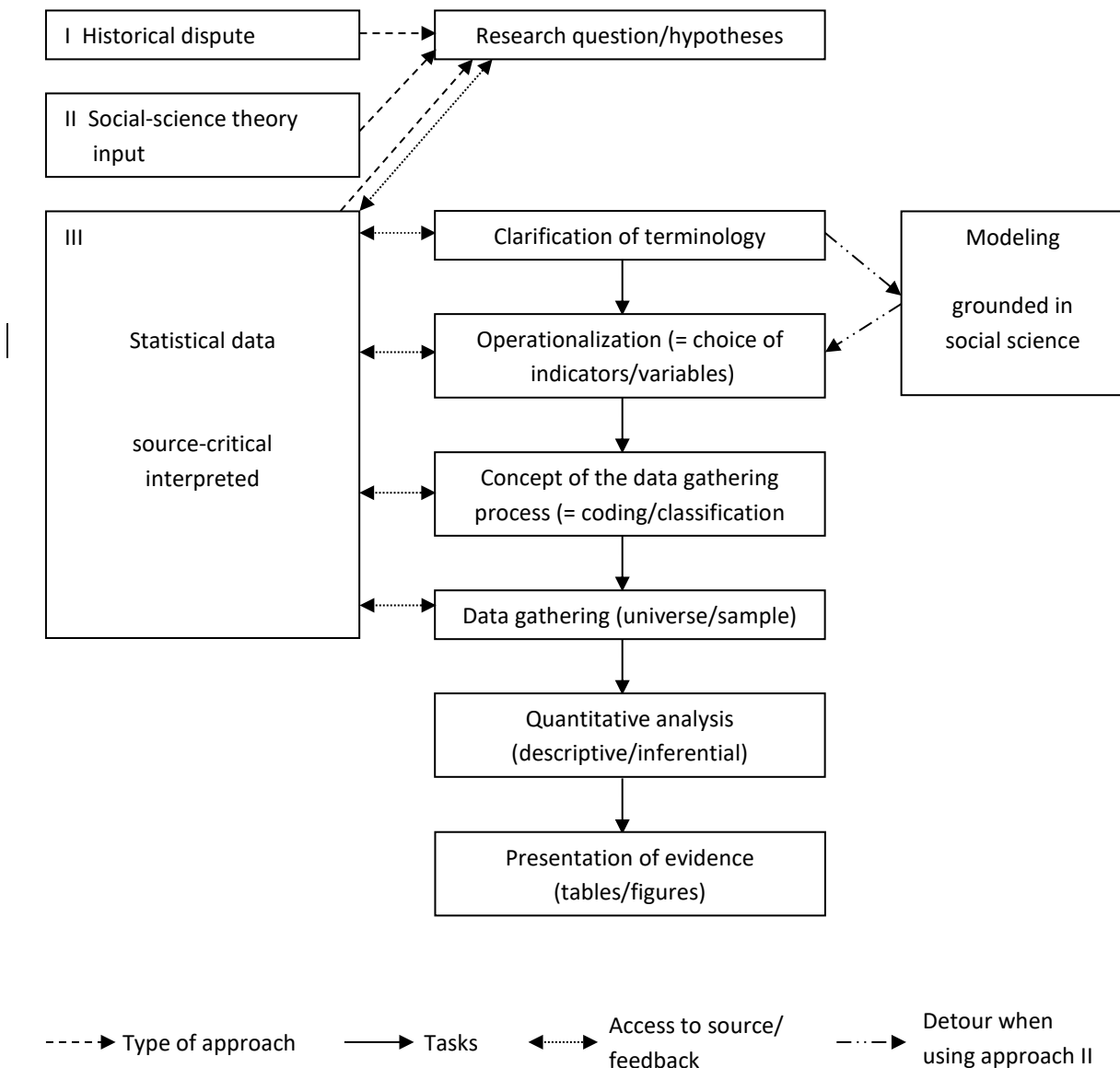
Statistical tests are based on the idea that there is a sample from which one can infer the characteristics of the population. Moreover, at least a few more samples could be taken to test the same relationship anew. For example, if a hypothesis test shows that a regression coefficient is statistically significant at the 10 (5, 1) % level, then this basically means the following: testing the same model on 9 (19, 99) additional samples would only give an estimate of the coefficient that was fundamentally out of range in one of 10 (20, 100) cases. The specific problem here is that in many cases tests are unrepeatable – either because of the source situation or because a particular characteristic can only be recorded once for a particular unit of investigation (for example, infant mortality at the level of a particular Prussian administrative district in 1853). This has the consequences that there are narrow limits to the replication, or verifiability, of historical findings obtained by statistical means.

4.5 The typical quantifying research approach

How does the typical research process for a quantitative historical study look like? On the basis of which scheme could such a study be broken down for better understanding? Our experience has shown that it is advantageous to address this point before reading a relevant text for the first time. A corresponding scheme then also functions, in a sense, as a scientific-

theoretical reference point for all further (critical) discussions. Alternatively, the development of such a scheme could, of course, be handled as a course objective and be worked out at the end of the course, e.g. in group work.

Figure 5: The typical quantifying research approach



Source: Authors' own depiction inspired by Bauer (1982: 65) and Komlos/Eddie (1999: 294).

Figure 5 illustrates the typical quantifying research approach in the form of a flowchart and should be self-explanatory, given what has been said so far. However, we would like to point out that historians can practically have arrived at their research question taking different avenues: firstly, motivated by a historical controversy, a controversy that is waiting to be resolved; secondly, motivated by the idea that the past can be explained by social science

theories (which is tantamount to testing these theories) or even used to improve old theories, or generate new ones (if the test is negative); or thirdly, motivated by the existence or (perhaps accidental) finding of a statistical source that simply needs to be evaluated. If the historian takes the second avenue to her research question, she will take a detour via social science modelling.

4.6 Course design

How could a basic course be structured? And should the course be completed with a regular grade, a "pass", or simply a certificate of attendance?

Giving grades

Let's start with the latter: in order to keep the entry threshold low, we recommend selecting the second or third alternative over the regular grade (only if formally possible, of course); the subject matter may already be a deterrent for the one or other student, thus the pressure of collecting a grade should not be a factor reducing the willingness to participate. It is also possible that participants will enter the course with very different levels of prior knowledge and that some will leave early, so that only the highly motivated will remain; it may then no longer be an option to make full use of the entire range of grades anyway.

Performance requirements

Irrespective of the aspect of grades, what independent achievements should be demanded of the students in addition to constant participation? In this respect, we have had good experience with a combination of short presentations and a small written work such as an essay. The former can be about the formal foundations of historical statistics (cf. below), but may also refer to other points and is supposed to stimulate joint reading or discussion. In the context of an essay on a selected quantitative text, the participants could demonstrate that they are able to grasp and critically evaluate the content and methodology of the text. In our opinion, the benefit of such a written exercise is greatest if the essays are finally discussed in the course. It is also conceivable that the participants develop their own questions by becoming acquainted with a concrete dataset and follow up on it in practice within the framework of the exercise. Their reflections can then be discussed in the group, both methodically and in terms of substance. An alternative would, of course, be to go through

consistently selected chapters of a textbook in such a way that all participants are expected to be able to prepare the chapter, present or discuss the contents, and indicate lack of understanding. However, this is only recommended for small groups with highly motivated participants.

Course design

Overview 1 shows our course outline. The introductions to quantitative methods for historians by Hudson and Ishizu (2017) and Feinstein and Thomas (2002) are the most recent available on the market and are, in our opinion, also best suited as preparation for the course and as basic reading for the course participants.

The problem with sources

Our course consists of 14 double lessons, two of which are reserved for the introduction and the final discussion. In the former, it is important to explain the relevant terms and illustrate them with a few examples; it is also possible to discuss the extent to which the historian's language is actually implicitly quantitative (cf. Fogel 1975: 330, Freeman 2010: 9-10). The remaining twelve double lessons are divided into four blocks: Block I is devoted to the scientific-theoretical fundamentals, i.e. to impart knowledge about the nature of statistical sources, source criticism, and the justifiability of a quantifying approach. In our opinion, a first approach to the problems of source criticism should take place within the framework of a joint reading. Furthermore, there would be the possibility of having the whole range of statistical sources presented in short papers (Characteristics? What do we have to pay attention to? What about the use in research and teaching?). Arguments in favour of and against quantification can best be worked out together on the basis of relevant "pamphlets".

Overview 1: Semester plan

<u>Lesson</u>	<u>Contents</u>	<u>Basic literature</u>
1	General introduction and organisational matters (L)	A: 1; HI: 1, 2; JH: 1
<i>Block I: Source-related problems</i>		
2	Handling of sources (L)/Challenges of a source criticism of statistical source (JR)	
3	Introducing statistical sources (SP; GW)	Pitz 1974
4	Costs and benefits of historical statistics (JR)/Role of statistics in the teaching of history at school (JR; SP)	A: 1; HI: 1; JH 3, 12
<i>Block II: Toolbox of historical statistics</i>		
5	Basics of descriptive statistics (L; SP)	A: 2-4; HI: 3-4; FT: 1.3-1.6, 2
6	Indices, time series, correlations (L; SP)	A: 6; HI: 5-6; FT: 1.8, 3
7	Testing hypotheses (L; SP)	HI: 7; FT: 5, 6
8	Basics of regression analysis (L; SP)	HI: 6; FT: 4, 8-11
9	The typical quantifying research approach (L)/Examples (JR)	JH: 3-4, 11, 3-5, 11
<i>Block III: The historian and the computer</i>		
10	Role of IT (L)/Introduction into Excel and/or SPSS (GW)	HI: 9; JH: 2
11	Presentation of participants' own practical studies (GW; SP)	
<i>Block IV: Discussion of exemplary studies</i>		
12	Critical discussion of relevant studies I (SP; JR a. E)	Z.B. Lavan 2016; Buylaert 2015; Lucassen/Lucassen 2009
13	Critical discussion of relevant studies II (SP; JR a. E)	Z.B. Manke/Sasnowski 1999 ; Haines/Kintner 2000; Falter 2015
14	Concluding discussion	

Notes: Abbreviations of organisational forms: L – Lecturer's input; JR – Joint reading (based on text preparation); GW – Group work; SP – Short presentation; E – Presentation of essay. Abbreviations of basic literature (given are chapters): A – Archdeacon 1994; FT – Feinstein/Thomas 2002; HI – Hudson/Ishizu 2017; JH – Jarausch/Hardy 1991.

Tool box

In five units, Block II provides the basic knowledge of the toolbox of historical statistics. Here the lecturer should give the essential input along the basic reading, whereas complementary presentations are certainly useful, e.g. on the possibilities of graphical presentation of data. However, if there are a large number of participants, it is certainly an alternative to have the subject matter covered completely by presentations.

IT application

Block III is dedicated to the computer as an important tool – a point that we have largely excluded from our presentation. This unit should suffice to build up a basic understanding of the possibilities offered by a spreadsheet program such as Microsoft Excel for data management and evaluation. For this purpose, the lecturer could confront the participants with a dataset plus a question and tasks them to solve it in Excel or SPSS.

Databases of historical data

A number of historical databases can be found on the Internet making it possible to create exemplary datasets for a course. We would like to briefly mention the ones we find most interesting:

- Germany in Data: Time series on historical statistics (<http://www.deutschland-in-daten.de/datensatz/>): here you can find time series that serve as a basis for the publication going by the same name by the Federal Agency for Civic Education; the database covers the period 1834-2012 and a wide variety of topics (e.g. "population, households and families", "prices", "religion" and "political participation") (cf. Rahlf 2015, 2016).
- Histat: Time series on historical statistics (<http://www.gesis.org/histat/de/index>): Histat is an extensive data archive (free registration required, thereafter mostly free access), in which the authors of many quantitative historical studies have stored more than 250,000 time series used or created as part of their research (including the time series on Germany in Data).
- iPEHD/The Ifo Prussian Economic History Database (<https://www.cesifo-group.de/de/ifoHome/facts/iPEHD-Ifo-Prussian-Economic-History-Database.html>): this database is based on the various Prussian population and other censuses carried out between 1816 and 1901 and thus formally provides several waves of cross-sectional data. The data were collected at the level of the Prussian administrative districts; they are provided in csv format (cf. Becker et al. 2014).
- Voyages: The Trans-Atlantic Slave Trade Database (<http://slavevoyages.org/>): this database provides data on more than 30,000 slave travels that took place in the period 1514-1866. Among other things, information is provided on the ship and voyage characteristics (ship name, tonnage, owner, port of origin and destination, etcetera), the crew, and the characteristics of the slaves transported (e.g. mortality). As for the iPEHD, the raw data for

the Voyages Database are provided in csv format, which can be easily imported into any standard statistical software.

- Centre for Global Economic History Databases (<http://www.cgeh.nl/data>): here you will find, among other things, data on historical conflicts and further links to historical datasets relating to "government action", i.e. the political sphere.
- Our World in Data (<https://ourworldindata.org>): provides empirically and historically saturated, informative contributions on a wide range of topics (including "population", "health" and "education"). Either the data is available on which a graph or table is based for direct download, or there is a link to a corresponding website.
- U.S. Church Membership Data (<http://www.thearda.com/Archive/ChCounty.asp>): the Association of Religion Data Archives (ARDA) portal provides a variety of cross-district, county-level, cross-cutting data sets on church membership in the United States in Excel format, for example, for the year 1890 (the first year for which data are provided) or for the year 2000 (the last).

Reading to comprehend

Finally, in Block IV, the "reading to comprehend" of relevant studies will be practiced, by letting the participants give structured lectures on such a text and, if necessary, by letting them present their essay; for a colourful mix of interesting texts, cf. Overview 1. This "empirical block" is particularly suitable for addressing the problems of source and method criticism, which we have addressed under "Pitfalls", on the object – and with the help of the lecturer.

Further options

Our focus will certainly be subject to change by each lecturer. For example, if the course is dedicated to a specific historical theme (let it be the slave trade in the transatlantic region), it will be necessary to include at least one session on this topic and to critically examine relevant data in further sessions; other content would have to be given way, inevitably. Even if no specific historical topic is to be the guiding theme, more space could be allocated to source criticism and data collection, the steps before the actual statistical analysis, as well as to the participants' own empirical work, for which we have ultimately scheduled two sessions (Block III).

Additional offers

The following considerations could also be helpful in preparing the course: are there multidisciplinary statistics courses at your own university? Could you get in contact with your fellow lecturers and perhaps develop joint teaching units? And can individual topics perhaps even be covered well by suitable YouTube tutorials – as part of the preparation or follow-up work in home study or as part of a session itself?

5. Final consideration

This book, which is aimed primarily at lecturers, is, as far as we know, the first (German-language) introduction of its kind (which, incidentally, is thanks to the initiative of the publisher). Our suggestions are the result of our own teaching experience; sometimes our courses went well, sometimes less well. Since participation was voluntary, the problem usually arose that some students ended the course prematurely. Apart from the fact that this makes planning and running the course more difficult, this is of course unpleasant for both sides. We have therefore tried to structure the course in such a way that the motivation increases by first discussing the advantages and disadvantages of quantitative work in Block I. Experience has shown that in the course of Block II, when the "hard" methods are discussed, most exits occur. In our opinion, it is therefore essential that the lecturer clearly articulates her own interest in keeping as many participants as possible on board and that she is also available outside of the course in consultation hours.

In our opinion, students who pass the course have considerably increased their methodological horizon and their understanding of science in general. They now know the basic features of a theoretical-empirical approach that is normally only attributed to the natural and many social sciences. Their methodological knowledge is considerably expanded, and certainly some participants would want to apply their newly acquired knowledge in a qualification work. But even if this is not the case, they now have the tools to critically approach quantitative studies. This means that they will acknowledge work that they were not able to read before. This knowledge will be useful to them beyond their studies and in their professional life.

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