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Big Data Insights Into Social Macro Trends: Expanding the Horizon (1800–2018)

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ABSTRACT

This article examines how big data can inform and challenge established theories and future visions of society. Utilising the most recent version of the arguably largest free online corpus, the Google Books corpus (version 20200217), we replicate and enhance Roth et al.'s (2019a) systems-theoretical methodology for analysing macro social trends. Thus extending the sample period into the postmillennium era, we detect tectonic shifts in macro social trends that are likely to be as consequential as the transition from the Middle Ages to modernity. We conclude that a 'Next Theory' is required to overcome analytical biases to political and economic trends and to remain sensitive to current and potential future changes in other domains of society, including health.

1 | Introduction

Notwithstanding the ever-accelerating pace of the digital transformation of society and the impressive methodological innovation in information systems, digital sociology or computational social sciences (Hassan et al. 2018), social theorists use digital infrastructures such as computers and Internet mainly to communicate orally and write books or articles (Roth, Dahms, et al. 2019).

A recent stream of research (Clausen 2021, 2024; Gegenhuber et al. 2022; Guy 2019, 2023; Karakilic 2019; Oksas 2021; Ossewaarde 2019; Palmås 2019; Rivero 2019; Roth 2019, 2023, 2024; Roth et al. 2020; Shadnam 2021; Valentinov et al. 2023; Wenzel and Will 2019) has challenged this analogue approach to an increasingly digitalised society, insisting that the digitalization of society has radical implications not only for social research methods but also for theorising in the social sciences. The key idea here is that *the expansion of digital social research methods* not only provides increasingly 'bigger' datasets for the testing of existing theories but also encourages and *necessitates the development of new forms of digital theorising* (Kitchin 2014).

Whereas one line of this research insists that we explore how the new digital research methods must be complemented by new digital social theories (e.g., Palmås 2019; Roth 2019, 2024), another line is more concerned with the theoretical implications of the methodological challenges and opportunities brought about by the computational social sciences and digital humanities revolutions (e.g., Wenzel and Will 2019; Roth et al. 2020).

The aim of this paper is to contribute to the second line of research as recent big data research on social macro trends (Roth et al. 2017; Roth, Schwede, et al. 2019) has challenged established concepts or 'self-definitions' of modern society such as the ideas of modern society being capitalist or an 'information society' (Castells 1996). As this research is based on an innovative method and produces both far-reaching and counter-intuitive results, it is important to verify that these results are robust. Genuine theory-testing, however, remains rare in our fields, although research on big data, such as the Google Books corpus, can assist in mapping out the most significant sociocultural trends across an extended period. To address these issues, in this paper, we aim to replicate the improved research design of Roth, Schwede, et al. (2019). Whereas the authors relied on a meanwhile updated version of their dataset, the Google Books corpus version 20120701, and analysed social macro trends for the period from the year 1800 to 2000, the present replication study will apply their methodology to the most recent update of that corpus (version 20200217), thus extending the sample period to the year 2018.

In this article, we shall therefore outline the basic motivation and research design of Roth, Schwede, et al. (2019), describe our extended approach to its replication and compare our results with those of the former study. Based on this contrastive analysis, we shall discuss implications for social theorising following from our replicated and extended big data research in social macro trends, focusing particularly on the postmillennium period, which was not covered in the previous study.

2 | Conceptual Framework and Hypotheses

Roth, Schwede, et al. (2019) conceptual framework for the analysis of social macro trends is based on Luhmann's (1977, 1982, 2013) theory of functional differentiation. In this context, functional differentiation refers to a relatively recent form social differentiation next to the more traditional forms of segmentary differentiation (e.g., Romans versus Etruscans), centre/periphery differentiation (e.g., cities versus villages) and stratification (e.g., nobility versus commoners). Though these different forms of social differentiation do co-exist, Luhmann holds that societies can be characterised and distinguished by their primary form of differentiation. An aristocratic society, for example, is one in which stratification takes prevalence, whereas modern society is characterised by the primacy of functional differentiation (Bergthaller and Schinko 2011; Demetis and Lee 2016; Kjaer 2010; Luhmann 1982, 2013, 2018; Martens 2006; Vanderstraeten 2004, 2006) defined as the differentiation of society into 'function systems' such as politics, economy, science, art, religion, law, health, education and the mass media. These function systems are thought to represent autonomous social domains that are 'incommensurable and thus of, in principle, equal importance to society' (Roth 2021, 120 636). In a functionally differentiated society, money cannot directly be converted into political power, and political power cannot define what is scientifically true or untrue. On the other hand, researchers 'regularly observe considerable differences in the importance that these systems have to different parts of society' (id.), yet these observations do not challenge the basic equality of the function systems if 'we realise that the absence of a predefined ranking of the function systems is a necessary condition that these systems can be ranked at all'. (id.).

As the modern form of social differentiation, functional differentiation is a central feature of many modern images of society. The definition of society as capitalist is a case in point as it suggests that such a society places high value on economic matters. A totalitarian society, by contrast, is one in which a political ideology is observed to dominate all aspects of social life, while the idea of an information society implies a strong importance of mass media-related issues. A secularised society is one in which the importance of religion has been in decline.

It is hence against this backdrop that Roth, Schwede, et al. (2019) have performed their longitudinal analysis of social macro trends in terms of changing importance of function systems in the years 1800 through 2000 and compared their results to prominent 'self-definitions' of modern society. To this end, the authors produced word frequency time series plots for keywords that referred to each of the above function systems (see Figure 1).

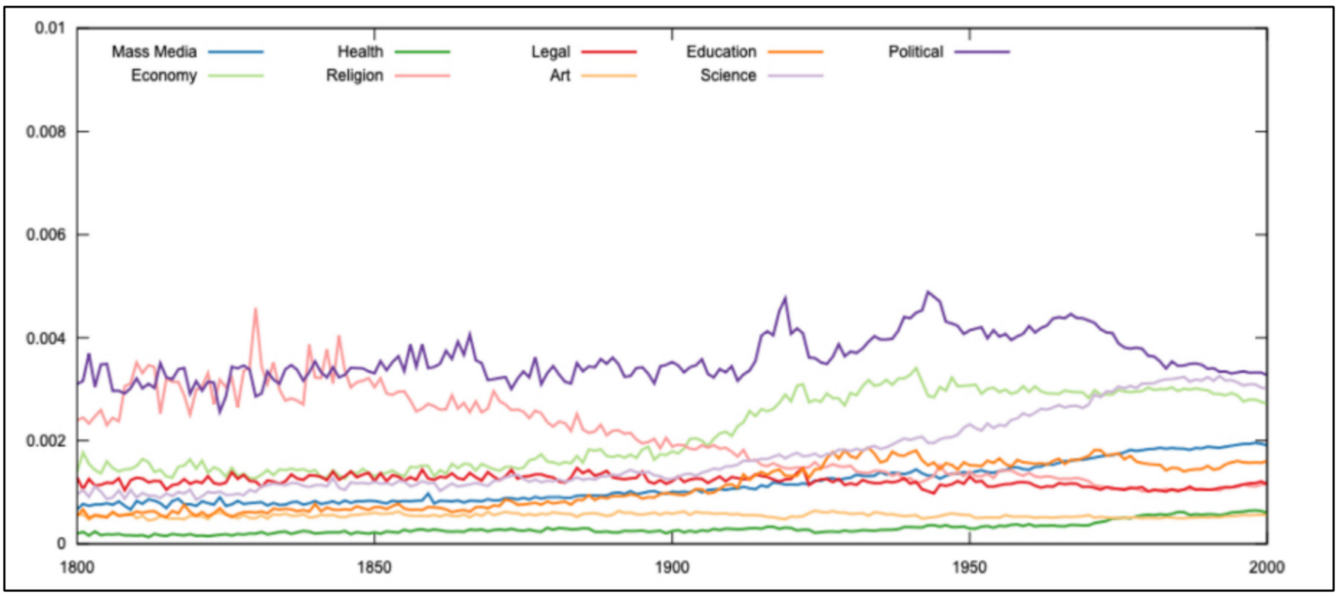

FIGURE 1 | Combined occurrence frequencies of the original function system-specific keywords as found in the original version of the English-language Google Books corpus (1800–2000) (*Source:* Roth, Schwede, et al. 2019, 4). [Colour figure can be viewed at wileyonlinelibrary.com]

The data on which this analysis was performed are from the Google Books corpus. 'Extra-large diachronic text corpora have recently become a popular research tool, offering new information on the development of society and social change' (Solovyev 2024, 144). Among these, the Google Books corpus is perhaps the 'largest online body of human knowledge' (Wilson-Lee 2017). As per October 2019, Google had digitalised over 40 million of an estimated 130 million books worldwide. The most recent version of the Google Books corpus thus contains words or 'ngrams' from an additional 15 million books compared to the 2012 version of the corpus, which Roth, Schwede, et al. (2019) used for their analysis.

The first hypothesis (H1) proposed in our replication study is therefore that this considerable update will have a significant impact on our results, which we expect to differ from those obtained in the previous study. As Roth, Schwede, et al. (2019) extracted their list of pertinent keywords from the 2012 Google Books corpus and a proper replication implies that we extract our keywords from the most recent version of the corpus, our second hypothesis (H2) is that a different list of keywords will lead to different results. Controlling this hypothesis implies running our analysis with both the original list of keywords and the list we extracted from the most recent version.

A third hypothesis (H3) we aim to test is that the significant decline of politics and economy starting will continue in the previously unanalysed period from 2000 to 2018. For the same period, we also expect to find the rise of a so-far relatively unimportant function system (H4).

3 | Sample: The English Version of the Google Books Corpus 2020

As intended by Roth et al. (2017); Roth, Schwede, et al. 2019, we assumed that 'word frequency is an established measure for word importance' and analysed word frequencies of function systems-related keywords, plotted onto word frequency charts, for which Roth et al. (2017) 'coined the amusing term *socioencephalography*' (Solovyev 2024, 158). Whereas the former studies were based on the July 2012 version of the Google Books 1-g data (version 20120701) and covered the period of the years 1800 through 2000, the present study explores the English-language 1 g from February 2020 (version 20200217), thus building on a considerably enlarged dataset and extending the sample period to the year 2018.

4 | Procedure: Reproducing a Programme Architecture for the Analysis of Social Macro Trends in the English-Language Area (1800–2018)

Roth, Schwede, et al. (2019) reused the word frequency lists extracted by Roth et al. (2017) from the version 20120701 1-g corpus using a Python programme. The first 2000 ngrams in these lists were checked for unambiguous references to one and only one of the function systems of society. The ngram 'university', for example, was excluded as it refers to both education and science, whereas an unambiguous ngram like 'money' was assigned to its function system category, in this case 'economy'. As a result, the authors obtained a list of about 150 function system-specific keywords.

In the present study, we repeated this exercise for the version 20200217 corpus, thus extracting and coding a new word frequency list and obtaining a list of about 250 keywords. Notable differences to the earlier list of 150 keywords include the omission of a term like 'Catholic', which does not belong to the most 2000 ngrams in the latest version of the corpus anymore, or the admission of new ngrams such as 'cash', 'drug' or 'vote'.

To test for H3, we decided to analyse the performance of both the 150- and the 250-keyword list in the most recent 20200217 version of the Google Books ngram corpus. For each of the two lists, we adhered to the procedure outlined in Roth, Schwede, et al., (2019, 119759). Based on the original code, our programme architecture, therefore, operated as follows (slightly modified from id.):

1. For each letter $K, download the 1-g frequency as found on https://storage.googleapis.com/books/ngrams/books/20200217/eng/eng-1-ngrams_exports.html.
2. Download the 'Total counts for 1-grams' file from http://storage.googleapis.com/books/ngrams/books/20200217/eng/totalcounts-1.
3. For each ngram in the 1-g frequency file, either replace the ngram with its function system category as assigned in the respective keyword list or remove it if no category is assigned.
4. Divide the frequency of each ngram by the total counts of the same year.
5. Compute the sums of frequencies for each year and each category.
6. Plot a line chart with one line per category.

As in the original case, our procedure was based on the following tools:

- GNU Bash: a Unix command-line interpreter and command language,
- GNU awk: a utility for searching files for units of text that match specific patterns and execute defined actions on them,
- mawk: an awk interpreter,
- GNU gzip: a data compression and decompression programme,
- GNU wget: a programme for retrieving web content from servers,
- GNU pipe viewer: a programme for monitoring data streamed through it and
- Gnuplot: a graphical user interface programme for data plotting.

The complete code for the programme is included in the appendix of this article.

5 | Results

In following the above procedure, we plotted aggregated frequencies of all keywords per function system as identified in the 20200217 version of the English-language Google Books ngram corpus. As we plotted these frequencies for both the original 'Version 2012070'-based list of 150 and the new 'Version 20200217'-based list of 250 keywords, we can now compare the performance of both the original and the new keywords in 202021 Google Books corpus with the original results of Roth, Schwede, et al. (2019), which were based on the original 'Version 20200217' of the Google Books corpus.

Showing the results of the original study, the above Figure 1 illustrates the fluctuating importance of the function systems politics, economy, science, art, religion, law, health, education and mass media between the years 1800 and 2000. Politics and religion feature as the most dominant function systems of the first half of the 19th century, before we witness a steady decline of the importance of religion down to a point around the fin du siècle where the declining line of religion meets that of a rising economy. Economy remains the second-most important function system for a period spanning from about World War I until the middle of the second half of the 20th century, a point in time when it is itself overturned by a steadily rising function system of science. Roth, Schwede, et al. (2019) also highlight the fact that the mass media system emerges as the fourth-most important system in the same period, thus relegating education to Rank 5, followed by law and religion. Health and art appear to have remained relatively insignificant throughout the entire sample period.

If we analyse the frequencies of the original keywords from 'Version 2012070' as they perform in the new 20200217 version of the Google Books data (Figure 2), there are some striking differences to the original results. First, the period where the economy is the second-most important function system starts about 50 years earlier and ends not before around the 2007–2008 financial crisis. Moreover, there are short periods between the two world wars where economy appears as the most important function system. The overall dominance of politics relative to all systems other than economy, however, seems greater than in the original plot, and particularly so for the period between the mid-19th and mid-20th century. The rise of science is steeper, with a take-off occurring during or shortly after World War II. There is a significant, though short-lived spike in the importance of law in the first half of the 19th century, and, despite an otherwise steady and comparatively modest performance, there is a period of roughly 50 years in the middle of the sample period where law is the third-most important function system. The dominance of religion in the 19th century is less pronounced and the decline faster. In fact, the system is overtaken by economy as early as in the middle of that century; there is, however, a certain countertrend for religion by the end of the 20th century that does not show on the original plot. In looking at the so-far uncovered period between 2000 and 2018, the most striking result are the significant postmillennium or postfinancial crisis decline of politics and economy as well as the fact that science appears, at times, as the most important function system.

If we further analyse the new set of keywords as they perform in the new 20200217 version of the Google Books data (Figure 3), we find that the basic structure of the Figure 2 has remained largely intact.

There are some notable differences though. First, the relative dominance of politics and economy is further increased. Second, the case for short periods of an economic dominance over politics is less clear in Figure 3 than in Figure 2. Third, religion seems even less important in the former figure than in the latter one. Fourth, the period where law is the third-most important systems is longer. Fifth, the postmillennium loss of importance of the economy is more pronounced, and the significance of the mass media system greater, with the result that the economy and mass media systems seem to compete for the third rank in the period after 2010, while there is a similar competition for Rank 1 between politics and science in the same period.

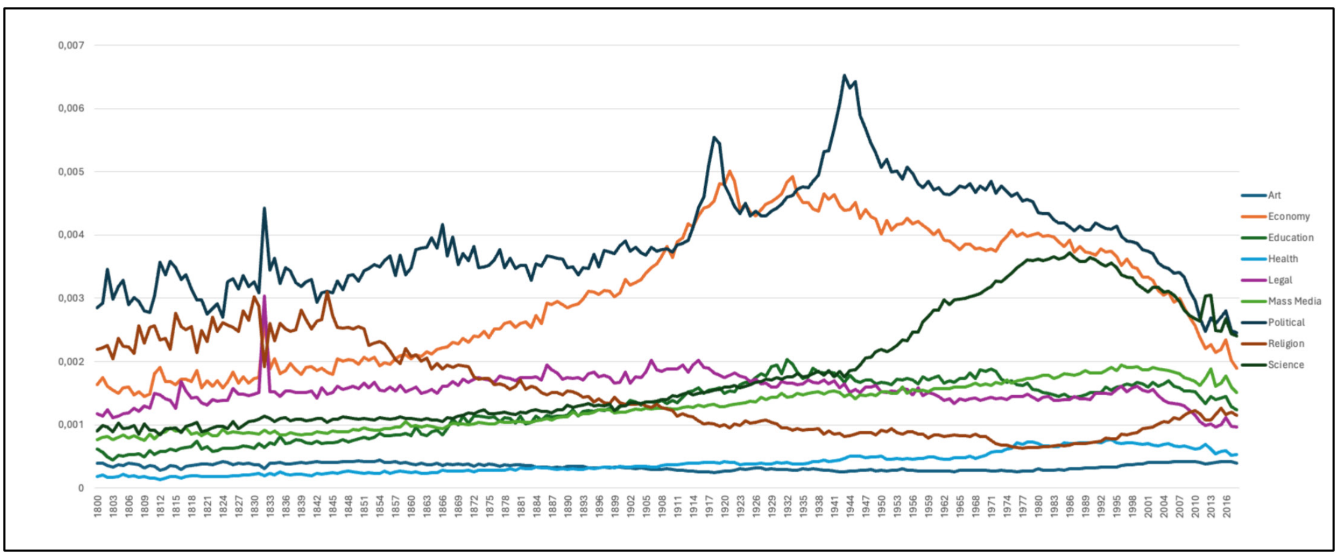

FIGURE 2 | Combined occurrence frequencies of the original function system-specific keywords as found in the new version of the English-language Google Books corpus (1800–2018) (authors provided). [Colour figure can be viewed at wileyonlinelibrary.com]

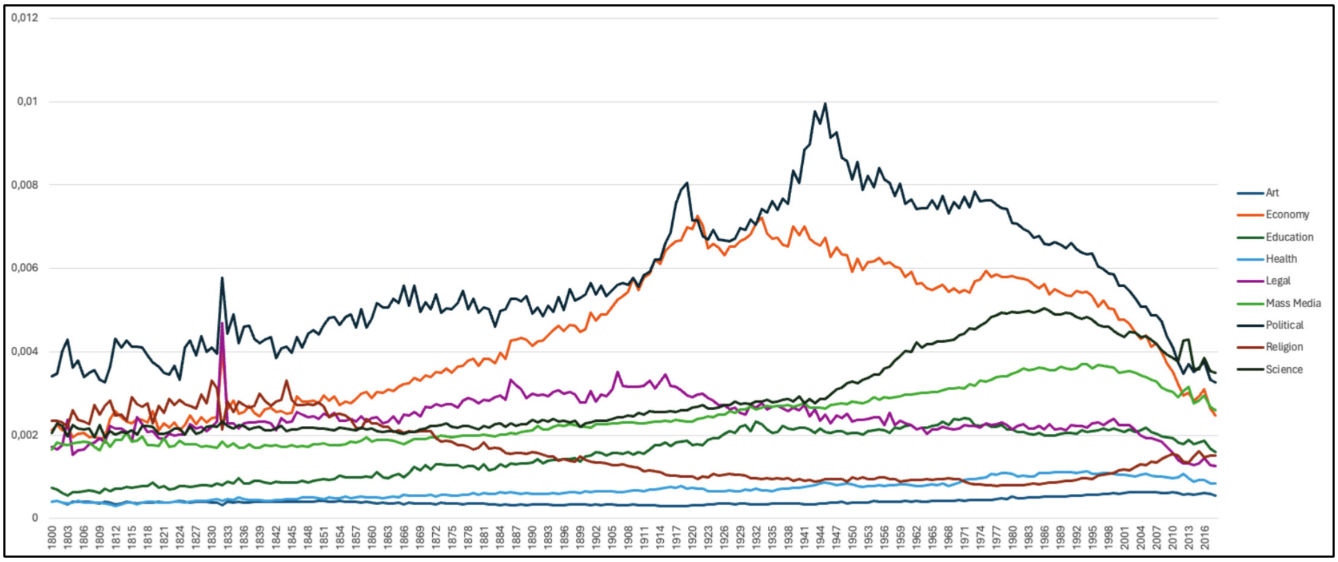

FIGURE 3 | Combined occurrence frequencies of the new function system-specific keywords as found in the new version of the English-language Google Books corpus (1800–2018) (authors provided). [Colour figure can be viewed at wileyonlinelibrary.com]

6 | Discussion

The perhaps most striking result from our replication study is that neither the constant updates of the Google Books corpus nor considerable modifications of the list of analysed keywords change the basic structure of the results. While some reservations apply to the first part of this statement, its second part is corroborated by the great deal of similarity between Figures 2 and 3. It thus seems that corpus updates are more important than keyword or coding variety if it comes to explaining differences between the results. Hypothesis H1 is therefore only partially corroborated, whereas H2 is more clearly rejected.

Despite some differences, our results suggest that the major findings of Roth, Schwede, et al. (2019) and even Roth et al. (2017) remain confirmed.

Politics and not economy has been the most dominant function system for most of the sample period.

There has been a secularisation, though this trend may have occurred and been terminated earlier than suggest by the original studies. Or should we say 'tentatively terminated' in view of the cautious trend reversal starting as we approach the end of the 20th century (a finding similar to particularly the cases of Romanic language areas studied in Roth et al. 2017)?

Subsequent to this secularisation, there has been a period of political-economic dominance that started earlier and lasted longer than originally assumed. This earlier rise of the economy is more in line with the idea of a 'golden age of capitalism' (Marglin and Schor 1960), at least if capitalism remains defined not as a mere take-off of an increasingly disembedded economy (Polanyi 1944; Weber 1968), but as a significant dominance of political-economic matters under the auspices of a dominant political system that stretches from the second half of the 19th century well into the second half of the 20th century.

The most significant difference between Roth, Schwede, et al. (2019) and the present work remains a reappraisal of the role of law during the second half on the 19th century and before World War I. Moreover, the rise of science appears more sudden and steeper and thus perhaps more spectacular; yet, this result also lends additional credence to Roth et al. (2017); Roth, Schwede, et al. (2019) claim about the cold war origins of the rising prominence of science during the second half of the 20th century.

By the end of the original sample period, the importance levels of politics, economy and science have converged in the original as much as in the present study. A closer focus on the extended sample period between 2000 and 2018 analysed in the present article confirms that this convergence is due to a decreasing importance of both politics and economy rather than a further increasing importance of science. Still, science appears less affected by the post-1980 downtrend and thus stabilised at a level where it can compete with politics for the first rank among all function systems. Even more significant is the decline of both politics and economy in the aftermath of the 2007–2008 financial crisis. In this context, the synchronicity of both graphs is striking and suggests that both systems have been affected similarly by the crisis. The corresponding effects, however, seem more dramatic for the economy than for politics, as the former system is now competing with the mass media for Rank 3 among the function systems. H3 is therefore confirmed, yet more strongly for economy than for politics. In extrapolating the underlying trend, we may nonetheless conclude that the near future might be characterised by a profound shift in the basic constellations of function systems that is equally consequential as the transition from a religious–political to a political-economic era captured in the original and confirmed in the present study. In fact, this future might be shaped more by science and the mass media than by politics and economy.

As a general observation, we find that the combined word counts across all function systems has been in decline since the second half of the 20th century. This finding might point to a general decrease in the importance of the function systems or functional differentiation, respectively.

A not-so-wild *wild card*, however, remains a result we have not seen in the present study. There is no significant rise of an alternative function system by the end of our extended sample period. H4 is therefore rejected. Most strikingly, there is no increase in the importance of health, a finding that appears strange against the backdrop of our recent coronavirus crisis experiences but can largely explained by the fact that the sample period ends in 2018. An expected post-2020 spike in the importance of health issues would make as obvious as intriguing a hypothesis for further research on the next extended version of the Google Books corpus that covers the period of after 2018. Health might thus challenge the above vision of a mass media technocracy.

7 | Conclusions: Consequences for Social Theory and Applications

In this article, we replicated and extended Roth, Schwede, et al. (2019) study that showed that the importance of function systems such as politics, science, economy, religion or the mass media is changing significantly over time.

One immediate implication of this corroborated finding is that while diagnoses of trends pertaining to individual function systems may be in synch with social evolution at least for some time, too strong a focus on isolated trends might also lead to reductionist or outdated theories of society (see Figure 4).

In looking at Figure 4, we find that Emile Durkheim's analyses of how social integration remains possible in a secularising world (see, e.g., Durkheim 1925) or Max Weber's influential focus on 'Economy and Society' and thus on the rising importance of economic issues mirror macro social trends reflected in our data. Yet, a second look on this data also suggests that society is more adequately defined by constellations rather than individual trends of specific function systems. While the first half of the 19th century seems defined by the rivalry of politics and a declining religion, a period extending from the second half of that century well into the second half of the subsequent one seems characterised by a competition between a rising economy and an ultimately dominating politics. This period corresponds to the golden age of politico- and political-economic theories of modern society such those developed in Marxist literature or the works of Karl Polanyi (1944) or Wallerstein (1971), that is, theories that place a high value on both the political regulation of economic issues and assumptions on how these issues influence politics. In the aftermaths of WWII, however, these overidentifications of societies with political economies were increasingly challenged by a rising importance of science, which in turn were mirrored by an increasing popularity of critical theories such as those proposed by representatives of the late Frankfurt School (Ross and Chiasson 2011; Mingers and Willcocks 2014) or later implied in 'triple helix' models of university, industry and government relations (Etzkowitz and Leydesdorff 2000). This trend to increasingly 'multifunctional' social theorising complements rather than replaces the focus on individual trends such as the peak of (totalitarian) politics reflected in the works of Friedrich August von Hayek (1944) or Popper (1945); the take-off of science mirrored by the popularity of Kuhn's (1962) *The Structure of Scientific Revolutions*; or the immense interest in.

Castells' (1996) work on the rise of an 'Information Age' or that of Chomsky (1991) on propaganda and mass media control.

With regard to the sample period not yet covered in Roth, Schwede, et al. (2019), that is, the period from the year 2000 through 2018, we find that, following a general decline the 'triple helix' function systems, science overtook politics at around 2010, thus breaking a political dominance that had lasted throughout the entire sample period (with the exception of a very short

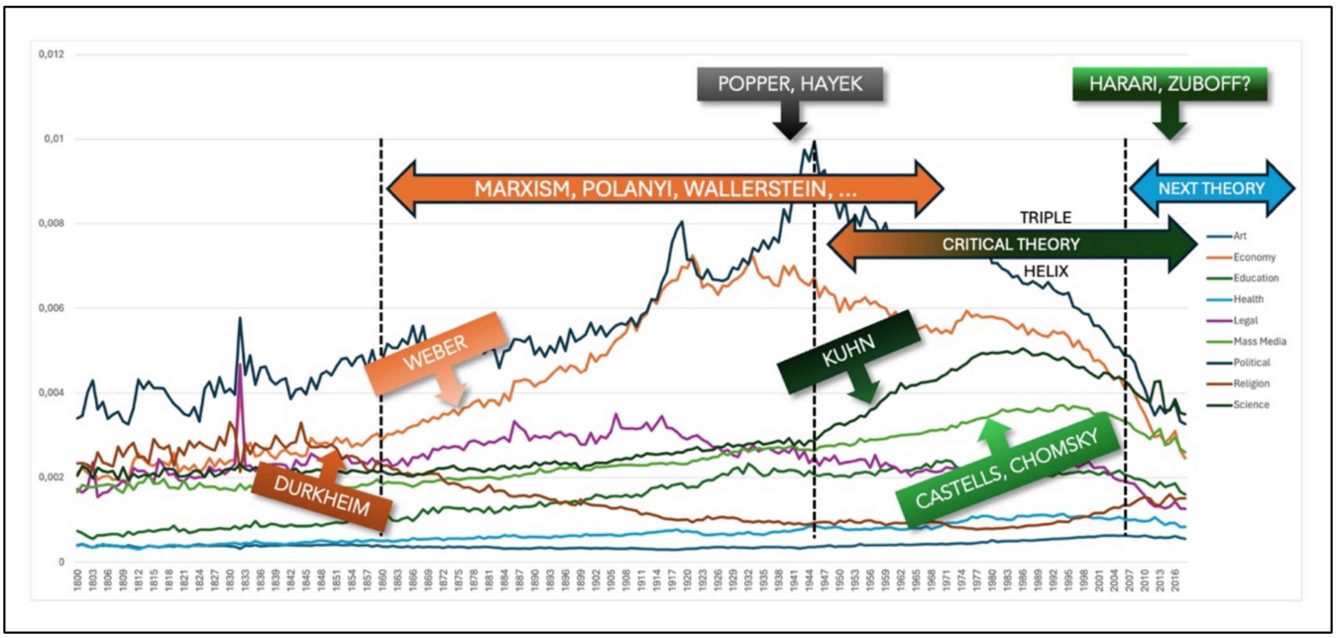

FIGURE 4 | Consequences for social theorising (authors provided). [Colour figure can be viewed at wileyonlinelibrary.com]

period after WWI). Thus, the postmillennium period appears as defined by a reorganised constellation of science, politics, mass media and the economy. While this constellation corresponds well with Harari's (2016) ideas on 'dataism' as a secular, science-driven mass media-religion, 'data colonialism' as new global power structure (Harari 2016) or Zuboff's (2018) work on an 'Age of Surveillance Capitalism', reservations apply with regard to an extrapolation of the underlying trends in functional differentiation because the present sample period ends right before the coronavirus crisis and because there are good reasons to assume that this crisis has considerably increased the importance of religion. The dawn of a 'neo-medieval world health society' as recently evoked by Roth (2021) would therefore be another plausible scenario. Speaking of 'medieval' scenarios, yet another vision of the future could build on the observation that religion is the only function system that has neither stagnated nor declined but rather has seen a modest increase since about the fall of the Berlin Wall. If this religious uptrend combined with the considerable downtrends of most other function systems were to continue, then the future might also bring about a situation where religion turns into the most important function system (again). Either of the latter two trends would effectively call for what we have referred to in Figure 4 as a 'Next Theory', that is a theory that no longer implies an observational bias to the so-far dominant function systems but rather reflects the most recent and remains sensitive to potential future changes of the relative importance of the function systems of society.

While our study offers valuable insights into macro social trends by analysing one of the largest available text corpora, an important limitation must be acknowledged. Our analysis is based exclusively on the English-language version of the Google Books corpus. As a result, the conclusions drawn here reflect trends primarily within the Anglophone cultural sphere and may not capture the full diversity of societal self-descriptions worldwide. Given linguistic, cultural and regional variations, the observed patterns might differ significantly in non-English-speaking contexts. Future research could extend this approach by incorporating multilingual corpora to provide a more globally representative perspective on evolving social macro trends.

Whatever the future might bring, a major implication of the present replication study remains that social theories seem to correspond to certain trends in functional differentiation and thus might be adequate for certain periods of social evolution, yet less so once the corresponding trends are over or superseded by new ones. One key question that can be discussed in this context is what such correspondence exactly means. Does it amount to proof of the practical or empirical relevance of the theories in question? Or could it also mean that these theories do little else except reflecting patterns of dominance of specific function systems? In either case, the present study supports calls for a need for a critical, or rather sceptical, debunking of social theories, including the traditional critical theory. '(T)heories and methods are performative; they do not only represent reality, but also produce it' (Schultze 2017, 60). In this sense, it turns out that traditional critical theory, too, performs and reproduces specific patterns of functional dominance that it purports to criticise.

If there is value in discerning how existing theories present correspond and adjust to trends in functional differentiation trends, then perhaps there is a space for more general meta-theorising. This theorising could be concerned with side-effects of evolutionary shifts of dominance of specific function systems.

In fact, we may hypothesise one of such possible side-effects: This is the rise of moral communication accompanying such shifts. As different function systems gain or lose prominence within society, this may lead to increased moral communication as values, norms and ethical guidelines are challenged and forced to evolve due to shifting social structures and dynamics. Moral communication typically arises from perceived moral issues, conflicts or societal changes. For instance, if the role of the dominant function system shifts from politics to science, there might be a surge in moral debates concerning scientific ethics, research integrity and the impact of scientific discoveries on society. Issues like genetic engineering, artificial intelligence and environmental sustainability could spark ethical discussions about the limits of scientific exploration and its effects on both humanity and the natural world. Similarly, as mass media and information technology become more central in modern society, this could intensify moral conversations about media ethics, digital privacy and online conduct. Concerns about fake news, data privacy issues and perceived online abuse might drive ethical discussions about responsible media and technology usage, the safeguarding of personal rights and the encouragement of responsible digital citizenship.

As the salience of function systems fluctuates, organisations of all kinds need special competences to adjust to such fluctuations, perhaps by cultivating their function-systemic profiles and multifunctional adaptation capacities. For example, for corporations, one of such adjustment strategies is CSR, which could stand for corporate engagement in various function systems (Roth, Dahms, et al. 2019). Another adjustment strategy could be using such engagement as a source of sustainable competitive advantage, which could not be imitated by those competitors who remain focused predominantly on the economic and political system. This argument would suggest that the strategic navigation of trends in functional differentiation confers competitive advantage and perhaps other (legitimacy) benefits on those organisations that are faster in adapting to such trends. Or, those organisations turn out to be particularly successful that are most skilled or vocal in promoting the right type of moral communication that mentioned earlier as a side-effect of the changing salience of function systems.

The conceptual basis for explorations of these moral side-effects, however, remains that the perceived importance or moral qualities of particular function systems are neither predefined nor otherwise set in stone. One practical implication of this insight is that it may be used to scrutinise macro social theories, but also more applied or middle-range concepts. Take the example of stakeholder theory, whose denial of shareholder primacy seems to align well with the decline in relative importance of the economy. If the findings of Roth, Schwede, et al. (2019) as well as the present replication study suggest that the economy has lost some of its relative importance compared to other function systems such as science and the mass media, then a stakeholder-theoretic interpretation would be that organisations might need to pay more attention to stakeholders from science and mass media. Prominent stakeholder salience or selection models, however, have remained focused on political and economic stakeholders so far (Valentinov et al. 2019). Insofar as participatory stakeholder dialogue is relevant to foresight and futures studies, such selection biases must be challenged and overcome to allow for more functionally diverse visions of the future. The same applies to traditional environmental screening tools such as PEST and its arbitrary extensions, which remain biased to the 'triple helix' systems of politics, economy and science. While it is clear that these three systems have been important systems of reference for the US-American petrochemical industry of the 1960s, and hence in the context in and for which PEST was originally developed (Aguilar 1967), it is equally clear that other industries and, more generally, other types of social contexts might require tools that allow them, if required, to shift their focus to other function systems of society.

Both macro social theories and more middle-range or applied approaches to social systems and environments are therefore required to manage a social–theoretical version of the 'third order risk' (Godet 1986), which consists in using the supposedly right theories or tools to perpetuate outdated descriptions of contemporary societies. The capacity to anticipate, detect or react to the macro social trends in functional differentiation identified or hypothesised in the present article is hence a matter of preparedness for tectonic shifts likely to be as consequential as the transition from the middle age to modernity.

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