The changing psychology of culture in German-speaking countries: A Google Ngram study

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*T*his article provides evidence for the long-term affiliation between ecological and cultural changes in German-speaking countries, based on the assumptions derived from *social change and human development theory*. Based on this theory, the increase in urbanisation, as a measure of ecological change, is associated with significant cultural changes of psychology. Whereas urbanisation is linked to greater individualistic values and materialistic attitudes, rural environments are strongly associated with collectivistic values like allegiance, prevalence of religion, and feelings of belonging and benevolence. Due to an increase in the German urbanisation rate over time, our study investigates whether Germany and the German-speaking countries around show the presumed changes in psychology. By using Google Books Ngram Viewer, we find that word frequencies, signifying individualistic (collectivistic) values, are positively (negatively) related to the urbanisation rate of Germany. Our results indicate that predictions about implications of an urbanising population for the psychology of culture hold true, supporting international universality of the *social change and human development theory*. Furthermore, we provide evidence for a predicted reversal for the time during and after World War II, reflecting Nazi propaganda and influence.

Keywords: Social change; Cultural change; Internet science; Google Ngram Viewer.

Tönnies (1887/1957) presented a normative theory that contained ideal types of social organisations. His conception of a social systems' nature relies on the distinction between *Gemeinschaft* (community) and *Gesellschaft* (society). *Gemeinschaft* is characterised by a rural environment, simple face-to-face relationships, low levels of technology, limited education and a life of need rather than of wealth. On the other hand, he defines *Gesellschaft* as an urban environment—a modern society with high levels of technology and wealth. Whereas the bonds of family and religion are weaker, economies are oriented not only towards subsistence but also towards commercial growth. Education becomes important and takes place at schools. Tönnies' (1887/1957) understanding of *Gemeinschaft* and *Gesellschaft* built the cornerstones of Greenfield's (2009) *social change and human development theory*, which suggests that changes in sociodemographic ecologies such as the global increase in the rate of urbanisation impacts on cultural values and influences learning and development.

Although previous research has recognised and discussed the importance of macro-level social changes on human development (cf. Silbereisen & Chen, 2010 for a review), Greenfield (2013) and Zeng and Greenfield (2015) provide novel empirical evidence for their hypothesis of urbanisation as a major driving factor of cultural change. In particular, they show that over time, word frequencies representing *Gesellschaft* (i.e., individualistic) values increase with growing urban population in the United States, United Kingdom and China whereas *Gemeinschaft* (i.e., collectivistic) values decrease. In line with Grossmann and Varnum (2015), who suggest that the development of *Gesellschaft* values is less robust to changes in urbanisation, Zeng and Greenfield (2015) show that besides urbanisation other sociodemographic factors such as shifts in socioeconomic status, for example, measured by personal wealth, are also associated with a cultural change.

Within the last centuries, the rate of urbanisation has increased drastically and globally. Related to the

industrialisation in Europe and the United States, Bähr (2007) documents massive migration from rural to urban regions leading to a strong increase in the urbanisation rate. Although urbanisation arrived later in some countries, it has become a global trend. In this article, we investigate whether Germany and the German-speaking regions in the countries around moved from *Gemeinschaft* towards *Gesellschaft* during the last two centuries. Moreover, due to "Gleichschaltung" (establishing a system of totalitarian control and coordination, "from the economy and trade associations to the media, culture and education," Strupp, 2013) of personal beliefs, desires and interests, and the sustained propaganda of collectivistic virtues such as responsibility, initiative and courage by National Socialist (i.e., Nazi) ideology (Föllmer, 2010), we predict a reversal at the time of World War II. In particular, given that changes can be bidirectional and shifts from *Gesellschaft* back to *Gemeinschaft* are possible (Inglehart & Baker, 2000; Park, Twenge, & Greenfield, 2014), we propose that although there is an overall trend from *Gemeinschaft* to *Gesellschaft*, during and shortly after World War II the German society moved from *Gesellschaft* towards *Gemeinschaft*.

Cultural values are reflected in terms used in writings. Thus, to provide evidence for the long-term cultural change in values, we use the Google Books Ngram Viewer (https://books.google.com/ngrams). By searching millions of digitalised books and quantitatively analysing changes in word frequencies, this tool has been designed to investigate cultural trends and salient semiotic developments (Michel et al., 2011).

Social change and human development

Classical concepts of individualism and collectivism characterise individualistic cultures as being autonomous from their in-groups and prioritising the achievement of personal goals, whereas people in collectivistic cultures are considered to be more interdependent with their in-groups and more concerned with relationships (cf. Triandis, 2001 for a review). Although previous research has noted the impact of sociodemographic influences with respect to increasing individualism (cf. Hofstede, 2001; Triandis, 1993), Greenfield's (2009) theory of *social change and human development* provides an in-depth explanation for the transformation and the development of cultural values based on different ecological types. In particular, Greenfield (2009) considers *Gemeinschaft* and *Gesellschaft* as prototypical sociocultural ecologies and defines them with contrasting characteristics representing individualism and collectivism, for example, technology and prosperity levels, religious awareness, economic systems, social relations and educational practices.

In line with Tönnies (1887/1957), Greenfield (2009) assigns values such as, for example, obligations and conscientiousness, general welfare, and a lifestyle according to religious duties (cf. Chalfant & Heller, 1991) to *Gemeinschaft*, that is, the focus lies on the community. In contrast, feelings, desires and personal aspects are more important in a *Gesellschaft* (cf. Inglehart & Baker, 2000; Kraus, Piff, Mendoza-Denton, Rheinschmidt, & Keltner, 2012), that is, the focus lies on the individual. Greenfield (2009) points out that in a *Gesellschaft*, individuals of lower social status as well as those living in rural areas, are rather associated to a *Gemeinschaft* than a *Gesellschaft* with its respective values. Therefore, it is assumed that individuals of lower status are more benevolent, and socially dependent than people of higher status (Kraus et al., 2012). Although shifts from *Gesellschaft* to *Gemeinschaft* are possible, on a whole, cultural changes are supposed to move in the direction of *Gesellschaft* and therefore lead to more materialism and individualism, based on an increase in urbanisation, wealth, technological progress and better educational systems (Greenfield, 2009; Park et al., 2014; Uhls & Greenfield, 2011).

METHODOLOGY AND PROCEDURE

Greenfield (2013) uses the level of urbanisation as a proxy for the whole complex of *Gesellschaft* factors and provides evidence that for the United States and United Kingdom, the movement from rural to urban environments is a potential driver of a change in values. As the German urbanisation rate highly correlates with the rates of the United States and United Kingdom (cf. Bähr, 2007), we assume a similar change in values for Germany and the German-speaking regions in neighbouring countries over time. In order to test this assumption, we examine the change in word frequencies in German language books to measure changes in cultural values, using the Google Books Ngram Viewer.

Research methods have seen unprecedented improvements and opportunities from the Internet (cf. Reips, 2008 for a review). In 2004, Google Books constructed a corpus of digitalised texts containing approximately 15 million of the estimated 129 million books published between 1500 and 2008. These books, mainly scanned from large libraries around the world (e.g., Harvard University Library, New York Public Library, Stanford University Library, University of Michigan Library, University of Oxford Library and The Bavarian State Library), contain approximately 500 billion words in seven languages, namely Chinese, English, French, German, Hebrew, Russian and Spanish. For our study of German terms, we can rely on a corpus of around 37 billion words. Whereas in early centuries only a few books per year were available, the main publication time span ranges from 1800 to 2000. The Google Books Ngram Viewer computes word

TABLE 1
Overview of value-carrying words representing *Gemeinschaft* and *Gesellschaft*

	Greenfield (2013)		*German translation*	
Gemeinschaft	obliged	duty	versprechen	Pflicht
	give	benevolence	geben	Güte
	act	deed	handeln	Handlung
	obedience, authority, pray, belong, power, worship, join, conformity		Gehorsam, Amtsgewalt, beten, gehören, Macht, Verehrung, zugesellen, Gleichförmigkeit	
Gesellschaft	choose	decision	auswählen	Entscheidung
	get	acquisition	bekommen	Kauf
	feel	emotion	spüren	Emotion
	individual, unique, child, self, personal, ego, baby, special		individuell, einzigartig, Kind, Selbst, persönlich, Ego, Baby, speziell	

Note: Column I presents *Gemeinschaft*-indexed and *Gesellschaft*-indexed words selected by Greenfield (2013). Column II displays German words, equivalent to Greenfield's (2013) *Gemeinschaft*-indexed and *Gesellschaft*-indexed words.

frequency by dividing the number of respective words' yearly instances by the total number of words in the respective year (Michel et al., 2011).

In order to obtain a qualitatively equal sample of terms as in Greenfield (2013), we also choose the time span 1800–2000. Greenfield (2013) selects six verbs (or adjectives) and six-related noun synonyms. Furthermore, she uses eight additional words as robustness, each indexing either *Gemeinschaft* or *Gesellschaft*. We translate each of Greenfield's (2013) 28 English value-indexed words into German using the first adequate entry of the online dictionary *Pons*.[1] Following Zeng and Greenfield (2015), we additionally asked two native German speakers, a 31-year-old male and a 56-year-old female to judge each translation on its usage contexts and underlying meaning. Without discussion, they both validated that the semantic interpretations of the German words do not differ from the English originals selected by Greenfield (2013).

Table 1 presents an overview of words selected by Greenfield (2013) and their translations to German. However, as Greenfield's selection of *Gemeinschaft*-indexed and *Gesellschaft*-indexed words can be argued to lack a clear criterion,[2] we improve on the method by collecting the first three one-word synonyms for the semantically most adequate grouping listed in *Duden Synonymwörterbuch* (2014) for each translation of Greenfield's (2013) robustness words (obedience, authority, pray, belong, power, worship, join, conformity individual, unique, child, self, personal ego, baby, special). Furthermore, we model and test for a temporal trend in the Google Ngram word frequency data by using various regression models.

Finally, we follow Zeng and Greenfield (2015) and establish a link between the change in values and ecological conditions by computing correlations between the annual frequency of German words and the urbanisation rate in the corresponding year.

RESULTS

The first contrasting words and underlying values that were examined by Greenfield (2013) are "obliged" and "duty" (*Gemeinschaft*-indexed, i.e., collectivistic) versus "choose" and "decision" (*Gesellschaft*-indexed, i.e., individualistic). While the first two words show a decrease over time the last two words exhibit an increase. In order to examine the respective value change for German, we select "Pflicht" (duty) and "versprechen" (obliged) as well as "Entscheidung" (decision) and "auswählen" (choose).

Figure 1 shows the difference in word frequency over the time span 1800–2000. In line with the findings of Greenfield (2013), the relative word frequency of "Entscheidung" (decision) almost tripled, whereas "Pflicht" (duty) displays an approximately fivefold decrease over time. Similar results are obtained for the verbs "versprechen" (obliged) and "auswählen" (choose) but we refrain from including their word frequencies in the same figure due to scaling differences.

The difference between getting something for oneself (*Gesellschaft*-indexed) and contributing to common good (*Gemeinschaft*-indexed) is represented by the words "get" and "acquisition" as well as "give" and "benevolence," respectively. Greenfield (2013) observed a decrease for

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[1]http://de.pons.com/. Exceptions are "versprechen," "Handlung," "Amtsgewalt," "Gleichförmigkeit" and "Kauf." We use "versprechen" (promise) rather than "verpflichten" (a direct translation of obliged) because "verpflichten" is mostly used in a military context. For "deed" the word "Tat" cannot be selected because it has a second meaning as the past tense of "tun" (do). For this reason, we choose the second translation "Handlung." For "conformity" we only obtain "Konformismus." As this technical term is not used steadily over time, we use the *Duden* dictionary (http://www.duden.de/suchen/englisch/conformity) to recheck and obtain "Gleichförmigkeit." For "acquisition" with respect to purchase we receive "Anschaffung," a rarely used term. Due to a higher frequency we use the word "Kauf."

[2]Greenfield (2013) states that words were chosen according to the following criteria: theory relevance, high frequency and narrow range of semantic interpretations.
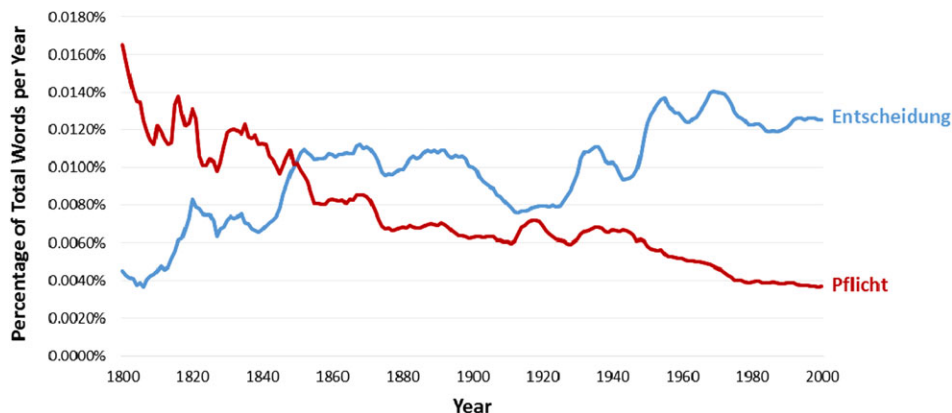

Figure 1. Frequency of the words "Pflicht" (duty) and "Entscheidung" (decision) in the Google corpus of German books from the years 1800 to 2000. The graph was made with the Google Books Ngram Viewer (Michel et al., 2011), with the standard smoothing of 3.

Figure 2. Frequency of the words "Güte" (benevolence) and "Kauf" (acquisition) in the Google corpus of German books from the years 1800 to 2000. The graph was made with the Google Books Ngram Viewer (Michel et al., 2011), with the standard smoothing of 3.
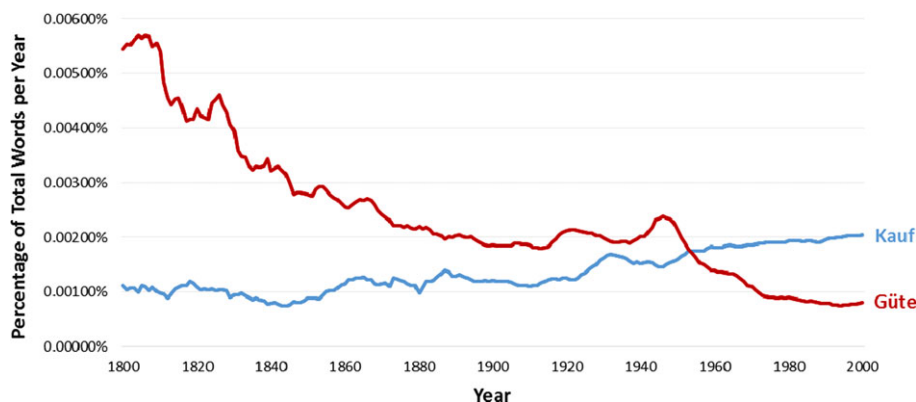
the first and an increase for the latter terms for the United States and United Kingdom. The respective German terms are "Güte" (benevolence) and "geben" (give) as well as "Kauf" (acquisition) and "bekommen" (get).

Figure 2 shows the *Gesellschaft*-indexed word "Kauf" (acquisition) increased over time, whereas the *Gemeinschaft*-indexed "Güte" (benevolence) decreased drastically. However, between 1940 and 1950, an increase in "Güte" (benevolence) is observed (and a corresponding slight decline of "Kauf"). This reversal of cultural change likely occurs due to the end of World War II in 1945 and Nazi ideology. While conformity and equality were highly propagandised during the Nazi Regime, to return to normal life, benevolence among people was of utmost importance after the war. One example is *Trümmerfrauen* (ruin women), who helped clear and reconstruct bombed cities as part of a new community. In line with these findings, Greenfield (2013) found a decline in "get" for the United States. She also assumed that this might represent a decrease in self-interest, based on the entering of the War in 1940. Although "bekommen"

(get) does not increase as strong as "Kauf" (acquisition), overall, "bekommen" (get) and "geben" (give) show similar patterns as the respective nouns. Again, due to scaling differences, verbs and nouns are not displayed simultaneously.

Furthermore, Greenfield (2013) used "act" and "deed" (*Gemeinschaft*-indexed) as well as "feel" and "emotion" (*Gesellschaft*-indexed) to contrast that in *Gemeinschaft* individuals appreciate the social world associated with action or behaviour, whereas in a *Gesellschaft* the inner psychological process is focused on. To replicate the findings in German, we examine "Handlung" (deed) and "handeln" (act) as well as "Emotion" (emotion) and "spüren" (feel). In line with Greenfield (2013), who reported a rise in "feel" and a strong decline in "act," our German translations display a consistent pattern. "Handlung" (deed) declined fourfold compared to the approximate 200-fold increase in "Emotion." For "handeln" (act) and "spüren" (feel) we find similar results. Whereas "handeln" (act) declined over time, "spüren" (feel) rose and reached its peak around 1940. In 2000,

Figure 3. Frequency of words representing *Gemeinschaft*-indexed values from the years 1800 through 2000. The graph was made with the Google Books Ngram Viewer (Michel et al., 2011), with the standard smoothing of 3.
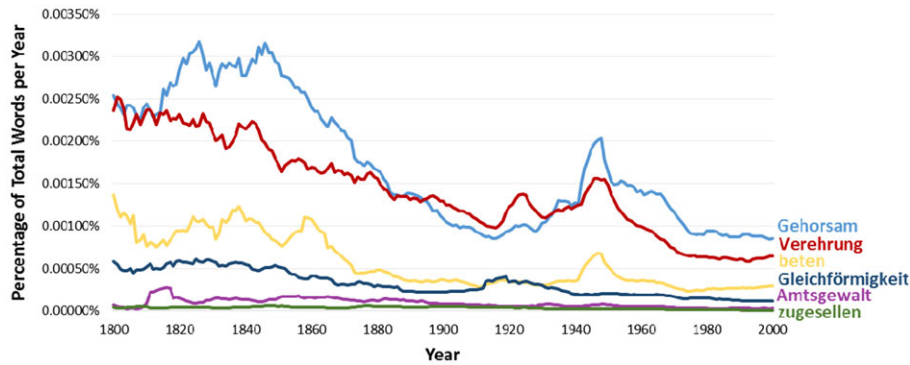

Figure 4. Frequency of words representing *Gesellschaft*-indexed values from the years 1800 through 2000. The graph was made with the Google Books Ngram Viewer (Michel et al., 2011), with the standard smoothing of 3.
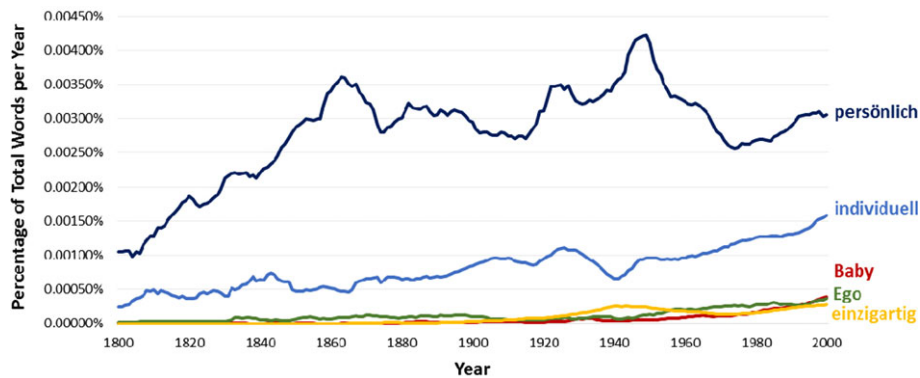
"spüren" (feel) exhibited a more than fivefold increase since 1800.

Finally, in order to highlight the "child"-centred socialisation to a "unique," "individual," "self" in a *Gesellschaft*, the quoted words were investigated. To test for robustness, Greenfield (2013) selected "baby," "personal," "special" and "ego" (*Gesellschaft*-indexed). An overall rise was observed, whereas words such as "obedience," "authority," "belong" and "pray" with the synonyms "conformity," "power," "join" and "worship" (*Gemeinschaft*-indexed) were reported to display an overall decrease over time. Thus, due to an increase in rural population, we expect the frequency of words with respect to the individual, the center of a *Gesellschaft*, to rise. Frequencies of words related to the community, religion and belonging are expected to decline. We replicate Greenfield's (2013) results by using the words "individuell" (individual), "einzigartig" (unique), "Kind" (child) and "Selbst" (self) with "persönlich" (personal), "Ego" (ego), "Baby" (baby) and "speziell" (special).

Figure 3 presents the predicted decrease in *Gemeinschaft* values by a decline in the frequency of the words "Gehorsam" (obedience), "Verehrung" (worship), "beten" (pray), "Gleichförmigkeit" (conformity), "Amtsgewalt" (authority) and "zugesellen" (join). A similar picture is given for the synonyms "Macht" (power) and "gehören" (belong).[3] However, as predicted due to Nazi propaganda in World War II and in contrast to the United States and United Kingdom, an increase in word frequencies for the majority of examined terms is observed for the years between 1941 and 1945. On the one hand, Nazi ideology tried to create a feeling of affiliation, on the other hand total obedience and worship (Verehrung) of Hitler was demanded (Welch, 2004). The observable increase in "beten" (pray) might likely be associated with people writing about God and faith to cope with the atrocities and hardships of dictatorship and war.

Figure 4 displays results for words representing *Gesellschaft* values, confirming the results of Greenfield (2013) by presenting a continuous increase for words associated with the development of a unique individual.

To review whether our results are indeed transferable to the *social change and human development* theory by Greenfield (2009), we conduct a set of robustness checks.

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[3]"Macht" (power) and "gehören" (belong) as well as "Kind" (child), "speziell" (special) and "Selbst" (self) are not displayed due to scaling differences. However, overall results do not change.

TABLE 2
Overview of value-carrying words representing *Gesellschaft* and *Gemeinschaft*

Panel A: *Gesellschaft*

Greenfield (2013)	*German translation*		*Synonyms*	
personal	persönlich	eigen	individuell	privat
individual	individuell	eigen	persönlich	privat
baby	Baby	Kind	Neugeborenes	Säugling
child	Kind	Baby	Neugeborenes	Säugling
ego	Ego	—		
self	Selbst	—		
special	speziell	außergewöhnlich	eigenwillig	extravagant
unique	einzigartig	außergewöhnlich	beispiellos	einmalig

Panel B: *Gemeinschaft*

Greenfield (2013)	*German translation*		*Synonyms*	
obedience	Gehorsam	Ergebenheit	Folgsamkeit	Fügsamkeit
authority	Amtsgewalt	—		
pray	beten	bitten	flehen	
belong	gehören	angehören	zugehören	
power	Macht	Ansehen	Autorität	Einfluss
worship	Verehrung	Anbetung	Glaube	Kult
join	zugesellen	—		
conformity	Gleichförmigkeit	—		

Note: Column I presents *Gesellschaft*-indexed words (Panel A) and *Gemeinschaft*-indexed words (Panel B) selected by Greenfield (2013). Column II displays German words, equivalent to Greenfield's (2013) *Gesellschaft*-indexed words (Panel A) and *Gemeinschaft*-indexed words (Panel B). Columns III–V (Panels A and B) provide synonyms for each German equivalent, obtained via *Duden Synonymwörterbuch* (2014).

TABLE 3
Descriptive statistics of synonyms obtained from *Duden Synonymwörterbuch* (2014)

	Gesellschaft	*Gemeinschaft*	*Total*
Number of Greenfield's (2013) robustness words	8	8	16
Number of *Duden* synonyms	18 (13)	13 (13)	31 (26)
Number of synonyms *with* predicted change in frequency	15 (11)	9 (9)	24 (20)
Number of synonyms *without* predicted change in frequency	3 (2)	4 (4)	7 (6)

Note: The number of unique words is put in parentheses.

First, we collect three synonyms for each translation of Greenfield's (2013) robustness words (obedience, authority, pray, belong, power, worship, join, conformity individual, unique, child, self, personal ego, baby, special). We obtain our synonyms by using the first three one-word synonyms for the semantically most adequate grouping listed in *Duden Synonymwörterbuch* (2014). We avoid choosing words that appear to be colloquial, dialect, humourous or obsolete. Based on this procedure, we exclude "selber" as a form of "persönlich" (personal), as well as "Bébé," "Wickelkind" and "Kleinstkind" as synonyms for "Baby" (baby). The main advantage of this approach is that the selection of words is performed mechanically, using the major German dictionary of synonyms. Hence, the analysis is robust to the choice of translation.

Table 2 provides an overview of Greenfield's (2013) *Gesellschaft*-indexed robustness words (Panel A) and *Gemeinschaft*-indexed robustness words (Panel B), as well as their German translations, and respective German synonyms obtained from *Duden Synonymwörterbuch* (2014).[4]

Table 3 shows descriptive statistics of the change in frequency for all synonyms presented in Table 2. For Greenfield's (2013) *Gesellschaft*-indexed robustness words (personal, individual, baby, child, ego, self, special and unique), we obtain 18 synonyms in total, using the first three synonyms listed in *Duden*

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[4]For the *Gesellschaft*-indexed words "Ego" (ego) and "Selbst" (self) and the *Gemeinschaft*-indexed words "Amtsgewalt" (authority), "zugesellen" (join) and "Gleichförmigkeit" (conformity) *Duden Synonymwörterbuch* (2014) lists no synonyms. For "Kind" (child), one of the three proposed synonyms by *Duden Synonymwörterbuch* (2014) is "Wurm," which we excluded because it mainly signifies the animal worm. Further, we skip "ausgefallen" as a synonym for "speziell" because it is often translated with "out of order."

TABLE 4
Results of the regression analysis

	t	*p*	*ß*	*F*	*df*	*p*	*Adj. R²*
Model I				764.61	199	.000	.7924
Year	27.65	.000	4.32e-06				
Model II				1797.89	199	.000	.8998
Year	−42.40	.000	−.0000125				
Model III				4925.56	199	.000	.9610
Year	−70.18	.000	−.0000168				
Model IV				1841.42	197	.000	.9650
Year	−73.27	.000	−.000017				
Nazi Regime	−3.39	.001	−.0664793				
Year × Nazi Regime	3.40	.001	.0000343				

Note: The dependent variable for Model I (and II) is the mean word frequency of *Gesellschaft*-indexed (and *Gemeinschaft*-indexed) words. The dependent variable for Models III and IV is the mean word frequency of *Gemeinschaft* minus *Gesellschaft*. N = 201. Nazi Regime is a dummy equal to one if the year is between 1935 and 1950 and zero otherwise.

Synonymwörterbuch (2014) wherever possible. However, as her *Gesellschaft*-indexed robustness words are semantically very similar, only 13 of 18 synonyms are unique words. Out of these words, only "Kind" (child) and "eigen" (personal/individual) do not show an overall increase. Nevertheless, substituting "eigen" with one of its inflections, that is, "eigene," "eigener," or "eigenes," the predicted increase over time is observed. For Greenfield's (2013) *Gemeinschaft*-indexed robustness words (obedience, authority, pray, belong, power, worship, join, conformity), we also obtain 13 different synonyms. "Autorität" (power) and "Kult" (worship) show an overall increase with peaks in 1950. Since that time "Autorität" (power) displays a steep decline, whereas "Kult" (worship) has been rising again since 1990. On the other hand, "Fügsamkeit" (obedience) and "angehören" (belong) reach their peaks between 1860 and 1880. From that time on, both words show a steady decline. Overall, we observe the predicted theory-based increase for *Gesellschaft*-indexed and decrease for *Gemeinschaft*-indexed synonyms over time.

Second, in addition to our descriptive analysis, we go further by modelling and testing for a temporal trend in the Google Ngram word frequency data, that is, by identifying changes in values over time. In particular, we access annual raw data for the years 1800–2000 of all translated words and *Duden Synonymwörterbuch* (2014) synonyms.[5] With this data, we run various regression models displayed in Table 4.

The regression result of Model I shows that the mean frequency of *Gesellschaft*-indexed words (dependent variable) significantly increases with time (independent variable), whereas the mean frequency of *Gemeinschaft*-indexed words decreases (Model II). Model III shows that the difference between the mean frequency of *Gemeinschaft*-indexed words and the mean frequency of *Gesellschaft*-indexed words decreases significantly with respect to the year indicating a change in values off from *Gemeinschaft* towards *Gesellschaft* over time. In Model IV, we additionally include a dummy variable that is equal to one if the year indicates the time between 1935 and 1950 (lagged time of Nazi Regime)[6] and zero otherwise, and an interaction term of the year and this dummy variable. The interaction term evidences that there is a significant countermovement in values during the Nazi Regime. This manifests the reliance of the method, that is, changes in word frequency seem to indicate changes in social and cultural values, as well as predicted changes for the German-speaking population.

Third, in order to establish the link between the change in values and changes in ecological conditions, we follow Zeng and Greenfield (2015) and compute correlations between the annual frequency of German words covered by Table 1 and the size of the urban population in the corresponding year. For this purpose, we obtain data on the urban population of Germany between 1961 and 2000 from the World Bank.[7]

Table 5 (column 1) shows the correlation coefficients for German *Gesellschaft*-indexed and

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[5]We add one inflection of "eigen" namely "eigene." Furthermore, by choosing the time span 1800–2000, we keep our sample well comparable to Greenfield (2013). However, results remained unchanged for the time span 1800–2008.

[6]We investigate a lagged time horizon to account for the fact that there might be a delay in value development and publication during the Nazi regime. Results remain robust for the exact time period of the Nazi regime, 1933–1945.

[7]The data (http://data.worldbank.org) roughly covers 40 years of our sample period. This should be long enough to identify a structural relationship between urbanisation and social values. Furthermore, because Grossmann and Varnum (2015) argue that urbanisation might be less robustly associated with a change in individualism we calculate (lagged) correlations between wealth increase as a proxy of socioeconomic status and German word frequencies representing *Gesellschaft* and *Gemeinschaft* values. Results remained stable and can be requested from the authors.

TABLE 5
Correlations between urban population and German word frequencies representing *Gesellschaft* and *Gemeinschaft* values

Panel A: Gesellschaft	Urban population	Urban population time lag one year	Urban population time lag two years
decision—Entscheidung	−.1327	−.1947	−.2858*
choose—auswählen	.7688***	.7754***	.7785***
get—bekommen	.7782***	.7629***	.7448***
acquisition—Kauf	.9370***	.9419***	.9323***
feel—spüren	.0370	.0781	.1335
emotion—Emotion	.8741***	.8664***	.8616***
individual—individuell	.9116***	.9225***	.9328***
unique—einzigartig	.6954***	.6954***	.6982***
child—Kind	.6775***	.6572***	.6508***
self—Selbst	.7281***	.7228***	.7180***
personal—persönlich	−.0668	−.0366	−.0025
ego—Ego	.8273***	.8455***	.8671***
baby—Baby	.8425***	.8396***	.8360***
special—speziell	.4023**	.3778**	.3525**

Panel B: Gemeinschaft	Urban population	Urban population time lag one year	Urban population time lag two years
duty—Pflicht	−.8428***	−.8558***	−.8715***
benevolence—Güte	−.8641***	−.8686***	−.8700***
obliged—versprechen	.5258	.5647***	.5802***
give—geben	−.8542***	−.8658***	−.8785***
deed—Handlung	−.3571**	−.3675**	−.3719**
act—handeln	−.6667***	−.6693***	−.6820***
authority—Amtsgewalt	−.7841***	−.7996***	−.8092***
obedience—Gehorsam	−.8033***	−.8199***	−.8362***
power—Macht	−.8272***	−.8359***	−.8481***
belong—gehören	−.8753***	−.8859***	−.8951***
pray—beten	−.5127***	−.4942***	−.4619***
join—zugesellen	−.8815***	−.8903***	−.8964***
worship—Verehrung	−.8131***	−.8073***	−.7980***
conformity—Gleichförmigkeit	−.8815***	−.8782***	−.8749***

Note: Data of urban population are from the World Bank. Column I shows the correlation coefficients for German *Gesellschaft*-indexed and *Gemeinschaft*-indexed words with urban population in the respective year. Columns II respectively III calculate correlations for the urban population in year x, using word frequency of year $x + 1$ and year $x + 2$, respectively.
*$p < .10$, **$p < .05$, ***$p < .01$.

Gemeinschaft-indexed words with urban population in the respective year. All significant correlations exhibit the predicted direction. In particular, words representing *Gesellschaft* values, that is, individualistic values— "auswählen" (choose), "bekommen" (get), "Kauf" (acquisition), "Emotion" (emotion), "individuell" (individual), "einzigartig" (unique), "Kind" (child), "Selbst" (self), "Ego" (ego), "Baby" (baby), "speziell" (special)— are significantly positively correlated with size of the urban population ($r = .402$ to $r = .937$, $p < .05$). In addition, words representing *Gemeinschaft* values, that is, collectivistic values—"Pflicht" (duty), "Güte" (benevolence), "geben" (give), "Handlung" (deed), "handeln" (act), "Amtsgewalt" (authority), "Gehorsam" (obedience), "Macht" (power), "gehören" (belong), "beten" (pray)—are significantly negatively correlated with size of the urban population ($r = −.368$ to $r = −.890$, $p < .05$).

We additionally control for possible time lags between writing and publishing in columns 2 and 3. In particular, we recalculate the correlations between size of the urban population in the period 1961–1999 (respectively 1961–1998) and word frequencies in the period 1962–2000 (respectively 1963–2000) and test for significance. Almost all correlations show unchanged patterns. The frequency of *Gesellschaft*-indexed words correlates significantly positive with size of the urban population ($r = .353$ to $r = .933$, $p < .05$) whereas *Gemeinschaft*-indexed words correlate significantly negative with size of the urban population ($r = −.368$ to $r = −.896$, $p < .05$).

Although correlations exhibit predicted relations and suggest that urbanisation might drive social values as measured via word frequencies, we cannot argue that there is a clear causal relationship. The relationship could be reverse, bidirectional, or there might exist latent variables that influence both, a change in social
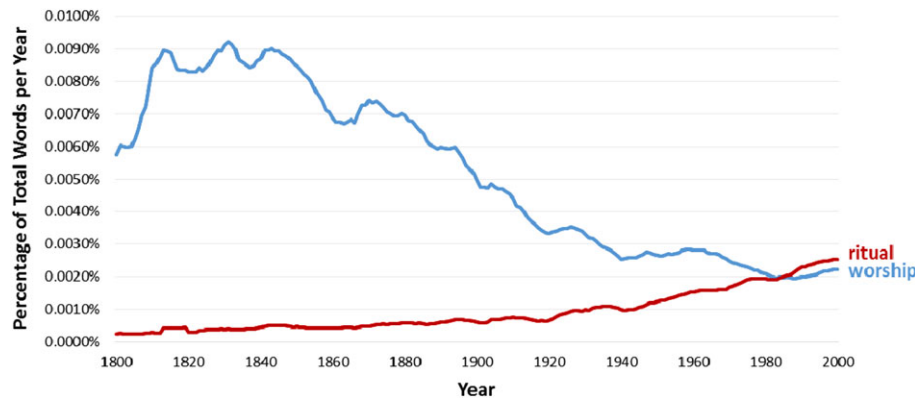
Figure 5. Frequency of the words "ritual" and "worship" in the Google corpus of American English books from the years 1800 to 2000. The graph was made with the Google Books Ngram Viewer (Michel et al., 2011), with the standard smoothing of 3.

structure as well as in word frequency. However, the large number of tested words attributes at least a predictive power to urbanisation with respect to cultural changes.

DISCUSSION

The theory of *social change and human development* predicts a global shift from *Gemeinschaft* to *Gesellschaft* based on sociodemographic changes. By using the Google Ngram Viewer, Greenfield (2013) and Zeng and Greenfield (2015) confirm this hypothesis for the United States, United Kingdom and China by respective shifts in word frequency in American English, British English and Chinese books. We replicate these findings for the German language culture and improve on the methodology by testing for the first three one-word synonyms listed in the most widely referenced synonym dictionary *Duden Synonymwörterbuch* (2014). Investigating changes in the German culture is especially interesting because of the Germans' role in World War II. In particular, we use the time period during and shortly after the war as a specific historical event with expected reversal of the global shift in cultural changes. We assume that the reported increase in the frequency of *Gemeinschaft*-indexed words might originate from Nazi-controlled publishing and the sustained propaganda of collectivistic values (Föllmer, 2010). Moreover, our results show that the overall increase in individualistic values is highly correlated with an increase in urbanisation. However, no causal relationship can be determined and urbanisation can only be viewed as a potential driver for this cultural development. Furthermore, in our study as well as in the study of Zeng and Greenfield (2015) a small fraction of words does not display the predicted directional trend. The persistence of or even increase in *Gemeinschaft* values may indicate a persisting cultural heritage that in some circumstances might contradict the process of social change (Hamamura, 2012).

Several studies have used Google Ngram to highlight cultural changes (Greenfield, 2013; Hamamura & Xu, 2015; Kesebir & Kesebir, 2012; Michel et al., 2011; Oishi, Graham, Kesebir, & Galinha, 2013; Twenge, Campbell, & Gentile, 2012a, 2012b; Xu & Hamamura, 2014; Yu et al., 2016; Zeng & Greenfield, 2015). With respect to this methodology, Twenge et al. (2012a) argue that studying language use in books allows to capture cultural changes from an individual level to group level. In fact, they suggest that books as cultural constructs mirror the viewpoint of authors, representing cultural changes of an influential portion of population, but might also highlight shifts in preferences, that is, what is in demand. We are aware that this reasoning simultaneously highlights the limitations of the methodology. In their work, Michel et al. (2011) admit that the corpus of literature is limited by the books obtained and preserved by the library partners of Google Books, raising criticism that the selection of books might not be enough to represent the majority of books and therefore culture in general. Finke and McClure (2015) address these concerns by investigating whether cultural and religious trends become visible through Ngram traces. Although the authors suggest to make use of a mix of methods in order to improve understanding, their results show that the Ngram Viewer is able to chart significant historical events in cultural and religious context. An issue with the original study by Greenfield (2013) remains in the criteria for the selection of terms and synonyms. The problem continues with the selection of translations.

Figure 5 highlights this problem. Replacing Greenfield's (2013) "worship" with the synonym "ritual," the picture changes completely and the predicted decrease turns into an increase. The same reversal is found for the German translation. By substituting "Verehrung" (worship) with the synonym "Kult" the story changes and an increase instead of a decrease is displayed. Thus, by including a predefined number of and a clear procedure

for selecting synonyms, we hope to increase the robustness of our findings.

Overall our study provides deeper insight into the cultural development of German values over time and highlights similarities in cultural changes among different countries. The impact of the World War II makes this investigation especially valuable and offers a good starting point for further research.

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