

# Cultural evolution over the last 40 years in China: Using the Google Ngram Viewer to study implications of social and political change for cultural values

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Chinese people have held collectivistic values such as obligation, giving to other people, obedience and sacrifice of personal interests for thousands of years. In recent decades, China has undergone rapid economic development and urbanisation. This study investigates changing cultural values in China from 1970 to 2008 and the relationship of changing values to ecological shifts. The conceptual framework for the study was Greenfield's (2009) theory of social change and human development. Changing frequencies of contrasting Chinese words indexing individualistic or collectivistic values show that values shift along with ecological changes (urbanisation, economic development and enrollment in higher education), thereby adapting to current sociodemographic contexts. Words indexing adaptive individualistic values increased in frequency between 1970 and 2008. In contrast, words indexing less adaptive collectivistic values either decreased in frequency in this same period of time or else rose more slowly than words indexing contrasting individualistic values.

**Keywords:** Social change; Cultural change; Big data; Google Ngram Viewer; Individualism; Collectivism; Urbanisation; Economic development; Education.

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## Ecological change and value shifts

Greenfield's (2009) theory of social change and human development provides a framework for understanding the implications of ecological change for value shifts. Relatively wealthy, urbanised, high tech, commercial environments with high levels of formal education can be summarised with the term *Gesellschaft*. Relatively poor, rural, low technology, subsistence-based environments with low levels of formal education can be summarised with the term *Gemeinschaft* (Tönnies, 1887/1957).

Materialistic and individualistic values (e.g. achievement, freedom of choice) are adapted to the features of a *Gesellschaft* environment. Concerning materialism, a greater desire for expensive items is fostered in a wealthier society (Park, Twenge, & Greenfield, 2014). Grades, an individual achievement, are key to success in formal education (Vasquez-Salgado, Burgos-Cienfuegos, & Greenfield, 2014). Urban environments can provide

perceived freedom from the social regulation of a close village community (Manago, 2012).

Collectivistic values are adapted to the features of a *Gemeinschaft* environment (Greenfield, 2009; Hofstede, 1980; Park, Twenge, & Greenfield, 2013; Snibbe & Markus, 2005; Triandis, 1995). Limited resources create a greater motivation to share (Raef, Greenfield, & Quiroz, 2000). The worldwide trend toward increasingly *Gesellschaft* environments therefore brings value change with it. As environments move in the *Gesellschaft* direction, values move toward increasing individualism and materialism (Greenfield, 2013). In this study, we apply this theory to Chinese society.

From a sociopolitical perspective, China is of special interest because it has been experiencing extremely rapid system-wide social change in recent years, thereby requiring its people to meet great challenges to their traditional values and life styles. This test of Greenfield's theory in an Asian country has theoretical importance: Understanding

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human diversity is crucial for constructing theories of the cultural evolution of human behaviour, while easy generalisations based on samples drawn entirely from Western, educated, industrialised, rich and democratic (WEIRD) societies are to be avoided (Henrich, Heine, & Norenzayan, 2010).

### **Collectivistic values in traditional Chinese culture**

Collectivistic values are adaptive and very important in traditional Chinese culture. Ancient China was once a *Gemeinschaft* nation of poor rural villages with a long feudal history from the Ch'in Dynasty (221 BC) to the Ch'ing Dynasty (1911). The first Ch'in emperor provided his people with a uniform code to facilitate a single approach to the fields of politics, economics and culture; collectivistic values were adaptive for a society in which the most valued job was to be an official and the second most valued job was to be a farmer (Bodde, 1986). Confucian values of effortful and respectful learning, behavioural reform, pragmatic learning and acquisition of essential knowledge (Tweed & Lehman, 2002) were representative of that time and were employed by the emperors to consolidate their power. Consequently, for thousands of years, Chinese people were accustomed to giving, obeying and following authority in an agricultural and feudal society. Extended families with hierarchical relationships were also important in traditional Chinese society.

Only in the 20th century did the feudal system break up and new values sprout among common people in Chinese society. However, the Cultural Revolution swept the nation from 1966 to 1976, driving Chinese people to extreme poverty (Yao, 2000) and state-oriented collectivism. A very popular Chinese saying in those years was "I am a brick for my motherland's construction, which can be moved to wherever there is need." That saying means that, like bricks, all people have the same functions and are willing to be assigned wherever needed by the government.

Thus, Chinese people attribute to the concept "collectivism" primarily national-level meanings, based on the idea that nation is the most basic and important collective. In contrast, other collectivistic cultures (e.g. Mexican) prioritise the family collective (Raef, Greenfield, & Quiroz, 2000). In the Chinese language, the word for collectivism implies giving, contributing, donating and even sacrificing to the group or nation.

### **Individualistic values and ecological shifts in modern Chinese society**

Chinese society has undergone rapid and radical changes since the Chinese party-state officially launched its

economic reforms in 1978 (after two years of intra-party transition), and the Chinese economy has been growing at an astonishingly fast pace (Yan, 2009). World Bank data provide a view of ongoing processes of urbanisation, wealth increase and formal education improvement, enabling us to understand how much the whole nation has changed in the past four decades. Specifically, urban population has tripled from 17.4% (1970) to 51.78% (2012); household per capita consumption (constant 2005 US\$) is up 10-fold from \$113.81 (1970) to \$1213.42 (2012); and tertiary school enrollment sharply increased from 0.13% (1970) to 24.33% (2011), revealing a general rise in level of formal education across the whole nation.

Such ecological shifts, both individually and in concert, encourage individualistic and egalitarian values (Greenfield, 2009; Manago, 2012, 2014). A tenet of Greenfield's theory is that each ecological variable, when it shifts, is equipotential in influencing value change. Urbanisation, wealth increase and formal education are sociodemographic forces that drive social value shifts from those adaptive in *Gemeinschaft* environments, such as interdependent and hierarchical social relationships, toward those adaptive in *Gesellschaft* environments, such as individual independence and egalitarian social relationships. These processes have occurred around the world, including the United States, Great Britain, Mexico, Japan, Taiwan, Turkey and Germany (Greenfield, 2009, 2013; Shimizu, Park, & Greenfield, 2014).

Social change in China is bringing similar value shifts. A cross-generation study shows that younger generations in China are more individualistic than older ones—they are more likely to live according to their own lifestyles and less likely to follow the traditional collective ideology (Sun & Wang, 2010). In the new environment, it has become important for children to acquire the individualistic skills of assertiveness, self-reliance and autonomy (Chen & Chen, 2010). Researchers and professionals in China now encourage parents and educators to help children develop individualistic skills that are adaptive in a market-oriented society: self-expression, self-direction and self-confidence (Yu, 2002). The traditionally valued characteristic of shyness is becoming a non-adaptive characteristic of Chinese children, as urbanisation encourages people to be outgoing and express themselves (Chen, Wang, & Wang, 2009).

### **The present study**

As a consequence of rapid societal change, Chinese people need to adapt themselves to new ways of being a person, living a moral life and aspiring for the future (Yan, 2009). During the course of this adjustment, what happens to traditional collectivistic values? Are individualistic values stepping onto the stage? Are there any conflicts or confusions in the process of value change?

How closely are changing values linked with ecological indicators? In order to answer these questions, we conducted a study to investigate changing cultural values in China and their relationship to ecological change, applying Greenfield's (2009) theory of social change and human development.

This study utilises the Google Ngram Viewer, a tool for massive culture-wide content analysis. This tool enables researchers to observe cultural trends and subject them to quantitative investigation using millions of digitised books (Michel et al., 2011). The method is based on the premise that books are a tangible and public representation of culture. Using the Google Ngram Viewer, Greenfield (2013) found that, in concert with urbanisation and correlated increases in wealth, the frequency of words reflecting individualistic values increased from 1800 to 2000 in both the United States and the United Kingdom, while those reflecting collectivistic values declined.

This study allows us to assess the usefulness of the tool to understand the value ramifications of social change in another region of the world. It also extends the analysis of Greenfield (2013) by testing the relationship of specific sociodemographic factors to value change. Last but not least, our study adds a political dimension to the study of values that was not present in Greenfield's (2013) analysis of changing cultural values in the United States and Great Britain.

Because of the ecological changes in China after the Cultural Revolution and during Economic Reform, we formulated two hypotheses concerning change in this recent period of Chinese history:

- (1) The frequency of Chinese words reflecting individualistic values would increase, while those reflecting collectivistic values would decrease.
- (2) These value shifts would be closely correlated with specific ecological changes in Chinese society: urbanisation, wealth and formal education.

## METHOD

### Corpus of books

The Google corpus used in this study consists of 302,652 Chinese-language books published between 1600 and 2008. These Chinese books were selected (according to the quality of their optical character recognition and authorisation from their publisher) from a much larger Chinese book corpus provided by Google's partners—40 libraries in the United States and Europe (e.g. Harvard University, Oxford University and University of California libraries); they included both popular and academic works. (Please see Discussion section for discussion of the potential limitations of this corpus.) While there was a shift in Google's way of collecting books after 2000

toward obtaining scans directly from publishers rather than from libraries. While there was a shift in Google's way of collecting books after 2000 toward obtaining scans directly from publishers rather than from libraries, there is no reason to believe that this shift in collection method after 2000 would introduce bias into the results.

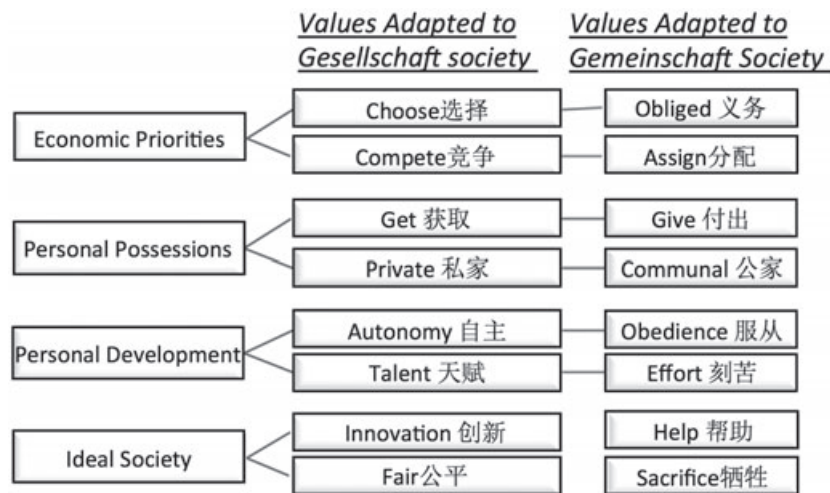
In order to analyze the correlation between value change and sociodemographic factors, we employed three ecological indicators from the World Bank: urban population, household consumption per capita (in constant 2005 US\$) and tertiary school enrollment. In consideration of the ecological forces predicted to drive value change, we chose 1970, in the midst of the Cultural Revolution, as the starting point for both ecological and cultural analysis, with the ending point at 2008 provided by the Google Ngram Viewer.

### Word selection

Like Greenfield (2013), we chose frequently used words with a narrow range of semantic interpretation (e.g. "take" and "go" are too broad to be interpreted). We also took into account important linguistic differences between Chinese and English. First, the same Chinese word can be used as a noun, verb or even adjective, so part of speech is a meaningless concept. Second, most of the frequently used Chinese words are composed of either one or two characters. One single Chinese character can have various meanings, whereas two or more characters usually combine to express a more specific meaning than the single character. Therefore, to avoid overly broad meanings, all the words used in this study are two-character words.

To better identify and compare similar words and find the most appropriate translations, the Oxford Advanced Learners' English-Chinese Dictionary, Oxford Chinese Dictionary and Modern Chinese Dictionary were used as tools in the process of word selection. In addition, a 26-year-old Chinese male (born in 1988) with a law degree and a 58-year-old Chinese female (born in 1955) with college degree in biology were invited to check the authors' selection. They judged each of the words on its usage contexts, importance and underlying meanings expressed in Chinese society. Without discussion, they both agreed that all 16 words are commonly used to represent important collectivistic or individualistic values in Chinese culture.

We selected 16 words (Figure 1) reflecting specific concepts/values that come from our theoretical analysis: they represent important values in Chinese society throughout or at different time points during the past 50 years. Where applicable to China, Greenfield's (2013) Google Ngram Viewer analysis of U.S. and British books was our word source. This source supplied five of our 16 words: "Choose" and "get" indexed Gesellschaft-adapted values; "obliged," "give" and "obedience" indexed Gemeinschaft-adapted values.



**Figure 1.** Sixteen words selected to index values adapted to Gemeinschaft and Gesellschaft environments.

Sources for the remaining five words indexing Gemeinschaft-adapted values (“assign,” “communal,” “effort,” “help” and “sacrifice”) lie in Chinese cultural and social traditions (e.g. Confucianism). Sources for the remaining six words indexing Gesellschaft-adapted values (“compete,” “private,” “autonomy,” “talent,” “innovation” and “fair”) lie in values hypothesised to be adaptive in the new China organised around a market economy. We used both Greenfield’s (2013) study and Chinese sources in this study in order to both generalise Greenfield’s prior findings and provide new culture-specific evidence for our theory-driven hypotheses.

The 16 selected words and the values they represent are grouped into four categories (Figure 1): economic priorities, personal possessions, personal development and ideal society.

The following 12 words are paired. For each pair of words, one represents an individualistic value, whereas the other represents a contrasting collectivistic value on the same dimension. Two pairs of words contrast adaptation to a planned economy versus adaptation to a market economy (“obliged” vs. “choose” and “assign” vs. “compete.”) (The concept of assignment refers to the government assigning both jobs and living quarters; Hong, 2013.) Two pairs of words contrast collectivistic concepts of possession versus acquisition of personal property (“give” vs. “get” and “communal” vs. “private”). Two pairs of words contrast collectivistic values for personal development versus individualistic ones (“obedience” vs. “autonomy” and “effort” vs. “talent”).

The remaining four words are not polar opposites, but they belong to the same category (Ideal Society, Figure 1). Two represent values adaptive in a poor agricultural village (“help” and “sacrifice”); the other two represent values adaptive in an egalitarian commercial environment (“innovation” and “fair”).

## RESULTS

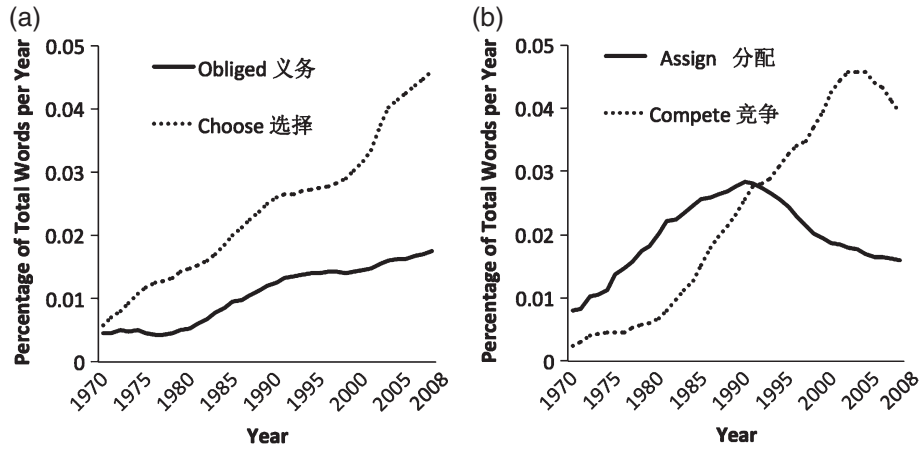
### Economic priorities

The words “obliged” and “choose” are replications of Greenfield’s (2013) study of American and British cultural values. Contrary to our hypothesis, Figure 2a shows that both words rise in frequency. However, the rise of “choose” occurs at a higher rate than “obliged.” Thus, we have partial confirmation of our hypothesis. This pattern may reflect a society in transition, where there is reaction against the new ways in order to preserve traditional values; but the traditional values are gradually being overtaken by new values.

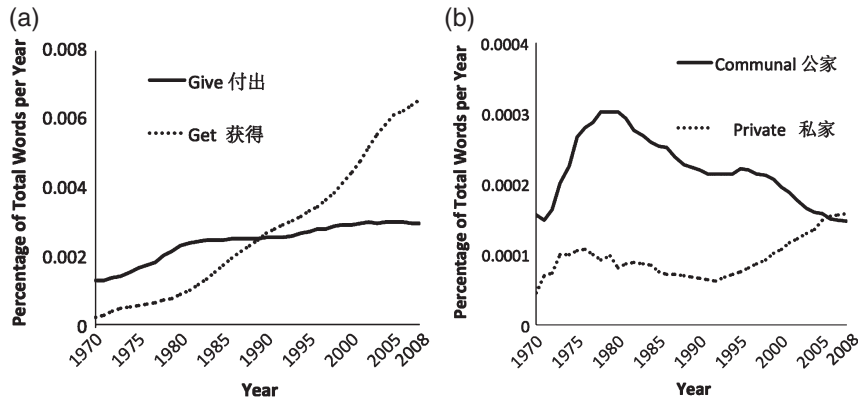
The other pair of contrasting words shown in Figure 2b, “assign” and “compete,” are of special significance in Chinese society. When the society began to switch to a market economy in the 1970s, “compete” began its upward trajectory. The frequency of “assign” also kept increasing until society finished the transition. Around 1990, the crossover point of the two lines, there was an increasing variety and quantity of housing and work, resulting from the productivity boom and labor diversity in a market economy, so jobs and housing were no longer assigned; instead individuals needed to compete for them. At that point, “assign” decreased in relative frequency, while “compete” continued to rise.

### Personal possessions

In the category of personal possessions, we employed “give” and “get” from Greenfield’s (2013) study to index the contrast between contributing to the welfare of other people and obtaining something for oneself. In addition, we selected “communal” to represent the value of collective ownership and “private” to represent the value of



**Figure 2.** (a) Frequencies of contrasting words “obliged” and “choose” in Google corpus of Chinese books (1970–2008). (b) Frequencies of contrasting words “assign” and “compete” in Google corpus of Chinese books (1970–2008).



**Figure 3.** (a) Frequencies of contrasting words “give” and “get” in Google corpus of Chinese books (1970–2008). (b) Frequencies of contrasting words “communal” and “private” in Google corpus of Chinese books (1970–2008).

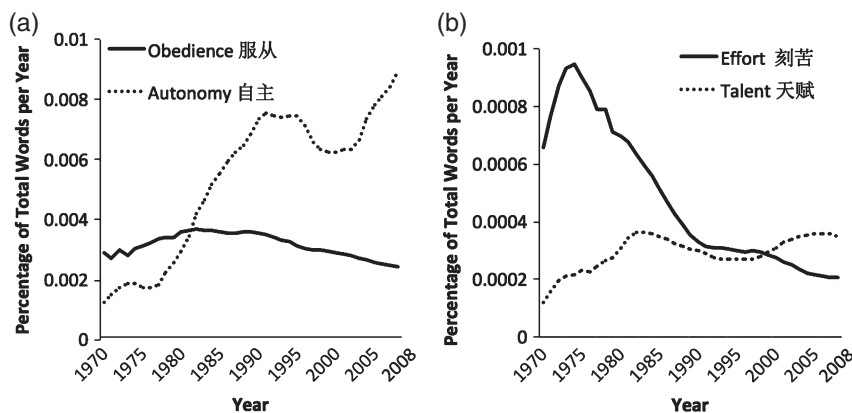
individual ownership and consumption. The frequency of “get” shows a ninefold increase, whereas the frequency of “give” barely rises (Figure 3a). Nineteen-eighty-nine is the point at which the crossover takes place, with “get” becoming more than twice as frequent as “give” by 2008. The frequency of “communal” rises sharply during the Cultural Revolution (1970–1976) and the period of intra-party transition (1976–1978); then, after a short period of stability, it begins to fall from about 1980, two years into the period of Economic Reform (Figure 3b). The relative frequency of “private” is considerably below that of “communal” until well into the period of Economic Reform. Starting in the 1990s, it rises steadily, overtaking the relative frequency of “communal” by 2006.

### Personal development

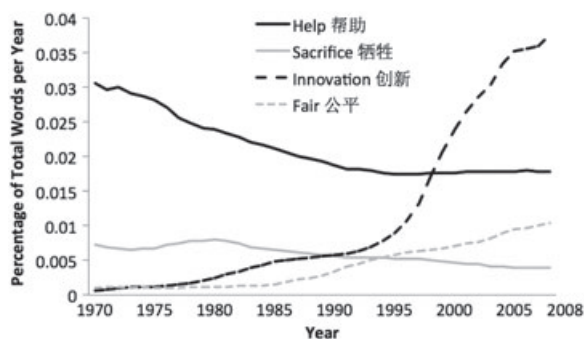
A contrast between “obedience,” from Greenfield’s (2013) analysis, and “autonomy” was used to index the fact that, in collectivistic contexts, “obedience” is regarded as positive, whereas, in individualistic

contexts, “autonomy” is crucial to personal development. “Obedience” remained relatively stable in frequency, whereas “autonomy” climbed from one-third the frequency of “obedience” to more than three times its frequency, with the reversal occurring in the early 1980s (Figure 4a).

We picked “effort” and “talent” to index contrasting beliefs in areas of education and personal development. Hard work is one of the core values of childrearing in traditional Chinese families (Hong, 2013). Chinese students are taught to work hard, even when the probability of success is low (Hau & Salili, 1991), while failures are usually attributed to lack of effort, based on the underlying assumption in a collectivistic orientation that individuals have the same natural endowments. In sharp contrast, the individualistic perspective is that different individuals have talents in different areas. Figure 4b shows that the frequency of “effort” fell after climbing to its summit in the 1970s (years of the Cultural Revolution); its frequency was overtaken by that of “talent” by the end of 1990s. This pattern indicates that “effort” is extremely valued in



**Figure 4.** (a) Frequencies of contrasting words “obedience” and “autonomy” in Google corpus of Chinese books (1970–2008). (b) Frequencies of contrasting words “effort” and “talent” in Google corpus of Chinese books (1970–2008).



**Figure 5.** Frequencies of words “help” and “sacrifice” in comparison with “innovation” and “fair” in Google corpus of Chinese books (1970–2008).

a collectivistic system whereas “talent” is more important in the current economic environment.

### Ideal society

“Help” and “sacrifice” are keys to an ideal society where collective interests lie before individual interests (Raef et al., 2000; Suzuki & Greenfield, 2002). In contrast, “innovation” and “fairness” are keys to an ideal society in which individual fulfillment and equal opportunity are priorities. As predicted, the relative frequency of “help” and “sacrifice” declined in the period of economic reform, while the relative frequency of “fair” and, especially, “innovation” rose (Figure 5). Of all the values assessed in this study, innovation is perhaps the one with the greatest significance in a market economy.

### Correlations with ecological indicators

In order to establish a connection between values and ecology, we calculated correlations between word’s frequency and ecological variables (see Table S1, Supporting information). As predicted, frequencies of all words

reflecting individualistic values—“choose”, “compete”, “get”, “private”, “autonomy”, “talent”, “innovation” and “fair” show highly significant positive correlations with urban population ( $r = .645$  to  $.998$ ,  $p < .001$ ), per capita household consumption (constant 2005 US\$) ( $r = .627$  to  $.981$ ,  $p < .001$ ) and tertiary school enrollment ( $r = .638$  to  $.978$ ,  $p < .001$ ).

Most, but not all, of the correlations between frequencies of collectivistic words and ecological indicators are significantly correlated in the predicted, negative direction (see Table S1). Correlations with five words are as predicted: “communal”, “obedience”, “effort”, “help” and “sacrifice” are negatively correlated with ecological indicators of a market economy: urban population ( $r = -.360$  to  $-.952$ ,  $p < .05$ ), per capita household consumption (constant 2005 US\$) ( $r = -.414$  to  $-.917$ ,  $p < .001$ ) and tertiary school enrollment ( $r = -.589$  to  $-.841$ ,  $p < .001$ ). However, contrary to prediction, “obliged” and “give” show significant positive correlations with these ecological indicators ( $r = .719$  to  $.944$ ,  $p < .001$ ), while “assign” shows no significant correlations. The unexpected positive correlations could be indicative of a reaction in China against the new values.

In order to control for probable time lags between writing and publishing books, we calculated correlations between ecological indicators (1970–2007) and word frequencies one year later (1971–2008), as well as the correlations between ecological indicators (1970–2006) and word frequencies two years later (1972–2008). The same pattern of correlations emerged: frequencies of all words reflecting individualistic values show significant positive correlations with our ecological indicators ( $r = .519$  to  $.997$ ,  $p < .01$ ). The same words representing collectivistic values (“communal”, “obedience”, “effort”, “help” and “sacrifice”) show significant negative correlations with our ecological indicators ( $r = -.560$  to  $-.944$ ,  $p < .01$ ), whereas “obliged” and “give,” as before, show significant positive correlations with the ecological indicators

( $r = .695$  to  $.940$ ,  $p < .001$ ), and “assign” shows no significant correlations.

## DISCUSSION

Values shift along with the process of ecological change. As predicted, individualistic values (indexed by words “choose,” “compete,” “get,” “private,” “autonomy,” “talent,” “innovation” and “fair”), increased in importance along with the sharp rise of urban population, household consumption and tertiary school enrollment, whereas collectivistic values (indexed by words “communal,” “obedience,” “effort,” “help” and “sacrifice”) declined between 1970 and 2008. Using books, a cultural product, to document the rise of individualistic values in concert with ecological shifts is consonant with findings from a large-scale survey in China: Cai, Kwan, and Sedikides (2012) found that narcissistic personality, a correlate of individualistic values, correlated significantly with urban residence and higher economic status.

While most words indexing collectivistic values declined in frequency in the Chinese corpus, “obliged” and “give” slightly increased their frequency over time, although the contrasting individualistic words always increased more rapidly. This is in sharp contrast to the United States, in which the frequency of “obliged” and “give” declined from 1800 to 2000 with the rise of a predominantly urban society (Greenfield, 2013). But in fact, China is currently at the middle stage of urbanisation, in that half the population lives a materially modern life with more personal wealth in urban areas, while the other half still lives a rural life with little personal wealth. On an individual level, traditional subsistence agriculture, limited personal wealth and limited technology help to maintain collectivistic values such as family obligation (Greenfield, 2004). On the national level, given that economic reform and accompanying social transformations are moving at different rates, Chinese society (including its value systems) simultaneously demonstrates pre-modern, modern and post-modern social conditions; and Chinese people must deal with all of these conditions at the same time (Yan, 2009). Accordingly, both collectivistic and individualistic values are actually adaptive in current Chinese society.

It is a social reality that collectivistic and individualistic values co-exist in developed East Asian countries. Japanese are substantially less independent (e.g. less dispositional bias in attribution, holistic attention, propensity to experience socially engaging emotions, happiness correlated with engaging positive emotions and smaller self in social network) than North Americans and Western Europeans (Kitayama, Park, Sevincer, Karasawa, & Uskul, 2009), although they live in a highly modernised society.

There is a parallel to some of our findings concerning the simultaneous rise of individualism and collectivistic words, but with individualistic words overtaking the frequency of collectivistic words in recent years: Chinese mothers encourage autonomy more than relatedness, but still have higher scores than Canadian mothers on encouraging relatedness and lower scores on encouraging autonomy (Liu, et al., 2005). Persisting or even rising collective values (social obligation, social harmony and social contribution) in East Asian cultures suggest a persisting cultural heritage that counteracts the market-driven process of social change by influencing educational philosophy and mass media (e.g. advertisements) (Hamamura, 2012).

The persistence of some collectivistic values may also be in reaction to the rising force of individualism. It is difficult to definitively change longstanding values in a short period of time. We found that individualistic values have stepped onto the stage at an increasing rate since the Economic Reform, accelerated by the emergence of newer generations who have grown up in a wealthier urban environment with more opportunity for higher education. However, the older generations who grew up when China was a poor country composed primarily of agricultural villages and who were socialised into collectivistic values are still in power in the current society. The Cultural Revolution generation (born between 1961 and 1970) in China attribute greater importance to the value of power, whereas the Social Reform generation (born between 1971 and 1975) attribute greater importance to being open to value change (Egri & Ralston, 2004). These authors further predicted that value conflicts will continue until more recent generations become the majority in Chinese organisations and society.

Focusing on the period from 1970 to 2008, our study shows what may be one of the steepest turning points in the long, zigzag course of China’s social and value development. In fact, the time span we selected in this study bears particular significance, as it contains the Cultural Revolution (1966–1976) and subsequent Economic Reform (1978 to now). The Cultural Revolution tended to form China as a communist (one type of collectivistic) society, whereas the economic reforms led Chinese society in another direction, one that encourages individual achievement, materialism, economic efficiency and entrepreneurship (Tian, 1998). This great transition brings dramatic changes—reflected in our ecological indicators (urban population, household consumption and tertiary school enrollment)—to the whole of Chinese society, leading to a reversal in the relative predominance of collectivistic and individualistic values in a number of domains.

## Limitations

A comprehensive interpretation of our results requires consideration of the possible bias caused by the absence

in the data base of books in Chinese libraries. In the UCLA library, one of the libraries used by Google as a source for digitising books, the top five topics of Chinese books are: literature (17.42%), history (14.70%), philosophy (8.30%), life and health (8.24%) and politics (7.96%). In the library of Beijing Normal University, the top five categories are literature (15.81%), economics (11.58%), history (9.96%), industrial technology (7.71%) and politics (5.23%). Thus, three of the five most frequent book categories were the same in both countries: literature, history and politics. Philosophy and life/health were in the top five categories at UCLA, but not at Beijing Normal University. Economics and industrial technology were in the top five categories in Beijing but not UCLA. If UCLA is typical of the libraries utilised by Google, the underrepresentation of economics could have caused an underestimation of the effects of the market economy on our findings; yet we found large effects. On the other hand, the higher proportion of books of history and philosophy and life/health (altogether for 23%) could have caused an overestimation of the importance of collectivism.

Concerning the driving forces of value change, all three ecological indicators in this study are signal features of wealthy urban environments. Lacking indicators of subsistence village ecologies limited our analysis and interpretations of the corresponding positive relationships between ecological indicators and the values adaptive in those environments.

Another limitation is that the corpus ended in the year 2008, failing to cover the accelerating economic and social changes between 2009 and 2014, including the rise of the Internet.

## CONCLUSIONS

Our research into value change in Chinese culture, as indexed by changing relative word frequencies, revealed that values have shifted in concert with ecological changes, as predicted by Greenfield's (2009) theory of social change and human development. We found evidence of rising individualism in concert with growing urbanism, increasing wealth and higher levels of formal education. The similar pattern of correlations for all three sociodemographic variables is in line with the theoretical tenet that each of these sociodemographic forces is equipotential in its effect on values.

In contrast, most but not all collectivistic words showed significant negative correlations with our sociodemographic indicators. While a few words indexing collectivistic values also increased in frequency over time, these trends were always weaker than the growth of the individualistic words with which they were paired. We interpret these weaker, yet real, rises in the frequency of collectivistic words as stemming from a desire, mainly on the part of older generations, to maintain traditional

Chinese values in the face of challenge by the individualism that has become adaptive in a market economy. This pattern characterises a society still in a transitional state from *Gemeinschaft* to *Gesellschaft* conditions. Furthermore, our findings suggest that political events can be one source of the ecological changes that impact value shifts.

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## SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

Table S1. Correlations between ecological factors (1970–2008) and frequencies of words representing individualistic/collectivistic values adapted to *Gesellschaft/Gemeinschaft* society.

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