Relationship between collectivism and corruption in American and Chinese books: A historical perspective

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Previous research on the relationship between collectivism and corruption has not investigated their co-variation over time. In this study, we use Google Ngram Viewer to track the frequency of words related to collectivism and corruption in American books (1800–2000) and in Chinese Books (1970–2008). The results demonstrate that a positive association between the usage of these terms during the periods in both Chinese and American books, with changes in words related to collectivism preceding changes in words related to corruption in American books. The theoretical and practical implications are also discussed.

Keywords: Collectivism; Corruption; Bribery; Google Ngram Viewer; Big data.

Corruption, widely defined as the misuse of public office, trust, or power, for private gain (O'Connor & Fischer, 2011), is a significant problem in society (Tan, Liu, Huang, Zheng, & Liang, 2016). Many cross-sectional studies have found that collectivism is correlated with and even can predict corruption (Cheung & Chan, 2008; Huang, Liu, Zheng, Tan, & Zhao, 2015; Mazar & Aggarwal, 2011; Triandis et al., 2001). However, despite the radical changes of social culture, including collectivism, over the past couple of decades, hardly any research has examined this relationship from a historical perspective. Nowadays the big data technology makes it possible to explore this topic. Therefore, this study employs a new "big data" approach, the Google Book Ngram Viewer, to determine whether the relationship between collectivism and corruption is reliable.

Collectivism and corruption

Collectivism is defined as the extent to which individuals view themselves as interdependent and part of a larger group or society (Hofstede, 1980; Mazar & Aggarwal, 2011). Collectivism has robust bound with psychological, behavioural and social variables. Previous research demonstrates that collectivism has significant impacts on social relationship, cognition, self-concept and values (Oyserman & Lee, 2008). Collectivism is also positively associated with maliciously intended ethics behaviours (Ralston, Egri, Furrer, & Al, 2015), while negatively related to wealth, human rights, gender-role equality and income equality (Taras, Kirkman, & Steel, 2010).

Corruption is widely viewed as an immoral and unjust behaviour. Both institutional factors such as government regulation, corruption detection, legal punishment, and salaries, etc., (Dong & Torgler, 2013) and non-institutional factors such as culture, beliefs and norms, etc., (Gong & Wang, 2013; Huang, Zheng, Tan, Zhang, & Liu, 2016) have impacts on corruption. Furthermore, the beliefs and norms often play more important roles than objective institutional factors (Larmout, 2009). Previous research demonstrates that cultural factors such as power-distance (Husted, 1999) and the social capital

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of strong bonds (Pena-López & Sánchez-Santos, 2014) can impact corruption. Besides that, collectivism is also considered as a critical cultural factor affecting corruption (Cheung & Chan, 2008; Huang et al., 2015; Mazar & Aggarwal, 2011; Triandis et al., 2001).

Most previous researchers have found that collectivism was positively associated with corruption. At a country level, Triandis et al. (2001) found that collectivism was positively related to the reported use of deception in negotiation. Davis and Ruhe (2003) found that collectivism can explain a significant proportion of the variance in perceived corruption. González-Trejo (2007) used data from 1996 to 2004 to investigate the relationship between culture and corruption and found a positive correlation between high collectivism and high-perceived corruption. Cheung and Chan (2008) found that collectivism affected the acts of corruption indirectly through enrolment in tertiary education and GDP per capita. Zheng, El Ghoul, Guedhami, and Kwok (2013) used a firm sample covering 38 countries and found that firms in more collectivist countries perceive a higher level of lending corruption than in countries with a higher level of individualism.

At an individual level, Mazar and Aggarwal (2011) conducted a laboratory experiment and found that the participants in the collectivist-priming group showed a stronger propensity to offer bribes to international business partners than those in the individualist group. They adopted a position of moral disengagement to explain the effect of culture on corruption. They proposed that collectivism promotes bribery through lower perceived responsibility for one's actions. Pillay and Dorasamy (2010) also found the pervasiveness of corruption was enhanced in collectivist cultures. They used institutional theory to link culture with corruption, arguing that collectivism means loyalty to family and personal relationships subordinates the equitable administration of justice. Huang et al. (2015) indicated that collectivism facilitated corruption when evaluation apprehension was low.

Hence, based on the previous mainstream empirical studies and theoretical analysis of the positive link between collectivism and corruption, we propose an exploratory hypothesis that *corruption is positively related to collectivism in a historical process* (H1).

Google ngram viewer, culture and social change

Previous research on the relationship between collectivism and corruption has focused on both individual and national level analyses (O'Connor & Fischer, 2011) but has helped little in our understanding of the association over time. The role of historical change in culture has not been sufficiently considered. Whether and how corruption in a country changes along with the evolution

of culture in a long-term historical process still remains unclear. Fortunately, Google Ngram Viewer sheds light on the questions.

Google Ngram Viewer is a big data tool for massive content analysis of Google's millions of digitised books to reveal implicit meanings in cultural products (Michel et al., 2011). This analysis is based on measuring the annual percentage of the frequency of a word in the total published books. Because of the opportunity to cover a long time span, this tool can be used to investigate cultural and social changes. In the current study, we use Google Ngram Viewer to analyse the frequencies of words related to collectivism and corruption and explore the pattern of their relationship over time.

Google Ngram Viewer has helped to reveal historical cultural changes. Twenge, Campbell, and Gentile (2012b) have found that collectivism had decreased in American culture by examining changes in pronoun use in the Google Book Ngram database of American books published from 1960 to 2008. Greenfield (2013) analysed cultural change in the U.S. and the U.K. from 1800 to 2000. He has found the frequency of words related to collectivism in Google books declined with decreasing rural population in both countries. Grossmann and Varnum (2015) also found that urbanisation contributed to the rise of individualism and a decline of collectivism in America. Zeng and Greenfield (2015) found some collectivistic values (e.g., "communal," "obedience" and "effort") decline while other values ("obliged" and "give") rise along with ecological changes in China from 1970 to 2008.

Google Ngram Viewer has also helped to show the influence of historical change on cultural and other psychological and social variables. In the field of collectivism research, researchers have found that the decrease of collectivism is associated with historical rises in personal happiness (Oishi, Graham, Kesebir, & Galinha, 2013), the status of women (Twenge, Campbell, & Gentile, 2012a), self-esteem (Konrath & Anderson, 2011) and a long-term decline in morality (Kesebir & Kesebir, 2012). Therefore, we suppose that the change of collectivism may similarly have some impact on corruption in a long-term process.

The broad influences of collectivism and various theories suggest that collectivism may be an antecedent of corruption. On the one hand, the decline of collectivism in recent centuries (Greenfield, 2013; Twenge et al., 2012b) plays a significant role in social change, including corruption (Kesebir & Kesebir, 2012; Oishi et al., 2013; Twenge et al., 2012a). On the other hand, previous theories suggest different mechanisms of impacts of collectivism on corruption. Moral engagement theory claims that collectivism promotes bribery through lower perceived responsibility for one's actions (Mazar & Aggarwal, 2011). Institutional theory asserts that people in collectivist culture consider the rule of family and close interpersonal relationships more important than the rule of fairness (Pillay

& Dorasamy, 2010). And social exchange theory indicates that Asians are more likely than North Americans to invoke a reciprocity norm in exchanging gifts with casual acquaintances (Shen, Wan, & Wyer, 2011). Therefore, we hypothesize that *corruption sequentially declined after the decrease of collectivism in the long-term process* (H2).

The current study

The current study aims to answer two questions. First, is corruption positively related to collectivism in a historical process? Second, will corruption show a change after a variation in collectivism? We use the U.S. and China as representatives for countries with individualistic culture and collectivistic culture respectively. American books from 1800 to 2000 and Chinese books from 1970 to 2008 were used as data sources and English and Chinese words related to collectivism and corruption were used to set up corpuses. Then, the frequencies of words were used to calculate a collectivism index (CI) and a bribery index (BI) for both American English and Chinese. Correlational analysis and regression analysis were conducted. Finally, in American books, time-lagged correlation analysis and a comparison of correlation coefficients were conducted to show chronological order of collectivism and corruption change.

METHODS

Data collection

Following Greenfield (2013) and Michel et al. (2011), the American Google Book corpus used in the present study consists of 1.2 million American English-language books published between 1800 and 2000. Because of the small number of digitised books for the first two centuries (1600–1800), the present analysis started with the year 1800, when the number of sampled books in the U.S. rose to more than 100,000 per century. The analysis stopped at the year 2000 because the sampling method of Google book changed from 2000 onwards (Greenfield, 2013; Michel et al., 2011). Following Zeng and Greenfield (2015), the Chinese Google Book corpus used in the present study contains Chinese-language books published between 1970 and 2008. Considering the simplified Chinese characters widely used after 1960s and the ecological and cultural changes of China, we chose 1970 as the starting point and chose 2008 provided by the Google Ngram Viewer as the ending point.

A python program was used to collect the data from the Google Ngram Viewer website. Then for each English word, 201 annual frequencies from 1800 to 2000 were recorded, and for each Chinese word, 39 annual frequencies from 1970 to 2008 were recorded.

TABLE 1
Words to represent collectivism in English

Part of speech	Number	Words
Verb	4	accompany, belong, give, respect
Adjective	4	communal, dutiful, same, submissive
Noun	4	conformity, duty, obligation, politeness

Corpus building

The collectivism and corruption corpuses are basic prerequisites for the Ngram analysis. We drew upon 38 collectivism/individualism scales and questionnaires (see Table S1, Supporting Information), which contain a lot of meaningful information on collectivism (Greenfield, 2013) to generate our words related to collectivism. Three raters who were familiar with the concept of collectivism independently selected notional words from the scales and questionnaires including nouns, verbs, and adjectives that can represent collectivism. Rater consistency was considered by only selecting words that were chosen at least twice in the first step. Next, we screened the words by their frequency to ensure the word can provide a meaningful variation. Words with a maximum annual frequency under 1.0×10^{-6} were eliminated. Then, we conducted criterion validity analysis to ensure the words in the collectivism corpus had a trend that was congruent with previous words that had been proven effective (*obliged*, *give*, *act*, *obedience*, *authority*, *belong* and *pray*, see Greenfield, 2013) in representing collectivism. Words related to bribery were selected from relevant academic articles. Different forms and parts of speech related to bribery were considered. Similarly, words with a highest annual frequency of less than 1.0×10^{-6} were eliminated. The Chinese collectivism corpus was translated from and corresponding to the English corpus.

In Chinese, we covered different types of corruption (贿赂 for bribery, *腐败* for corruption and 贪污 for embezzlement), because those words in Chinese are unambiguous. In English, we use bribery as an example for corruption due to bribery's importance and our method's limitation. On the one hand, bribery is representative for corruption because it is one of the most common and notorious form of corruption: more than 3% of the world gross domestic product (GDP) was paid annually in bribes (The World Bank, 2004). On the other hand, the words suitable to be analysed by Google Ngram Viewer should be unambiguous and frequently used. In English, words related to "bribery," rather than those related to polysemous words (e.g., corruption) or rarely used words (e.g., embezzlement), meet the two standards of words for the Google Ngram Viewer.

TABLE 2
Words to represent collectivism in Chinese

Part of speech	Number	Words
Verb	4	陪伴(accompany), 归属(belong), 给予(give), 尊重(respect)
Adjective	4	公共(communal), 尽责(dutiful), 共同(same), 顺从(submissive)
Noun	4	责任(conformity), 义务(duty), 遵守(obligation), 礼貌(politeness)

Indicator generation

In order to improve the reliability of our research, we generated a CI, as the indicator for collectivism and a BI, as the indicator for bribery, by averaging the standard score of frequencies of the same variable. We used the *Z*-score of the frequencies because different words varied a lot in their annual frequency. If we average the raw frequencies directly, the more common words would swamp those with a lower frequency. Chinese and

American English indicators were generated by using the same method.

Indicator analysis

Correlation and regression analyses were conducted to test our first hypothesis that collectivism would be positively correlated with corruption with both English indicators and Chinese indicators. Due to the long-time range of American books, time-lagged correlational analysis and a difference test were conducted to probe the relationship between the collectivism and corruption more deeply in American books (Grossmann & Varnum, 2015). Different lag years (from negative 50 years to positive 50 years) between collectivism indicator and corruption indicator were used to explore chronological gap between the two indicators' changes.

RESULTS

Corpus building and indicator generation in both Chinese and English

After examining the criterion validity, there were 12 words (4 verbs, 4 adjectives and 4 nouns) left in the English corpus for collectivism (see Table 1) and corresponding Chinese corpus (see Table 2). Six forms of bribery were considered in English—*bribe*, *bribery*, *bribee*, *briber*, *bribed*, and *bribing*. The highest frequen-
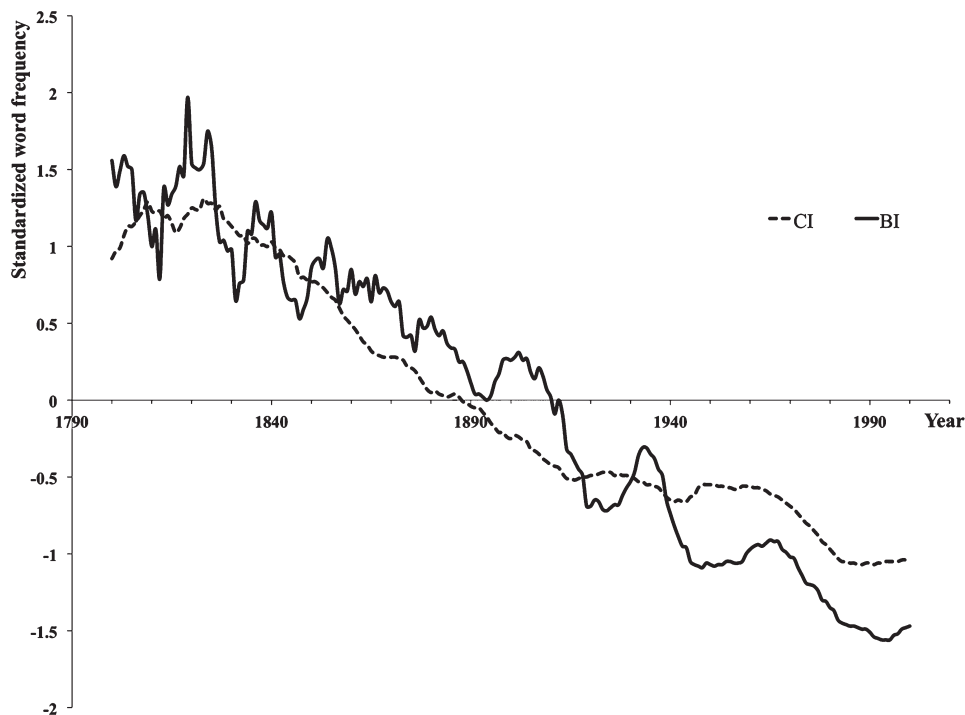

Figure 1. The trends of CI and BI from 1800 to 2000 in American books.

TABLE 3
Regression results using CI to predict BI in America

Model	B	SE	β	t
Constant	.000	.022		.000
CI	1.212	.028	.950	42.964***

Note. ***$p < 0.001$.

cies of *briber*, *bribee*, and *bribing* were under 1.0×10^{-6} so we used *bribe*, *bribery* and *bribed* to derive our index for bribery.

After converting the frequencies into Z-scores, we calculated the reliability of each English index as $\alpha_{CI} = 0.935$, $\alpha_{BI} = 0.975$. The reliability of each Chinese index are $\alpha_{CI} = 0.972$ and $\alpha_{BI} = 0.917$.

Correlation and regression analyses of American books

Both the trends (see Figure 1) and the correlation between CI and BI ($r = 0.950$, $p < 0.01$) show that BI declined through 1800–2000 along with CI. The series for CI was smoother than that of BI because the greater frequency of words in this index is associated with less random variation from year to year.

The results of the regression analysis showed that CI was a predictor of BI ($\Delta R^2 = 0.922$, adjusted $\Delta R^2 = 0.921$, $p < 0.001$, see Table 3). Since Google Ngram Viewer can show historical trends in cultural products through frequencies of related words, the results imply that collectivism has a positive bound with

corruption in the long term. It confirmed our first hypothesis that corruption is positively related to collectivism in a historical process.

Correlation and regression analyses of Chinese books

Considering the possible cultural differences, we replicated the analyses in Chinese books. Consistent with the findings of Zeng and Greenfield (2015), the results of the present research also supports an escalating trend of collectivism in China. More importantly, the result demonstrates that both the trends (see Figure 2) and the correlation between CI and BI ($r = 0.889$, $p < 0.01$) show that BI raised through 1970–2008 along with CI. The results further confirmed the positive correlation hypothesis between collectivism and corruption.

The results of the regression analysis showed that CI was a predictor of BI ($\Delta R^2 = 0.790$, adjusted $\Delta R^2 = 0.785$, $p < 0.001$, see Table 4). The results imply that collectivism has a positive bound with corruption in a long term.

Time-lagged correlation analyses of American books

In consideration of the hysteretic and chronic nature of the impacts of collectivism, just a 39-year period is not sufficient to explore the possible lagging influence of collectivism on corruption, thus only the American Google Book corpus was employed with the time-lagged analysis
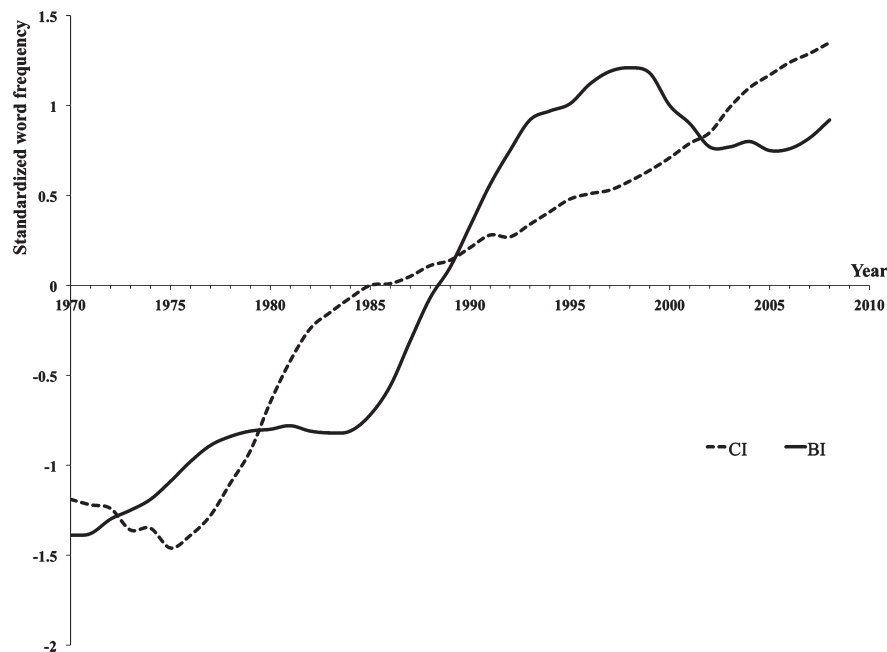

Figure 2. The trends of CI and BI from 1970 to 2008 in Chinese books. *Note.* BI-CI lag is the lagged year of BI data behind CI data.

TABLE 4
Regression results using CI to predict BI in China

Model	B	SE	β	t
Constant	.000	.069		.000
CI	.942	.080	.889	11.815***

Note. ***$p < 0.001$.

to explore the chronological order of collectivism and corruption. The results confirmed that corruption sequentially declined after the decrease of collectivism in the long-term process. First, it was found that the variances of the correlation coefficients of the association between earlier CI and later BI were larger than those of the association between earlier BI and later CI. Levene's test for equality of variances showed the difference in variances is not significant ($F = 3.227$, $p = 0.076$). Second, we found the mean value of correlation coefficients from positive BI–CI time lag years was higher than that from negative BI–CI time lag years ($m_{pos} = 0.957$, $m_{neg} = 0.897$, $t = 3.470$, df $= 99$, $p < 0.001$). Third, we found the slope of the correlation from negative BI–CI time lag years was positive (see Figure 3). That is to say, the earlier BI we used to correlate with CI, the smaller the correlation coefficient we would get. To sum up, correlation with early CI and BI was larger and more stable. Therefore, we infer that shifts in collectivism tend to precede shifts in corruption.

DISCUSSION

In the present research, we answered two important questions about the relationship between corruption and collectivism in the U.S. and China, using the big data method, Google Ngram Viewer. The present research indicates that there are declining trends of collectivism and corruption over the period 1800–2000 in American books, but escalating trends of collectivism and corruption over the period 1970–2008 in Chinese books. There is a reliable correlation between collectivism and corruption in the long-term process in the both samples. In addition, a time-lagged correlation analysis of American books demonstrates the decline of collectivism precedes the decrease in corruption.

This research provides a new historical perspective in the field of corruption by using a new data source and analysing tool, Google Books and Google Ngram Viewer. The historical trends of corruption in American books over a time span of 200 years and in Chinese books over a time span of 39 years have been revealed for the first time. Our indicators and results may inspire future studies on not only the historical process and general trend of corruption in America and China, but also the general relationship between corruption and other variables. Our work contributes to research in this area by confirming the covariation of collectivism and bribery, which has been observed in several studies in this field (Davis & Ruhe, 2003; González-Trejo, 2007; Huang et al., 2015; Mazar & Aggarwal, 2011; Pillay & Dorasamy, 2010; Triandis et al., 2001) and also operates as a historical process.

The results can be interpreted in different ways. From a cultural influence perspective, our results support the founding that collectivism has a positive influence on corruption. However, the findings must be treated with some caution. As Husted (1999) reiterates, collectivism shows a clear relation to the problems of corruption due to its association with amoral familism. Individuals tend to
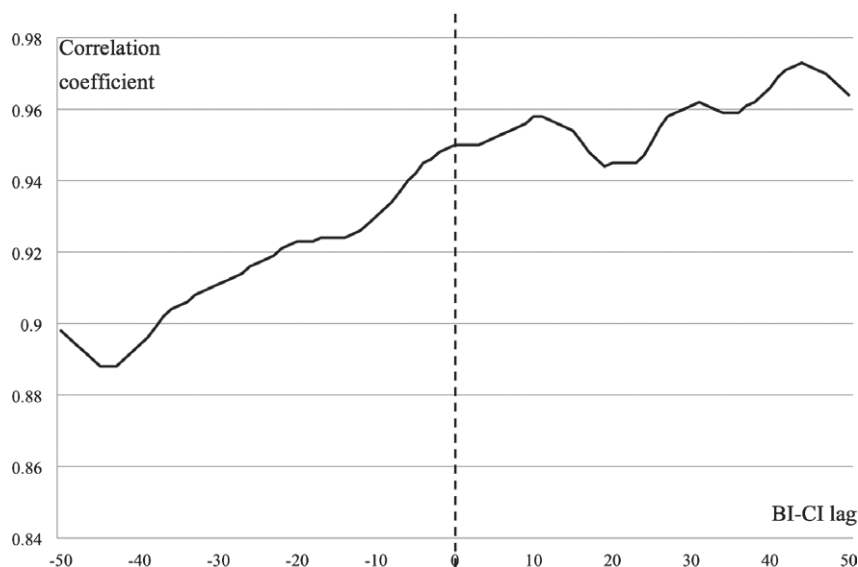

Figure 3. The time-lagged correlation between BI and CI from 1800 to 2000 in American books.

adopt patrimonialist attitudes and defend group interests and not those of society as a whole. From an ecological change perspective, more fundamental factors, such as urbanisation and economic development, may play important roles in changing decreasing collectivism and corruption sequentially (Greenfield, 2013; Grossmann & Varnum, 2015).

Prospect for future research

There are some limitations to our research. First, due to the difficulty of controlling for extra variables with data from books, the analysis of variables using Google Ngram Viewer is usually descriptive and correlational. It is impossible to verify the causal relationship from a historical perspective. Therefore, it is important to integrate findings from different data sources (e.g., online corpora, experiments and surveys) to confirm this result. Second, our findings imply China presents a process of increasing collectivization, which seems counterintuitive with the negative association between modernity and collectivism. It is worthy to further explore the relationship among modernity, collectivism and corruption.

Third, to further distinguish the mechanism of the positive link, it would be meaningful to add words representing mediators and moderators in collectivism's link with corruption, for example, different types of collectivism and corruption (Mazar & Aggarwal, 2011), evaluation apprehension (Huang et al., 2015) as moderators, and morality as a mediator (Mazar & Aggarwal, 2011). It is also worthy to examine the roles that other fundamental factors (i.e., urbanisation and economic indicators) which have played in decreasing collectivism and raising corruption sequentially. Finally, to expand validation of the results, more various index of corruption and more tests in other countries should be considered. More indicators for corruption (e.g., graft and nepotism), books in more other languages (e.g., French and German) can be included in future research.

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Table S1. Scales and measures of collectivism included in this study.

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