Talk the talk, but walk the walk: what do we know about marital demography and corporate greenwashing?

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Abstract
Using a sample of 21,628 firm-year observations from the Chinese stock market during the period of 2008–2017, this study finds that the divorce–marriage ratio, the proxy for marital demography, is significantly positively associated with corporate greenwashing. This finding suggests that higher divorce–marriage ratio is associated with stronger individualistic social atmosphere, lower conformity to social norms, and more unfavorable attitude towards environmental conservation, abets firms to talk the talk rather than walk the walk, and foments corporate greenwashing. Moreover, China's Environmental Protection Law attenuates above positive relation. Lastly, our conclusions are robust to sensitivity tests using the divorce rate, alternative proxies for greenwashing, and individual-level divorce data, and further our findings are also valid after addressing the endogeneity issue.

Keywords: China's Environmental Protection Law; greenwashing; the divorce–marriage ratio

Introduction

Corporate greenwashing derived its original meaning from the American hotel industry in the 1960s – 'reuse your towels in order to save the environment' (Kenton, 2020), as guests can see from the notices on the beds of hotel rooms today. In recent decades, a great number of firms are actively engaging in greenwashing (Delmas & Burbano, 2011). Greenwashing misleads stakeholders in the supply chain (e.g., upstream suppliers and downstream customers) by environmental window-dressing behavior (Du, 2015), by which firms grab huge environmental benefits of products (services) and even government subsidies at the expense of stakeholders (Delmas & Burbano, 2011; Du, 2015).

Greenwashing refers to the process of conveying the false impression or misleading information about how a firm and/or its products are eco-friendly (Du, 2015; Kenton, 2020). The Concise Oxford English Dictionary (Pearsall, 2002) broadly defines greenwashing as 'the behavior that an organization disseminates disinformation to present an environmentally responsible public image'. Referring to Kenton (2020) and Pearsall (2002), greenwashing has broken through product- (service-) specific behavior. As a matter of fact, the ways of greenwashing have continuously expanded from specific items or dimensions by green advertising and marketing to greenwash the whole enterprise by public claims of eco- (earth- or environmental) friendliness and greenization (Chen & Chang, 2013).

Corporate greenwashing has attracted special attentions from policymakers, nongovernment organizations (NGOs), researchers, and the public (Du, Jian, Zeng, & Chang, 2018). Especially, scholars have examined the determinants and economic consequences of greenwashing (Delmas & Burbano, 2011; De Vries, Terwel, Ellemers, & Daamen, 2015; Du, 2015; Laufer,

2003; Ramus & Montiel, 2005; Testa, Boiral, & Iraldo, 2018; Walker & Wan, 2012). Nevertheless, the research on the determinants and consequences of corporate greenwashing is still far from in-depth up to now. As far as the determinants of corporate greenwashing, most extant studies pay close attention to market, institutional, organizational, regulatory policies, and governance mechanisms, but they rarely touch on how macrolevel social culture and/or CEO-(manager) specific characteristics affect a firm's greenwashing behavior. Motivated by above gap in prior literature, our study explores the marital demography as an additional and important driver of eliciting corporate greenwashing.

For a long time, sociologists and social scientists have focused on social influences and economic consequences of the marital status (marital demography) because the divorce rate is closely associated with cultural values (Holden & Smock, 1991; Ross & Mirowsky, 1999; Toth & Kemmelmeier, 2009). Divorce is validated to be related with extreme individualism (Naroll, 1983), and further the likelihood of divorce around the world is significantly higher in regions (countries) with individualistic cultures than for that with collectivistic cultures (Vandello & Cohen, 1998, 1999). As a matter of fact, the marriage–divorce ratio (the divorce rate) reflects macrolevel social culture – the commitment and responsibility to and the attitude towards the matrimony. More importantly, the marriage–divorce ratio embodies the extent of individualism within a region (state, province) (Vandello & Cohen, 1999), which has been validated to inversely affect a firm's tendency towards environmental conservation (Husted, 2005; McCarty & Shrum, 2001; Price, Walker, & Boschetti, 2014). Furthermore, individualistic culture is more likely to elicit corporate greenwashing, compared to collectivistic culture (Berry, 1994; Lim & Tsutsui, 2012; Tokar, 1997). Lastly, given the community isomorphism (Bies, Bartunek, Fort, & Zald, 2007; Marquis, Glynn, & Davis, 2007) and the 'peer effect' (Bursztyn, Ederer, Ferman, & Yuchtman, 2014; Cao, Liang, & Zhan, 2019; Feld & Zölitz, 2017), the effect of individualism-dominated social culture on greenwashing can be extended to firms within a community. As such, our study predicts that the divorce–marriage ratio, which can serve as the proxy for the marital demography and individualistic social culture (U.S. Bureau of the Census, 1996; Vandello & Cohen, 1999), is positively related to the extent (likelihood) of corporate greenwashing.

According to Allen, Qian, and Qian (2005), Du, Jian, Zeng, and Du (2014), and Williamson (2000), when formal institutions fall behind corporate practices, informal systems play their important role in affecting corporate behavior. However, along with the continuous improvement of formal institutions (law), the impact of informal systems on corporate behavior will be weakened. In response, the impact of individualistic social culture embedded in the divorce–marriage ratio (an informal system) on corporate greenwashing is attenuated by China's Environmental Protection Law (CEPL) in 2015 (a formal institution).

Institutional background, prior literature, and hypotheses development
The marital demography in China

For thousands of years, given the effect of Confucian culture on the Chinese society, the structure within the family was extremely stable (Fei, Fei, Hamilton, & Zheng, 1992, pp. 87–93) and divorce was rare in China. Since the founding of the People's Republic of China, women had been given the unprecedented status, known as 'Women can hold up half of the sky' (Du, 2016), and thus the divorce has become common in China. According to China's National Bureau of Statistics (www.stats.gov.cn), in the mid-1980s, the average divorce–marriage ratio (divorce rate) was about 6.82% (.68‰), but the highest ratio (rate) at the province level was 34.99% (3.64‰).

Along with China's deepening of the Reform and Opening-Up Policy, the weakened influence of Confucian culture on the Chinese society, and the impact of foreign culture, the mean

(maximum) values of the divorce–marriage ratio and divorce rate in 1999 reached 16.90% (35.62%) and 1.11‰ (3.29‰).[1] In 2017, the average divorce–marriage ratio (divorce rate) was 41.64% (3.14‰), along with the maximum value of 68.97% (5.20‰). Overall, the average divorce–marriage ratio (divorce rate) in most provinces of mainland China embodies the steady increased tendency. Figure 1a (1b) outlines the changing tendency of the divorce–marriage ratio (divorce rate) from the mid-1980s to 2017, revealing the marital demography in contemporary China.

Given the close relation between marriage (divorce) and collectivism (individualism) (Vandello & Cohen, 1999), the continuous upward divorce–marriage ratio (divorce rate) in the past decades embodies the change in social culture. The Chinese society is always characterized with higher (lower) extent of collectivism (individualism) (Chen, Meindl, & Hunt, 1997; Earley, 1989), but this impression seems to be undergoing the challenge (Koch & Koch, 2007). In this regard, the divorce–marriage ratio (divorce rate) reflects the dynamic and evolving attitude and the weakened responsibility towards the matrimony (family) (Du, 2016; Vandello & Cohen, 1999).

Motivated by above settings, our study aims to investigate whether individualistic social culture – which is embedded in increasingly high divorce–marriage (divorce) ratio – affects greenwashing.

Environmental conservation and greenwashing in China

Greenwashing originated from the American hotel industry (Kenton, 2020), but the hotels in the world just enjoy the benefit of lower laundry costs and do not conduct sufficient eco-friendly activities. Inspired by the hotel industry, a variety of corporations in various industries claim that their products, services, and even the whole enterprise are environmentally friendly (Du, 2015). However, a great number of corporations are only talk the talk rather than walk the walk. Against this context, corporate greenwashing becomes increasingly prevalent today (Greenpeace USA, 2013; Parguel, Benoît-Moreau, & Larceneux, 2011).

Compared with western countries, greenwashing behavior is not inferior in China. Du et al. (2014, 2016, 2018) and Du (2015) reveal that environmental performance of Chinese listed firms is far from optimistic. Specifically, Chinese listed firms tend to score about 3.53 out of 95 (the full score) on average and the highest score is about 44 – less than half of 95. In this regard, it is a huge irony that a great number of Chinese listed firms have declared their eco-friendliness. More likely, hundreds of enterprises conduct greenwashing to cover their environmental weaknesses or unfriendliness.

Greenwashing has penetrated into food, medical treatment, and public welfare products. Du (2015) and the South Weekend (www.infzm.com; China's most influential unofficial newspaper) summarize Chinese-style greenwashing: (1) a naked liar (open fraudulence); (2) deliberately concealing facts; (3) double-standard environmental behavior; (4) empty promises; (5) environmental policy interference; (6) environmental impression management; and (7) negative environmental externality.

As environmental pollution becomes increasingly prominent and greenwashing intensifies, some unofficial organizations and the media step forward bravely to disclose the lists of firms that conduct greenwashing behavior. For example, with the support of careful investigations, the South Weekend has published the yearly list of firms with greenwashing since 2012 (Du, 2015). It is amazing that some very famous Chinese enterprises (even multinational enterprises) appear more than once in these lists (e.g., China Sinopec, 600028.SH). In recent year, due to the continuous attention to carbon emission and the greenhouse effect, China Sinopec – one of the largest oil companies conducted greenwashing through rebranding itself as the environmental pioneer. Specifically, China Sinopec renamed its services, repacked its products, and even advertised its green or environmental image during the processes of charitable donations and conveying the sympathy to the victims of natural disasters.

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[1]In European countries, the divorce rate rose 400% during the period of 1960 and 2004 (Eurostat, 2006).

Prior literature on the marital demography

Family is the most basic component of the human society (Morgan & Morgan, 1996), the matrimony affects family composition, and in turn family composition shapes social stability and social culture (Olson & DeFrain, 2003, pp. 100–105; Sanders & Nee, 1996). In recent year, scholars in the fields of economics and management borrow the proxies for marital demography from the sociology (demography) to examine their effect on individual behavior and corporate decisions.

Prior studies have reached consistent conclusions that marriage (divorce) can improve (reduce) individual subjective well-being. Gove, Hughes, and Style (1983) find that the marital status is the most powerful predictor of the mental health. Gove and Shin (1989) validate that, compared to the married people, the psychological well-being of the divorced (widowed) is far poorer. Stutzer and Frey (2006) focus on the relationships between marriage and subjective well-being, validating that happier singles are more likely to opt for marriage. Shapiro and Keyes (2008) find that married persons have a significant social well-being advantage, in addition to the positive link between marriage and psychological well-being.

Marital status also strengthens philanthropic giving and reduces the likelihood of crime. Bryant, Jeon-Slaughter, Kang, and Tax (2003) argue that the marital status is an important dimension of social capital, and thus married people are more connected with social networks than single, separated, and divorced people – who are less likely to be volunteers or make philanthropic giving. Einolf and Philbrick (2014) and Barnes and Beaver (2012) verify that marriage has a stronger positive (negative) effect on giving (crime).

Besides, a branch of research examines the influence of marital status on the attitudes towards the risk and managerial behavior. Hartog, Ferrer-i-Carbonell, and Jonker (2002) argue that the married people are more risk averse than their counterparts because the marriage contract increases the costs of breaking up the relationship. Roussanov and Savor (2014) find that marital status affects individual preferences towards risk, and firms with single (married) CEOs always have higher (lower) stock volatility and exhibit more (less) aggressive investment. Christiansen, Joensen, and Rangvid (2010) conclude that marriage is a financial risk-reducer for men and financial risk-increaser for women. Nicolosi and Yore (2015) validate that mergers and major capital expenditures are significantly related with divorces (marriages), and especially, the link between a CEO's marital status and the preference for option-based compensation. Neyland (2016) verifies that divorce has significant effect on firms with cash-poor CEOs. Hilary, Huang, and Xu (2017) find that firms with single CEOs display a higher degree of earnings management than firms with married CEOs.

Lastly, another focus in extant studies addresses the impact of marital status on social culture. Vandello and Cohen (1999) find that states with higher marriage–divorce ratios are more collectivist in the USA. Toth and Kemmelmeier (2009) find that divorce is more likely to link with individualist societies. As a matter of fact, the divorce rate is consistently associated with the individualistic cultural tendency within a region or society, and highly individualist regions (states, societies) always exhibit higher divorce rates (Dion & Dion, 1996; Lester, 1995).

Prior literature on corporate greenwashing

Greenwashing means a variety of different misleading communications that aim to form overly positive beliefs among stakeholders about a company's environmental practices (Torelli, Balluchi, & Lazzini, 2020). Thus, greenwashing is a firm's unsubstantiated claims, aiming at inducing stakeholders to believe that its products and services are energy-saving orientation and the whole enterprise is eco-friendly (Kenton, 2020). However, these claims could at most be partially believed, along with exaggerating the work in environmental protection and concealing environmental misconducts to the greatest extent (Du, 2015). In response, a branch of prior literature addresses the ways of identifying a firm's greenwashing.
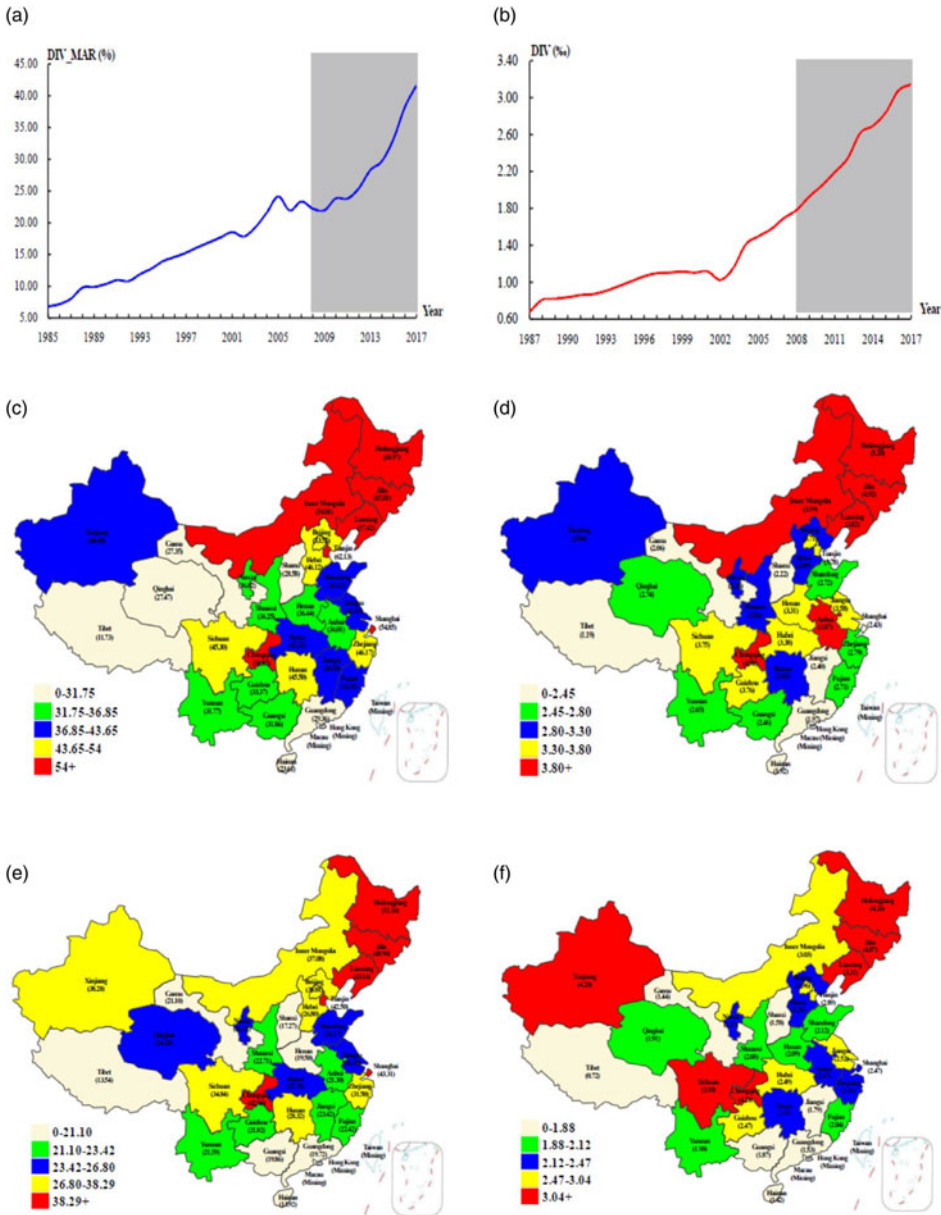
Figure 1. The distribution characteristics of marital demography. (a) The tendency of the divorce–marriage ratio during the period of 1985–2017 (unit: %; the shaded part denotes the sample period), (b): The tendency of the divorce rate during the period of 1985–2017 (unit: ‰; the shaded part denotes the sample period), (c): China's provincial distribution of the divorce–marriage ratio in 2017 (unit: %), (d): China's provincial distribution of the divorce rate in 2017 (unit: ‰), (e): China's provincial distribution of the mean value of the divorce–marriage ratio during the sample period (2008–2017; unit: %), (f): China's provincial distribution of the mean value of the divorce rate during the sample period (2008–2017; unit: ‰).

Unfulfilled environmental commitment is closely linked with greenwashing (Lee & Hageman, 2018). Parguel et al. (2011) argue that unfulfilled CSR claims and eco-friendly commitment motivate greenwashing, and further independent sustainability ratings can deter greenwashing

and encourage firms to engage in eco-friendly activities. Laufer (2003) argues that fair social reporting is a channel of identifying greenwashing because it reflects whether a firm has abided by environmental laws. In addition, no independent verification induces greenwashing. There is no statutory requirement that independent third party should verify environmental information, so large and leading-edge firms have lower likelihood of involving in greenwashing (Berrone, Fosfuri, & Gelabert, 2017; Ramus & Montiel, 2005). Du (2015) adopts the published lists of firms in the South Weekend to proxy for greenwashing. Lyon and Maxwell (2011) verify that the threat of environmental audit drives a firm's greenwashing. Lyon and Montgomery (2013) find that social media can mitigate corporate greenwashing. Delmas and Burbano (2011) argue that managers, NGOs, and policymakers have the obligations to mitigate greenwashing. Siano, Vollero, Conte, and Amabile (2017) extend the greenwashing taxonomy by identifying a new type of irresponsible behavior, namely 'deceptive manipulation', which strengthens the 'communicative constitution of organizations' perspective. By combining the signaling theory with the legitimacy theory, Seele and Gatti (2017) argue that greenwashing epistemologically depends on an external accusation, which is viewed as a distortion factor altering the signal reliability of green messages. And then, Seele and Gatti (2017) propose a revised definition of greenwashing as cocreation of an external accusation toward an organization with regard to presenting a misleading green message.

Greenwashing is conducted to capitalize on increasing demands for eco-friendly image, products, and services from the society, regardless of whether the ways or channels of achieving these objectives are recyclable, free of environmental pollutions, or nonwasteful (Kenton, 2020). In other words, the only purpose of greenwashing is to deceive the society into believing that the firm and the green label are inseparable, and then grab the huge profits at the expense of the whole society. Thus, another branch of prior literature has investigated the economic consequences of corporate greenwashing.

Greenwashing leads to negative market reactions. Du (2015) validates that greenwashing results in significantly negative cumulative abnormal returns around the exposure of greenwashing. Moreover, greenwashing elicits the skepticism from external auditors and customers. Du et al. (2018) find that greenwashing is significantly positively associated with a firm's receiving modified audit opinion. Chen & Chang (2013) verify that greenwashing brings out green consumer confusion and increases green perceived risk. Rahman, Park, and Chi (2015), Bloch and Banjeree (2001) find that the ulterior motive in greenwashing brings out consumer skepticism about environmental claims. Lastly, Bowen (2014) finds the reduction in environmentalism after corporate greenwashing. Torelli et al. (2020) find that different levels of greenwashing have a significantly different influence on stakeholders' perceptions of corporate environmental responsibility and stakeholders' reactions to environmental scandals.

To sum up, prior literature has investigated the determinants and consequences of greenwashing, but it remains unknown about whether individualistic social culture – which is embedded into and evolves along with marital demography (the divorce–marriage ratio) – affects a firm's greenwashing.

The marital demography and greenwashing (Hypothesis 1)

Confucian culture in China can be classified as being collectivistic (Du, 2016), which embodies as stable material status and extremely low divorce rate or divorce–marriage ratio. However, as the implementation of family planning policy and the impact of western culture on contemporary China, the big family in the traditional sense no longer exists, young people under the one-child policy have become more and more selfish, and thus individualistic culture is on the rise and collectivistic culture is declining (Evans, 2012; Kipnis, 2012). An obvious example is the increasing divorce rate (see Figure 1). In this regard, the divorce–marriage ratio can serve as an appropriate proxy for individualism in China.

The divorce rate is a product of social and cultural transformation from the collectivism to the individualism (Inglehart, 1997). Collectivism refers to a social pattern of closely linked individuals who view themselves as interdependent members within a collective (e.g., family; Vandello & Cohen, 1999). However, individualism as a cultural pattern emphasizes the independence of the self and individual autonomy (Markus & Kitayama, 1991; Triandis, 1995). Collectivism and individualism are very different in the attitude towards family, matrimony (marriage, divorce), individual belief, and social behavior (Triandis, 1994, 1995; Vandello & Cohen, 1998, 1999).

First, in the collectivist society (region), people enjoy the matrimony and share themselves with their partners in the marriage, and thus they evaluate the self's authenticity at the family level rather than at the individual level (Cross, Gore, & Morris, 2003; Liu & Chan, 1999). Toth and Kemmelmeier (2009) argue that, in the collectivist society, people always exhibit greater adherence to tradition and social conventions. In China, for quite a long time, collectivism is prevalent and people place the emphases on family unity and self-sacrifice (Singh & Kanjirathinkal, 1999). As a result, it is less likely to dissolve the marriage. Comparatively, it is intolerable to sacrifice personal fulfillment for the marriage in the individualistic society. Thus, once the marital relationship let people unhappy, they are highly likely to choose to opt out (Toth & Kemmelmeier, 2009). Similarly, Vandello and Cohen (1999) find that states with higher marriage–divorce ratios are more collectivist in the USA. Overall, higher divorce–marriage ratio (divorce rate) is consistently linked with cultural individualism and is more likely in countries with cultural individualism (Dion & Dion, 1996; Lester, 1995; Toth & Kemmelmeier, 2009). As a matter of fact, the divorce–marriage ratio reflects the contrast between individualistic and collectivistic social cultures, and further higher divorce–marriage ratio, a concrete reflection of the individualistic value or belief, is closely associated with individualism-dominated social culture in a region (society).

Second, individualism-dominated social culture is inversely related with environmentally friendly activities. People in individualism-dominated social culture exhibit lower conformity to group norms and have unfavorable attitude towards public interests (Toth & Kemmelmeier, 2009; Vandello & Cohen, 1999). Given that environmentally friendly behavior is in the public interests, individualism- dominated regions should exhibit more unfavorable attitude towards environmental protection and have higher likelihood of tolerance for greenwashing. McCarty and Shrum (2001) find that individualism is negatively associated with environmental recycling and sustainable belief. Cho, Thyroff, Rapert, Park, and Lee (2013) find that individualism negatively affects pro-environmental commitment and environmental attitude. More importantly, a branch of very thin but growing literature (Lim & Tsutsui, 2012; Tokar, 1997) provides indirect and preliminary evidence in an incidental way that individualistic (collectivistic) social culture positively (negatively) affects corporate greenwashing. In addition, Roulet and Touboul (2015) find that the positive attitudes towards individualism/liberalism elicit greenwashing.

The sacred marriage requires strong responsibilities and a solemn commitment to stay together for a lifetime (Amato & DeBoer, 2001). In this regard, higher divorce–marriage ratio highlights the irresponsible social atmosphere (culture) of breaking promises (Adams & Jones, 1997). As a result, the aforementioned two points, taken together, suggest that individualistic social culture embedded in higher divorce–marriage ratio is positively related with corporate greenwashing.

Lastly, Marquis et al. (2007)'s community theory states that community isomorphism shapes local social norms and cultural cognition (e.g., the shared local community ideology, value and belief among CEO groups). Bies et al. (2007), Gellers (2012), Pentifallo and VanWynsberghe (2012) conclude that community isomorphism can impel firms and their CEOs to fulfill environmental conservation or involve in greenwashing, depending on whether community isomorphism is individualism dominated or collectivism dominated. Moreover, community isomorphism brings out the 'peer effect' (Bursztyn et al., 2014; Feld & Zölitz, 2017), which leads to similar

behavior of CEOs within a region (industry). For example, prior literature has validated that the 'peer effect' widely exists in CSR and different CSR dimensions (Bollinger, Burkhardt, & Gillingham, 2018; Cao et al., 2019; Malik, Al Mamun, & Amin, 2019; Qiu, Yin, & Wang, 2016).

The divorce–marriage ratio (divorce rate) is an important social indicator – a numerical measure of portraying a society as a whole (Inglehart, 1997; Toth & Kemmelmeier, 2009). As such, according to the community theory and the 'peer effect', higher divorce–marriage ratio is closely associated with individualistic social culture, shapes community isomorphism at the province level, induces the 'peer effect' of mitigating environmental involvement, and eventually results in corporate greenwashing. Marriage or divorce belongs to individual-specific event, but high divorce–marriage ratio shapes the individualism-dominated social culture at the macrolevel, which imperceptibly affects all people within a region (province). Maybe CEOs or top managers in some enterprises do not support or agree with individualistic social culture, but they may have to adjust their behavior and corporate decisions due to the community isomorphism, isomorphism pressures, and the 'peer effect'.

To sum up, higher divorce–marriage ratio characterizes individualism-dominated social culture, which mitigates a firm involving in environmentally friendly activities and increases the extent of greenwashing. Due to the community isomorphism and the 'peer effect', the positive effect of individualism-dominated social culture – which is portrayed by divorce–marriage ratio – on corporate greenwashing spreads within a region (province). Thus, we formulate Hypothesis 1 (H1) as below:

H1: Ceteris paribus, the divorce–marriage ratio is positively associated with (the extent of) corporate greenwashing.

The moderating effect of the environmental protection Law (Hypothesis 2)

China has been the largest emerging market and the second largest economy, but rapid economic growth cannot cover the fact that formal institutions fall short and far from adequate (Allen et al., 2005). As an alternative, informal system (e.g., Confucian culture, social ties) plays the substitutive role in affecting the Chinese society, corporate governance, and individual behavior (Du, 2016). For this reason, H1 predicts the positive impact of the divorce–marriage ratio – which captures the contest between individualistic and collectivistic social cultures – on corporate greenwashing.

However, it is indisputable that the role of informal institutions depends on how perfect the formal system is (Williamson, 2000). Williamson (2000) outlines a four-level social institution framework: '(1) social embeddedness (e.g., informal institutions, customs, traditions, norms), which remains fairly stable and only evolves slowly over time; (2) institutional environment – formal rules such as judiciary and bureaucracy; (3) governance (e.g., contract); and (4) resource allocation and employment (i.e., price, incentive)'. Moreover, Williamson (2000) argues that some formal institutions like laws derive from informal system, but formal institution can exert the crowding-out (extrusion) effect on informal system. Extending Williamson (2000), Elias and Jephcott (1982), Foucault (2012), Lowes, Nunn, Robinson, and Weigel (2017) and Tabellini (2008) validate that formal institutions may crowd out the original effect from informal systems. Especially, Du et al. (2014) find that, the continuous improvement of China's laws weakens the original impact of religious atmosphere around a firm (an informal system) on corporate behavior.

To protect the ecology environment, prevent pollution and other public hazards, ensure public health, promote the construction of ecological civilization and the sustainable development, the Environmental Protection Law of the People's Republic of China has been in force and implemented since 2015.[2] Based on Williamson (2000)'s four-level social institution

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[2]Please refer to the official website of 'www.npc.gov.cn' (the Standing Committee of the National People's Congress).

analyses framework and the aforementioned discussions, it can be logically inferred that CEPL as a formal institution will crowd out the influence of the divorce–marriage ratio (an informal system and individualistic social culture) on greenwashing. Thus, we formulate Hypothesis 2 (H2) as below:

H2: Ceteris paribus, CEPL attenuates the positive effect of the divorce–marriage ratio on corporate greenwashing.

Research design

Sample

The initial sample includes all Chinese listed firms during the period of 2008–2017. Our sample period begins in 2008 because most firms have not disclosed environmental information in 2007 and before. Then, we select the research sample based on several criteria: First, we delete firms pertaining to the banking, insurance, and other financial industries. Second, we discard firm-year observations whose net assets are below *zero*. Lastly, we eliminate firm-year observations with missing data on firm-specific variables. As a result, we get a final sample of 21,628 firm-year observations, covering 3,003 unique firms. To mitigate the effect of extreme firm-year observations on regression results, all continuous variables are winsorized at the 1 and 99% of their original values.

We sort industries based on the China Securities Regulatory Commission (CSRC) industry classification standard, but manufacturing industry (Coded by C) is divided into ten subindustries, labeled with the second industry code. No serious clustering phenomenon exists except for C4 and C7. Nevertheless, all reported *t*-(*z*-) statistics are based on standard errors adjusted for clustering at firm and year level (Petersen, 2009).

Data source

Data sources of variables are reported as below (see Appendix 1): First, the data on corporate greenwashing (GW) are calculated on the basis of hand-collected data on environmental performance by checking annual reports, CSR reports, and corporate official websites (Clarkson, Li, Richardson, & Vasvari, 2008; Du et al., 2014, 2016; GRI, 2006). Second, the data on divorce–marriage ratio (DIV_MAR) are hand-collected from the official website of *CNBS* (http://www.stats.gov.cn/; China's National Bureau of Statistics). Third, we obtain the data on Marketization index (MKT) from Wang, Fan, and Hu (2019). Lastly, we obtain the data on control variables from *CSMAR* (China Stock Market and Accounting Research).

Corporate greenwashing (dependent variable)

In our study, the dependent variable is corporate greenwashing, labeled as GW. In prior literature, researchers employ two types of proxies for greenwashing (Du, 2015; Du et al., 2018; Laufer, 2003; Ramus & Montiel, 2005): (1) ex ante proxy; and (2) ex post proxy. Most extant studies identify greenwashing by ex post proxies such as sustainable ratings (Parguel et al., 2011) and the lists of greenwashing in the media (Du, 2015). However, a branch of very thin but growing literature has constructed ex ante proxy to measure greenwashing (e.g., Du et al., 2018).

Our measure of corporate greenwashing (GW) can borrow important support from Richardson (2006), who adopts similar approach to measure overinvestment. Referring to Du et al. (2018) and Richardson (2006), we construct ex ante proxies for greenwashing: First, we obtain original information from the annual reports, CSR reports, and official websites. Second, we calculate and hand-collect data on a firm's actual value of environmental performance (Appendix 3 and descriptive statistics) based on GRI (2006) and Clarkson et al. (2008). Third, by regressing Clarkson et al. (2008)'s model, we obtain the expected value of a firm's environmental performance (Appendix 2). Lastly, we define corporate greenwashing as the difference between

the actual value and the expected value of environmental performance if the former is less than the latter, and 0 otherwise.[3]

The divorce–marriage ratio (marital demography, independent variable)

Prior literature adopts three approaches to measure the marital demography (U.S. Bureau of the Census, 1996; Vandello & Cohen, 1999): (1) the divorce–marriage ratio (or the reverse scored), measured as the divorce rate at the province level divided by provincial marriage rate (× 100); (2) the crude divorce rate, computed as the ratio of the number of annual divorces per year to total population; and (3) the fine divorce rate, measured as the ratio of the number of divorces per year to the population of married women, excluding the number of young women below the legal age of marriage.

In this study, we adopt the divorce–marriage ratio (DIV_MAR) based on the first approach for main tests.[4] DIV_MAR is the proxy for marital demography, measured as the divorce rate divided by marriage rate at the province level (U.S. Bureau of the Census, 1996; Vandello & Cohen, 1999). If the coefficient on DIV_MAR is positive and significant, H1 is supported.

China's Environmental Protection Law (moderating variable)

In this study, the moderating variable is CEPL. CEPL is an indicator variable, equaling 1 for years of 2015 and after and 0 otherwise. Thus, a significantly negative coefficient on DIV_MAR × CEPL is consistent with H2.

Control variables

To identify the incremental effect of the divorce–marriage ratio on corporate greenwashing, we refer to Clarkson et al. (2008), Kumar (2020), and Du et al. (2018) to include a set of control variables into regressions (see Appendix 1 for variable definitions). First, to isolate the impacts of governance mechanisms on greenwashing, blockholder ownership (BLOCK), institutional ownership (INST), managerial ownership (MAN_SHR), the indicator for CEO-chairman duality (DUAL), the ratio of independent directors (INDR), and board size (BOARD) are incorporated into the regression model.

Second, firm-specific financial characteristics such as firm size (SIZE), liability-to-equity ratio (LTE), the ratio of cash flow from operating activity (CFO), corporate growth opportunity (TOBIN'Q), financing activities (FIN), capital intensity (CAPIN), a firm's stock price volatility (VOL) and an indicator for state-owned enterprises (STATE) are included in the regression model. By doing so, the influence of firm-specific financial characteristics on greenwashing can be isolated to some extent.

Third, two macrolevel factors – marketization index (MKT) and GDP per capita at the province level (GDP_PC) – are controlled in the regression model, referring to Du et al. (2018).

Lastly, we include a set of dummies to control for fixed effects of industry and year.

Results
Descriptive statistics

Table 1 reports results of descriptive statistics. The mean value of GW is 1.4300, revealing that the actual value is 1.43 less than the expected value on average with regard to corporate

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[3]We also develop five variables for robustness checks: (1) GW_DUM: the likelihood of GW; (2) LN (1+GW), which obeys the normal distribution; (3) GW_RANK: the ordinal variable of GW; (4) GW_DU: an indicator for greenwashing following Du et al. (2018); and (5) CEP: corporate environmental performance based on GRI (2006), Clarkson et al. (2008) and Du et al. (2014).

[4]We also directly use the crude divorce rate at the province level as the explanatory variable for robustness checks.

environmental performance. Referring to GW_DUM (the dummy variable of GW), the actual value of environmental performance is less than the expected value for about 61% of firms – a considerable proportion, suggesting that corporate greenwashing widely exists in China. The mean value of DIV_MAR is 30.9885, implying that the divorce rate accounts for almost 31% of marriage rate at the province level.[5] Such a high divorce–marriage ratio reveals that unstable marital status is prevalent in contemporary China. The mean value of CEPL is .3775, displaying the sample distribution during 2008–2017 (given that CEPL has been implemented since 2015).

As for control variables, on average and approximately, blockholder ownership (BLOCK) is 34.78%, institutional ownership (INST) accounts for 24.58%, managerial ownership (MAN_SHR) reaches 10.32%, CEO-chairman duality (DUAL) exists in 23.20% of sample firms, the percentage of independent directors on corporate boards (INDR) is 37.23%, the board of directors (BOARD) consists of eight to nine directors ($e^{2.1509}$), the asset scale of the sample firms (SIZE) is 3.69 billion Yuan (RMB), liability-to-equity ratio (LTE) is 1.3309, operating cash flow ratio (CFO) is 4.90%, corporate growth opportunity (TOBIN'Q) is 2.2466, the ratio of financing (FIN) in the year is .2875, capital intensity ratio (CAPIN) is 12.33%, a firm's price volatility (VOL) accounts for 5.17%, 41.16% of sample firms are state-owned enterprises (STATE), marketization index at the province level (MKT) is 9.0026, and provincial GDP per capita (GDP_PC) is 53.64 thousand Yuan (RMB; $e^{10.8900}$), respectively.

Pearson correlation analyses

In Table 2, the correlation coefficient between GW and DIV_MAR is positive and significant, suggesting the positive effect of the divorce–marriage ratio on greenwashing and lending preliminary support to H1. Moreover, the negative correlation between CEPL and GW, as well as the significantly positive correlation between CEPL and DIV_MAR, urges our study to address the interactive effect between the divorce–marriage ratio and CEPL on greenwashing.

Moreover, there are positive and significant correlations between GW and BLOCK, INST, BOARD, SIZE, LTE, CFO, FIN, CAPIN, and STATE, while GW is significantly negatively correlated with MAN_SHR, DUAL, TOBIN'Q, VOL, MKT, and GDP_PC. Moreover, almost all correlations among control variables are relatively low (<.30), implying that multicollinearity may not be serious when our models include them simultaneously.

Multivariate tests of H1 and H2: main findings

Table 3 reports the step-by-step regression results of H1 and H2. As shown in the antepenultimate line, Pseudo R^2 for each regression model is significant. In addition, the last line reveals incremental explanatory power between nearby models (see Δ Pseudo R^2). Furthermore, all reported *t*-statistics are based on standard errors adjusted for clustering at the firm and year level (Petersen, 2009).

Column (1) of Table 3 reports the effects of all control variables on corporate greenwashing. As column (1) reveals, managerial ownership (MAN_SHR), the ratio of independent directors (INDR), board size (BOARD), and liability-to-equity ratio (LTE) can mitigate a firm's greenwashing to some extent. However, firm size (SIZE), operating cash flow (CFO) and growth opportunity (TOBIN'Q) are found to be significantly positively associated with corporate greenwashing.

Column (2) reports results of H1 by adding the main explanatory variable (DIV_MAR) into the regression model. In column (2), the coefficient on DIV_MAR is positive and significant at the 1% level (.0129 with *t* = 3.70), implying the positive effect of the divorce–marriage ratio on corporate greenwashing. In addition, higher divorce–marriage ratio in China is closely associated with stronger

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[5]Moreover, in Figures 1(a) and (b), the change in the divorce–marriage ratio (the divorce rate) since 1985 (1987) is outlined – especially, the shaded part for our sample period (2008–2017). Furthermore, Figures 1(c) and (d) outline the divorce–marriage ratio (the divorce rate) in 2017 at the province level, and further Figures 1(e) and (f) display the average divorce–marriage ratio (the divorce rate) during our sample period (2008–2017) at the province level.

Table 1. Descriptive statistics

Variable	N	Mean	SD	Min	25%	Median	75%	MAX
Descriptive statistics of variables used in main tests								
GW	21,628	1.4300	1.7074	0	0	.8030	2.4735	12.4258
DIV_MAR (%)	21,628	30.9885	12.3744	7.1800	20.4500	28.3800	38.8400	68.9700
CEPL	21,628	.3775	.4848	0	0	0	1	1
BLOCK	21,628	.3478	.1548	.0017	.2277	.3293	.4538	.7702
INST	21,628	.2458	.2305	.0000	.0538	.1659	.3977	.9917
MAN_SHR	21,628	.1032	.1840	.0000	.0000	.0002	.1211	.7042
DUAL	21,628	.2320	.4221	0	0	0	0	1
INDR	21,628	.3723	.0539	.2500	.3333	.3333	.4167	.7500
BOARD	21,628	2.1509	.2041	1.0986	2.0794	2.1972	2.1972	2.7081
SIZE	21,628	22.0278	1.3077	18.2636	21.1081	21.8623	22.7610	27.2732
LTE	21,628	1.3309	1.7613	.0071	.3933	.8120	1.5998	16.2147
CFO	21,628	.0490	.0980	-.3826	.0015	.0470	.0977	.6257
TOBIN'Q	21,628	2.2466	1.6726	.8847	1.2995	1.7239	2.5359	17.8865
FIN	21,628	.2875	.3305	.0000	.0544	.2130	.4107	3.6520
CAPIN	21,628	.1233	.1700	.0002	.0250	.0658	.1491	1.2531
VOL	21,628	.0517	.0220	.0160	.0371	.0472	.0611	.2263
STATE	21,628	.4116	.4921	0	0	0	1	1
MKT	21,628	9.0026	2.0197	-.72	7.4	9.55	10.86	11.71
GDP_PC	21,628	10.8900	.4971	9.1957	10.5691	10.9707	11.2599	11.7675

Descriptive statistics of variables for robustness, endogeneity, and additional tests (checks)

DIV (%)	21,628	2.5062	.8511	.4200	1.9300	2.3700	2.9300	5.2000
GW_DUM	21,628	.6100	.4878	0	0	1	1	1
LN (1 + GW)	21,628	.6643	.6573	0	0	.5895	1.2452	2.5972
GW_RANK	21,628	5.1243	4.2311	0	0	7	9	10
GW_DU	21,628	.1576	.3643	0	0	0	0	1
CEP	21,628	3.5259	4.8572	0	0	2	5	44
FAMILY	21,628	3.1145	.3713	2.4200	2.8100	3.0950	3.3900	4.1700

Note: All the variables are defined in Appendix 1.

Table 2. Pearson correlation analyses

Variable		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
GW	(1)	1.0000																		
DIV_MAR (%)	(2)	.0310 (<.0001)	1.0000																	
CEPL	(3)	−.0071 (.2943)	.5433 (<.0001)	1.0000																
BLOCK	(4)	.0847 (<.0001)	−.0413 (<.0001)	−.1117 (<.0001)	1.0000															
INST	(5)	.0626 (<.0001)	.2964 (<.0001)	.4102 (<.0001)	.0664 (<.0001)	1.0000														
MAN_SHR	(6)	−.1145 (<.0001)	.0266 (.0001)	.0884 (<.0001)	−.1066 (<.0001)	−.2308 (<.0001)	1.0000													
DUAL	(7)	−.0476 (<.0001)	.0230 (.0007)	.0639 (<.0001)	−.0584 (<.0001)	−.0278 (<.0001)	.2468 (<.0001)	1.0000												
INDR	(8)	−.0066 (.3340)	.0296 (<.0001)	.0608 (<.0001)	.0303 (<.0001)	.0037 (.5893)	.0766 (<.0001)	.0953 (<.0001)	1.0000											
BOARD	(9)	.0531 (<.0001)	−.0642 (<.0001)	−.1081 (<.0001)	.0384 (<.0001)	.0515 (<.0001)	−.1818 (<.0001)	−.1701 (<.0001)	−.4773 (<.0001)	1.0000										
SIZE	(10)	.2569 (<.0001)	.1614 (<.0001)	.1588 (<.0001)	.2331 (<.0001)	.2576 (<.0001)	−.2535 (<.0001)	−.1478 (<.0001)	.0228 (.0008)	.2531 (<.0001)	1.0000									
LTE	(11)	.0238 (.0005)	−.0197 (.0037)	−.0604 (<.0001)	.0359 (<.0001)	−.0081 (.2341)	−.2169 (<.0001)	−.0895 (<.0001)	−.0095 (.1639)	.0844 (<.0001)	.2506 (<.0001)	1.0000								
CFO	(12)	.0757 (<.0001)	−.0347 (<.0001)	−.0020 (.7700)	.0860 (<.0001)	.0670 (<.0001)	−.0136 (.0448)	−.0196 (.0039)	−.0282 (<.0001)	.0583 (<.0001)	.0538 (<.0001)	−.1432 (<.0001)	1.0000							
TOBIN'Q	(13)	−.0997 (<.0001)	.0655 (<.0001)	.1851 (<.0001)	−.1566 (<.0001)	.0218 (.0013)	.0018 (.7968)	.0673 (<.0001)	.0598 (<.0001)	−.1526 (<.0001)	−.4294 (<.0001)	−.0855 (<.0001)	.0381 (<.0001)	1.0000						
FIN	(14)	.0437 (<.0001)	−.0310 (.0011)	.0056 (.4070)	.0254 (.0002)	.0392 (<.0001)	−.0702 (<.0001)	−.0088 (.1958)	−.0020 (.7635)	.0368 (<.0001)	.2205 (<.0001)	.2142 (<.0001)	−.0758 (<.0001)	−.1649 (<.0001)	1.0000					
CAPIN	(15)	.0296 (<.0001)	−.0651 (<.0001)	−.0766 (<.0001)	−.0156 (.0221)	−.0011 (.8754)	.0611 (<.0001)	.0436 (<.0001)	−.0048 (.4787)	.0364 (<.0001)	−.0036 (.5973)	−.0618 (<.0001)	.0479 (<.0001)	−.0413 (<.0001)	.0843 (<.0001)	1.0000				
VOL	(16)	−.0780 (<.0001)	−.0011 (.8758)	.1816 (<.0001)	−.0199 (.0034)	−.0610 (<.0001)	.0675 (<.0001)	.0439 (<.0001)	.0366 (<.0001)	−.0967 (<.0001)	−.1515 (<.0001)	.0249 (.0003)	.0064 (.3437)	.3291 (<.0001)	.0889 (<.0001)	−.0326 (<.0001)	1.0000			
STATE	(17)	.0867 (<.0001)	−.0221 (.0011)	−.1054 (<.0001)	.2182 (<.0001)	.0954 (<.0001)	−.4508 (<.0001)	−.2725 (<.0001)	−.0598 (<.0001)	.2491 (<.0001)	.2952 (<.0001)	.1888 (<.0001)	.0312 (<.0001)	−.1522 (<.0001)	.0057 (.4000)	−.0352 (<.0001)	−.0861 (<.0001)	1.0000		
MKT	(18)	−.0775 (<.0001)	.0587 (<.0001)	−.0652 (<.0001)	.0258 (.0001)	−.0657 (<.0001)	.1620 (<.0001)	.0991 (<.0001)	−.0060 (.3813)	−.0571 (<.0001)	−.0320 (<.0001)	−.0954 (<.0001)	−.0014 (.8331)	−.0038 (.5747)	−.0019 (.7849)	−.0604 (<.0001)	.0176 (.0096)	−.1689 (<.0001)	1.0000	
GDP_PC	(19)	−.0357 (<.0001)	.5555 (<.0001)	.4049 (<.0001)	−.0152 (.0255)	.1841 (<.0001)	.1798 (<.0001)	.1060 (<.0001)	.0430 (<.0001)	−.1069 (<.0001)	.1338 (<.0001)	−.0937 (<.0001)	−.0428 (<.0001)	.0573 (<.0001)	−.0365 (<.0001)	−.0851 (<.0001)	−.0140 (.0397)	−.1763 (<.0001)	.6506 (<.0001)	1.0000

Note: p value is presented in parentheses. All the variables are defined in Appendix 1.

Table 3. Regression results of greenwashing on divorce demography, environmental law, and other determinants

| | Dependent variable: GW | | | | | | | |
| | (1) | | (2) | | (3) | | (4) | |
Variable	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
DIV_MAR			.0129***	3.70	.0127***	3.62	.0189***	4.07
CEPL					−.4078***	−3.72	−.4651***	−4.18
DIV_MAR × CEPL							−.0117***	−3.87
BLOCK	.1733	.60	.1700	.60	.1482	.51	.1436	.50
INST	−.1118	−.90	−.1104	−.88	−.1097	−.60	−.1019	−.56
MAN_SHR	−.9254***	−5.52	−.8971***	−5.34	−.8553***	−3.29	−.8448***	−5.02
DUAL	.0027	.05	.0047	.08	.0078	.13	.0067	.11
INDR	−1.4696**	−2.13	−1.4530**	−2.09	−1.4541**	−1.98	−1.4453**	−1.97
BOARD	−.6893***	−3.67	−.6889***	−3.68	−.7014***	−3.74	−.7025***	−3.75
SIZE	.4997***	11.74	.5001***	11.76	.5165***	11.58	.5165***	11.58
LTE	−.0704***	−4.52	−.0712***	−4.58	−.0730***	−4.69	−.0727***	−4.67
CFO	.8013**	2.55	.8137***	2.60	.7949***	2.71	.7903***	2.71
TOBIN'Q	.0260*	1.65	.0266*	1.69	.0390**	2.33	.0383**	2.29
FIN	−.0526	−.84	−.0473	−.76	−.0478	−.76	−.0503	−.80
CAPIN	.1185	.81	.1120	.77	.0922	.63	.0837	.57
VOL	−1.3139	−.56	−1.3022	−.57	−.8227	−.37	−.8926	−.40
STATE	−.0395	−.29	−.0516	−.38	−.0681	−.89	−.0678	−.88
MKT	−.0344	−1.38	−.0023	−.09	−.0252	−.85	−.0217	−.73
GDP_PC	−.0513	−.45	−.2972**	−2.39	−.1618	−1.05	−.1791	−1.16
Constant	−7.7650***	−5.89	−5.8182***	−4.30	−7.1855***	−4.21	−7.1693***	−4.20
Industry and Year	Controlled		Controlled		Controlled		Controlled	

(Continued)

Table 3. (*Continued.*)

Variable	Dependent variable: GW							
	(1)		(2)		(3)		(4)	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Observations	21,628		21,628		21,628		21,628	
Pseudo R^2	.0238		.0243		.0245		.0247	
LR(p value)	1,798.38***(<.0001)		1,839.04***(<.0001)		1,854.19***(<.0001)		1,865.30***(<.0001)	
Δ Pseudo R^2			40.65***		15.15***		11.11***	

Note: ***, **, and * represent the 1, 5, and 10% levels of significance, respectively, for a two-tailed test. All reported *t*-statistics are based on the robust standard errors clustering at firm and year level. All the variables are defined in Appendix 1.

individualistic social atmosphere, lower conformity to social norms, and more unfavorable attitude towards environmental conservation – they foster each other, imperceptibly affect individual behavior and attitudes within the administrative jurisdiction (a province), abet firms to talk the talk rather than walk the walk, and thus foment corporate greenwashing. Furthermore, the coefficient estimation on DIV_MAR suggests that one-standard-deviation increase in the divorce–marriage ratio leads to about .1596 increase in greenwashing (GW), equaling about 11.16% of the mean value of GW. In this regard, this amount is both statistically and economically significant, providing strong support to H1.

In column (3), we further include the moderating variable –CEPL into the regression model. As shown in column (3), DIV_MAR still has a significantly positive coefficient, lending additional support to H1. Moreover, the coefficient on CEPL is negative and significant at the 1% level (−.4078 with $t = -3.72$), implying that CEPL can mitigate corporate greenwashing to some extent since its implementation in 2015.

Column (4) provides results of H2 after including DIV_MAR, CEPL and the interactive item of DIV_MAR × CEPL in the regression model simultaneously. DIV_MAR has a significantly positive coefficient, verifying H1 again. Similarly, as expected, CEPL has a significantly negative coefficient. More importantly, the coefficient on DIV_MAR × CEPL is negative and significant at the 1% level (−.0117 with $t = -3.87$), suggesting that CEPL attenuates the positive association between the divorce–marriage ratio and greenwashing. Moreover, the coefficient estimation on DIV_MAR × CEPL reveals that the positive effect of the divorce–marriage ratio on greenwashing has been attenuated by about 61.90% since the implementation of CEPL in 2015. Above results, taken together, lend strong and important support to H2.

Using the scatter diagram, Figure 2a (2c) outlines the relation between annual (the mean value of) divorce–marriage ratio and the annual mean value of greenwashing for all listed firms in a province. As shown in Figure 2a (2c), there exits an obvious and positive relation between the divorce–marriage ratio and greenwashing. Similarly, in Figure 2b (2d), we replace the divorce–marriage ratio by the divorce rate, and the obviously positive effect of the divorce ratio on greenwashing can be still observed.

Figure 3 displays the moderating effect of CEPL on the relation between the divorce–marriage ratio (DIV_MAR) and corporate greenwashing (GW). The blue, red, and yellow lines denote the effect of DIV_MAR on a firm's greenwashing for the full sample, the CEPL subsample (CEPL = 1), and the non-CEPL subsample, respectively. In Figure 3, it is clear that the positive relation between DIV_MAR and GW is less pronounced for the CEPL subsample (the red line) than for the non-CEPL subsample (the yellow line), which provides additional support to H2.

Robustness checks of H1 and H2 using the divorce rate as the proxy for marital demography

In Table 4, we employ the divorce rate (DIV) at the province level to conduct robustness checks. As shown in column (2) of Table 4, DIV has a positive and significant coefficient (.1379 with $t = 3.14$), validating H1 again. In addition, in column (4), the coefficient on DIV × CEPL is negative and significant (−.0707 with $t = -1.90$), consistent with H2.

Robustness checks of H1 and H2 using other proxies for corporate greenwashing

In Panels A–E of Table 5, we successively adopt five alternative proxies for greenwashing as dependent variables to retest H1 and H2: (1) GW_DUM, equaling 1 if a firm's actual value of environmental performance is less than the expected value and 0 otherwise. (2) LN (1 + GW), measured as the natural logarithm of (1 + greenwashing). (3) GW_RANK, the rank of GW. Specifically, the positive values of GW are divided into ten groups from low to high by year (GW_RANK is defined as 0 when GW equals to 0), the first, second, …, tenth groups are ranked
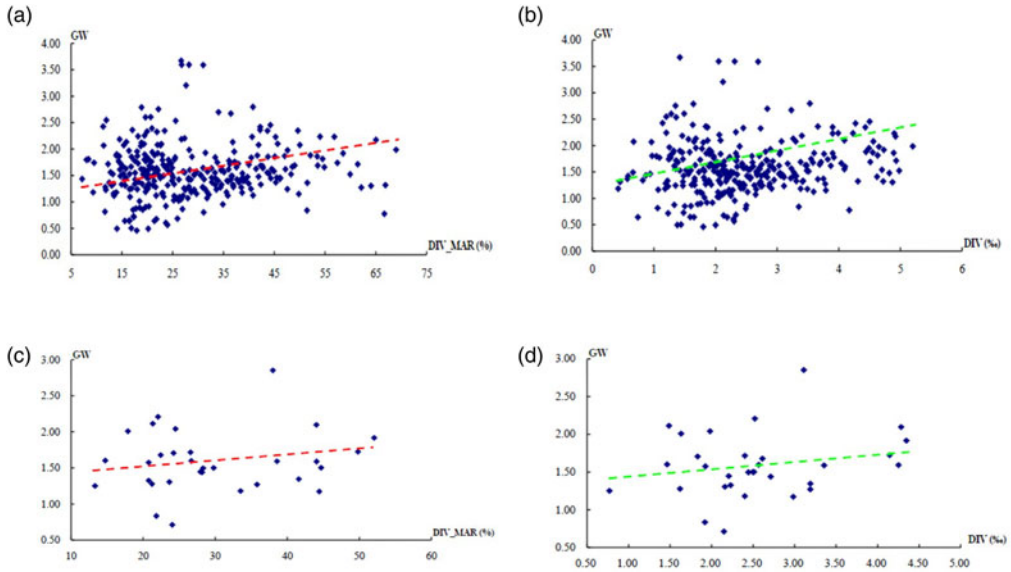
Figure 2. The scatter diagram about the relation between marital demography and provincial greenwashing, (a): the scatter diagram about the relation between annual divorce–marriage ratio (%) and the annual mean value of greenwashing (GW) for all listed firms in a province, (b): the scatter diagram about the relation between annual divorce rate (‰) and the annual mean value of greenwashing (GW) for all listed firms in a province, (c): the scatter diagram about the relation between the mean value of the divorce–marriage ratio (%) and the mean value of greenwashing (GW) for all listed firms in a province, (d): the scatter diagram about the relation between the mean value of the divorce rate (‰) and the mean value of greenwashing (GW) for all listed firms in a province.
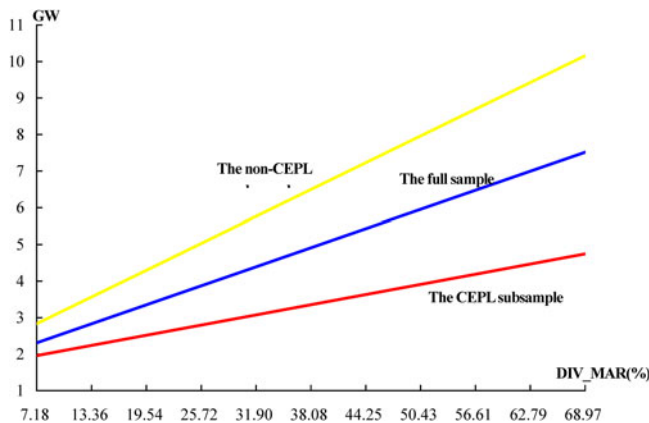
Figure 3. The moderating effect of China's Environmental Protection Law (CEPL) on the relation between the divorce–marriage ratio (DIV_MAR) and corporate greenwashing (GW). *Note:* In the figure, the blue line, the red line and the yellow line denote the effect of the divorce–marriage ratio (DIV_MAR) on corporate greenwashing (GW) for the full sample, the CEPL subsample, and the non-CEPL subsample, respectively.

as 1, 2, …, and 10, respectively; (4) GW_DU, an indicator variable for greenwashing following Du et al. (2018); (5) CEP – a firm's environmental performance, which is computed following Clarkson et al. (2008) and GRI (2006).

Table 4. Robustness checks using the divorce rate as the proxy for marital demography

| | Dependent variable: GW | | | | | | | |
| | (1) | | (2) | | (3) | | (4) | |
Variable	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
DIV			.1379***	3.14	.1460***	3.30	.1794***	3.25
CEPL					−.4724***	−4.27	−.3018*	−1.80
DIV × CEPL							−.0707*	−1.90
BLOCK	.1733	.60	.1711	.60	.1456	.50	.1457	.50
INST	−.1118	−.90	−.1190	−.95	−.1186	−.65	−.1152	−.92
MAN_SHR	−.9254***	−5.52	−.9183***	−5.48	−.8689***	−3.44	−.8643***	−5.15
DUAL	.0027	.05	.0019	.03	.0055	.09	.0045	.08
INDR	−1.4696**	−2.13	−1.4416**	−2.08	−1.4408**	−1.98	−1.4348**	−1.97
BOARD	−.6893***	−3.67	−.6850***	−3.65	−.6991***	−3.73	−.6990***	−3.73
SIZE	.4997***	11.74	.4986***	11.72	.5174***	11.60	.5177***	11.61
LTE	−.0704***	−4.52	−.0716***	−4.60	−.0737***	−4.74	−.0737***	−4.74
CFO	.8013**	2.55	.8134***	2.61	.7926***	2.73	.7887***	2.72
TOBIN'Q	.0260*	1.65	.0271*	1.72	.0416**	2.48	.0412**	2.46
FIN	−.0526	−.84	−.0489	−.78	−.0492	−.78	−.0507	−.81
CAPIN	.1185	.81	.1118	.77	.0883	.61	.0848	.58
VOL	−1.3139	−.56	−1.3213	−.56	−.7660	−.34	−.7913	−.35
STATE	−.0395	−.29	−.0409	−.30	−.0604	−.79	−.0594	−.77
MKT	−.0344	−1.38	.0009	.03	−.0228	−.76	−.0202	−.67
GDP_PC	−.0513	−.45	−.2116*	−1.73	−.0700	−.47	−.0788	−.53
Constant	−7.7650***	−5.89	−6.6957***	−4.94	−8.1711***	−4.85	−8.1724***	−4.85
Industry and year	Controlled		Controlled		Controlled		Controlled	

(Continued)

Table 4. (*Continued.*)

Variable	Dependent variable: GW							
	(1)		(2)		(3)		(4)	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Observations	21,628		21,628		21,628		21,628	
Pseudo R^2	.0238		.0242		.0245		.0245	
LR(p value)	1,798.38***(<.0001)		1,828.13***(<.0001)		1,848.37***(<.0001)		1,850.65***(<.0001)	
Δ Pseudo R^2			29.74***		20.24***		2.96*	

Note: ***, **, and * represent the 1, 5, and 10% levels of significance, respectively, for a two-tailed test. All reported t-statistics are based on the robust standard errors clustering at firm and year level. All the variables are defined in Appendix 1.

In column (2) of Panels A–D of Table 5 in which dependent variables are GW_DUM, LN (1 + GW), GW_RANK, and GW_DU, respectively, all the coefficients on DIV_MAR are positive and significant. In addition, in column (2) of Panel E in which the dependent variable is CEP, DIV_MAR has a significantly negative coefficient. Above results collectively lend strong evidence for H1.

In column (4) of Panels A–D of Table 5, the coefficients on DIV_MAR × CEPL are all negative and significant at the 1 or 5% level. Moreover, in column (4) of Panel E, DIV_MAR × CEPL has a positive and significant coefficient. Above results, taken together, provide additional support to H2.

Endogeneity and additional tests

Endogeneity tests using two-stage instrumental variable approach

Next, we adopt two-stage instrumental variable approach to mitigate the potential endogeneity between the divorce–marriage ratio and greenwashing. By doing so, the primary task is to identify the instrumental variable. Spanier (1984) suggests the negative relation between the number of household population and the likelihood of divorce. Whitehead (1998) argues that the divorce is less likely to happen in large-scale families. Referring to Spanier (1984) and Whitehead (1998), the average number of household population (FAMILY) can serve as the appropriate instrumental variable. FAMILY is predicted to be negatively related to the divorce– marriage ratio (DIV_MAR), but it is unlikely that household population affects a firm's greenwashing.

After including FAMILY and all control variables in the first-stage regression, we estimate the fitted value of the divorce–marriage ratio. In column (1) of Table 6, FAMILY is negatively and highly significantly associated with DIV_MAR (-17.5934 with $t = -10.21$), consistent with our prediction.

In the second-stage regressions, we further use the fitted value of the divorce–marriage ratio (i.e., DIV_MAR*) as the main explanatory variables. As shown in column (2) of Table 6, the coefficient on DIV_MAR* is positive and significant at the 1% level (.0139 with $t = 2.61$), authenticating H1 again. In addition, DIV_MAR* × CEPL has a negative and significant coefficient, validating H2.

Overall, after addressing the endogeneity, results in Table 6 suggest that our main findings are not qualitatively changed, and thus our conclusions are less likely to be changed by the endogeneity issue.

Additional tests using individual-level divorce data[6]

Next, we hand-collect individual-level divorce data (DIVORCE).[7] DIVORCE is an indicator, equaling 1 if a firm's CEO, top managers, or the controlling shareholder divorced in the year and 0 otherwise. During our sample period, we only obtain 40 firms with individual-level divorce, so we employ the propensity score matching approach, abide by the one-to-one principle, and adopt ' ± .001' as the threshold to match each DIVORCE (the treated firm) to only one non-DIVORCE (the matched firm). Blockholder ownership (BLOCK), CEO-chairman duality (DUAL), board size (BOARD), firm size (SIZE), financial leverage (LEV), and GDP_PC are chosen to conduct the first-stage matching process. Finally, we get a sample of 80 observations, including 40 treated firms and 40 matched firms.

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[6]Untabulated results show that: (1) the positive relation between the divorce–marriage ratio and greenwashing is more pronounced for firms in high polluting industries, in high competition industries, with lowly educated CEOs and with male CEOs than those in low pollution industries, in low competition industries, with highly educated CEOs and with female CEOs, respectively. (2) Our main findings are still valid for GW_HARD (a firm's greenwashing index based on hard environmental performance; Section A–D of Appendix 3), GW_SOFT (a firm's greenwashing index based on soft environmental performance; Section E–G), and GW^t (t=A, B, C, D, E, F, and G; a firm's greenwashing index based on environmental performance in Section t).

[7]Individual-level divorce data are hand-collected from the CNINFO database (http://www.cninfo.com.cn).

Table 5. Robustness checks using other proxies for greenwashing

Panel A: Robustness checks using the indicator of greenwashing (GW_DUM) as the dependent variable

| | Dependent variable: GW_DUM | | | | | | | |
| | (1) | | (2) | | (3) | | (4) | |
Variable	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
DIV_MAR			.0093***	3.00	.0092***	2.93	.0143***	3.58
CEPL					−.1524	−1.45	−.2029*	−1.79
DIV_MAR × CEPL							−.0097***	−2.98
Other control variables	Yes		Yes		Yes		Yes	
Constant	−1.0871	−1.10	.2959	.29	−.2294	−.16	−.2110	−.15
Industry and year	Controlled		Controlled		Controlled		Controlled	
Observations	21,628		21,628		21,628		21,628	
Pseudo R^2	.0091		.0101		.0102		.0106	
LR(p value)	261.98***(<.0001)		292.53***(<.0001)		295.72***(<.0001)		306.85***(<.0001)	
Δ Pseudo R^2			30.55***		3.18*		11.13***	

Panel B: Robustness checks using LN (1 + GW) as the dependent variable

| | Dependent variable: LN (1 + GW) | | | | | | | |
| | (1) | | (2) | | (3) | | (4) | |
Variable	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
DIV_MAR			.0033***	3.19	.0033***	3.07	.0049***	3.94
CEPL					−.0808**	−2.50	−.0966***	−2.85
DIV_MAR × CEPL							−.0031***	−2.91
Other control variables	Yes		Yes		Yes		Yes	

	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Constant	−1.2888***	−3.81	−.7923**	−2.31	−1.0675**	−2.33	−1.0630**	−2.30
Industry and Year	Controlled		Controlled		Controlled		Controlled	
Observations	21,628		21,628		21,628		21,628	
Adjusted R^2	.0733		.0751		.0754		.0759	
F(p value)	35.33***(<.0001)		35.46***(<.0001)		34.61***(<.0001)		34.27***(<.0001)	
Δ R^2			42.44***		9.52***		12.64***	

Panel C: Robustness checks using the rank of greenwashing (GW_RANK) as the dependent variable

	Dependent variable: GW_RANK							
	(1)		(2)		(3)		(4)	
Variable	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
DIV_MAR			.0330***	3.67	.0325***	3.61	.0504***	4.24
CEPL					−.8542***	−3.25	−1.0219***	−3.84
DIV_MAR × CEPL							−.0341***	−4.32
Other control variables	Yes		Yes		Yes		Yes	
Constant	−4.8369	−1.54	.1223	.04	−2.7780	−.68	−2.7324	−.67
Industry and year	Controlled		Controlled		Controlled		Controlled	
Observations	21,628		21,628		21,628		21,628	
Pseudo R^2	.0049		.0052		.0053		.0054	
LR(p value)	499.05***(<.0001)		535.35***(<.0001)		544.51***(<.0001)		557.40***(<.0001)	
Δ Pseudo R^2			36.30***		9.17***		12.89***	

(Continued)

Table 5. (*Continued.*)

Panel D: Robustness checks using an indicator of greenwashing following Du et al. (2018) as the dependent variable

	Dependent variable: GW_DU							
	(1)		(2)		(3)		(4)	
Variable	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
DIV_MAR			.0185*	1.85	.0182*	1.82	.0348***	2.58
CEPL					−.4623***	−3.41	−.6011***	−3.59
DIV_MAR × CEPL							−.0328**	−2.50
Other control variables	Yes		Yes		Yes		Yes	
Constant	−2.7080*	−1.92	.1192	.06	−1.3044	−.72	−1.3271	−.73
Industry and year	Controlled		Controlled		Controlled		Controlled	
Observations	21,628		21,628		21,628		21,628	
Pseudo R^2	.0496		.0533		.0540		.0577	
LR(p value)	935.42***(<.0001)		1,003.69***(<.0001)		1,017.11***(<.0001)		1,088.15***(<.0001)	
Δ Pseudo R^2			68.27***		13.41***		71.04***	

Panel E: Robustness checks using corporate environmental information transparency (CEP) as the dependent variable

| | Dependent variable: CEP | | | | | | | |
| | (1) | | (2) | | (3) | | (4) | |
Variable	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
DIV_MAR			−.0349***	−4.16	−.0366***	−4.35	−.0513***	−4.45
CEPL					2.0018***	5.93	1.1182***	2.79
DIV_MAR × CEPL							.0268***	3.48
Other control variables	Yes		Yes		Yes		Yes	
Constant	−54.3489***	−19.12	−60.0890***	−19.49	−54.4387***	−14.36	−54.5403***	−14.37
Industry and year	Controlled		Controlled		Controlled		Controlled	
Observations	21,628		21,628		21,628		21,628	
Pseudo R^2	.0635		.0640		.0645		.0646	
LR (p value)	6,861.69***(<.0001)		6,917.16***(<.0001)		6,973.74***(<.0001)		6,984.84***(<.0001)	
Δ Pseudo R^2			55.47***		56.57***		11.10***	

Note: ***, **, and * represent the 1, 5, and 10% levels of significance, respectively, for a two-tailed test. All reported *t*-statistics are based on the robust standard errors clustering at firm and year level. All the variables are defined in Appendix 1.

Table 6. Endogeneity tests using two-stage instrumental variable regression approach

Variable	Dependent variable: DIV_MAR (1)		Dependent variable: GW (2)		(3)		(4)	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
FAMILY	−17.5934***	−10.21						
DIV_MAR*			.0139***	2.61	.0134**	2.52	.0165***	2.61
CEPL					−.4081***	−3.72	−.4282***	−3.88
DIV_MAR* × CEPL							−.0064*	−1.84
BLOCK	−2.2107***	−2.74	.1713	.60	.1494	.51	.1468	.51
INST	2.9689**	2.56	−.1098	−.88	−.1092	−.59	−.1052	−.57
MAN_SHR	1.4469	1.28	−.8944***	−3.77	−.8531***	−3.12	−.8514***	−3.09
DUAL	.2127	1.15	.0055	.09	.0086	.15	.0083	.14
INDR	.8707	.51	−1.4465**	−2.05	−1.4481*	−1.94	−1.4437*	−1.93
BOARD	−1.2417**	−2.14	−.6863***	−3.66	−.6989***	−3.72	−.6988***	−3.72
SIZE	.2523	1.62	.4999***	11.75	.5163***	11.57	.5161***	11.56
LTE	.0137	.25	−.0714***	−4.59	−.0731***	−4.70	−.0731***	−4.70
CFO	−1.5459**	−2.30	.8156***	2.50	.7964***	2.59	.7931***	2.59
TOBIN'Q	.2130*	1.74	.0267*	1.69	.0391**	2.33	.0388**	2.31
FIN	−.1922	−.70	−.0463	−.74	−.0469	−.75	−.0482	−.77
CAPIN	−.0432	−.06	.1113	.76	.0916	.63	.0902	.62
VOL	−21.3497*	−1.92	−1.3114	−.56	−.8311	−.37	−.8424	−.37
STATE	−.2999	−.69	−.0516	−.68	−.0680	−.89	−.0683	−.89
MKT	−1.1209**	−2.28	−.0004	−.01	−.0238	−.78	−.0211	−.68
GDP_PC	9.6484***	4.05	−.3138**	−2.20	−.1745	−1.03	−.1952	−1.13
Constant	−6.0358	−.22	−5.6892***	−3.88	−7.0879***	−3.93	−6.9615***	−3.83

Industry and year	Controlled	Controlled	Controlled	Controlled
Observations	21,628	21,628	21,628	21,628
Adjusted R^2/Pseudo R^2	.7337	.0241	.0243	.0243
F/LR(p value)	1,249.45***(<.0001)	1,822.14***(<.0001)	1,837.29***(<.0001)	1,839.27***(<.0001)
Δ Pseudo R^2		23.75***	15.16***	3.78*

Note: ***, **, and * represent the 1, 5, and 10% levels of significance, respectively, for a two-tailed test. All reported *t*-statistics are based on the robust standard errors clustering at firm and year level. All the variables are defined in Appendix 1.

As Panel A shows, the differences in all chosen variables are significant between the DIVORCE subsample and the non-DIVORCE subsample. However, after conducting the PSM process, all the differences in chosen variables between the treatment sample and the control sample are insignificant. Above results, taken together, suggest that a fairly good work has been done.

As shown in column (2) of Panel B of Table 7, the coefficient on DIVORCE is positive and significant at the 1% level (.9623 with $t = 2.87$), consistent with H1 and suggesting that firms with the divorced CEO exhibit higher extent of greenwashing than their counterparts. In addition, in column (4) of Panel B, the coefficient on DIVORCE × CEPL is negative and significant (-2.0031 with $t = -2.24$), verifying H2 again. Overall, results using individual-level divorce data further support H1 and H2.

Discussion

Theoretical contributions

Our study makes several contributions as below. First, to our knowledge and literature in hand, our study is the first one to associate marital demography with corporate greenwashing. Prior literature has examined the determinants of greenwashing such as institutional, organizational, and individual drivers (Delmas & Burbano, 2011), institutional complexity and stakeholder pressures (Testa et al., 2018), social accountability (Laufer, 2003), environmental policy (De Vries et al., 2015; Ramus & Montiel, 2005), the globalization of environmental disclosure (Marquis & Toffel, 2011), and selective disclosure (Marquis, Toffel, & Zhou, 2016). Moreover, previous studies have focused on economic consequences of greenwashing such as financial performance (Walker & Wan, 2012), market reactions (Du, 2015), the moderating role in the relation between environmental performance, and modified audit opinions (Du et al., 2018). However, little is known about whether the marital demography or the matrimony status (divorce or marriage) can affect a firm's fulfilling environmental responsibility and involving in greenwashing by shaping the CEO's individual preference. To fill the above gap, this study focuses on the Chinese context to examine the effect of the marital demography on greenwashing. In this regard, our study contributes to prior literature on the determinants of corporate greenwashing.

Second, our study adds to the existing literature about the influence of macrolevel social culture on corporate decisions (e.g., Guiso, Sapienza, & Zingales, 2006; Stulz & Williamson, 2003). Previous studies have focused on country-specific culture to examine their impacts on corporate decisions. China has a vast territory in which social culture (e.g., marital demography) varies across provinces. In this regard, our findings on the basis of different provinces in mainland China can provide important supplement to prior literature about the association between cross-national cultures and corporate behavior.[8]

Third, our study contributes to prior literature on 'law and finance' (Graff, 2008; La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1998; Malmendier, 2009). It is well known that, the law and formal institutions have fallen short and legal enforcement has been relatively weak for a long time in China (Allen et al., 2005; Du et al., 2014). Consequently, informal systems play the substitutive role in economic growth (Allen et al., 2005) and corporate decisions (Du et al., 2014). Our study reveals that the continuous improvement of China's formal institutions (the environmental protection law) mitigates corporate greenwashing, and further weakens

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[8]Our study distinguishes itself from extant studies using individual-level divorce data (Christiansen et al., 2010; Gove et al., 1983; Neyland, 2016; Nicolosi & Yore, 2015). The individual-level divorce data captures CEO-specific marital status and its influence on corporate decisions. In comparison, the divorce–marriage ratio borrows important support from the community isomorphism (Bies et al., 2007; Gellers, 2012; Marquis et al., 2007) and the 'peer effect' (Bursztyn et al., 2014; Feld & Zölitz, 2017), emphasizing social culture embedded in the divorce–marriage ratio (divorce rate) – an informal institution – and its effects on individual belief and corporate decisions.

Table 7. Regression results of greenwashing on individual-specific divorce, environmental law, and other determinants

Panel A: *t*-tests about the differences between the treatment subsample and the control subsample

| | Full sample | | | | | | | Matched sample | | | | | |
| | DIVORCE = 1 [*N* = 40] | | DIVORCE = 0 [*N* = 16,872] | | | DIVORCE = 1 [*N* = 40] | | DIVORCE = 0 [*N* = 40] | | | | | |
Variable	Mean	SD	Mean	SD	*t*-test	Mean	SD	Mean	SD	*t*-test
BLOCK	.2757	.1491	.3467	.1549	−2.90***	.2757	.1491	.2873	.1241	−.38
DUAL	.4500	.5038	.2377	.4257	3.15***	.4500	.5038	.5000	.5064	−.44
BOARD	2.0911	.1664	2.1486	.2007	−1.81*	2.0911	.1664	2.0141	.2088	1.52
SIZE	21.7031	1.0895	22.0600	1.3088	−1.72*	21.7031	1.0895	21.6975	1.2846	.02
LEV	.7481	1.0358	1.3207	1.7639	−3.49***	.7481	1.0358	.6321	.5055	.64
GDP_PC	11.0808	.4452	10.9302	.4700	2.02**	11.0808	.4452	11.1457	.4164	−.67

(Continued)

Table 7. (*Continued.*)

Panel B: Regression results of the second stage of propensity score matching approach

| | Dependent variable: GW | | | | | | | |
| | (1) | | (2) | | (3) | | (4) | |
Variable	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
DIVORCE			.9623***	2.87	.9623***	2.87	2.4226***	3.52
CEPL					−1.0681*	−1.79	.5724	.65
DIVORCE × CEPL							−2.0031**	−2.24
BLOCK	1.9202	1.24	1.7757	1.16	1.7757	1.16	3.3405*	1.97
INST	−1.8353	−1.43	−2.1588	−1.67	−2.1588	−1.67	−3.3718**	−2.38
MAN_SHR	−.4302	−.34	−1.3260	−1.07	−1.3260	−1.07	−2.2391*	−1.79
DUAL	−.2715	−.67	.0550	.13	.0550	.13	.0877	.22
INDR	6.5001	1.38	3.9741	.84	3.9741	.84	4.4377	.97
BOARD	4.2475**	2.64	3.5377**	2.19	3.5377**	2.19	3.3226**	2.27
SIZE	.7543***	3.99	.7041***	4.20	.7041***	4.20	.8273***	4.75
LTE	.8060***	2.79	.6701**	2.66	.6701**	2.66	.4784*	1.88
CFO	−4.1728	−1.28	−2.4209	−.67	−2.4209	−.67	−3.7722	−1.06
TOBIN'Q	.1085	.82	.1083	.75	.1083	.75	.1646	1.14
FIN	.3608	.65	.3374	.60	.3374	.60	.3362	.62
CAPIN	−.4853	−.34	−1.7071	−1.14	−1.7071	−1.14	−1.8254	−1.27
VOL	−2.0596	−.19	−6.7119	−.65	−6.7119	−.65	−8.0810	−.86
STATE	−.2800	−.36	.3746	.46	.3746	.46	−.0568	−.07
MKT	−.0132	−.08	.0812	.48	.0812	.48	.1433	.78
GDP_PC	−.1289	−.15	−.3597	−.45	−.3597	−.45	−.1400	−.17
Constant	−27.1860***	−3.02	−21.9104**	−2.61	−20.8423**	−2.48	−27.7970***	−3.15

Industry and year	Controlled	Controlled	Controlled	Controlled
Observations	80	80	80	80
Pseudo R^2	.3148	.3401	.3401	.3636
LR(p value)	83.22***(<.0001)	89.90***(<.0001)	89.90***(<.0001)	96.10***(<.0001)
Δ Pseudo R^2		6.68***	2.80*	5.40**

Note: ***, **, and * represent the 1, 5, and 10% levels of significance, respectively, for a two-tailed test. All reported t-statistics are based on the robust standard errors clustering at firm and year level. All the variables are defined in Appendix 1.

the role of informal systems (marital demography). In this regard, our study provides strong evidence to the existing literature on 'law and finance'.

Fourth, we develop a new approach to construct ex ante proxies for corporate greenwashing on the basis of Delmas and Burbano (2011) and Du et al. (2018), contributing to prior literature on the measurement of greenwashing. Our approach provides important supplement to Du et al. (2018) by incorporating the whole environmental performance to compute the extent of greenwashing, as well as Delmas and Burbano (2011)'s four-classification method of identifying corporate greenwashing.

Lastly but not least, our study can extend prior literature about the impact of informal systems on corporate decisions (e.g., Vandello & Cohen, 1998, 1999) by validating that the impact of the marital demography as social culture (individualism or collectivism) on greenwashing depends on CEO- (industry-) specific characteristics. At a minimum, our findings reveal the interactive effect between cultural factors and CEO- (industry-) specific influencing factors on a firm's greenwashing behavior.

Managerial implications

Our study has several managerial implications as below: First, our findings suggest that firms within a region (province) with higher divorce–marriage ratio may just talk the talk – do not fulfill their environmental responsibilities – rather than walk the walk. Given the relation between the marital demography and individualistic social atmosphere, the positive effect of marital demography (the divorce–marriage ratio) on corporate greenwashing can urge the regulatory bodies (e.g., the Ministry of Environmental Protection; the State-owned Assets Supervision and Administration Commission; CSRC; Shanghai Stock Exchange; Shenzhen Stock Exchange), stakeholders in the supply chain (e.g., upstream suppliers and downstream customers), and the public to pay special attention to greenwashing behavior and environmental conservation of enterprises located in provinces with increasingly divorce–marriage ratio.

Second, the positive association between the divorce–marriage ratio and a firm's greenwashing depends on industry-specific and CEO-specific characteristics, which motivates the regulatory bodies to further limit the scope of regulated firms due to environmental conservation and greenwashing behavior. Especially, the regulatory bodies should be paid close attention to firms in regions with higher divorce–marriage ratio and in high polluting (and/or competition) industries, as well as firms in provinces with higher unstable marital status and with lowly educated CEOs (and/or male CEOs), which are closely associated with higher extent (likelihood) of greenwashing behavior.

Lastly, compared with western countries, environmental consciousness and legislation in China are still in the infancy, and thus environmental regulations and laws have fallen behind the deteriorating natural environment. Even worse, when some enterprises are deeply involved in controversial environmental issue, they try to cover up their environmentally unfriendly behavior by greenwashing. In this regard, the reduction effect of the environmental protection law on corporate greenwashing, as well as the mitigating effect of the environmental protection law on the positive relation between the divorce–marriage ratio and corporate greenwashing, suggests that China's legislative and regulatory bodies (e.g., National People's Congress and CSRC) should formulate and implement laws and regulations related with environmental conservation to strengthen corporate environmental consciousness and responsibility and further to mitigate corporate greenwashing.

Limitations and future directions

Our study has three limitations that can be addressed in future research. First, in our study, marital demography at the province level is employed to examine the effect of the divorce–marriage ratio on corporate greenwashing. Also, individual-level divorce data are adopted to conduct additional test to ensure that our findings are robust. In this regard, future research can further address the concern about whether and how marital status of CEO or top managers leads to

corporate greenwashing. Second, our study focuses on the Chinese context, so it should be very cautious to generalize our conclusions to other contexts. The marriage and divorce in China must be registered according to the Marriage Law (the Codified Law), which is very different from those in western countries. As a result, the differences in the commitment and responsibility to the matrimony, combined with individualistic (collectivistic) social cultures, may result in different divorce–marriage ratio. Third, in this study, we employ marital demography as the proxy for individualism in the Chinese society and examine its impact on corporate greenwashing. However, as a matter of fact, Confucianism is a multidimensional concept (Du, 2021), and it is interesting and useful to investigate business practices and their connection with local culture and history. In this regard, it is a pending and important issue to further investigate how culture in China is becoming individualistic and then how individualism affects corporate behavior including corporate greenwashing.[9] Lastly, we call on future research to focus on the international setting and use cross-national data to examine whether the effect of the divorce–marriage ratio on corporate greenwashing is similar or different across countries.

Conclusion

This study examines the relation between marital demography, proxied by the divorce–marriage ratio, and a firm's greenwashing behavior, and further investigates the moderating effect of CEPL. The findings reveal the positive effect of the divorce–marriage ratio on corporate greenwashing, and further above effect is weakened by CEPL. Our findings are robust to a variety of alternative proxies for marital demography and corporate greenwashing, and our conclusions are valid after controlling for the endogeneity issue. In addition, the positive effect of the divorce–marriage ratio on greenwashing is more pronounced for firms in high polluting industries, in high competition industries, with lowly educated CEOs and with male CEOs.

Conflict of interest. All the authors declare that they have no conflict of interest.

Ethical standards. This article does not contain any studies with human participants or animals performed by any of the authors.

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[9]Untabulated results show that Confucian culture as a whole can mitigate corporate greenwashing. Specific to different dimensions of Confucianism, seniority ranking among directors on corporate boards, CEO-chairman hometown connectedness, and CEO-chairman dialect sharing can significantly mitigate corporate greenwashing, but CEO-director surname connectedness cannot significantly affect corporate greenwashing.

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Appendix 1: Variable definitions

Variable		Definition	Data source
GW	=	A firm's greenwashing index following Du et al. (2018). First, we follow the Sustainability Reporting Guidelines (GRI, 2006), Clarkson et al. (2008) and Du et al. (2018) to hand-collected and compute the actual score of a firm's environmental performance. Second, by regressing Clarkson et al. (2008)'s model, we obtain the expected value of a firm's environmental performance. Lastly, we define GW as the difference between the actual score of a firm's environmental performance and the expected value of a firm's environmental performance if the former is less than the latter, and 0 otherwise.	Hand-collected and calculated
DIV_MAR (%)	=	Divorce demography or the frequency of marriage and divorce, measured as divorce rate at the province level divided by provincial marriage rate (×100).	*CNBS*
CEPL	=	A dummy variable for China's Environmental Protection Law, equaling 1 for years of 2015 and after and 0 otherwise.	CSMAR
BLOCK	=	The percentage of shares held by the controlling shareholders.	CSMAR
INST	=	Institutional ownership, measured as the percentage of shares held by institutional investors.	CSMAR
MAN_SHR	=	Managerial ownership, measured as the percentage of shares held by top managers.	CSMAR
DUAL	=	A dummy variable for CEO-chairman duality, equaling 1 if the CEO serves as the Chairman of the board of directors and 0 otherwise.	CSMAR
INDR	=	The ratio of independent directors, measured as the number of independent directors scaled by the total number of directors on corporate boards.	CSMAR
BOARD	=	Board size, measured as the natural logarithm of the total number of directors in the boardroom.	CSMAR
SIZE	=	Firm size, measured as the natural logarithm of a firm's total assets.	CSMAR
LTE	=	Liability-to-equity ratio, measured as the total liabilities scaled by the total equities.	CSMAR
CFO	=	The ratio of cash flow, measured as the amount of cash flow from the operating activities scaled by total assets at the beginning of the year.	CSMAR
TOBIN'Q	=	Corporate growth opportunity, measured as the total market value of a firm's equity scaled by the total book value of a firm's equity.	CSMAR
FIN	=	The amount of cash flow from financing activities (equity capital and debt) scaled by total assets at the beginning of the year (Clarkson et al., 2008).	CSMAR
CAPIN	=	Capital intensity, measured as capital spending (fixed assets, intangible assets, and other long-term assets) scaled by sales revenue in the year (Clarkson et al., 2008).	CSMAR
VOL	=	Stock price volatility, computed as the standard deviation of market adjusted weekly stock return (Clarkson et al., 2008).	CSMAR

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Variable		Definition	Data source
STATE	=	An indicator variable, equaling 1 for state-owned enterprises and 0 otherwise.	CSMAR
MKT	=	Marketization index at the province level.	Wang et al. (2019)
GDP_PC	=	The natural logarithm of GDP per capita at the province level.	CSMAR
DIV	=	Divorce rate, measured as the ratio of the number of annual divorces to total population (×100).	*CNBS*
GW_DUM	=	A dummy variable, equaling 1 if the actual value is less than the expected value with regard to a firm's environmental performance and 0 otherwise.	Hand-collected
LN (1 + GW)	=	The natural logarithm of (1 + greenwashing).	Hand-collected
GW_RANK	=	The rank of GW. Specifically, the positive values of GW are divided into ten groups from low to high by year (When GW equals 0, then GW_RANK is defined as 0), the first group ranks 1, the second group ranks 2,…, and the rank of the tenth group is 10.	Hand-collected
GW_DU	=	An indicator variable for greenwashing following Du et al. (2018).	Hand-collected
CEP	=	A firm's environmental performance on the basis of the sustainability reporting guidelines (Clarkson et al., 2008; Du et al., 2014; GRI, 2006).	Hand-collected
FAMILY	=	The mean value of the number of household population at the province level.	*CDESY*
DIVORCE	=	An indicator variable, equaling 1 if a firm's CEO, top managers, or the controlling shareholder divorced in the year and 0 otherwise.	Hand-collected

Note: CSMAR, China Stock Market and Accounting Research; *CNBS*, China's National Bureau of Statistics (http://www.stats.gov.cn/); *CDESY*, China Demographic and Employment Statistics Yearbook.

Appendix 2: The determinants of corporate environmental performance

	Dependent variable: CEP	
Variable	Coefficient	t-value
BLOCK	.8812*	1.84
SIZE	1.7388***	17.09
LTE	−.1993***	−6.58
CFO	1.0438**	2.02
TOBIN'Q	.2402***	5.72
FIN	−.5046***	−3.11
CAPIN	.0266	.09
VOL	−4.3433	−1.53
STATE	.2133	1.09
Constant	−35.5390***	−17.06
Industry and Year	Controlled	
Observations	21,628	
Adjusted R^2	.2556	
$F(p$ value)	127.67***(<.0001)	

Note: ***, **, and * represent the 1, 5, and 10% levels of significance, respectively, for a two-tailed test. All reported *t*-statistics are based on the robust standard errors clustering at firm and year level. All the variables are defined in Appendix 1.

Appendix 3: Descriptive statistics of corporate environmental performance based on the GRI Sustainability Reporting Guidelines

Descriptive statistics

Item	Mean	SD	Min	25%	Median	75%	Max
A: Governance structure and management systems (max score is 6)							
1. Existence of a department for pollution control and/or management positions for environment management (0–1)	.1078	.3102	0	0	0	0	1
2. Existence of an environmental and/or a public issues committee in the board (0–1)	.0077	.0873	0	0	0	0	1
3. Existence of terms and conditions applicable to suppliers and/or customers regarding environment practices	.0230	.1500	0	0	0	0	1
4. Stakeholder involvement in setting corporate environmental policies	.0051	.0711	0	0	0	0	1
5. Implementation of ISO14001 at the plant and/or firm level	.2407	.4275	0	0	0	0	1
6. Executive compensation is linked to environmental performance	.0148	.1207	0	0	0	0	1
Subtotal	.3991	.6840	0	0	0	1	5
B: Credibility (max score is 10)							
1. Adoption of GRI sustainability reporting guidelines or provision of a CERES report (0–1)	.2416	.4281	0	0	0	0	1
2. Independent verification/assurance about environmental information disclosed in the environmental performance report/ web	.0101	.0999	0	0	0	0	1
3. Periodic independent verifications/audits on environmental performance and/or systems (0–1)	.0299	.1704	0	0	0	0	1
4. Certification of environmental programs by independent agencies (0–1)	.0283	.1657	0	0	0	0	1
5. Product certification with respect to environmental impact (0–1)	.0389	.1933	0	0	0	0	1
6. External environmental performance awards and/or inclusion in a sustainability index (0–1)	.0674	.2507	0	0	0	0	1
7. Stakeholder involvement in the environmental disclosure process (0–1)	.0025	.0504	0	0	0	0	1
8. Participation in voluntary environmental initiatives endorsed by Ministry of Environmental Protection of China (0–1)	.0103	.1008	0	0	0	0	1
9. Participation in industry specific associations/initiatives to improve environmental practices (0–1)	.0069	.0830	0	0	0	0	1
10. Participation in other environmental organizations/association to improve environmental practices (if not awarded under B8 or B9)	.0099	.0990	0	0	0	0	1

	Mean	SD					Max
Subtotal	.4457	.8028	0	0	0	1	7
C: Environmental performance indicators (EPI) (max score is 60)							
1. EPI on energy use and/or energy efficiency (0–6)	.1937	.6393	0	0	0	0	5
2. EPI on water use and/or water use efficiency (0–6)	.1169	.4742	0	0	0	0	5
3. EPI on greenhouse gas emissions (0–6)	.0691	.3756	0	0	0	0	5
4. EPI on other air emissions (0–6)	.1426	.5389	0	0	0	0	5
5. EPI on TRI (land, water, air) (0–6)	.0651	.3788	0	0	0	0	4
6. EPI on other discharges, releases and/or spills (not TRI) (0–6)	.0505	.3266	0	0	0	0	5
7. EPI on waste generation and/or management (recycling, reuse, reducing, treatment and disposal) (0–6)	.1204	.4658	0	0	0	0	5
8. EPI on land and resources use, biodiversity and conservation (0–6)	.0305	.2322	0	0	0	0	4
9. EPI on environmental impacts of products and services (0–6)	.0064	.1136	0	0	0	0	4
10. EPI on compliance performance (e.g., exceedances, reportable incidents) (0–6)	.0275	.2196	0	0	0	0	4
Subtotal	.8227	2.2882	0	0	0	0	25
D: Environmental spending (max score is 3)							
1. Summary of dollar savings arising from environment initiatives to the company (0–1)	.0118	.1082	0	0	0	0	1
2. Amount spent on technologies, R& D and/or innovations to enhance environmental performance and/or efficiency (0–1)	.1729	.3782	0	0	0	0	1
3. Amount spent on fines related to environmental issues (0–1)	.0043	.0651	0	0	0	0	1
Subtotal	.1890	.4082	0	0	0	0	3
E: Vision and strategy claims (max score is 6)							
1. CEO statement on environmental performance in letter to shareholders and/or stakeholders (0–1)	.2400	.4271	0	0	0	0	1
2. A statement of corporate environmental policy, values and principles, environ. codes of conduct (0–1)	.4459	.4971	0	0	0	1	1
3. A statement about formal management systems regarding environmental risk and performance (0–1)	.0848	.2786	0	0	0	0	1
4. A statement that the firm undertakes periodic reviews and evaluations of its environment performance (0–1)	.0294	.1689	0	0	0	0	1

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Descriptive statistics

Item	Mean	SD	Min	25%	Median	75%	Max
5. A statement of measurable goals in terms of future environmental performance (if not awarded under A3) (0–1)	.0108	.1035	0	0	0	0	1
6. A statement about specific environmental innovations and/or new technologies (0–1)	.2441	.4296	0	0	0	0	1
Subtotal	1.0551	1.1673	0	0	1	2	6
F: Environmental profile (max score is 4)							
1. A statement about the firm's compliance (or lack thereof) with specific environmental standards (0–1)	.0848	.2787	0	0	0	0	1
2. An overview of environmental impact of the industry (0–1)	.0831	.2761	0	0	0	0	1
3. An overview of how the business operations and/or products and services impact the environment. (0–1)	.1380	.3449	0	0	0	0	1
4. An overview of corporate environmental performance relative to industry peers (0–1)	.0068	.0819	0	0	0	0	1
Subtotal	.3127	.6143	0	0	0	0	4
G: Environmental initiatives (max score is 6)							
1. A substantive description of employee training in environmental management and operations (0–1)	.1056	.3073	0	0	0	0	1
2. Existence of response plans in case of environmental accidents	.0893	.2852	0	0	0	0	1
3. Internal environmental awards (0–1)	.0076	.0870	0	0	0	0	1
4. Internal environmental audits (0–1)	.0096	.0974	0	0	0	0	1
5. Internal certification of environmental programs (0–1)	.0288	.1671	0	0	0	0	1
6. Community involvement and/or donations related to environment (if not awarded under A4 or B7) (0–1)	.0608	.2389	0	0	0	0	1
Subtotal	.3016	.6721	0	0	0	0	6
Total	3.5259	4.8572	0	0	2	5	44

Note: In subsection C, a point is awarded for each of the following items: (1) performance data is presented; (2) performance data is presented relative to peers/rivals or industry; (3) performance data is presented relative to previous periods (trend analysis); (4) performance data is presented relative to targets; (5) performance data is presented both in absolute and normalized form; (6) performance data is presented at disaggregate level (i.e., plant, business unit, geographic segment).

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