Does Market Competition Dampen Environmental Performance? Evidence from China

Duanmu, Jing-Lin and Bu, Maoliang and Pittman, Russell

University of Surrey, Nanjing University, Antitrust Division, U.S. Department of Justice

18 April 2018

Does Market Competition Dampen Environmental Performance?

Evidence from China

Research summary: Departing from the extant literature which assumes that firms pursue strong environmental performance as a differentiation strategy, we analyse the general relationship between firms' competitive strategy and their response to heightened market competition. We find that, using a large sample of Chinese manufacturing firms between 2000 and 2005, intensified market competition has an overall negative impact on firms' environmental performance. The negative impact is exacerbated in firms adopting a cost-leadership strategy, but attenuated in those adopting a differentiation strategy. The results emphasize the importance of including an examination of the particular competitive strategies chosen by firms in seeking to understand the impact of intensified market competition.

Managerial summary: Advocates of corporate social responsibility (CSR) have long argued for the differentiation role of CSR. However, managers may be misguided if the assumed benefits of differentiation critically depend on certain presumptions. In the China's context and focusing on the environmental dimension of CSR, our study finds a negative relationship between market competition and corporate environmental performance. It suggests that firms to a large extent can't escape competition via environmental differentiation. Managers should therefore be careful of the dimension of CSR as a viable competitive device for firms to employ.

Key words: Market competition, environmental performance, China, corporate social responsibility, cost leadership, differentiation, market concentration.

Does Market Competition Dampen Environmental Performance? Evidence from China

Introduction

Corporate environmental performance has been the focus of an increasing number of academic studies in recent decades. The literature has evolved through several distinct periods (Marcus and Fremeth, 2009), from creating awareness, exploring ethical mandates and moral responsibility (*e.g.,* Levitt, 1958; Donaldson and Davis, 1991), building a business case for sustainability (*e.g.,* Porter and van der Linde, 1995), to explicitly questioning the financial returns of environmentally responsible business practices (*e.g.,* Russo and Fouts, 1997; King and Lenox, 2002). In this study, we seek to contribute to the literature by probing the relationship between market competition and firms' environmental performance. We are motivated by the current literature which predominantly views firm social or environmental performance as a type of product 'differentiation' device, analogous to a specific type of product innovation, because it gives the product an additional 'attribute' attractive to some segments of the market (*e.g.,* Bagnoli and Watts, 2003; Conrad, 2005; Fisman, Heal, and Nair, 2006). But the relationship between intensified competition and environmental performance, following this theoretical framework, is far from certain.

It has long been recognized that differentiation is not the only strategy that firms deploy to establish a competitive advantage in the marketplace; cost leadership is one well studied and documented alternative (*e.g.,* Porter, 1980). The reaction of a firm that has chosen a cost-leadership strategy to an increase in industry competition may be very different from that of a firm that has chosen a differentiation strategy. This is the key argument that distinguishes our study from the extant literature.

Empirically, we use longitudinal Chinese firm level data from 2000 to 2005, and exploit the exogenous variations in industry competition stemming from a quasi-natural experiment to test our hypotheses: China's WTO accession in 2001. The event coupled with the firm-level longitudinal data enable us to apply a difference-in-difference approach to infer the relationship

between market competition and environmental performance. Our indicator of environmental performance also improves upon previous studies: we utilize the World Bank 'Green Watch' data, a comprehensive rating system that includes multiple performance indicators, such as hazardous waste disposal, solid waste recycling, pollution accidents, and public complaints, to yield an unambiguous measure of firms' environmental ratings (see Appendix 1). It enables us not only to understand how the multiple indicators collectively contribute to the rating of the firm, but also to differentiate between basic regulatory compliance and voluntary over-compliance.

We find that the exogenous competitive shock stemming from China's accession to WTO dampens firms' environmental performance in our sample. The negative effect is exacerbated in firms adopting a cost-leadership strategy, but attenuated in those adopting a differentiation strategy. Our empirical evidence thus suggests the importance of relaxing the assumption prevailing in the current literature that all firms adopt social-performance-based 'differentiation'. Instead, it is important to consider firm heterogeneities, such as firms' strategic position and the overall industrial and institutional context in which the way they compete with each other might differ. This then allows us to have a more generalized discussion of the relationship between firms' competitive strategy and their social performance, and to explain why in some industrial contexts intensified competition may not foster but can rather dampen firms' social performance. Although our findings are drawn on Chinese data in the early 2000s, where the specific institutional and historical context certainly shapes what we can find, it is the differences of our findings from others in the literature that provide us with an avenue to seek deeper understanding on the complex relationship between market competition, the social and institutional environment, and corporate social strategies.

We organize the remainder of the paper as follows. In the next section, we review the CSR literature, proceeding from studies that view CSR as an aggregate concept to those that focus on environmental performance. This is followed by a discussion of the prevailing view of CSR as a differentiation device, which leads to our critique and hypothesis development. We then present our research setting, describe our data, and outline our identification strategy before presenting

the empirical evidence. Finally, we reflect on the limitations of our research and discuss future research directions.

Literature Review

CSR as a differentiation device

Dorobantu, Kaul, and Zelner (2017) connect CSR with the nonmarket strategy research. In their view, CSR not only represents a way to "do good" (while possibly doing well), but also is mainly a strategy through which firms realize the value of their externalities by establishing and voluntarily committing to a new set of local institutional structures, with the expectation that they will be rewarded for such activities by stakeholders who find it in their own best interest to incentivize the firm to continue its CSR activities. Similarly, Kaul and Luo (2017) build an economic model of CSR. They suggest that firms with weak competitive advantage in their core business are more likely to pursue corporate philanthropy, outsourcing the provision of the social good to a non-profit and realizing both modest profits and limited social benefit. In contrast, firms with strong competitive advantage in their core business are more likely to undertake in-house CSR activities, and to realize substantial additional profit from doing so, though the social benefit of their CSR activities is more ambiguous. Zhang, Wang, and Zhou (2017) focus on the reaction to CSR by securities analysts, and argue that new firms may seek to behave in "conformity" with the standard CSR practices of their industry, while firms later in their life cycles may seek to deviate to a degree from standard industry CSR practices in order to differentiate themselves for the same audience.

While the above studies inspire us to deeply think and compare the dimensions of CSR, they also remind us of a very relevant question from a "strategy" point of view (Zhang, Wang, and Zhou, 2017). It is a fundamental question faced by all firms: which strategy should they select, differentiation or cost leadership? Recent studies have provided evidence supporting the view that CSR can be a differentiation device. For example, Flammer (2015) finds that responding to enhanced import competition, US listed firms increase their engagement in CSR to differentiate themselves from their foreign rivals. In a similar vein, Flammer (2017) also finds that in the U.S.

Business-to-Government context, companies with higher CSR win more government procurement contracts than their peers with lower CSR.

Will firms generally increase their CSR when facing tougher competition in order to "escape" from competition? Two more studies provide affirmative answers (Fernández-Kranz and Santaló, 2010; Hawn and Kang, 2015). Both use the Herfindahl-Hirschman Index (HHI) as a proxy for market competition and CSR data from Kinder, Lydenberg, Domini Research & Analytics (KLD).[1] However, two other studies fail to find such a relationship using the same datasets. Declerck and M'Zali (2012) find that although competition has a positive relationship with shareholder and employee-related social actions, it has no such relationship with actions affecting other stakeholders. Fisman, Heal, and Nair (2006) focus only on one particular component of CSR, corporate philanthropy, because it is considered more aligned with the 'public' nature of social performance, and find that competition is not statistically associated with corporate philanthropy. Collectively, the mixed evidence of the relationship between competition and CSR is intriguing. It motivates a call for a deeper understanding of the institutional context and drivers of CSR.

Institutional context and drivers of CSR

According to Matten and Moon (2008), implicit CSR consists of values, norms, and rules that result in mandatory and customary requirements for corporations to address stakeholder issues and that define proper obligations of corporate actors in collective rather than individual terms. Hence, such CSR activities appear as a social phenomenon and do not exist independent of the firms' institutional context (Wang, *et al.*, 2016). Similarly, Campbell (2007) argues that "socially responsible corporate behaviour may mean different things in different places to different people and at different times". In this regard, two strands of research seem particularly relevant.

[1] These studies share a common issue: they all use as their measure of competition the HHI based on Compustat data, which contains a sampling bias due to the listed status of these firms (Ali, *et al.*, 2008). Moreover, using the HHI as a proxy for market competition raises the question of its endogeneity to firm strategies. Flammer (2015) addresses this methodological issue by exploiting U.S. import tariff reductions between 1992 and 1998 as a source of exogenous shock in competitive pressure for U.S. firms, and finds support for a causal positive relationship between competition and firms' CSR.

The first strand of research pays increasing attention to the differences between developed countries and developing ones (emerging markets/transitional economies/less developed ones, etc.). For example, Marano, Tashman and Kostova (2017) find that developing country multinational enterprises (MNEs) use CSR reporting to overcome the institutional voids in their *home* country to overcome the liability of origin perceived in their overseas operation. By contrast, Ghoul, Guedhami, and Kim (2017) find that the value of CSR is greater in *host* developing countries with weaker market institutions and suggest that foreign MNEs can compensate for institutional voids via CSR.

The second strand of research emphasizes that national level institutions matter for corporate social performance. Ioannou and Serafeim (2012) find that in countries where laws and regulations promote higher levels of competition, corporations will score lower on the corporate social performance index. They argue that given high levels of competition, firms are faced with razor-thin profit margins, to the extent that their very survival may be put at risk. Therefore, they believe social performance will be lower for two reasons. First, firms with minimal or zero profits have fewer, if any, resources to invest in activities that would increase CSR. Second, firms in highly competitive environments would be more likely to cut corners and attempt to save money whenever and however possible (p. 839). Ioannou and Serafeim's second reason is also noted by Campbell (2007), which asks why corporations behave in socially responsible ways from an institutional perspective. In situations where competition is so extremely intense that profit margins are narrow enough to put shareholder value and firm survival at risk, Campbell (2007) suggests that the incentive to cut corners and save money will cause corporations to act in socially irresponsible ways insofar as they believe that this will help them turn a profit and survive.

In sum, whether CSR makes sense as a differentiation device depends on the institutional context and the extent to which resource providers such as consumers and employees appreciate CSR[2]. In developing countries, firms' environmental performance may not translate into higher willingness-to-pay by consumers (or higher willingness-to-supply by employees) as in developed

2. We appreciate the comment from one anonymous reviewer.

economies. However, this important distinction has not yet received sufficient attention in previous studies[3].

Hypothesis development

In this research, we define environmental performance as the firms' curtailment of public "bads" in the form of environmental pollution beyond the level required by the law (Bagnoli and Watts, 2003; Besley and Ghatak, 2007). This definition entails that to be environmentally responsible firms will incur *additional* costs in their provision of private goods (Jaffe, *et al.*, 1995). We start with a brief discussion of firms' competitive strategies, which leads to our core hypotheses, namely, how market competition may shape a firm's environmental performance in different ways depending on the strategic choice that the firm pursues.

According to Porter (1985), there are two basic types of competitive advantage: cost leadership and differentiation. While it is conceptually straightforward that a cost leadership strategy attracts consumers by low prices, such as Walmart's "everyday low price" model, firms may "differentiate" through various avenues. Two contingent factors are important for the scope of differentiation. One is product characteristics. Any product can be viewed as a bundle of different characters or attributes (Lancaster, 1966). These attributes can be varied in quantity and/or combined in different ways to differentiate a product. Thus, the number of attributes inherent in a product creates scope for differentiation. The other factor important for differentiation is consumer diversity (Hill, 1988; Sharp and Dawes, 2001). Consumer diversity in terms of income, education, aesthetic taste, and social preference creates further scope for differentiation even for a relatively homogenous product (Phillips, Chang, and Buzzell, 1983; Myers and Harvey, 2001; Foellmi and Zweimuller, 2004).

Given that the strategy-performance linkage often generates conflicting results, recent developments suggest that aligning strategy with the social environment is important (Li and Li, 2008). An emphasis on cost leadership is more likely to create superior financial performance for

[3] Two recent papers emphasize the importance of time in strategy (Crilly, 2017; Hawn, Chatterji and Mitchell, 2018). We would regard this dynamic focus as in line with our perspective here.

firms operating in some contexts, such as in emerging economies, because firms gain a comparative advantage from their low labor and production costs, and lower price offerings appeal to consumers, given their low level of disposable income. Similarly, some studies suggest that most firms in China adopt a cost-leadership strategy because the value of differentiation is low (Aulakh, Kotabe, and Teegen, 2000; Murray, Kotabe and Zhou, 2005). This is largely driven by the consumers' preference for lower prices and physical attributes/function of products, rather than, for example, under what working conditions these products are produced (Lin, 2010).

Apart from consumer behavior that renders cost leadership a more viable competitive advantage, institutional features in developing countries also make it challenging for firms to pursue "differentiation". For instance, marketing research suggests that developing countries have weak intellectual property rights protection, which often jeopardizes the value of "branding" as a key expression of differentiation. This is both illustrated and complicated by the fact that there is a proliferation of counterfeits, replicas, and unbranded products (Strizhakova, Coulter, and Price, 2008).

More specifically regarding "green" differentiation, Orsato (2006) theorizes that a lack of reliable information about products' environmental performance is a major barrier for consumer's willingness to pay, hence dampens corporations' willingness to "go green". Berrone, *et al.* (2013) model firms' engagement in environmental differentiation as largely influenced by state-level environmental monitoring, with consumer awareness proxied by the number of NGOs, using longitudinal data of 326 publicly traded firms in the U.S. in the period of 1997 to 2001. Their findings suggest that when the public attention to environmental protection is low, firms are less inclined to seek environmental differentiation (p. 905). In a similar vein, Jayachandran, *et al.* (2013) find that although social performance broadly contributes to firms' finance performance, environmental performance in particular does not. More interestingly, in a cross-country qualitative study, Bansal and Roth (2000) find that both Japanese and UK firms consider environmental initiatives only if they enhance their financial performance; moreover, interviewed Japanese firms so strongly conformed to their industry norm at a time when the prevailing norm of protecting environment was low that the focal firm would not take a lead

because exceeding industry expectations would make it persecuted by their industry peers for making them look bad (p. 732).

In developing countries such as India, Biswas and Roy (2015) find that consumers are highly sensitive to prices, rendering 'green' differentiation a risky strategic choice. Chan (1999) studied consumers' green attitudes in China, and concluded that a green strategy would be hard to implement successfully when consumers are not concerned about protection of the environment. Therefore, we argue that it is important to consider that some firms may not adopt social-performance-based differentiation when various social, cultural, and institutional factors are not strong or stable enough to make it viable. By contrast, a cost-leadership strategy can be an effective alternative because it is less dependent on social and institutional infrastructure. This strategy can be particularly effective in hyper-competitive environments with a dispersed industrial structure, where firms aim to enhance performance and increase market share through a low-cost position relative to their rivals. A cost leadership strategy typically requires large-scale production, rigorous process improvements, learning by doing, cost control, and cost minimization in R&D, advertising, sales, and services (Gao, *et al.*, 2010).

This leads us to argue that when the overall environment is characterized as cost-oriented and hyper-competitive, heightened market competition could have an overarching negative effect on firms' environmental performance. Furthermore, firms explicitly adopting a cost-leadership strategy in this type of environment will face greater pressure on their production costs to maintain their leadership position. This will constrain them from attaining more desirable environmental performance even more than their peers. We sum up the discussion into the following two hypotheses:

H1: An increase in market competition will reduce the environmental performance of all firms operating in a cost-oriented industrial environment.

H2: A firm-level cost-leadership strategy will exacerbate the negative impact of market competition on firms' environmental performance in a cost-oriented industrial environment.

By the same logic, price pressure may be less threatening for firms pursuing a differentiation strategy. Differentiation is the process of distinguishing a product or service from others (Mercer, 1992; Dickson, 1997) and making it more attractive to a particular target audience or market (Dickson and Ginter, 1987). The objective of differentiation is to develop a position that potential customers see as unique, thereby softening price-based competition. There are a variety of avenues through which firms may differentiate themselves in the marketplace, for example, based on their treatment of workers, such as Ben and Jerry's Ice Cream,[4] or on their treatment of animals, such as Chipotle,[5] or use of natural and organic ingredients, such as Burt's Bees and Patagonia,[6] or commitment to clean and sustainable production techniques, such as Starkist, Tyson, and Tim's of Maine,[7] or on their technological innovations, such as Apple, GE, and Nokia, or customer service, such as Amazon, UPS, and FedEx. In addition, a firm's focus on advertising and other marketing activities may serve either to emphasize these and other objective attributes that differentiate it from its competitors or to create subjective differentiating attributes that perform the same differentiating function (Buehler and Halbheer, 2011).

A 'differentiation' strategy will generally soften price-based competition in two complementary ways. First, differentiation may create brand loyalty, reducing demand elasticity (Baker, 1996; Dickson, 1997). Second, differentiation affects performance through reducing the *directness* of competition: as the products become more different, categorisation becomes more difficult and hence there are fewer direct comparisons among rival products (Kotler, *et al.*, 1996; Trout, 2000; Sharp and Dawes, 2001). In terms of the classic model of Hotelling (1931), differentiation strategies increase the distance of a particular product from its competitors in "product space", making it a more distant substitute for rival products (Salop, 1979). Thus, a

---

[4] Catherine Taibi, "9 Reasons to Love Ben and Jerry's That Have Nothing to Do with Ice Cream,' *Huffington Post*, 15 August 2013, https://www.huffingtonpost.com/2013/08/15/ben-and-jerrys-love_n_3726083.html (accessed 8 November 2017).

[5] "'Why Chipotle Insists on Humanely Raised Meat,' *Newsweek*, May 3, 2008, http://www.newsweek.com/why-chipotle-insists-humanely-raised-meat-89691 (accessed 8 November 2017).

[6] David Gianatasio, 'Burt's Bees Tells Two Young Women's Remarkable Stories of Unique Beauty,' *Adweek*, May 13, 2016, http://www.adweek.com/news/advertising-branding/burts-bees-tells-two-young-womens-remarkable-stories-unique-beauty-171461 (accessed 8 November 2017).

[7] Willy Blackmore, "A major American meat company is going big with antibiotic-free pork," *Takepart*, February 25, 2016, http://www.takepart.com/article/2016/02/25/tyson-antibiotic-free-pork (accessed 8 November 2017).

successful product differentiation strategy will move the product from competing based primarily on price to competing on non-price factors, which should reduce the negative impact of market competition on firm environmental performance. We state the argument as the following hypothesis:

H3: A firm-level differentiation strategy will positively moderate the negative impact of market competition on firms' environmental performance in a cost-oriented industrial environment.

Having articulated our main hypotheses, we proceed to discuss our empirical context, dataset, and identification strategy.

Empirical Context

Different from the majority of studies that have examined firms' social/environmental performance in the U.S. or other developed economies, we choose China in the early 2000s as our empirical setting for several reasons. First, China represents a vastly different social context from countries such as U.S., and yet it is important for us to have more understanding of this country given its rising economic and political power. For example, if we consider the 'environmental Kuznets curve' discussion (Grossman and Krueger, 1995), China remains on the left side of the curve, indicating that environmental degradation will be likely to continue to increase with the economic development before the country's income level reaches the turning point predicted by the theory. In addition, being a former socialist economy, China's industrial transformation since the late 1970s is built upon market-oriented and profit-seeking agenda. Not only is the diversion from profit objectives blamed for the inferior performance of and the justification for the reform of a large number of state owned enterprises, but also stripping away the social objectives of enterprises is ideologically heralded as paramount for efficiency and productivity in modern China (Bo, Li and Toolsema, 2009; Lin, 2010). This has led to severe environmental problems in China. In addition, the legal system in China does not make it easy to protect the natural environment in comparison to that in countries such as the U.S., where the strong legal traditions can facilitate the challenge and punishment of violators at the initiative of citizens and different stakeholders, raising the costs of non-compliance. By contrast, China's legal

system remains subdued by the undemocratic political system. The state remains the dominant stakeholder, and whether or not a certain social issue receives due attention depends largely on the state's economic and political agenda.

On a more micro level, publicly traded firms in the U.S. are large, resource abundant, and technologically advanced, and arguably tend to operate in relatively concentrated industrial environments (Chemmanur, He, and Nandy, 2010).[8] By contrast, non–listed Chinese manufacturing firms are relatively small, more labor-intensive, and more resource-constrained, and generally operate in far more dispersed industrial structures. Taking these considerations together, it is plausible that Chinese firms' perception of and engagement in environmental performance could be immensely different from that in the U.S., which makes it difficult to extrapolate previous findings to this context.

Last but not least, while Flammer (2015) suggests that heightened import competition will make it harder for U.S. domestic firms to compete with foreign competitors on a 'cost' basis, thus increase their incentive to engage in CSR-based 'differentiation', we argue that it is plausible the opposite holds true for Chinese firms given their different comparative advantages. For example, Barney and Zhang (2008) argue that 'Made in China' stands for low cost and good value. This country-based image emerged out of the business level strategies pursued by many Chinese firms, namely, a strategy that focused on average quality linked with very low cost manufacturing (Loo and Davies, 2006; Child and Rodrigues, 2005). The success of these strategies has led China to develop the reputation of being the 'world factory' (Deloitte Research, 2003). Taking these arguments together, our empirical focus on Chinese manufacturing firms justifies the reference to a 'cost oriented industrial environment' that we have made in our hypotheses.

[8] For example, between 2000 and 2006, the average three digit HHI index based on the SIC is 0.1519 among listed US firms that are simultaneously present in the KLD database and Compustat. This is the sample used in most CSR studies. In the same period, the average four digit HHI index based on the Chinese Industrial Classification of all Chinese manufacturing firms with annual turnover of RMB 5 million or above is only 0.0188. Admittedly, these are not directly comparable due to the difference in industry classification systems, but it is still evident that the former represents a very different industrial structure from the latter. For a recent discussion regarding increasing concentration among US listed firms, see Grullon, Larkin, and Michaely (2016).

Data Description

We use a sample of Chinese firms monitored by the 'Green Watch' program in Jiangsu Province between 2000 and 2005 to evaluate our hypotheses. Here we outline the background of the program and explain the data choice.

In 1999, China's State Environmental Protection Administration (SEPA) launched its Green Watch Program supported by the World Bank's InfoDev Program. Such public disclosure program rates firms' environmental performance from best to worst in five colors—green, blue, yellow, red and black (Wang, *et al.*, 2004), as shown in Appendix 1. The primary benchmarks for ratings are China's emission and discharge standards that specify effluent concentration limits. Firms violating any of these standards are rated red (we code it as 2), and firms violating standards in more than 60 percent of inspections are rated black (we code it as 1, the worst performance). The secondary benchmarks are China's load-based emission and discharge standards. Firms that satisfy the primary benchmarks but violate the secondary standards are rated yellow (we code it as 3). The rating system also incorporates other performance indicators, such as whether or not the firm received public complaints and whether or not the firm had a China Cleaner Production certificate and/or an ISO14000 certificate. The system specifies a link between each rating (from 1 to 5) to one or multiple indicators that determine it. Our coding follows that in previous research, such as Jin, Wang, and Wheeler (2010) and Bu, Liu and Gao (2011).

The program was extended from Zhenjiang City to all of Jiangsu Province in 2001, and to eight other provinces during 2003-2005. Nationwide implementation of Green Watch has been promoted since 2005. Our data comes from the 'Green Watch' program in Jiangsu Province between 2000 and 2005 since it started the earliest in this province. Jiangsu is geographically next to the commercial center of mainland China, Shanghai, and is one of the most affluent regions in the country. It has thirteen municipal cities and an average GDP per capita of $22,622 (PPP adjusted) in 2012, ranking it the richest province in China. We illustrate the location of Jiangsu in Appendix 2. A detailed map of Jiangsu with its thirteen cities is presented in Appendix 3. Appendix 4 presents the number of firms across the six years, and Appendix 5 presents the two-digit industrial distribution of the sample. All firms are from the industrial sector. We identify

these firms' financial and ownership data from the Annual Survey of Industries conducted by China's National Bureau of Statistics (NBS). NBS data have been used in many studies before, including Guariglia, Liu, and Song (2011) and Chang and Wu (2014).

Identification Strategy

To test our hypotheses, we specify environmental performance (EP) for each firm *f,* in sector *j,* in year *t*, in location *l* as follows:

$$EP_{fjt}=a_0-a_1Competition_{jt-1}-a_2Competition_{jt-1}*Cost\text{-}Leadership_{fjt}+a_3Competition_{jt-1}**Differentiation_{fjt}+a_4\sum controls_{ft-1} + \eta_f + d_t + d_t*\varphi_l + \varepsilon_{ft} \quad (I)$$

We include firm fixed effects, η_f, year fixed effects d_t, the interaction terms d_t and φ_l (*i.e.,* location) to account for possible location-specific time trends, and white noise ε_{ft}. Our central interests lie on a_1, a_2, and a_3. We measure 'competition' by exploiting variations stemming from a quasi-natural experiment in firms' competitive environment: China's WTO accession in December 2001.[9] Under WTO obligations, China's import tariff (for output) reductions ranged between 10 and 75 percent in the period of 2001-2005 (Hu and Liu, 2014; Bas and Strauss-Kahn, 2015). Compared with other developing countries, China agreed to much more significant import tariff reductions in negotiating its accession to WTO. We exploit the fact that Chinese firms in industries with higher import tariffs for output prior to December 2001 suffered a bigger 'competitive shock' following China's accession to WTO than firms operating in industries with prior lower import tariffs. The exact phase-out process of industries varied, but import tariff rates for output converged in 2005 (Naughton, 2007). To avoid potential endogeneity of the phase-out, we treat all industries equally regardless of their phase-out schedule, and exploit only the level of import tariffs before the WTO accession. Therefore, we use average import tariff rates for output in 1999 (pre-sample) classified by four digit industries as the measure of the level of

[9] While WTO accession has both a 'competitive' impact on domestic firms and a 'market enlargement' effect where exporters tend to benefit from easier access to larger markets, in this study, like much previous work in this area, we focus exclusively on the former aspect.

exposure of the industry to trade liberalization.[10] To account for the fact that many firms have multiple products, we then construct firm level import tariff rates in 1999 by using the weights of each of the firms' main products. We construct PostWTO as a dummy that equals '1' between 2002 and 2005 and equals '0' for 2000 and 2001. Thus, we have the interaction term of $ImportTariff_{1999}$ and PostWTO, and its coefficient a_1 captures the competitive effect on EP_{ft}.

We measure cost-leadership following Gao, *et al.* (2010), but with one modification. While Gao, *et al.* (2010) measure cost strategy by the ratio of production cost to total sales, with *small* values indicating *stronger* cost-leadership, we modify this measurement by using 'total sales - production cost' as the numerator, so that *larger* values indicate *stronger* cost-leadership, which will allow more straightforward interpretation of our results.[11] We expect a_2 to be negative to support H2. We also followed the Gao, *et al.* (2010) measure of 'differentiation'. To be more specific, 'differentiation' is proxied by a firm's divergence from the typical level of the ratio of advertising expense to total sales in its three-digit industry.[12] A positive a_3 would support H3. Thus, equation (I) can be rewritten as follows:

$$EP_{fjt} = a_0 - a_1 ImportTariff_{1999}*PostWTO - a_2 ImportTariff_{1999}*PostWTO*Cost\text{-}leadership_{fjt} + a_3 ImportTariff_{1999}*PostWTO*Differentiation_{fjt} + a_4 \sum controls_{ft-1} + \eta_f + d_t + d_t*\varphi_l + \varepsilon_{ft} \quad (II)$$

In equation (II), $\sum controls_{ft-1}$ is a vector of one period lagged control variables including firm age, size (log assets), product diversity, profitability (return on assets), innovation (value added), and debt ratio, based on previous studies of environmental and social performance (*e.g.,* Russo and Fouts, 1997; Fisman, Heal, and Nair, 2006; Fernández-Kranz and Santaló, 2010; Declerck and

[10] Our import tariff (for output) data were obtained from the World Integrated Trade Solution (WITS) database. We use the effective rates of tariff (denoted as AHS [effectively applied tariffs] tariff in the WITS system) at the four-digit level under ISIC Rev.3. Since China's National Bureau of Statistics (NBS) uses its own industry classification system, we use a concordance between the NBS system of industry classification and the ISIC classification when merging the tariff database with the Chinese firm-level database. This method is also used in Hu and Liu (2014).

[11] $Cost\ Leadership\ Competencies_{i,t} = \frac{(CL)_{i,j,t} - median_{-i,j,t}(CL)}{range\{[(CL)_{i,j,t} - median_{-i,j,t}(CL)] \forall i \in j,t\}} \in [-1,1]$

[12] $Differentiation\ Competencies_{i,t} = \frac{(DF)_{i,j,t} - median_{-i,j,t}(DF)}{range\{[(DF)_{i,j,t} - median_{-i,j,t}(DF)] \forall i \in j,t\}} \in [-1,1]$

M'Zali, 2012; Flammer, 2015; Hawn and Kang, 2015). Among these controls, the literature has documented that age tends to be negatively associated with social performance because of organizational inertia. Firm size, product diversity, profitability, and innovation are positively associated with social performance because stronger financial and innovative ability usually lead to stronger social performance and potential economies of scope of social performance over multiple products. Debt ratio is often argued to reduce the slack resources the managers may divert for social performance, which may lead to a negative association with social performance. We use value added as the proxy of firm innovation because R&D information for non-listed Chinese firms is highly incomplete. We also control for five types of equity in the firm: state; collective; foreign; Hong Kong, Taiwan and Macao (HTM); and individual equity holdings.

Last but not least, we include two more control variables and their respective interactive terms with PostWTO. One is an export dummy. This is to consider the potential market access benefit that exporters may have gained due to WTO accession. The second is the import tariff for input. We include it to consider that its reduction occurred simultaneously with import tariff reductions for output, and firms may benefit from input tariff reductions because of cheaper or higher quality inputs. We adopt the methodology used in Hu and Liu (2014) to compute input tariff rates. In this method, the input tariff rate of an industry is computed as the weighted average of the output tariff rates of its upstream industries. The Chinese input-output table of 2002 was used as the weight matrix to construct input tariffs[13]. Table 1 provides the descriptive statistics for the sample data. The correlation matrix of main variables is presented in Table 2.

(Insert Table 1 here)

(Insert Table 2 here)

Data Analysis & Results

Before we present our main results, it is useful to have a look at the trajectory of our dependent

[13] Our identification strategy is similar to that used in several previous studies. For example, Griffith (2001) uses the same difference-in-difference method to examine how UK firms' efficiency increased as result of the Single Market Program (SMP) implemented across Europe. Guadalupe and Wulf (2010) use the method to examine how the exogenous increase in competition created by the Canada-US Free Trade Agreement of 1989 (FTA) influenced the organizational structure of US firms and their use of incentive pay.

variable: environmental performance from 2000 to 2005. As visualized in Graph 1 in the Appendix, we divide firms into two groups: one is those belonging to industries with higher import tariff for output in 1999, and the other is those belonging to industries with lower import tariff for output in 1999. Graph 1 shows that both groups have similar movement before 2002, the treatment year that we use. But clearly, those in industries with higher import tariff for output in 1999 experienced a much larger decline in their environmental performance compared to those firms in industries with lower import tariff for output in 1999 after 2002. While this alone does not suffice to support our main hypothesis, we proceed to present our main results presented in Table 3.

Table 3 reports coefficients and robust standard errors of all variables included in the estimations. The inclusion of firm fixed effects is supported by the results of a Hausman test across all estimations, which indicates that the fixed effects model is preferable to the random-effects model (for example, in Model 1 of Table 3: $\chi 2=80.645$, $p=0.00002$). We cluster our standard errors are the industry level considering the tariff movement occurs at this level. We also replicate our main results by using clusters at the firm level and at the city level. These results can be found in Appendix 6.

We first discuss our baseline results concerning competition, which is measured by the interaction term of PostWTO and $ImportTariff_{1999}$. It is not statistically different from zero as shown in Model (1) where we consider firm and year fixed effects. In Model (2), we add city specific time trends, the interaction term of postWTO and $ImportTariff_{1999}$ becomes statistically significant (robust standard error =0.009, $p=0.055$), with a negative coefficient of 0.019. This can be interpreted as for one standard deviation increase in competition, firms' environmental performance drops by 16 percent. On a scale of 1 to 5, this is equivalent to approximately 0.76 reduction, a magnitude that is economically significant as well. This result is noteworthy because it indicates the importance of including location-specific time effects, where some time-varying characteristics, such as changes in the cities' environmental or economic policies, have an important impact on the results. We will return to this shortly.

(Insert Table 3 here)

In Model (3) we begin to consider the moderation effect of cost leadership and differentiation strategies. We find that while the main result of competition remains statistically significant- the coefficient is -0.022 and it is statistically significant at 5% level, the interactive term of 'cost leadership' and competition attains a negative and statistically significant result, supporting the second hypothesis. Meanwhile, the interaction term of 'differentiation' and competition also receives a positive and statistically significant result, supporting our third hypothesis. The model has an overall higher explanatory power, indicated in R-squared. We then move to Model (4), which includes observations where the environmental performance exceeds the basic regulatory requirements, namely, those observations whose environmental performance exceed the value of 2. This is more in line with the discussion in CSR literature that to be socially responsible, firms have to exceed basic regulatory compliance. The overall results are unchanged from those in Model (3). More specifically, our key interest, the coefficient of postWTO and $ImportTariff_{1999}$ is -0.042, significant at 1% level.

In Model (5) we consider firms with continued presence in the sample for six consecutive years since 2000. Previous models are based on an unbalanced sample, which may introduce some upwards bias: that is, firms with poor environmental performance may drop out the sample while those with strong performance remain. The negative coefficient for market competition is now -0.053, indeed larger than those in previous estimates, and remains statistically significant (robust standard error=0.014, p=0.015). This coefficient is equivalent to a 43 percent drop in firms' environmental performance in response to an increase in competition of one standard deviation, equivalent to a reduction of approximately 2 in the scale from 1 to 5. In cases where the firm's starting performance was rated at 5, a reduction of 2 would mean that the performance dropped to 3, which is basic compliance. But in cases where the firm's stating performance is lower than 5, this means that competition reduced its environmental performance to a non-compliance level. The main results with respect to competition and its interactive term with cost leadership and differentiation are visualized in Graph 3a, to 3c in Appendix.

Having obtained the main results, we conducted several robustness checks. First, we provide some explorations regarding how city specific trends have affected our main results in Model 2 of Table

3. To this end, we evaluate to what extent the city's status in terms Two Control Zone (TCZ) may have some bearings on firms' environmental performance. The TCZ policy is one of the most important policies to tackle air pollution in China, which was initially adopted by the State Council of China in 1998. 175 prefectures out of 375 across 27 provinces were designated as TCZ locations due to their exceeding national mandate thresholds for either acid rain or SO_2. The 10th Five-Year Plan (from 2000 to 2005) then set the reduction target for SO_2 by 10% from the 2000 level by 2005 in TCZ locations. Therefore, the TCZ status means more stringent regulations. Relating the TCZ policy to firms' response to market competition, we conjecture that it is possible that firms' environmental performance may deteriorate more in TCZ locations because more fierce foreign competition makes it harder for firms to afford higher level of clear-up costs required in TCZ locations. It is highly likely when local government prioritize local economic development and employment over environmental protection. By contrast, firms in non-TCZ face less stringent regulations, which means that they operate in a "natural" state with limited policy intervention. Therefore those firms' environmental performance may decline by a smaller margin precisely because of more lax environmental regulations there.

To test the possibility, we replicate the analysis in Model 2 of Table 3 by including the interactive term of TCZ and year to replace the city specific trends. This way we can capture potentially different trends across two groups of cities that are in TCZ locations and those are not in. The results are presented in Appendix 7. The results that we obtain in Model (1) of Appendix 6 are highly similar to those results in Model (2) of Table 3, lending some support for the view that there are some divergent trends across the two types of cities that explain firms' response to intensified competition. More specifically, the coefficient is -0.027, which is significant at 1% level. This is quite close to the coefficient in Model (2) of Table 3, which is -0.019 and is significant at 5% level. We then extend our analysis by including the interactive term of cost leadership and differentiation in Model (2) in Appendix 7. The results are qualitatively unchanged from what we obtain in Table 3. Last but not least, we limit our sample to those firms that have over-compliance level in their environmental performance in Model (3), and those with balanced presence in the sample in Model (4). All our results are highly consistent with those in Table 3. This exercise provides some but not necessarily exhaustive insights into the sources of city specific time trends.

Secondly, we use alterative measurements for cost leadership and differentiation. Specifically, we use ratio of the difference of total sales and selling and administrative cost to total sales as the alternative proxy for cost leadership. This is derived from Gao, *et al.* (2010) with a modification in the numerator to allow for a more straightforward interpretation. We also use new product output as the alternative to the one based on advertising. Note that the information of new product output is less complete than that of advertising, which has made our sample sizes smaller. The results are reported in Appendix 8, where we replicate the analysis of Table 3 by using these two alterative proxies. The results are overall consistent with those obtained in Table 3. In addition, based on Appendix 8, we then use a dummy variable to indicate firms' cost leadership and differentiation strategy by using sample mean as the cutoff point. The results are presented in Appendix 9. The overall results are highly consistent with those when the two variables are measured as continuous ones.

Third, state-owned-enterprises are arguably less subject to market competition due to political intervention; therefore including them in the sample may underestimate the real impact of competition on environmental performance. We replicate regressions in Table 3 by limiting our sample to firms with less than 50 percent state ownership, and find that our earlier results remain unchanged. The results are presented in Appendix 10.

Finally, we evaluate how our findings may be related to the 'pollution haven' literature, which argues that multinational firms can 'export pollution' by locating their dirtier operations to developing countries with lax environmental standards (Jaffe, *et al.*, 1995; Copeland and Taylor, 2004; Bu and Wagner, 2016). The empirical support for 'pollution haven' remains mixed (Levinson and Taylor, 2008; Grether, *et al.*, 2012; Millimet and Roy, 2016), and its vast empirical and theoretical literature is beyond the scope of our paper. Our empirical setting is also not well equipped to study this hypothesis given that our focus is on changes in 'competitive pressure' rather than changes in 'environmental standards'. But it is worthy to evaluate the possibility that if industries with high import tariff protections in 1999 also concurrently attracted higher levels of FDI in our sample, and firms with foreign equity responded more negatively to competition than their domestic counterparts, then our findings would resemble the 'pollution haven' notion.

Neither speculation is supported in our data. We use a fixed effects model and find that foreign equity is not positively associated with "competition"; nor is foreign equity associated with worse environmental performance. The fact that our balanced sub-sample always generates larger expected coefficients indicates that it is more of within-firm effect than a between-firm effect that we capture.[14]

Discussion and Conclusions

Solow once characterized a finding of Hotelling as demonstrating that "the monopolist is the conservationist's friend" (Solow, 1974; Hotelling, 1929). He was referring specifically to Hotelling's theoretical prediction that a monopolist would deplete a given stock of natural resources more slowly than would a competitive firm. We may update this idea by replacing "conservationist" with "environmentalist", and note that the output reduction associated with monopoly can also be expected, all else equal, to be accompanied by lower levels not only of resource usage but also of the production of negative externalities such as water pollution, air pollution, and global warming. Modern strategic analysis goes an important step further than this by incorporating the environmental performance of a firm into the framework of corporate strategy. Following Porter, we divide the broad strategies chosen by firms into two categories, cost leadership and differentiation. We find that apart from an overall negative impact of competition on firms' environmental performance in our sample, a cost-leadership strategy on the part of the firm exacerbates this negative impact. By contrast, a differentiation strategy positively moderates the negative relationship between competition and environmental performance.

We hope that our research makes a first step towards a deeper understanding of the relationship between firms' strategic choices and their environmental performance. We close with some reflections on our findings and their implications for further research in this area.

First, although we do not utilize institutional comparisons in our analysis, our results are clearly institutions-laden in the sense they cannot be detached from China's unique economic and institutional environment in the early 2000s, when a cost-based leadership strategy remained the

[14] We thank an anonymous reviewer for the comment that has led to this discussion.

dominant competitive advantage of manufacturing sectors in China, and that may have compromised their social performance[15]. The contrasting results that we obtain in comparison to those in Flammer (2015) indicate that more theoretical and empirical work is needed to systematically assess to what extent institutional environments such as variations in consumers' care for and willingness to pay for green products, and variations in countries' regulatory and legislative settings, may give arise to divergent competitive advantages which in turn affect corporate social performance in different ways. It is only with cross-country comparisons that such cross-country differences may be revealed. This is an important future research direction, which should provide a more in-depth understanding of how national cultural and institutional environment matters for CSR.

Our second reflection is on differentiation. It is worth emphasizing that the third hypothesis regarding the moderating role of differentiation strategy on firms' environmental performance is a general prediction. It is distinct from the innovation literature in the sense that we argue that so long as firms pursue a differentiation strategy, regardless of form or shape, they can reduce the sensitivity of their customers to price, and this in turn should mitigate the negative impact of competition on firms' environmental performance. By contrast, technological innovation is *the* "differentiation" device emphasized in the innovation literature, which analyses the returns of this particular strategy in industries that have different distributions in terms of the number of firms that are technology leaders versus technology laggards.

Our hypothesis does not contradict the key theoretical arguments in the innovation literature. First, if we view "environmental strategy" as the *only* differentiation device that firms deploy, firms' response to heightened competition may differ depending on the extent to which they adopt their "environmental" differentiation strategy *ex ante*. For example, Fisman, *et al.* (2006) argue that CSR is more likely to occur in highly competitive markets where CSR is the *only* product differentiation device for an otherwise homogenous product. This theoretical argument is in line with the "escape" competition argument in the innovation literature (Aghion, *et al.*,

[15] The institutional context in China may have changed or slowly shifted since 2006, the end of our sample period. See relevant discussion in Marquis and Qian (2014).

2005), but does not consider the variations of firm distributions in terms of whether they are 'environmental' leaders or laggards, thus ignoring the other prediction (*i.e.,* the Schumpeterian effect with respect to rent dissipation) discussed in the same literature.[16] If we accept the "environmental" differentiation strategy as one, but not the only, way that firms differentiate themselves, then we may find it appropriate to argue that differentiation in general softens the negative impact of competition on firms' environmental performance.

As noted earlier, the ability of a firm to utilize product differentiation as a competitive strategy depends on the characteristics inherent to the product itself and the heterogeneity of customers. Two additional factors seem likely to increase the incidence and importance of a strategy of product differentiation going forward. First, and somewhat corresponding to the importance of a "hyper-competitive environment" in forcing the adoption of a cost minimization strategy, there is arguably a positive income elasticity of consumer taste for product differentiation. Only if consumers have a certain level of disposable income can they afford to buy sweatshop-free clothing as opposed to the least expensive items on sale. Thus if the world continues to exhibit both the broad increase in average income and the reduction in the incidence of absolute poverty that have characterized recent decades, consumers demand for more differentiated products should incentivise companies to move from cost minimization to differentiation as a competitive strategy. Our results suggest that such a move will have a positive side effect of environmental improvements as a result of increased environmental CSR: a global move to the right and down the environmental Kuznets curve.

Second, and related, both global income growth and rapid technological change are likely to lead to an increased growth of the services sector in economies around the world, at the (relative) expense of both the agricultural and manufacturing sectors (Eichengreen and Gupta, 2009). The Googles and Facebooks of the world, and their inevitable successors, are capital-intensive firms without large stocks of physical capital (Haskel and Westlake, 2017), and their billion-dollar

[16] For example, Li and Zhou (2017) find that, using US listed firms from 1976 to 2005, import competition from high-wage countries increases US firms' innovation because such competition is viewed as 'neck-to-neck'; by contrast, import competition from low-wage countries does not increase US firms' innovation.

revenue streams are accompanied to a large degree by the pollution only from the electricity required to power them. Firms like Google and Facebook mostly offer products that are free to consumers, but in neither case is that related to a cost minimization strategy: for these firms, differentiation is all. Again, to the degree that such firms face increased competition, our results suggest that they are likely to seek to increase their CSR, environmental and otherwise.

An interesting implication of our results is that, while China's WTO accession both increased competition and likely opened markets for Chinese firms, such a market enlargement effect may have a less clearly positive impact on overall Chinese economic welfare than economists would otherwise assume. The interpretation could be that the removal of trade barriers makes the competitiveness advantage of China as the world's factory (i.e., low cost manufacturing coupled with less stringent environmental regulations) more salient. This would be consistent with our earlier discussion that China is likely still on the left hand side of the environmental Kuznets curve, the side where economic growth leads to a more rather than a less pollution-intensive manufacturing sector and living environment. This emphasizes the importance of government policies that alleviate rather than exacerbate the harmful nature of this trade-off, seeking to move the country to a range where growth is green rather than brown.

Finally, we suggest that more research can look into how corporations adjust their social performance when market competition loosens rather than toughens. Are the incentives and results that we have discussed here symmetric? Do corporations become more generous in allocating investment and resources for social causes when market competition softens? How do the competitive strategies chosen by firms increase or moderate tendencies in that direction? The current emerging 'protectionism' might provide such interesting empirical opportunities.

References

Achabou MA Dekhili S. 2013. Luxury and sustainable development: Is there a match? *Journal of Business Research*. **66**: 1896-1903.

Aghion P, Bloom N, Blundell R, Griffith R, Howitt P. 2005. Competition and Innovation: An Inverted–U Relationship. *Quarterly Journal of Economics*. **120**:701-728.

Aguinis H, Glavas A. 2012. What We Know and Don't Know About Corporate Social Responsibility: A Review and Research Agenda. *Journal of Management*. **38**(4): 932-968.

Ali A, Klasa S, Yeung E. 2008. The Limitations of Industry Concentration Measures Constructed with Compustat Data: Implications for Finance Research. *The Review of Financial Studies*. **22**(10):3839-3871.

Aulakh P, Kotabe M, Teegen H. 2000. Export strategies of service companies emerging markets. *The Academy of Management Journal*. **43**(3): 342-361.

Bagnoli M, Watts SG. 2003. Selling to Socially Responsible Consumers: Competition and the Private Provision of Public Goods. *Journal of Economics and Management Strategy*. **12**(3):419-45.

Baker MJ. 1996. *Marketing: An Introductory Text*, Sixth ed. Bath, UK: The Bath Press.

Bansal P. Roth K.2000. Why companies go green? A Model of ecological responsiveness. *Academy of Management Journal*. **43**(4): 717-736.

Bansal P, Song H-C. 2017. Similar But Not the Same: Differentiating Corporate Sustainability from Corporate Responsibility. *Academy of Management Annals* **11**(1): 105-149.

Barin-Cruz L, Boehe DM. 2008. CSR in the global marketplace: Towards sustainable global value chains. *Management Decision*. **46**(8): 1187-1209.

Barney J. Zhang S. 2008. Collective Goods, Free Riding, and Country Brands: The Chinese Experience. *Management and Organization Review*. **4**(2): 211-223.

Bas M, Strauss-Kahn V. 2015. Input-trade liberalization, export prices and quality up grading. *Journal of International Economics*. **95**(2):250-262.

Berrone P., Fosfuri A, Gelabert L, Gomez-Mejia L. R. 2013. Necessity as the Mother of 'Green'Inventions: Institutional Pressures and Environmental Innovations, *Strategic Management Journal*. **34**(8): 891-909.

Besley T, Ghatak M. 2007. Retailing Public Goods: The Economics of Corporate Social Responsibility. *Journal of Public Economics*. **91**(9):1645-63.

Biswas A, Roy M. 2015. Green products: an exploratory study on the consumer behaviour in emerging economies of the East. *Journal of Cleaner Production*. **87**: 463-468.

Blackman A. 2010. Alternative pollution control policies in developing countries. *Review of Environmental Economics and Policy*. **4**(2):234-253.

Bo H, Li T, Toolsema LA. 2009. Corporate social responsibility investment and social objectives: an examination on social welfare investment of Chinese state owned enterprises. *Scottish Journal of Political Economy* **56**(3): 267-295.

Bu M, Liu Z, Gao Y. 2011. Influence of International Openness on Corporate Environmental Performance in China. *China & World Economy* **19**(2): 77-92.

Bu M, Wagner M. 2016. Racing to the bottom and racing to the top: The crucial role of firm characteristics in foreign direct investment choices. *Journal of International Business Studies* **47**(9): 1032-1057.

Buehler S, Halbheer D. 2011. Selling When Brand Image Matters. *Journal of Theoretical and Institutional Economics*. **167**, 102-118.

Campbell J. 2007. Why Would Corporations Behave in Socially Responsible Ways? An Institutional Theory of Corporate Social Responsibility. *Academy of Management Review*. **32**(3): 946-967.

Chan R. 1999. Environmental Attitudes and Behaviour of Consumers in China. *Journal of International Consumer Marketing*. **11**(4): 25-52

Chang L, Li W, Lu X. 2015. Government Engagement, Environmental Policy, and Environmental Performance: Evidence from the Most Polluting Chinese Listed Firms. *Business Strategy and the Environment*. **24:**1-15.

Chang S-J, Wu B. 2014. Institutional barriers and industry dynamics. *Strategic Management Journal* **35**(8): 1103-1123.

Chemmanur TJ, He S, Nandy DK. 2010. The going-public decision and the product market. The *Review of Financial Studies*. **23**(5):1855-1908.

Child J, Rodrigues SB 2005. The internationalization of Chinese firms: A case for theoretical extension? *Management and Organization Review*. **1**: 381-410.

Conrad K. 2005. Price Competition and Product Differentiation When Consumers Care for the Environment. *Environmental and Resource Economics*. **31**(1): 1-19.

Copeland, BR, Taylor MS. 2004. Trade, growth, and the environment. *Journal of Economic literature*, ***42***(1):7-71.

Cunat V, Guadalupe M. 2005. How Does Product Market Competition Shape Incentive Contracts? *Journal of the European Economic Association*. **3**(5):1058-1082.

Declerck DM, M'Zali B. 2012. Product market competition and corporate social responsibility. Unpublished paper, *https://cenf.univ-paris1.fr/fileadmin/.../Product_market_competition_and_CSR.pdf* (accessed 8 November 2017).

Delmas MA, Toffel MW. 2008. Organizational responses to environmental standards: Opening the black box. *Strategic Management Journal*. **29**(10): 1027-1055.

Deloitte Research. 2003. The worlds' factory: China enters the 21st century. New York: Deloitte.

Dickson PR, Ginter JL. 1987. Market Segmentation Product Differentiation and Marketing Strategy. *Journal of Marketing*. **51**(2): 1-10.

Dickson. 1997. *Marketing management*. Thomson South-Western.

Donaldson L, Davis JH. 1991. Stewardship theory or agency theory: CEO governance and shareholder returns. *Australian Journal of management*. **16**(1): 49-64.

Dorobantu S, Kaul A, Zelner B. 2017. Nonmarket strategy research through the lens of new institutional economics: An integrative review and future directions. *Strategic Management Journal* **38**(1): 114-140.

Earnhart D, Khanna M, Lyon TP. 2013. Corporate environmental strategies in developing and transition economies, *mimeo, Ross School of Business,* University of Michigan.

Fee CE, Hadlock CJ, Pierce JR. 2009. Investment, financing constraints, and internal capital markets: Evidence from the advertising expenditures of multinational firms. *Review of Financial Studies*. **22**(6): 2361-2392.

Fernández-Kranz D, Santaló J. 2010. When necessity becomes a virtue: The effect of product market competition on corporate social responsibility. *Journal of Economics & Management Strategy*. **19**(2): 453-487.

Flammer C. 2015. Does Product Market Competition Foster Corporate Social Responsibility: Evidence from Trade Liberalization? *Strategy Management Journal*. **36**(10):1469-1485.

Flammer C. 2017. Competing for Government Procurement Contracts: The Role of Corporate Social Responsibility. Available at SSRN: https://ssrn.com/abstract=2548750

Fisman R, Heal G, Nair VB. 2006. A model of ccorporate philanthropy. Working paper, (Wharton School, University of Pennsylvania).

Foellmi R, Zweimuller J. 2004. Inequality, market power, and product diversity. *Economic Letters*. **82**(1): 139-145.

Gao G. Murray J Kotabe M and Lu J. 2010. A 'Strategy tripod' perspective on export behaviours: Evidence from domestic and foreign firms based in an emerging economy. *Journal of International Business Studies*. **41**: 377-396.

Ghoul SE, Guedhami O, Kim Y. 2017. Country-level institutions, firm value, and the role of corporate social responsibility initiatives. *Journal of International Business Studies*. **48**(3): 360-385.

Grether JM, Mathys NA., de Melo J. 2012. Unravelling the worldwide pollution haven effect. *The Journal of International Trade & Economic Development*. ***21***(1), 131-162.

Griffith R. 2001.Product Market Competition, Efficiency and Agency Costs: An Empirical Analysis. *The Institute for Fiscal Studies*. WP01/12.

Grossman GM, Krueger AB. 1995. Economic Growth and the Environment. *The Quarterly Journal of Economics*. **110**(2):354-377.

Grullon G., Larkin, Y., and Michaely R. 2016. Are US Industries Becoming More Concentrated? Accessed at https://finance.eller.arizona.edu/sites/finance/files/grullon_11.4.16.pdf

Guadalupe M, Wulf J. 2010. The Flattening Firms and Product Market Competition: The effect of Trade Liberalization on Corporate Hierarchies. *American Economic Journal: Applied Economics*. **2**(4):105-127.

Guariglia A, Liu X, Song L. 2011. Internal finance and growth: microeconometric evidence on Chinese firms. *Journal of Development Economics*. **96**(1):79-94.

Hawn O, Kang H-G. 2015. The Market for Corporate Social Responsibility (CSR): How Industry Structure Determines CSR. Available at SSRN2380641.

Hill CWL. 1988. Differentiation versus low cost or differentiation and low cost: A contingency framework. *Academy of Management Review*. **13**(3): 401-412.

Hotelling H. 1929. Stability in Competition. *Economic Journal* **39**(1): 41-57.

Hotelling H. 1931. The Economics of Exhaustible Resources. *Journal of Political Economy*. **39**: 137-175.

Hu AG, Liu Z. 2014. Trade Liberalization and Firm Productivity: Evidence from Chinese Manufacturing Industries. *Review of International Economics*. **22**(3):488-512.

Husted BW, Montiel I, Christmann P. 2016. Effects of local legitimacy on certification decisions to global and national CSR standards by multinational subsidiaries and domestic firms. *Journal of International Business Studies* **47**(3): 382-397.

Ioannou, I. & Serafeim, G. 2012. What drives corporate social performance? The role of nation-level institutions. *Journal of International Business Studies*, **43**(9): 834-64.

Jaffe AB, Peterson SR, Portneya PR, Stavins RN. 1995. Environmental regulation and international competitiveness: what does the evidence tell us? *Journal of Economic Literature*. **33**(1):132-163**.**

Jayachandran S, Kalaignanam K, and Eilert M. 2013. Product and Environmental Social Performance: Varying Effect on Firm Performance. *Strategic Management Journal.* **34**: 1255-1264.

Jin Y, Wang H, Wheeler D. 2010. Environmental Performance Rating and Disclosure. *The World Bank Policy Research Working Paper* 5420.

Kaul A, Luo J. 2017. An Economic Case for CSR: The Comparative Efficiency of For-Profit Firms in Meeting Consumer Demand for Social Goods. *Strategic Management Journal.* forthcoming.

King A, Lenox M. 2002. Exploring the Locus of Profitable Pollution Reduction. *Management Science*. **48**(2):289-299.

Kotler P, Ang SH, Leong SM, Tan CT. 1996. *Marketing Management - An Asian Perspective*. Prentice Hall, Singapore.

Lancaster KJ. 1966. A New Approach to Consumer Theory. *Journal of Political Economy*. **74**(2): 132-157.

Levitt T. 1958. The dangers of social responsibility. *Harvard Business Review*. **36**(5): 41-50.

Levinson, A.Taylor MS. 2008. Unmasking the pollution haven effect. *International economic review*, ***49***(1), 223-254.

Li CB, Li JJ. 2008. Achieving Superior Financial Performance in China: Differentiation, Cost Leadership, or Both? *Journal of International Marketing*. **16(**3): 1-22.

Li H, Ma H, Xu Y. 2015. How do exchange rate movements affect Chinese exports? –A firm level investigation. *Journal of International Economics*. **97**(1): 148-161.

Li X. Zhou YM 2017. Origin Matters: The Differential Impact of Import Competition on Innovation. *Advances in Strategic Management: Geography, Location, and Strategy*. **38**: 387-427.

Li X. Zhou YM. 2017. Offshoring pollution while offshoring production: *Strategic Management Journal*. **38**(11): 2310-2329.

Lin LW. 2010. Corporate Social Responsibility in China: Window Dressing or Structural Change? *Berkeley Journal of International Law*. **28**(1): 64-100.

Loo, T., and Davies G. 2006. Branding China: the ultimate challenge in reputation management? *Corporate Reputation Review*. **9**: 198-210.

Lyon T, Lu Y, Shi X, Yin Q. 2013. How do investors respond to Green Company Awards in China? *Ecological Economics*. **94**:1-8.

Marano V, Tashman P, Kostova T. 2017. Escaping the iron cage: Liabilities of origin and CSR reporting of emerging market multinational enterprises. *Journal of International Business Studies* **48**(3): 386-408.

Marcus A, Fremeth R. 2009. Green management matters regardless. *Academy of Management Perspectives*. **23**(3):17-26.

Matten D. Moon J. 2008. "Implicit" and "explicit" CSR: A conceptual framework for a comparative understanding of corporate social responsibility. *Academy of Management Review*. **33**(2): 404-414.

Mercer D. 1992. *Marketing.* Oxford, UK: Blackwell Publishers.

Millimet DL, Roy J. 2016. Empirical tests of the pollution haven hypothesis when environmental regulation is endogenous. *Journal of Applied Econometrics*, ***31***(4), 652-677.

Murray JY, Kotabe M, Zhou JN. 2005. Strategic alliance-based sourcing and market performance: evidence from foreign firms operating in China. *Journal of International Business Studies*. **36**(2): 187-208.

Myers MB, Harvey M. 2001. The value of pricing control in export channels: a governance perspective. *Journal of International Marketing*. **9**(4): 1-29.

Naughton B. 2007. *The Chinese Economy: Transitions and Growth.* Cambridge, MA. MIT Press.

Newman G, Gorlin, M. and Dhar R. 2014. When Going Green Backfires: How Firm Intentions Shape the Evaluation of Socially Beneficial Product Enhancements. *Journal of Consumer Research*. **41**:823-839.

Orsato R. 2006. Competitive Environmental Strategies: When Does It Pay To Be Green? *California Management Review*. **48**(2):127-143.

Phillips LW, Chang DR, Buzzell RD. 1983. Product quality, cost position and business performance: A test of some key hypotheses. *The Journal of Marketing*. **47**(2): 26-43.

Porter ME. 1980. *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. New York: Free Press.

Porter ME. 1985. *Competitive Advantage*. The Free Press, NY.

Porter ME, van der Linde C. 1995. Green and competitive: Ending the stalemate. *Harvard Business Review*. **73**(5):120-134.

Russo MV, Fouts PA. 1997. A resource-based perspective on corporate environmental risk management and profitability. *Academy of Management Journal*. **40**(3):534-559.

Salop SC. 1979. Monopolistic Competition with Outside Goods. *The Bell Journal of Economics*. **10**(1): 141-156.

Servaes H, Tamayo A. 2013. The Impact of Corporate Social Responsibility on Firm Value: The Role of Customer Awareness. *Management Science* **59**(5): 1045-1061.

Sharp B, Dawes J. 2001. What is Differentiation and How Does it Work? *Journal of Marketing Management*. **17**(7-8):739-59.

Solow R. 1974. The Economics of Resources or the Resources of Economics. *American Economic Review Papers and Proceedings*. **64**: 1-14.

Strizhakova, Y., Coulter R and Price L. 2008. Branded Products as a Passport to Global Citizenship: Perspectives from Developed and Developing Countries. *Journal of International Marketing*. **16**(4): 57-85.

Trout J. 2000. Differentiate or Die: Survival in Our Era of Killer Competition, Wiley, New York, NY.

Wang H, Bi J, Wheeler D, Wang J, Cao D, Lu G, Wang Y. 2004. Environmental performance rating and disclosure: China's Green Watch program. *Journal of Environmental management*. **71**(2):123-133.

Wang, H., Tong, L., Takeuchi, R., & George, G. 2016. Corporate Social Responsibility: An Overview and New Research Directions Thematic Issue on Corporate Social Responsibility. *Academy of Management Journal*. **59**(2): 534-44.

Xu L. 2012. Profitability and capital structure: evidence from import penetration. *Journal of Financial Economics*. **106**(2):427-446.

Zhang, Y., Wang, H., Zhou, X. 2017. Dare to be different? Conformity and distinctiveness in corporate social responsibility strategies and the response of securities analysts. Working paper.

Table 1: Descriptive statistics

Variable	Measurement	Source	Mean	Std. Dev.	Min	Max
Environmental performance	1-5, higher values indicate better performance	Green Watch Program in Jiangsu China	3.58	0.81	1.00	5.00
Post WTO	Dummy variable; before 2001 is coded as '0', otherwise '1'	This study (NBS)	0.62	0.48	0.00	1.00
Import tariff rates for output 1999	Import tariff rates for output in 1999	WITS website	20.29	5.91	6.45	32.47
Export	Dummy variable; exporter is coded as "1", otherwise "0"	This study (NBS)	0.36	0.48	0.00	1.00
Import tariff rates for input 1999	Import tariff rates for input in 1999	WITS website	8.89	3.28	3.94	13.27
Age	Number of years in operation	This study (NBS)	13.69	13.88	1.00	109.00
Log assets	Natural log of total assets	This study (NBS)	10.65	1.63	3.82	16.87
Return on assets	Return on assets	This study (NBS)	0.07	0.10	0.00	4.23
Product diversity	Number of main products	This study (NBS)	1.45	0.72	1.00	3.00
Log value added	Natural log of value added	This study (NBS)	10.50	0.98	1.60	15.24
Debt ratio	Long term liability/total assets	This study (NBS)	0.64	0.25	0.00	3.87
State equity %	State equity/total received capital	This study (NBS)	0.06	0.21	0.00	1.00
Collective equity %	Collective capital/total received capital	This study (NBS)	0.07	0.24	0.00	1.00
Foreign equity %	Foreign capital/total received capital	This study (NBS)	0.13	0.31	0.00	1.00
HKTM equity %	HKTM capital/total received capital	This study (NBS)	0.07	0.23	0.00	1.00
Individual equity %	Individual capital/total received capital	This study (NBS)	0.46	0.47	0.00	1.00
Cost leadership	See endnote 11	This study (NBS)	0.18	0.30	-1.00	1.00
Differentiation	See endnote 12	This study (NBS)	0.05	0.32	-1.00	1.00

Table 2: Correlation matrix of main variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
(1) Environmental performance	1																	
(2) Post WTO	-0.02	1																
(3) Import tariff rates for output 1999	-0.04	0.02	1															
(4) Export	0.12*	-0.06*	0.05*	1														
(5) Import tariff rates for input 1999	0.01	0.02*	0.81*	0.07*	1													
(6) Age	-0.03	-0.09*	-0.05*	0.10*	-0.02	1												
(7) Log assets	0.24*	-0.08*	-0.07*	0.36*	-0.03*	0.19*	1											
(8) Return on assets	0.03	0.05*	-0.05*	-0.01	-0.07*	-0.11*	-0.12*	1										
(9) Product diversity	0.01	-0.04*	-0.10*	0.04*	-0.12*	0.22*	0.13*	-0.05*	1									
(10) Log value added	0.14*	0.01	-0.13*	0.11*	-0.15*	0.02	0.37*	0.02	0.01	1								
(11) Debt ratio	-0.13*	-0.03*	-0.07*	-0.06*	0.09*	0.13*	-0.11*	-0.16*	0.04*	-0.05*	1							
(12) State equity %	0.02	-0.08*	-0.04*	0.06*	-0.03	0.32*	0.21*	-0.07*	0.14*	0.07*	0.04*	1						
(13) Collective equity %	-0.08*	-0.05*	-0.00	-0.08*	-0.02	0.08*	-0.07*	0.12	0.02	-0.04*	0.05*	-0.08*	1					
(14) Foreign equity %	0.04*	0.01	-0.01	0.31*	-0.01	-0.15*	0.34*	-0.00	-0.07	0.16*	-0.22*	-0.08*	-0.11*	1				
(15) HTM equity %	0.25*	0.00	0.04*	0.14*	0.04*	-0.12*	0.113*	-0.13*	-0.06*	0.06*	-0.09*	-0.07*	-0.07*	-0.13*	1			
(16) Individual equity %	-0.17*	0.05*	0.06*	-0.23*	0.06	-0.03	-0.41*	-0.40*	-0.03	-0.15*	0.16*	-0.25*	-0.26*	-0.40*	-0.28*	1		
(17) Cost leadership	-0.12*	-0.02*	0.03*	-0.21	0.00	-0.08	-0.49	-0.05	-0.06	0.01	0.06	-0.06	0.03	-0.18	0.04	0.17*	1	
(18) Differentiation	0.05*	0.02*	-0.02	0.04*	-0.01	0.04*	0.07*	0.01	0.00	-0.01	-0.01	-0.02	0.03*	0.00	-0.03*	0.01	-0.09*	1

Notes: pairwise correlation. *p<0.01

Table 3: The effect of China's WTO accession on firms' environmental performance

	(1)	(2)	(3)	(4)	(5)
	Full sample	Full sample	Full sample	Over-compliance	Balanced panel
	Coef. p-value	Coef. p-value	Coef. p-value	Coef. p-value	Coef. p-value
Post WTO	0.181 (0.363)	0.453 (0.011)	0.122 (0.857)	0.217 (0.690)	0.937 (0.015)
	[0.201]	[0.179]	[0.672]	[0.544]	[0.384]
Import tariff for output 1999	0.006 (0.712)	0.016 (0.564)	-0.001(0.989)	-0.026 (0.444)	0.049 (0.028)
	[0.024]	[0.029]	[0.041]	[0.034]	[0.022]
Post WTO*import tariff for output 1999	-0.009 (0.417)	-0.019 (0.055)	-0.022 (0.041)	-0.042 (0.008)	-0.053 (0.010)
	[0.013]	[0.009]	[0.010]	[0.011]	[0.014]
Post WTO*import tariff for output*Cost leadership			-0.132 (0.054)	-0.131 (0.042)	-0.148 (0.037)
			[0.068]	[0.057]	[0.059]
Cost leadership			-1.331 (0.269)	-1.075 (0.115)	-1.159 (0.120)
			[1.200]	[0.791]	[0.891]
Post WTO*cost leadership			1.414 (0.293)	0.895 (0.254)	0.897 (0.221)
			[1.341]	[1.023]	[1.021]
Import tariff for output*cost leadership			0.134 (0.028)	0.134 (0.028)	0.135 (0.020)
			[0.061]	[0.061]	[0.058]
Post WTO*Import tariff for output*differentiation			0.124 (0.004)	0.096 (0.003)	0.097 (0.003)
			[0.043]	[0.035]	[0.036]
Differentiation			0.038 (0.400)	0.041 (0.412)	0.085 (0.276)
			[0.045]	[0.045]	[0.095]
Post WTO*differentiation			-0.056 (0.466)	-0.025 (0.431)	-0.024 (0.412)
			[0.077]	[0.075]	[0.075]
Import tariff for output*differentiation			0.018 (0.553)	0.021 (0.554)	0.020 (0.555)
			[0.053]	[0.061]	[0.059]
Lagged age	0.002 (0.221)	0.004 (0.270)	0.001 (0.868)	-0.002 (0.551)	-0.018 (0.230)
	[0.010]	[0.003]	[0.003]	[0.003]	[0.015]
Lagged log assets	-0.009 (0.756)	-0.020 (0.610)	-0.056 (0.466)	-0.081 (0.172)	-0.108 (0.456)
	[0.033]	[0.039]	[0.077]	[0.059]	[0.117]
Lagged return on assets	-0.065 (0.708)	-0.388 (0.341)	-0.244 (0.604)	0.252 (0.112)	-0.394 (0.649)
	[0.186]	[0.408]	[0.470]	[0.127]	[0.866]
Lagged product diversity	0.028 (0.331)	0.073 (0.270)	0.038 (0.400)	0.019 (0.576)	0.029 (0.190)
	[0.034]	[0.066]	[0.045]	[0.035]	[0.028]
Lagged value added	0.045 (0.799)	0.050 (0.043)	0.050 (0.041)	0.050 (0.040)	0.095 (0.120)
	[0.023]	[0.025]	[0.025]	[0.025]	[0.061]
Lagged debt ratio	-0.054 (0.632)	-0.170 (0.345)	-0.102 (0.517)	-0.238 (0.108)	-0.142 (0.442)
	[0.115]	[0.180]	[0.184]	[0.148]	[0.185]
Lagged state equity %	0.061 (0.508)	0.046 (0.727)	0.092 (0.544)	0.085 (0.462)	0.060 (0.767)
	[0.094]	[0.132]	[0.151]	[0.115]	[0.203]
Lagged collective equity %	-0.030 (0.760)	-0.074 (0.616)	-0.118 (0.475)	-0.128 (0.332)	-0.197 (0.340)
	[0.102]	[0.147]	[0.165]	[0.132]	[0.206]
Lagged foreign equity %	0.082 (0.521)	0.081 (0.669)	-0.570 (0.132)	-0.323 (0.299)	0.130 (0.633)
	[0.138]	[0.189]	[0.378]	[0.310]	[0.271]
Lagged HTM equity %	0.070 (0.573)	0.073 (0.554)	-0.713 (0.048)	-0.446 (0.118)	0.079 (0.742)
	[0.123]	[0.152]	[0.360]	[0.284]	[0.242]
Lagged individual equity %	-0.097 (0.041)	-0.250 (0.029)	-0.160 (0.154)	-0.221 (0.009)	-0.056 (0.616)
	[0.042]	[0.114]	[0.112]	[0.084]	[0.111]
Import tariff for input	-0.030 (0.647)	-0.213 (0.167)	-0.240 (0.050)	-0.241 (0.050)	-0.165 (0.311)
	[0.063]	[0.147]	[0.122]	[0.122]	[0.163]
Import tariff for input * Post WTO	-0.043 (0.336)	-0.045 (0.318)	0.029 (0.746)	-0.044 (0.205)	-0.115 (0.151)
	[0.045]	[0.045]	[0.091]	[0.035]	[0.080]
Export	-0.184 (0.201)	-0.238 (0.108)	-0.100 (0.780)	-0.086 (0.190)	-0.502 (0.046)
	[0.143]	[0.148]	[0.359]	[0.066]	[0.252]
Export * Post WTO	0.108 (0.464)	0.140 (0.334)	0.298 (0.433)	0.298 (0.412)	0.231 (0.343)
	[0.147]	[0.145]	[0.380]	[0.376]	[0.243]
Constant	3.361 (0.000)	3.573 (0.000)	3.870 (0.001)	4.169 (0.000)	3.889 (0.001)
	[0.428]	[0.482]	[1.144]	[1.022]	[1.176]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
City*Year effects	No	Yes	Yes	Yes	Yes
N	3064	3064	2918	2834	1262
R2	0.4781	0.4815	0.6089	0.6069	0.6168

Notes: This table reports coefficients from the regression of firm environmental performance on the interactive term of Post WTO and import tariff for output in 1999 and its interactions with cost leadership and differentiation. The dependent variable is environmental performance in 2000-2005. Robust standard errors clustered at industry level are in square bracket. P-values are in parentheses.