Environmental Scandals and Green Products*

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Abstract

In this paper, we apply a novel text-based classification procedure to identifying green trademarks in the USPTO trademark dataset and study the development of environment-friendly products and services in the US economy over the past forty years. Given the "use in commerce" requirement for US trademarks, these trademarks capture newly commercialized green products/services and thus firms' commitment to environmental protection and sustainability. We first show that firms with more green products receive higher environmental ratings, hold more green patents, and have higher revenue growth and market value. We then explore whether and how firms' green product introduction is influenced by the environmental scandals in their industry, and find that firms launch significantly more new green products after product market peers receive negative media coverage of their environmental issues. We also present suggestive evidence for the two driving forces underlying this pattern: product market competition and stakeholder pressure. We conclude that environmental scandals trigger stakeholders' green demands and that firms catering to those demands do well by doing good.

Keywords: green trademarks; environmental scandals; corporate social responsibility; USPTO trademarks; green products; green services; market followers; green experience

JEL classification: G30; G38, O30, O32, O33

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"The role of IP in environmental protection has traditionally been studied by focusing on technology and innovation, using patent filings as the principal indicator of innovative activity in this sphere…. However, to date virtually no studies have considered trade mark filings as an indicator of innovation related to environmental protection."

- The European Union Intellectual Property Office (2021, p. 5)

1. Introduction

Environmental crises can heighten the awareness of environmental protection and sustainability from consumers, the public, government agencies, and regulators, and trigger corporate actions. In the early 1990s, researchers found that 60 to 80 percent of the waste in the ocean was non-biodegradable plastic, and later discovered the "Great Pacific Garbage Patch" in the calm regions between ocean currents.[1] Media coverage of such environmental crises raises public awareness and leads to initiatives and actions from large corporations. Coca-Cola introduced 2-liter bottles with 25 percent of its material using recycled plastic in 1991 (New York Times 1991), and Patagonia launched its first polyester fleece jacket using recycled plastic bottles in 1993. In 2015, a video uploaded on YouTube titled "Sea Turtle with Straw up its Nostril" went viral. Subsequently, Starbucks announced that it would phase out plastic straws from its stores by 2018, an initiative followed by many large restaurant chains including McDonald's and Dunkin'.

Green products (like Coca-Cola's new 2-liter bottles) and services (like waste management) are uniquely positioned to address the environmental protection emergency. The pressure from consumers' and the public's green demands urges firms to cultivate their own green brands and eco-marks that are environment-friendly (Park 2022).[2] In this paper, we plan to conduct the first large-sample study of the development of environment-friendly products and services in the US economy by applying a novel text-based classification procedure for identifying green trademarks ("green marks" henceforth) in the United States Patent and Trademark Office (USPTO) trademark dataset. These green marks featuring environment-friendly products/services are direct and visible ways for

[1] https://www.theguardian.com/environment/2018/nov/13/the-plastic-backlash-whats-behind-our-sudden-rage-and-will-it-make-a-difference and https://education.nationalgeographic.org/resource/great-pacific-garbage-patch/.

[2] A recent study by Dentsu International and Microsoft Advertising reports that over 90 percent of consumers are interested in brands that are committed to and can demonstrate they are making sustainability a priority. See The Rise of Sustainable Media (microsoft.com).

firms to communicate their sustainable initiatives to various stakeholders and can be associated with higher revenue growth and market value. Moreover, such a new dataset enables us to examine whether and how firms respond to environmental scandals of their product market peers by changing their investments in green products/services.

When a firm prepares to launch a new product or service, it will first file a new trademark at the USPTO for marketing that product or service. Given the "use in commerce" requirement by the US trademark law,[3] the firm has to provide evidence for the commercialization of the product/service in order to register the trademark. Moreover, in its trademark application, the firm must provide an "identification" to describe the product or service covered by the mark in a precise and understandable way, which defines the scope of protection.[4]

We identify green marks that capture firms' commitment to environmental protection and sustainability by applying the newly released green trademark taxonomy from the European Union Intellectual Property Office (EUIPO) (2021) to the identifications of all registered US trademarks over the period 1981-2020. The EUIPO (2021) employs an algorithm that combines machine learning with human interventions and uses the 904 green terms labelled by EUIPO experts as the training set for the algorithm. The algorithm then generates 375 green expressions that can be used to identify green marks so long as a mark's identification of products and services is in English. A term (which could be one word or multiple words) in a mark's identification is green if it matches to one of those green expressions and satisfies additional relevant conditions. A mark is a green mark if its identification contains at least one green term. In our application of the EUIPO taxonomy to identify green marks in the USPTO trademark dataset, we also modify the taxonomy to account for the US context.

Our green mark dataset offers several advantages in data availability, legal implications, and scope of coverage. Unlike surveys that tend to be small and selective in sampling, the USPTO

[3] The term "use in commerce" is legally defined as the bona fide use of a mark in the ordinary course of trade, and not made merely to reserve a right in a mark. See Section 45 of the Trademark Act, 15 U.S.C. §1127: https://www.uspto.gov/sites/default/files/trademarks/law/Trademark_Statutes.pdf.

[4] According to the Trademark Manual of Examining Procedure (TMEP), a mark's identification should not include extra or unnecessary information, and must describe goods or services in ways that general readers can easily understand the goods or services themselves. See: https://tmep.uspto.gov/RDMS/TMEP/current#/current/TMEP-1400d1e1982.html.

trademark data are updated frequently and freely available to the public. In addition, unlike advertisements or news releases, green marks (and their product descriptions) are examined, verified, and approved by an official third party (the USPTO), which mitigates concerns about corporate greenwashing. The EUIPO also emphasizes that a green mark is a valid indicator for green inventions (EUIPO 2021). Finally, unlike patents that are subject to patentability limitation, trademarks cover all products and services (Hall et al. 2014); therefore, our green mark dataset allows us to study the full landscape of green product/service market in the US.

After constructing our green mark dataset for all US public firms over the period 1981-2020, we first conduct a number of validation tests for green marks using alternative measures of firms' commitment to environmental protection and sustainability – environmental ratings and green patents. We find that firms with more green marks are associated with higher environmental scores and more green patents. We also examine the value relevance of green marks and show that firms with more green marks are associated with higher future revenue growth and Tobin's *q*. As far as we are aware, we are the first in the literature to establish the value-relevance of green brands.

Motivated by high profile anecdotal evidence on environmental disasters and subsequent corporate actions (see examples earlier), we next examine the extent to which firms respond to the environmental scandals in their industry by changing their investments in new, environment-friendly products/services. The environmental scandals to a focal firm in our setting are the occurrences of severe environmental news featuring its product market peers (but not the focal firm itself). The rareness of such events (about 2% of the firm-year observations) makes them unlikely to be anticipated by the focal firm. Moreover, our identification of product market peers is more granular than prior studies as our approach combines both product market overlap and industry affiliation. As a result, our analysis helps pinpoint consumers' demand for green products as a potential driver for our findings. We show that firms launch more green products/services following product market peers' negative environmental news coverage. We note that our main findings are robust to alternative measures of product market peers, peers' negative environmental news, and model specifications.

Delving deep into our main analysis, we further show that in response to their industry's environmental scandals, firms produce more exploratory green marks (i.e., green marks in a product

class in which they have not registered any trademark before) than non-exploratory ones. Moreover, we show that firms produce significantly more green marks unrelated to their corporate names and significantly fewer green marks bearing their corporate names. These results indicate that affected firms intentionally differentiate their new, green products/services from their existing (core) products/services or market image.

We propose two mutually-nonexclusive driving forces underlying firms' launch of green products/services in response to the environmental scandals in their industry. The first is product market competition. The corporate social responsibility (CSR) literature argues that firms act socially responsible because they anticipate benefits and profits from launching green products to cater to customers' preferences (Navarro 1988; Russo and Fouts 2001; Luo and Bhattacharya 2006; Elfenbein, Fisman, and McManus 2012). We propose that a firm's reactions to its product market peers' environmental scandals will be conditional on its product market position, i.e., whether it is a market leader or not, and its past experience in green innovation. Prior work shows that market leaders are reluctant to replace their existing products (Holmes, Levine, and Schmitz 2012; Akcigit and Kerr 2018), while market followers have strong incentives to make the transition to green products in order to catch up.[5] In addition, the literature on path dependence in technical change shows that firms with a prior history of invention in pollution mitigation technologies are quicker to produce new green patents in response to government incentives (e.g., Aghion et al. 2016; Brown, Martinsson, and Thomann 2022). We thus predict that to differentiate themselves, market followers and firms with prior experience in green innovation will launch more green products by taking advantage of the opportunity that product market peers' environmental scandals render, compared to market leaders and firms without prior green experience. This competition explanation is supported by our empirical tests in which we show that market followers and firms with green innovation experiences are associated with significantly more green products after product market peers' negative environmental news.

[5] Dhaliwal et al. (2011) show that firms that initiate disclosure of their CSR activities enjoy lower costs of equity capital. Eccles, Ioannou, and Serafeim (2014) find that firms that voluntarily adopt ESG policies experience higher stock returns and better accounting performance than their peers.

The second driving force is stakeholder pressure. Environmental scandals pose serious risks to the focal firm's stakeholders, the public, and the government. Intensified external scrutiny and monitoring put pressure on high pollution firms in the focal firm's industry that are more subject to environmental risk and damage. Berrone et al. (2013) document that a firm polluting more than its peers is under greater external pressure and is more likely to engage in environmental innovation. We thus predict that high pollution firms will more likely respond to environmental scandals by launching more green products to reduce potential scrutiny and reputation damage compared to their peers with low pollution. This stakeholder pressure explanation is supported by our empirical tests in which we show that only high pollution firms produce significantly more green product/services in response to product market peers' environmental scandals.

We conclude that environmental scandals trigger stakeholders' green demands and that firms cater to those demands do well by doing good.

Our study contributes to several strands of the literature. First, we contribute to the growing literature on green innovation. Recent studies focus on technological changes and optimal public climate change policies that facilitate the transition from dirty technologies to clean technologies (Acemoglu et al. 2016; Aghion et al. 2016; Cohen, Gurun, and Nguyen 2022; Bolton, Kacperczyk, and Wiedemann 2023), but none of these studies examine green trademarks that cover a much wider spectrum of environment-friendly green products and services. Our green mark dataset is a timely addition to this literature and offers possible solutions for corporations, stakeholders, international organizations, and government agencies seeking to systematically leverage all activities, products, and services in sustainable development. A noteworthy advantage of our dataset is that we capture "users" instead of "producers" of green technologies – the former is a much larger set of firms than the latter in our economy.

Second, our study adds to the literature on whether and how firms do well by doing good in their environmental performance. The positive association between firms' number of green marks and their future revenue growth (and Tobin's *q*) offers new evidence based on commercialized green products, which differs from prior studies in this literature mainly based on surveys, proprietary data, rating agencies' indexes, or corporate disclosures to measure firms' ESG activities and performance

(Lev, Petrovits, and Radhakrishnan 2010; Edmans 2011, Eccles, Ioannou, and Serafeim 2014; Dimson, Karakaş, and Li 2015; Khan, Serafeim, and Yoon 2016).

Third, our study also adds to the literature on whether and how the environmental pressure from stakeholders changes corporate investment decisions (Berrone et al. 2013; Dai, Liang, and Ng 2021; Gantchev, Giannetti, and Li 2022). Different from prior literature, our identification of product market peers is new, requiring both a high degree of product market overlap and same industry affiliation. As a result, we provide rich micro-evidence on consumers' demand for green products underlying firms' green market production in response to product market peers' environmental scandals. From a broader perspective, we highlight the media's disciplining role in ESG issues, with implications for green products/services (Gantchev, Giannetti, and Li 2022; Serafeim and Yoon 2023).

2. Literature Review and Conceptual Framework

Prior work shows that the media plays an important governance role in shaping executive compensation and corporate disclosure (Core, Guay, and Larcker 2008; Dyck, Volchkova, and Zingales 2008; Baloria and Heese 2018). In the CSR space, Flammer (2013), Krüger (2015), and Serafeim and Yoon (2023) find a negative and significant association between negative ESG media coverage and stock returns. Gantchev, Giannetti, and Li (2022) and Houston and Shan (2022) further establish the link between negative ESG media coverage and real corporate outcomes.[6] Tang and Tang (2016) find that the media plays a disciplining role by disseminating environmental information and guiding public opinion and assessment of corporate malfeasance in their environmental performance. The discussions above suggest that negative environmental news coverage can trigger public attention to a particular firm and/or its industry, and influence these firms' managerial decisions and business operations. However, most prior studies on the media's disciplinary role tend to focus on some reactive activities of the focal firm (i.e., the polluter) and ignore how its peer firms'

[6] Using RepRisk ratings, Houston and Shan (2022) show that banks cut off lending in response to a borrower's negative ESG news, and that those borrowers are more likely to move to lenders with worse ESG performance than their own. Gantchev, Giannetti, and Li (2022) show that firms with negative environmental and social news coverage experience large stock price drops, and respond to E&S-conscious investors by improving their E&S performance.

environmental practices are affected due to them sharing the same product market space, production technologies, and stakeholders. When examining peer firm effects, Sharkey and Bromley (2015) show that a firm tends to reduce its pollution when more of its peers are rated by a third-party ESG rating agency on environmental issues. Cao, Liang, and Zhan (2019) find that when peer firms are targeted by shareholder CSR proposals and subsequently implements changes, a firm also adopts similar CSR practices.

Prior studies on firms' green investment and innovation tend to focus on green patents and pollution abatement activities.[7] Studies based on green patents, however, are limited to a small sample of patenting firms that create environment-friendly technologies. However, some green investments and innovation may not be patentable or firms choose to keep them as trade secrets (without patenting). After surveying the economic literature, both theoretical and empirical, on the choice of intellectual property protection by firms, Hall et al. (2014) conclude that, trademarks are the most commonly used approach to protect intellectual property and cover the most number of product and service categories.[8] Some recent studies have started to use newly registered trademarks to measure product and service inventions (see, for example, Chen, Hsu, and Wang 2022; Hsu et al. 2022). Moreover, given the "use in commerce" requirement and the precise identification required for product/service description in trademark registrations, green marks employed in our study can capture firms' *actual* green investment and innovation broadly. The above discussions lead to our main hypothesis as follows: There will be potential positive spillover effects on firms' green investment and innovation when their product market peers receive negative news coverage on their environmental practices.

We posit that there are two mutually-nonexclusive factors driving firms' responses to product market peers' negative environmental news by introducing more green products/services: product market competition and stakeholder pressure. According to the competition angle, focal firms'

[7] A large number of studies examine environmental regulations and their impact on green innovation (Jaffe and Palmer 1997; Brown, Martinsson, and Thomann 2022). More recent studies shed light on different factors contributing to the transition to clean technologies (Acemoglu et al. 2012, 2016; Aghion et al. 2016; Cohen, Gurun, and Nguyen 2022; Bolton, Kacperczyk, and Wiedemann 2023).
[8] For example, the legal protection using patents is either infeasible or not meaningful in some industries such as financial and other service industries.

responses hinge on their market positions and prior experience in green product development. Market leaders have a lower incentive to replace their existing products, and the lower competitive pressure faced by market leaders further lessens their incentive to incur the necessary switching costs (Holmes, Levine, and Schmitz 2012; Akcigit and Kerr 2018).[9] In contrast, market followers may view the environmental scandals in their industry as a new opportunity to catch up if they bring out environmentally friendly products faster, as their progress on the CSR front sends a positive signal to investors and the public and helps differentiate themselves from competitors (Dhaliwal et al. 2011; Eccles, Ioannou, and Serafeim 2014). These discussions lead to our prediction that ceteris paribus, market followers will launch more green products following product market peers' negative environmental news, compared to market leaders.

The literature on path dependence in technical change shows that firms with a prior history of invention in pollution mitigation technologies are quicker to produce new green patents in response to government incentives (e.g., Aghion et al. 2016; Brown, Martinsson, and Thomann 2022). Albuquerque, Koskinen, and Zhang (2019) develop a model with heterogeneous firms of different costs in adopting CSR production technologies and show that firms with lower costs achieve product differentiation and earn higher profit margins. In line with these arguments, we predict that ceteris paribus, firms with more experience in developing green products are more likely to produce more green products/services in response to peer firms' environmental news because they are in a better position to convert peers' news into opportunities, enhancing their competitive positions.

According to the stakeholder pressure angle, negative environmental news of a product market peer highlights the structural and fundamental issues within the industry, and thus shifts the public's attention and scrutiny to all firms in that industry (Tang and Tang 2016). High pollution firms, in particular, face heightened pressure to act up due to their core activities often closely associated with environmental destruction. Such firms are more likely to be subject to public and media scrutiny, which can rapidly escalate in the age of social media, posing significant risks to their

[9] Others argue that more prominent firms, being more powerful, are less dependent on key stakeholders such as the government and civil society, and are therefore more likely to resist external pressures and to possess more freedom in choosing whether and how to comply externally imposed standards (e.g., the United Nations Global Compact) (Greenwood and Suddaby 2006; Okhmatovskiy and David 2012).

reputation and profitability. Berrone et al. (2013) examine environment-related patents of 326 publicly traded firms from polluting industries in the US and find that institutional pressures trigger such innovation, especially in those firms polluting relatively more than their industry peers. Similarly, Cohen, Gurun, and Nguyen (2022) find that it is brown firms who have the incentive/capacity to produce green innovation. We thus predict that ceteris paribus, high pollution firms are more likely to respond to peer firms' environmental scandals by launching more green products in order to reduce potential scrutiny and reputational damage, compared to low pollution firms. All of these discussions lead to our main hypothesis that firms increase their green mark production upon product market peers' environmental scandals and two possible explanations – product market competition and stakeholder pressure.

3. Data and Descriptive Statistics

We construct a dataset that combines the USPTO trademark and patent data, RepRisk for environmental news, Refinitiv for environmental scores, and CRSP-Compustat for firms' financial and accounting information. We describe each of these data sources in this subsection.

3.1. Identifying green marks

We download the *case file* of all registered trademarks from the USPTO,[10] including a mark's identification, mark words, filing date, registration date, Nice class(es), owner name, and owner address. The sample comprises 6,830,227 unique trademarks applied by US and non-US firms over the period 1981-2020.[11] After requiring registered trademarks with corporate owners whose headquarters are located in the US, we are left with 5,905,067 unique trademarks.

Each trademark application provides an "identification" that describes the properties and features of products and services under the mark and is reviewed and approved by the USPTO attorney. A trademark application may cover one or more Nice classes (and corresponding goods and

[10] https://www.uspto.gov/learning-and-resources/electronic-data-products/trademark-case-files-dataset-0
[11] We drop trademarks whose owners are *individuals*. In a *case file*, owner information is in the item "own_entity_cd," coded as 1 for individuals, and 2, 3, 9, 10, 11, 13, 16, or 19 for corporations.

services) and if the latter, it will provide an identification for each Nice class.[12] For instance, Nike's trademark for NFT (No. 97095855) covers three Nice classes (009, 035, and 041, which correspond to electrical and scientific apparatus, advertising and business, and education and entertainment, respectively). Its identification for the Nice class 009 states, "downloadable virtual goods, namely, computer programs featuring footwear, clothing, headwear, eyewear, bags, sports bags, backpacks, sports equipment, art, toys and accessories for use online and in online virtual worlds." A "term" is a basic unit in the identification, i.e., words or phrases describing a good or service. In the above example, "computer programs," "footwear," and "sports bags" are terms. In this section, we summarize our procedure to identify green marks and provide a detailed description in the Internet Appendix Section 1.

To develop its green trademark taxonomy, the EUIPO (2021) employs an algorithm that combines machine learning with human interventions and uses the 904 green terms labelled by EUIPO experts as the training set. The full list of green terms is provided in the Annex 1 of the EUIPO study (2021). Based on these green terms, the EUIPO algorithm generates 375 green expressions that can be used to identify green marks as long as a mark's identification is in English.[13] To fit our context of studying green marks applied in the US, we modify the EUIPO green expressions by making use of the British-American-English conversion.

To identify a green mark, we start with a mark's identification and parse that piece of textual information. We perform the same preprocessing step for the 375 green expressions in the EUIPO green trademark taxonomy. A term in a mark's identification is a green term if it matches one of the green expressions. A mark is a green mark if its identification contains at least one green term and

[12] The Nice Classification, administered by the World Intellectual Property Organization (WIPO), is a system of classifying goods and services for trademark applications. There are 45 classes, 34 of which cover goods and 11 services. A trademark can apply for a group of Nice classes.

[13] For example, one of the green expressions (Ref. 13) is:

+battery +chargeable −acidulated −telephone −computer −fire.extinguisher −game −cigarette −cutters −cell.phone −mobile.phone −smartphone −wireless

It means: A term is green if it contains the word "battery" and the word "chargeable," and does *not* contain the words "acidulated," "telephone," "computer," "fire extinguisher" (together, and in that order), "game," "cigarette," "cutters," "cell phone" (together, and in that order), "smartphone," or "wireless." In this example, the expression (Ref. 13) is assigned to the group "Energy Conservation" and the category "Storage of electricity."

satisfies some additional conditions. For example, Tesla Inc. registered the trademark "MODEL Y" on June 9, 2020. The trademark's goods and services identification is "Electric vehicles" in the Nice class 12. The term is matched to the green expression Ref. 73: "+electric +vehicle −cigarette −door −horn −lock −sunroof −alternator −alarm −temperature −theft −antitheft −washers −7 −37". We thus code this mark as a green mark.

Arguably, there are other ways to identify green products and services such as searching for environment-related keywords in a company's disclosed information (e.g., advertisements or websites). However, our green marks have the following advantages over alternative measures. First, as discussed earlier, like all trademarks, green marks are approved meeting the "use in commerce" requirement whereby firms provide evidence of their actual commercialization. Second, we identify green marks based on a mark's identification that is directly related to its legal protection and has been examined and verified by the USPTO attorney. With all these features, we argue that green marks cannot be simply attributed to firms' self-promotion or greenwashing. Finally, green marks are public information and allow us to measure green innovation across firms in many different sectors.

3.2. Descriptive statistics of green marks

Our data cover all USPTO green marks across industries and over time. Figure S1 in the Internet Appendix plots the number of registered green marks at the USPTO over the period 1981-2020. It shows that the number of green marks has been increasing, with a large jump in 2007, and reached 8,108 green marks by 2020, the end of our sample period. We further note that this increasing trend is largely driven by US firms. Non-US firms contribute more green marks after 2016. We next zoom in onto US firms (both private and public firms), examining the temporal trend of their green marks. To form our public firm sample, we first harmonize names of mark owners, and then manually match those owners to US public firms in Compustat based on name, location, and industry.

Figure 1 Panel A presents the number of registered green marks by US public firms over time. We note a steady increase up to 2011 then a decline after, reflecting the fact that the number of public

firms declined in 2010s (solid line).[14] When we scale the number of green marks by that of all registered marks in a year, the figure presents an increasing time trend, and an even bigger rise after the 2009 Copenhagen Accord, suggesting that green marks have become an important part of US marks (dashed line). As a comparison, Panel B presents both the number and share of registered green marks by US private firms. We note both measures experience steady increases over the sample period.

Table S1 in the Internet Appendix presents the frequency distribution of registered green marks by US firms (both private and public firms) at the USPTO over the period 1981-2020 based on a mark owner's headquarters state. It lists the states based on their number of registered green marks. We note that California contributes the most number of registered green marks, reflecting the fact that California is a green technology hub capable of commercializing green innovation into green products and services.

We further classify US firms' green marks into nine groups following the EUIPO's classification scheme (2021): Pollution Control, Climate Change, Energy Production, Energy Conservation, Environmental Awareness, Reusable, Waste Management, Transportation, and Agriculture. Table 1 presents the frequency distribution of these nine groups. We note that US firms' green marks concentrate in the group "Pollution Control" (17%), followed by three climate change relevant groups: Energy Production (16%), Climate Change (16%), and Energy Conservation (15%). Table 2 also presents the frequency distribution of the 35 categories under the nine groups (the share of each category is within its own group). We note that the number one category with the most number of registered green marks is Environmental services (14,249 green marks), followed by Water purification (8,046 marks), Solar energy (6,716 marks), Storage of electricity (6,601 marks), and Recycling (6,325 marks).

3.3. Firm-level analysis

[14] Our sample indicates that the average number of unique US public firms is 2,984 in 1980s, 4,099 in 1990s, 3,479 in 2000s, and 2,537 in 2010s.

To conduct firm-level analysis, we focus on public firms and aggregate the mark-level green mark dataset into different firm-year level datasets, and present the summary statistics in Table 2. We drop firms in the financial sector (SIC2-digit: 60-69) due to some legal development that makes patents in this sector incomparable to those in other sectors.[15] The sample comprises 129,966 firm-year observations associated with 9,687 unique firms that have at least one registered mark over the period 1981-2020. Within this sample, the share of firms with at least one registered green mark in a year is 4% (i.e., 5,218 out of 129,966 firm-year observations). Within this subsample of firm-year observations with non-zero green mark (i.e., 5,218 firm-year observations), firms on average register 1.8 green marks and 10.6 non-green marks in a year. In other words, 15% (= 1.8/(1.8 + 10.6)) of a firm's newly registered marks in a year are green marks.

Table S2 in the Internet Appendix presents the frequency distribution of registered green marks by industry over the period 1981-2020. There are 59 SIC2 industries with non-zero green marks (out of a total of 67 unique SIC2 industries) over the sample period, suggesting that green marks capture green goods and services more broadly than green technologies underlying green patents. The top three industries with the most number of green marks are: (1) electric, gas, and sanitary services; (2) chemicals and allied products; and (3) industrial machinery and equipment. Other industries, such as utilities, oil, gas, transportation, business services, also produce many green marks. While Cohen, Gurun, and Nguyen (2022) highlight that oil, gas, and energy-producing firms are heavily involved in developing *green patents*, our novel green mark data further reveal that there are many industries outside the oil and gas industry that also contribute to green innovation in terms of green marks. Table S3 in the Internet Appendix lists the top 30 public firms in terms of their numbers of registered green marks. The top five firms are General Electric Co., NextEra Energy Inc., Xcel Energy Inc., Honeywell International Inc., and Ford Motor Co. On the other hand, according to Cohen, Gurun, and Nguyen (2022), the top five US firms in terms of producing green patents are

[15] We do not include the financial industry in our sample because the well-known Federal Circuit Court of Appeals decision in the case of State Street Bank v. Signature Financial Group in 1998 effectively improves the patentability of business method patents that are common in the industry, and thus change financial firms' propensity to file patents and seek other intellectual property protection (Lerner 2002; Tufano 2003).

General Electric Co., Ford Motor Co., Dupont De Nemours Inc., United Technologies Group, and General Motors Co.

3.4. Validation tests for green marks

We conduct a number of tests to help validate that our green marks indeed capture firms' efforts to create environment-friendly products and services. First, we examine whether a firm's number of registered green marks is correlated with its overall environmental score (and also its score on environment-related innovation) by ESG rating agencies. Second, we examine whether a firm's number of registered green marks increases after it develops more green patents. Third, we examine whether a firm's green marks contain "green words" in their mark words that may be suggestive of greenwashing, instead of real commitment to environmental protection and sustainability.

3.4.1. Environmental scores

We first examine if green marks identified by following the EUIPO green trademark taxonomy are accounted for in firms' environmental scores by ESG rating agencies. We use Refinitiv's environmental scores on innovation, resource use, and emission reduction (and the average across these three scores as the overall environmental score), and merge these scores to our firm-year level dataset using a mark's registration year. We drop firm-year observations with missing values on at least one of the three environmental scores. Given that rating agencies evaluate a firm's environmental performance at the time when its green marks are registered (and thus become public information), we match the Refinitiv data with our green mark dataset by a mark's registration year (to better capture the timing when information on green marks becomes available to outsiders such as ESG rating agencies).[16] Since Refinitiv started to provide environmental scores in 2001, the sample for this validation test comprises 17,220 firm-year observations associated with 2,312 unique trademarking firms (i.e., firms with at least one registered mark) over the period 2001-2020. We estimate the following Poisson regression:[17]

[16] In our study, the average gap between a mark's filing year and its registration is 1.4 years, and 80% of trademark applications will be registered within two years from their application date.
[17] We use the Quasi-Maximum Likelihood Poisson estimation of Correia, Guimarães, and Zylkin (2019) that allows high-dimensional fixed effects.

$$E[Green\ TM\ count_{i,t}|\mathcal{X}\ ] = \exp(\alpha + \beta Environmental\ score_{i,t} + \delta_i + \delta_t + \delta_{j,t}), \qquad (1)$$

where the dependent variable, *Green TM count*$_{i,t}$, is the number of registered green marks by firm *i* in year *t*. Given that our dependent variable is the number of registered green marks, a count variable, we employ a Poisson regression specification (Cohn, Liu, and Wardlaw 2022). Our variables of interest are *Environmental score* which is the average of the three environmental scores: *Innovation score*, *Resource use score*, and *Emission reduction score*, and the three environmental scores. We note that according to Refinitiv, *Innovation score* captures firms' capability to create "new market opportunities through new environmental technologies and processes, or eco-designed products," and therefore is directly linked to green marks. All other variables are defined in the Appendix. All model specifications include firm fixed effects δ_i, year fixed effect δ_t, and SIC3-by-year fixed effects δ_{jt}. Standard errors are clustered at the firm level. Table 2 Panel B presents the summary statistics of all variables used in Equation (1).

Table 3 Panel A presents the regression results of Equation (1). We note that *GreenTM count* is positively and significantly related to the innovation score (column (2)), whereas it is unrelated to the overall environmental score, or the resource use, and emission reduction scores. As discussed above, the innovation score, as constructed by Refinitiv, is most closely related to green innovation captured by our green marks. The findings in Panel A suggest that a firm's green marks are recognized and incorporated into its environmental score produced by ESG rating agencies.

We then replace the dependent variable with the number of *non-green* marks (*NonGreen TM Count*) in Equation (1) and Table 3 Panel B presents the regression results. This test serves as a placebo test because by construction, these non-green marks should be unrelated to firms' environmental ratings. Indeed, we find that a firm's number of non-green marks is unrelated to any of its environmental scores.

We conclude that using Refinitiv's environmental scores as an alternative measure of a firm's commitment to environmental protection and sustainability, our green marks serve as a valid indicator for a firm's green innovation.

3.4.2. Green patent intensity

Our second validation test look at the relation between green patents and green marks, as green marks are expected to capture the commercialization of green technologies measured by patents. Given that it will take time from developing ideas/patents to producing new products/services, we conduct a lead-lag regression analysis between green patents and green marks. We identify green patents following the classification scheme adopted by the Organization for Economic Cooperation and Development (OECD) (Haščič and Migotto 2015),[18] and employed in several recent studies.[19] Section 2 in the Internet Appendix provides more detailed discussion of green patents. Figure S2 in the Internet Appendix presents an upward temporal trend in the number of granted green patents over the period 1981-2020, a pattern consistent with the recent literature (e.g., Cohen, Gurun, and Nguyen 2022).

To examine the relation between different markers for green innovation, patents and marks, we first merge the green patent data with the green mark data at the firm-year level, and focus on firms with at least one granted patent and at least one registered trademark over the period 1981-2020. The sample comprises 80,466 firm-year observations associated with 4,918 unique firms. To be consistent with the above validation test using Refinitiv data, we use the same sample period 2001-2020 as our baseline. It is worth noting that using the full sample period 1981-2020, our main findings remain (shown in Table S4 in the Internet Appendix). Table 2 Panel B presents the summary statistics for the variables used in the regression.

We examine the lead-lag relation between green patents and green marks by running the following Poisson regression:

$$E\left[Green\ TM\ count_{i,t+n}\middle|\mathcal{X}\right] = \exp\left(\alpha + \beta Green\ patent\ ratio_{i,t} + \delta_i + \delta_t + \delta_{j,t}\right), \qquad (2)$$

where the dependent variable, *Green TM count*$_{i,t+n}$, is the number of registered green marks by firm *i* in year *t*+1 or years *t*+1 to *t*+2 (i.e., *n* = 1 or 2). *Green patent ratio*$_{i,t}$ is the share of green patents to all patents by firm *i* in year *t*, taking the value of zero if firm *i* has no newly granted patent in year *t*. We

[18] The classification scheme is described in Haščič and Migotto (2015) and results in a broad coverage including technologies related to environmental pollution, water scarcity, and climate change mitigation.
[19] For example, Cohen, Gurun, and Nguyan (2022) find that the energy sector is the primary producer of green patents. Bolton, Kacperczyk, and Wiedemann (2023) examine the determinants and emission impact of corporate green innovation.

use the green patent ratio to capture firm *i*'s green patent intensity in year *t*, without being biased by firm size. Accordingly, our alternative dependent variable is constructed similarly. *Green TM ratio*$_{i,t+n}$ is the share of registered green marks to all marks by firm *i* in year *t*, taking the value of zero if firm *i* has no newly registered mark in year *t*. We run the following ordinary least squares (OLS) regression:

$$Green\ TM\ ratio_{i,t+n} = \alpha + \beta Green\ patent\ ratio_{i,t} + \delta_i + \delta_t + \delta_{j,t} + \varepsilon_{i,t+n}, \quad (3)$$

Both model specifications include firm fixed effects δ_i, year fixed effect δ_t, and SIC3-by-year fixed effects $\delta_{j,t}$. Standard errors are clustered at the firm level. Table 4 presents the results.

We show that in columns (1) and (2), the coefficient estimates on *Green patent ratio* are positive and significant at the 1% level, suggesting that firms with higher green patent intensity tend to produce more green marks in the next one or two years. When the dependent variable is *Green TM ratio*, we show that in column (3), the coefficient estimate on *Green patent ratio* is positive and significant at the 1% level, suggesting that high green patent intensity firms also increase their green mark intensity in next year (not in the next two years though as shown in column (4)).

Overall, these findings in Table 4 help validate our green marks as we show that firms active in green patenting are also more likely to register more green marks that successfully commercialize their green ideas/technologies.

3.4.3. Green words

An important feature of a trademark is its mark words. For instance, "Model X," "Model Y," and "CYBERTRUCK" are mark words. One concern of our green mark measure is that it might not capture firms' real commitment to environmental protection and sustainability, but just reflects firms' marketing effort to signal their greenness without real actions. Ceteris paribus, such marketing gimmick is more likely to play out when a firm's green mark contains "green words." [20] Our third validation test is to examine whether green marks contain "green words" in their mark words (such as

[20] The World Intellectual Property Office (WIPO) warns that applications for trademarks that specifically include direct environmental claims, such as calling a product green, sustainable or eco-friendly, are likely to face a refusal, and the basis for such refusal is most often because the mark is descriptive. See https://www.wipo.int/wipo_magazine/en/2022/04/article_0006.html. In addition, the USPTO has rejected applications for marks such as GREEN CEMENT for a type of cement that is not damaging the environment, GREEN-KEY for environmentally friendly key cards, CARBON NEGATIVE FIBER for natural fibers used in composite materials for manufacturing, and ZERO WASTE TEE for clothing.

green, eco, environment, etc.). If a green mark captures firms' genuine effort to produce green products and services, we would expect firms not to use "green words" excessively. Based on our sample of registered green marks by public US firms over 2001-2020, we consider the following as green words: "green," "sustainable," "recycl," "orga," "eco," and use them to search among our green marks to see if their mark words contain these green words. We find that only 388 out of 6,464 of green marks contain these green words, representing a 6% share,[21]while 2,067 out of 202,258 non-green marks contain these green words, representing a 1% share. This comparison suggests that most of our green marks do not include green words. In other words, most of our green marks are not packed with green words, suggesting that green marks in our sample are not intended to potentially mislead consumers or engage in greenwashing.

In summary, using a number of validation tests, we conclude that our green marks are a valid marker for firms' commitment to developing environment-friendly products and services.

3.5. Green marks and firm value

Under our conceptual framework, we expect green marks help firms gain higher price premium and/or achieve product differentiation, resulting in higher revenue growth and market value. To examine the relation between green marks and revenue growth, we run firm-year level OLS regressions relating future sales growths to an indicator variable, *I(Green TM)*, for a firm registering any green mark in a year, or *Ln(Green TM count)*, the number of newly registered green marks in logarithm, controlling for firm characteristics, firm fixed effects, and year fixed effects. Table 2 Panel C provides the descriptive statistics for the sample that examines the relation between firms' green mark production and sales growth (firm value). The sample contains 74,800 firm-year observations associated with 6,698 unique firms over the sample period 2001-2020. Table 5 Panel A presents the regression results. We show a positive and significant association between a firm's newly registered green marks and its revenue growth in next year or next three years.[22]

[21] Among marks using these green words, the share of the word "green" is 46%, followed by "eco" (36%), "recycl" (12%), "sustainable" (3%), and "orga" (3%).
[22] Alternatively, we include industry-by-year fixed effects. Our main findings remain. See Table S5 in the Internet Appendix.

Next, we explore the relationship between green marks and firm value. We use Tobin's *q* to proxy for firm value. We consider both traditional Tobin's *q* (market value divided by physical capital) and intangible-adjusted Tobin's *q* (market value divided by the sum of physical capital and intangible capital) proposed by Peters and Taylor (2017). Peters and Taylor (2017) show that the intangible-adjusted Tobin's *q* significantly improves the explanatory power of the investment-*q* relation. Conceptually, green marks are the output of intangible investments, which makes the intangible-adjusted Tobin's *q* a more suitable measure of firm value than the traditional Tobin's *q*. We regress Tobin's *q* in next year on the green mark measures, and control for firm characteristics, firm fixed effects, and year fixed effects. Table 5 Panel B presents the regression results. We show a positive and significant association between a firm's green marks and its market value.

In summary, as far as we are aware, we are one of the first in the literature establishing the value implications of producing green products and services.

4. Environmental Scandals and Green Products

4.1. Research design

Motivated by high-profile anecdotes discussed in the introduction, we now provide a systematic analysis of the role of peer firms' environmental scandals in triggering focal firms' green investment in products/services, captured by their green mark production. We consider severe negative environmental news featuring product market peers as a shock to elevate the environmental awareness a focal firm faces. We do not consider negative environmental news featuring a focal firm itself because both the negative news on the focal firm and its reaction could be influenced by its past activities and fundamentals, which leads to endogeneity concerns. To cleanly delineate the causal effect of an external negative shock that triggers stakeholders' awareness of fundamental issues in an industry, we deliberately choose to focus on negative environmental news about a focal firm's product market peers rather than itself. To identify product market peers to a focal firm, we take a two-pronged approach that is more granular and new in the literature. First, we employ a trademark-based measure of product market proximity between firm-pairs by leveraging the fact that our trademark data cover a firm's entire product portfolio. Specifically, *TMSimilarity* is the cosine similarity

between firm *i*'s and firm *j*'s trademark distributions across different 45 Nice classes based on their active trademarks as of year *t*. The measure ranges between zero and one. A high value indicates a high degree of overlap between a firm-pair in the product market space. To a focal firm, we start with the top five firms with the highest trademark similarity scores to it as a potential set of peer firms. Second, we require those potential peers to be in the same three-digit SIC industry as the focal firm to ensure comparability.[23] By taking the above two steps, we identify a focal firm's product market peers. As a result, news of severe environmental issues of any of these peers will create pressure on the focal firm regarding its environmental performance given that they share common product markets (using the TM similarity filter) and similar production technology (using the SIC filter). We further require the focal firm not to be featured in any environmental news in the current year or over past two years. This design helps ensure peer firms' environmental scandals are plausibly unrelated to the focal firm's own fundamentals or choices.

We estimate the following Poisson regressions relating peer firms' environmental scandals to focal firms' responses in terms of producing green marks:

$$E[Green\ TM\ count_{i,t+n}|\mathcal{X}] = \exp(\alpha + \beta_1 Peer\ environmental\ news_{i,t} + Controls_{i,t} + Firm\ FE + Year\ FE), \quad (4)$$

where the dependent variable $Green\ TM\ count_{i,t+n}$ is the number of green marks filed by firm *i* in year *t*+1 or years *t+1* and *t*+2. The analysis covers the period 2010-2020 due to the data availability of RepRisk. The key variable of interest, $Peer\ environmental\ news_{i,t}$, is an indicator variable that takes the value of one if any product market peer (as defined earlier) is reported to have severe negative environmental news in year *t*. To capture environmental scandals, we employ RepRisk news data and select news with "medium to high severity." We employ three different versions of the peer negative environmental news measure, each is based on a different set of restrictions placed on the negative environmental news exposure of the focal firm. The primary measure, *Peer environmental news*, requires that the focal firm does not experience any environmental news in the most recent three

[23] SIC codes are four-digit numerical representations of major businesses and industries. SIC codes are assigned based on common characteristics shared in the products, services, production and delivery system of a business. Among the top five similarity score matched peers, about 29% of matched peers are in the same three-digit SIC industry.

years (year *t*-2 to *t*). The first alternative measure, *Alternative peer env-news1*, requires that the focal firm has no environmental news in the most recent two years (year *t*-1 to *t*), while the second alternative measure, *Alternative peer env-news2*, requires that the focal firm has no environmental news in year *t* (i.e., it places no restrictions on the focal firm's prior news exposure). By doing so, we mitigate the concern that focal firms' and product market peers' news might be correlated, and rule out the possibility that focal firms' green marks are simply lagged responses to their own activities or news. We acknowledge that the focal firm and peers may have news about their social or governance (S&G) issues that potentially could affect firms' environmental commitment. We will conduct robustness checks including (i) excluding sample firms with S&G news to avoid confounding events; and (ii) using peer firms' negative S&G news as a placebo test.

In our main specification, we include a number of firm characteristics that might influence their production of green marks: firm size, book-to-market, leverage, cash, R&D expense, and advertising expense. Additionally, to capture a firm's trademark production capability, we control for the number of active trademarks and the number of active green marks produced. Firm and year fixed effects are included. Standard errors are clustered at the SIC3 industry level because our key variable of interest is product market peers' negative environmental news.

Table 2 Panel D presents the summary statistics of all variables used in the Poisson regression in Equation (4). The sample averages of *Peer environmental news*, *Alternative peer env-news1*, and *Alternative peer env-news2* are 0.019, 0.020, and 0.021, respectively. These low values suggest that peers' negative environmental news is indeed a rare event to the focal firm.

4.2. Data source and variable construction

We conduct our analysis for peer environmental news using data from RepRisk, a global provider of business intelligence focusing on environmental, social, and governance (ESG) risks (Gantchev, Giannetti, and Li 2022; Houston and Shan 2022). RepRisk has been compiling daily updates on negative news related to specific ESG issues of companies around the world since 2010. Their data collection involves systematic screening of over 100,000 sources, including traditional and

online media, NGOs, government bodies, regulators, and social media. The scope of RepRisk's coverage encompasses more than 200,000 firms globally, of which approximately 7% are public.

RepRisk categorizes ESG incidents/news events into 29 distinct issues,[24] covering a wide spectrum of environmental, social, and governance concerns. It assigns a unique identifier (reprisk_id) to each incident/news event from different media sources, and also categorizes each piece of news based on novelty, reach, and severity in a scale from one to three, with a score of three indicating the highest level of a particular category.

In our study, the focus is on negative environmental news, although we also examine social and governance-related news for robustness checks and placebo tests. To classify a news event as a negative environmental incident, we require that event's severity score to be of medium to high severity and to be labeled as violating at least one of the following three environment-related United Nation Global Compact (UNGC) principles: Principle 7 (supporting a precautionary approach to environmental challenges), Principle 8 (undertaking initiatives to promote greater environmental responsibility), and Principle 9 (encouraging the development and diffusion of environmentally friendly technologies). In robustness checks, we also consider alternative definitions of negative environmental news by examining severe news events related to the RepRisk's own environmental issues, or considering only high-severity news.

4.3. Main results

Table 6 presents the Poisson regression results of Equation (4). The dependent variable in columns (1), (3), and (5) is the number of eventually registered green marks filed in year t+1; and the dependent variable in columns (2), (4), and (6) is the number of green marks filed in years t+1 and t+2. The variable of interest in columns (1) and (2) is our primary measure *Peer environmental news*,

[24] These issues include: Human rights abuses and corporate complicity; Animal mistreatment; Anti-competitive practices; Child labor; Climate change, GHG emissions, and global pollution; Controversial products and services; Corruption, bribery, extortion and money laundering; Discrimination in employment; Executive compensation issues; Forced labor; Fraud; Freedom of association and collective bargaining; Impacts on communities; Impacts on landscapes, ecosystems and biodiversity; Local participation issues; Local pollution; Misleading communication; Occupational health and safety issues; Other ESG issues; Overuse and wasting of resources; Poor employment conditions; Products (health and environmental issues); Social discrimination; Supply chain issues; Tax evasion; Tax optimization; Violation of international standards; Violation of national legislation; and Waste issues. RepRisk AG. (2023). RepRisk Research Scope: ESG Issues. Retrieved from https://www.reprisk.com/media/pages/static/958363135-1705635320/reprisk-esg-topic-tags-definitions.pdf

in columns (3) and (4) (columns (5) and (6)) is *Alternative peer env-news1* (*Alternative peer env-news2*).

We show that in column (1), the coefficient estimate on *Peer environmental news* is 0.618 and significant at the 1% level, suggesting that, after experiencing peers' negative environmental news, firms will increase their number of new green marks by 85.52% (exp(0.618) − 1) in next year. Given the average number of new green marks for the Poisson regression sample at 0.404 marks per year, this translates to an average increase of 0.234 green marks. A one-standard-deviation increase (0.137) in peers' negative environmental news will increase firms' number of green marks by 11.7% (85.52% × 0.137). In column (2), the coefficient estimate on *Peer environmental news* is 0.449 and significant at the 1% level, suggesting a 56.67% increase in green marks over next two years, corresponding to an average increase of 0.542 green marks, relative to the average number of 0.798 green marks produced over the same period (untabulated).

The above main findings remain when using different definitions of peer negative environmental news, as shown by the magnitude of the coefficient estimates in columns (3) to (6). We conclude that industry peers' negative environmental news leads to an increase in green marks produced by focal firms, suggesting that environmental awareness drives sample firms' green innovation efforts, both in the short and medium term. We next conduct a number of robustness checks on our main findings.

4.4. Robustness checks

In this section, we briefly discuss robustness checks on our main findings and leave the details to Section 3 in the Internet Appendix. Specifically, we vary the composition of our product market peer set, consider time-varying industry-level shocks or time-varying state-level shocks, and employ alternative definitions of environmental news. All results are reported in Section 3 in the Internet Appendix.

In our first robustness check, we consider the top two or top ten most similar firms in terms of product market overlap when identifying product market peers (instead of using the top five in our baseline analysis), and find consistent results in Table S6.

There may be concerns regarding industry-level shocks that could simultaneously influence the likelihood of environmental news exposure and green mark production patterns within an industry. To address this potential confounding factor, we add industry-by-year fixed effects (to absorb any time-varying trends or shocks in specific industries) in our regression. We control for SIC3-by-year (SIC2-by-year) fixed effects in Table S7 columns (1) to (4), and show that our main findings remain.

There could be some potential influence of regulatory actions at the state level, which could simultaneously increase firms' exposure to negative environmental news and compel additional compliance efforts that lead to more green marks. To rule out the possibility that our findings are driven by local regulatory actions, we include headquarters state-by-year fixed effects in Table S7 columns (5) and (6). We note that the results are largely intact compared with the baseline results.

In Table S8, we consider only high-severity news instead of medium to high severity. In another set of robustness checks, we consider an alternative definition of environmental news using the RepRisk's environment-related issues that cover climate change, GHG emissions, global pollution, impacts on landscapes and biodiversity, local pollution, other ESG issues, overuse and wasting of resources, product-related health and environmental issues, and waste issues. We find consistent results when we use this alternative approach in Table S9.

Next, we examine whether our main findings are driven by peer firms' environmental news, as opposed to by concurrent social or governance news. We exclude peer firms' environmental news events that take place in the same year as any social or governance news pertaining to the focal firms. The results reported in Table S9 confirm that the observed patterns remain unchanged once we ensure that focal firms are not facing concurrent negative social or governance news events.

We further conduct a placebo test by examining whether firms' green mark production is a response to their peers' negative social or governance (S&G) news. To mitigate potential confounding effects from negative environmental news, we exclude peers' negative S&G news events that take place in the same year as focal firms' negative environmental news. Table S11 shows that firms' green marks are unrelated to their peers' S&G news, confirming that our main findings are driven by peer firms' environmental issues rather than S&G-related issues.

4.5. Different types of green marks

Our trademark dataset covers every public firm's product portfolio and contains rich information about each mark, which allows us to further examine different dimensions of focal firms' green mark production when facing environmental scandals of their product market peers.

At the firm-year level, we first categorize a firm's green marks into two types: exploratory and non-exploratory. Exploratory green marks are those registered in Nice classes in which a firm has not previously registered any marks, and the rest are non-exploratory. We also group green marks based on whether they bear the corporate name of the assignee or not. A non-name-bearing mark suggests its owner's intention is to distance this new product from its central branding, indicating its non-core nature. Table 7 presents the Poisson regression results exploring different types of green marks: exploratory, non-exploratory, non-name-bearing, and name-bearing green marks produced in the next year.

Comparing columns (1) and (2), we show that, in response to peer firms' negative environmental news, firms produce more exploratory green marks than non-exploratory ones. Comparing columns (3) and (4), we note that, in response to peer firms' negative environmental news, firms increase their production of non-name-bearing green marks, while reduce producing green marks bearing corporate names. These results suggest that in response to the environmental scandals of product market peers, firms' production of green marks is concentrated in their non-core businesses. In other words, we show that firms intentionally differentiate their new, green products/services from their existing ones.

5. The Economic Forces

In this section, we test two mutually-nonexclusive explanations for firms' reactions to their peers' environmental scandals: (1) product market competition; and (2) stakeholder pressure.

5.1. Product market competition

We posit that market followers will produce more green products/services by taking up the opportunity to differentiate themselves at the times of intensified environmental awareness triggered by peer firms' negative environmental news. To test this conjecture, we construct two indicator

variables, *Sales follower* and *Trademark follower*, to capture a firm's market position. A firm is a sales follower if its average sales over past three years fall below the corresponding three-digit SIC industry median. A firm is a trademark follower if its total number of new trademarks over past three years falls below the corresponding industry median. We then add the interaction terms between *Peer environmental news* and these market follower indicators to our baseline model in Equation (4). Table 8 columns (1) and (2) present the Poisson regression results. We show that the coefficient estimates on these two interaction terms are positive and significant, suggesting that market followers are indeed more likely to increase green mark production in response to product market peers' negative environmental news. The standalone terms for *Sales follower* and *Trademark follower* are positively significant, showing these market followers have been using green marks to differentiate themselves and catch up, and even more so during crisis.

Under the product market competition explanation, we further posit that firms with prior experience in green marks will launch more green marks upon peers' negative environmental news given path-dependence in green innovation (Aghion et al. 2016; Brown, Martinsson, and Thomann 2022). To test this conjecture, we introduce an indicator variable, *Green experience*, that takes the value of one for firms ranked as the top five green mark producers over past three years within their three-digit SIC industry, i.e., capturing firms' experience in green mark development, and zero otherwise. We then add the interaction term between *Peer environmental news* and *Green experience* to our baseline model in Equation (4). Table 8 column (3) presents the Poisson regression results. We show that the coefficient estimate on the interaction term *Peer environmental news* × *Green experience* is positive and significant, supporting our conjecture that firms more experienced in green marks will continue to produce more green marks under environmental scandals. The standalone term for *Green experience* is insignificant, indicating that firms with more green mark experience are not likely to keep producing more, but would quickly increase the production during adverse times.

5.2. Stakeholder pressure

We posit that heavily polluting firms are more likely to respond to environmental scandals by offering more green products/services to prevent potential scrutiny and reputation damage. To test this

conjecture, we use the US EPA's toxic release inventory (TRI) database to determine a firm's pollution level and identify high pollution firms. The TRI database reports the storage, use, and release of hazardous substances. We create two indicator variables for firms' pollution levels, *High pollution* (*High onsite land pollution*), takes the value of one if a firm's average total pollution (onsite land pollution) over past three years is above the corresponding three-digit SIC industry median, and zero otherwise. We then add an interaction term between *Peer environmental news* and this high-pollution indicator (*High pollution* and *High onsite land pollution*) to our baseline model in Equation (4). Table 9 presents the regression results.

We show that following peer firms' environmental scandals, high pollution firms, are more likely to increase their green mark production compared to their low pollution peers. Interestingly, we note that the coefficient estimate on *Peer environmental news* loses its statistical significance, suggesting that the observed increase in green mark production under environmental scandals is predominantly driven by heavy polluters. Also, the standalone term for *High pollution* is negatively significant, demonstrating that these polluting firms indeed engage in less green products/services during the normal times. This set of results supports our conjecture and underscores the relevance of stakeholder pressure, especially for firms with significant pollution footprints.

We conclude that the environmental scandals in an industry trigger more production of green products and services due to product market competition and stakeholder pressure.

6. Conclusions

There has been a lack of indicators to capture firm-level engagement in environmentally friendly products and services in the past. In this paper, we fill a void by applying a novel text-based classification procedure to the USPTO trademark dataset to identify green marks in the US economy over the past forty years. Given the "use in commerce" requirement for US trademarks, these green marks capture newly commercialized green products/services and thus firms' commitment to environmental protection and sustainability. This indicator is validated by our tests showing that firms producing more green marks receive higher environmental ratings, hold more green patents, and have higher revenue growth and market value. Moreover, our green marks are identified using legal

documents of product and service descriptions, cover innovative activities in almost all sectors, are free from self-promotion bias, and are publicly available. Our indicator thus has the potential to offer a full picture of the landscape of green products.

Why would firms produce more green products and services? Anecdotal evidence suggests that public pressure plays an important role. We explore whether and how firms' green product/service launches are triggered by the public's awareness of potential environmental issues in their businesses. We show that firms launch significantly more new green products/services after their product market peers are featured in negative environmental news. Our empirical evidence further suggests that such reactions can be attributed to both product market competition and stakeholder pressure. We conclude that the disclosure of environmental scandals triggers stakeholders' green demands and that firms catering to those demands do well by doing good.

Appendix
Variable definitions

All continuous variables are winsorized at the 1st and 99th percentiles.

Variable	Definition
Trademark Variables	
I(Green TM)	An indicator variable that takes the value of one if a firm registers at least one new green mark in a year, and zero otherwise. A mark is a green mark if its identification contains at least one green term according to the (modified) EUIPO green trademark taxonomy. See the detailed description of steps involved to identify green marks in the Internet Appendix Section 1.
Green TM count	Number of newly registered green marks by a firm in a year.
Green TM ratio	Share of newly registered green marks to all marks by a firm in a year. It takes the value of zero if a firm has no newly registered mark in a year.
Green TM stock	Number of active green marks of a firm in a year.
Green TM owner-name	Number of newly registered green marks whose mark words contain elements that are the same or an abbreviation of the mark owner's corporate name. For example, 7-ELEVEN, INC. owns a list of corporate marks, including: 7 ELEVEN, 7 ELEVEN EXPRESS, 7 ELEVEN GO-GO TAQUITOS, 7-ELEVEN BAKERY MINIS, 7-ELEVEN BAKERY STIX FRESH OFF THE GRILL OH THANK HEAVEN, 7-ELEVEN BREW KEG, 7-ELEVEN CONVENIENCE CARD, 7-ELEVEN SPEAKOUT, 7-ELEVEN TRAVEL BREW, 7-ELEVEN VALUE+, 7-ELEVEN WEEKEND REWARDS.[25]
Green TM exploratory	Number of newly registered green marks in a Nice class in which a firm has never registered any mark before.
NonGreen TM count	Number of newly registered non-green marks by a firm in a year.
TM stock	Number of active marks of a firm in a year.
TMSimilarity	Cosine similarity between firm *i*'s and firm *j*'s trademark distributions across the 45 Nice classes. For firm *i* in year *t*, $TMSimilarity_{ijt}$ measures the degree of product market closeness between firms *i* and *j* as of time *t*. Specifically, we follow Hsu, Li, Liu, and Wu (2022) and define $TMSimilarity_{ijt}$ as the uncentered correlation of the trademark distributions between all pairs of firms *i* and *j*, $$TMSimilarity_{ijt} = \frac{TM_{it}TM'_{jt}}{(TM_{it}TM'_{it})^{1/2}(TM_{jt}TM'_{it})^{1/2}},$$ where $TM_{it} = (TM_{it1}, TM_{it2}, \cdots, TM_{it45})$ is a vector of firm *i*'s proportional share of trademarks across the 45 Nice goods and service classes over all active trademarks owned by a firm as of time *t*. The measure ranges between zero and one. A higher value indicates firms *i* and *j* share many similar product/service classes.
Patent Variables	
Green patent count	Number of green patents granted to a firm in a year. A patent is a green patent if its Cooperative Patent Classification (CPC) (International Patent Classification (IPC)) falls within the OECD green patent taxonomy (Haščič-Migotto 2015, pp. 46-58). See the detailed description of steps involved to identify green patents in the Internet Appendix Section 2.
Green patent ratio	Share of green patents to all patents of a firm in a year. It takes the value of zero if a firm has no newly granted patent in a year.

[25] The application numbers (i.e., serial number) of these trademarks are: 78193506, 78199420, 76404786, 78247939, 75806473, 78296825, 78186836, 76287061, 76199471, 76298365, 76213496.

Environmental Score Variables	
Environmental score	Average of the three environmental scores provided by Refinitiv: innovation score, resource use score, and emission reduction score.
Innovation score	The innovation score reflects a company's capacity to reduce the environmental costs and burdens for its customers, thereby creating new market opportunities through new environmental technologies and processes, or eco-designed products. It ranges from 0 to 1. Data is from Refinitiv.
Resource use score	The resource use score reflects a company's performance and capacity to reduce the use of materials, energy or water, and to find more eco-efficient solutions by improving supply chain management. It ranges from 0 to 1. Data is from Refinitiv.
Emission reduction score	The emission reduction score measures a company's commitment and effectiveness towards reducing environmental emissions in its production and operational processes. It ranges from 0 to 1. Data is from Refinitiv.
Peer News Variables	
Peer environmental news	An indicator variable that takes the value of one if a firm's peers have negative environmental news in year *t*, while the firm itself does not have any environmental news in year *t-2*, *t-1*, or *t*, and zero otherwise. Negative environmental news refer to environmental news (of medium to high severity) that is related to violation of at least one out of the following three UNGC principles (Principle 7: Businesses should support a precautionary approach to environmental challenges; Principle 8: undertake initiatives to promote greater environmental responsibility; and Principle 9: encourage the development and diffusion of environmentally friendly technologies.) Environmental news data is from RepRisk
Alternative peer env-news1	An indicator variable that takes the value of one if a firm's peers have negative environmental news in year *t*, while the firm itself does not have any environmental news in year *t-1* or *t*, and zero otherwise.
Alternative peer env-news2	An indicator variable that takes the value of one if a firm's peers have negative environmental news in year *t*, while the firm itself does not have any environmental news in year *t*, and zero otherwise.
Negative S&G news	Social- and/or governance news (of medium to high severity) that is related to violation of at least one out of the following UNGC principles (Principles 1-6 on social issues, and Principle 10 on governance issues). News data is from RepRisk.
Negative environmental news2 (by RepRisk issues)	Environmental news (of medium to high severity) that is related to violation of at least one out of the following RepRisk issues: Climate change, GHG emissions, and global pollution; impacts on landscapes, ecosystems, and biodiversity; local pollution; other ESG issues; overuse and wasting of resources; products (health and environmental issues); waste issues. Environmental news data is from RepRisk.
Firm Characteristics	
Firm size	Natural logarithm of total assets (in 2009 million dollars).
Book-to-market (B/M)	Book value of equity divided by market value of equity.
Leverage	Book debt divided by total assets.
ROA	Income before extraordinary items divided by total assets.
Cash	Natural logarithm of total cash (in 2009 million dollars).
R&D expense	Natural logarithm of average R&D spending (in 2009 million dollars) over past three years.

Advertising expense	Natural logarithm of average advertising spending (in 2009 million dollars) over past three years.
Sales follower	An indicator variable that takes the value of one if a firm's average sales over past three years is below the corresponding three-digit SIC industry median, and zero otherwise.
Trademark follower	An indicator variable that takes the value of one if a firm's total number of trademarks produced over past three years is below the corresponding three-digit SIC industry median, and zero otherwise.
Green experience	An indicator variable that takes the value of one if a firm is among the top five green mark producers over past three years in the three-digit SIC industry, and zero otherwise.
High pollution	An indicator variable that takes the value of one if a firm's pollution amount over past three years is above the corresponding three-digit SIC industry median, and zero otherwise. Data is from the EPA's TRI dataset.
High onsite land pollution	An indicator variable that takes the value of one if a firm's onsite land pollution amount over past three years is above the corresponding three-digit SIC industry median, and zero otherwise. Data is from the EPA's TRI dataset.

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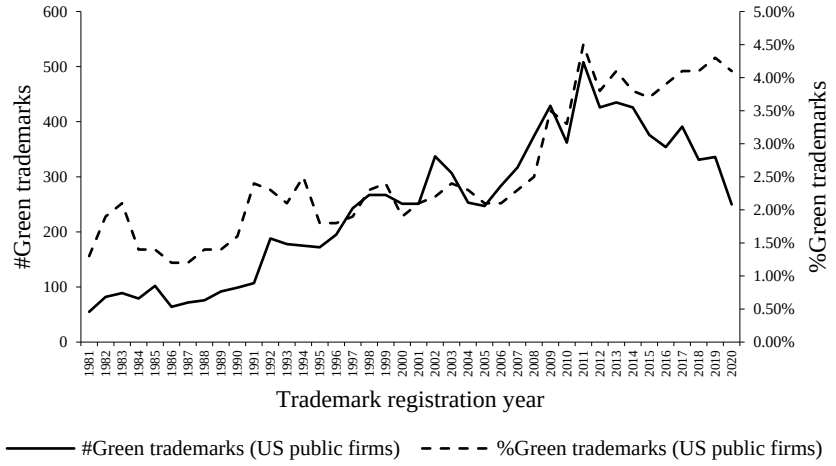
Figure 1
Green marks at the USPTO

This figure plots the number of registered green marks at the USPTO by US firms (both private and public) over the period 1981-2020 (85,516 green marks). The solid line represents the number of registered green marks by US private (public) firms in each year. The dashed line represents the share of registered green marks to all marks by US private (public) firms in each year. Panel A presents the temporal pattern for public firms. Panel B presents the temporal pattern for private firms.

Panel A: Public firms



Panel B: Private firms

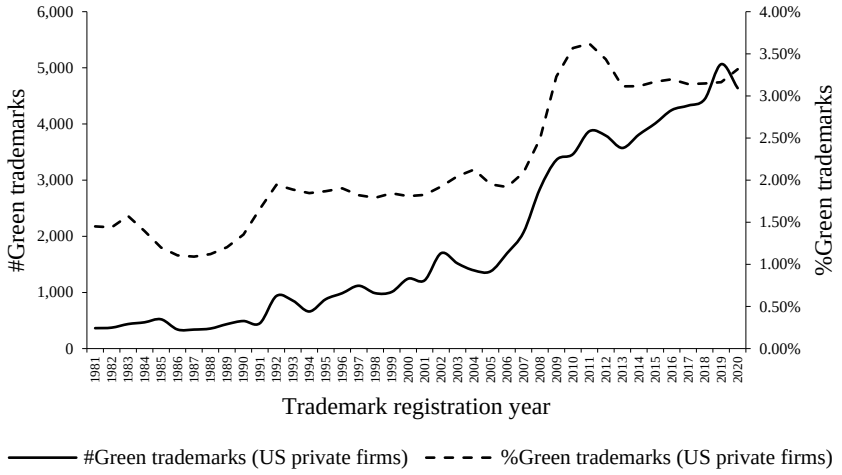


Table 1
Green marks at the USPTO by green group and category

This table reports the number and frequency distribution of 85,516 registered green marks at the USPTO by US firms (both private and public) over the period 1981-2020 using the green group classification by the EUIPO (2021). There are nine groups: Agriculture, Climate Change, Energy Production, Energy Conservation, Environmental Awareness, Pollution Control, Reusable, Transportation, and Waste Management, and 35 categories (as listed below).

Group	#Green marks	%Group	Category	#Green marks	%Category within a group
Pollution Control	16,156	17.86%	Water Purification	8,046	49.80%
			Pollution General	4,579	28.34%
			Air Purification	2,150	13.31%
			Biodegradable	1,381	8.55%
Climate Change	14,913	16.48%	Environmental Services	14,249	95.55%
			Carbon Monitor	419	2.81%
			Carbon Brokerage	245	1.64%
Energy Production	13,982	15.46%	Solar Energy	6,716	48.03%
			Other Energy	5,274	37.72%
			Biofuels	1,300	9.30%
			Wind Energy	692	4.95%
Energy Conservation	13,144	14.53%	Storage of Electricity	6,601	50.22%
			Energy Saving	3,251	24.73%
			Energy Management	2,461	18.72%
			Low Energy Lighting	831	6.32%
Environmental Awareness	9,923	10.97%	Sustainability	4,988	50.27%
			Ecology	4,935	49.73%
Reusable	9,129	10.09%	Recycling	6,325	69.28%
			Reusable Bags	1,130	12.38%
			Reusable Bottles	754	8.26%
			Other Reusable	610	6.68%
			Refilling Cartridge	310	3.40%
Waste Management	7,083	7.83%	Process Waste	5,908	83.41%
			Waste Disposal	1,175	16.59%
Transportation	5,079	5.61%	Electric Engines	2,089	41.13%
			General Transport	1,839	36.21%
			Other Vehicles	495	9.75%
			Electric Moto	267	5.26%
			Electric Bike	220	4.33%
			Electric Car	82	1.61%
			Hybrid Vehicle	65	1.28%
			Hydrogen Vehicle	22	0.43%
Agriculture	1,059	1.17%	Fertiliser Alternatives	801	75.64%
			Pesticide Alternatives	221	20.87%
			Other Agriculture	37	3.49%

Table 2
Summary statistics

This table reports the summary statistics for different samples used in our regression analyses. We require sample firms have at least one registered trademark over the sample period 1981-2020. We exclude firms in the financial sector. The full sample comprises 129,966 firm-year observations associated with 9,687 unique public firms. *I(Green TM)* is an indicator variable that takes the value of one if a firm registers at least one new green mark in a year, and zero otherwise. *Green TM count* is the number of new green marks registered by a firm in a year. *NonGreen TM count* is the number of new non-green marks registered by a firm in a year. Panel A reports the descriptive statistics for the full sample. Panel B reports the descriptive statistics for the sample used in the validation tests over the period 2001-2020 (due to data availability from Refinitiv). We remove observations with missing values for at least one of the three environmental scores. The Refinitiv sample comprises 17,220 firm-year observations associated with 2,312 unique firms. The green patent sample comprises 36,481 firm-year observations associated with 3,175 unique firms. Panel C reports the descriptive statistics for the sample that examines the relation between firms' green mark production and sales growth (firm value). The sample contains 74,800 firm-year observations associated with 6,698 unique firms over the sample period 2001-2020. Panel D reports the descriptive statistics for the sample used in the negative environmental news analysis that employ RepRisk to obtain environmental news over the period 2007-2020. The Reprisk sample comprises 5,333 firm-year observations associated with 627 unique firms. *Peer environmental news* is an indicator variable that takes the value of one if a firm's peers have negative environmental news in year *t*, while the firm itself does not have any environmental news in year *t-2*, *t-1*, or *t*, and zero otherwise. *Alternative peer env-news1* is an indicator variable that takes the value of one if a firm's peers have negative environmental news in year *t*, while the firm itself does not have any environmental news in year *t-1* or *t*, and zero otherwise. Alternative peer env-news2 is an indicator variable that takes the value of one if a firm's peers have negative environmental news in year *t*, while the firm itself does not have any environmental news in year *t*, and zero otherwise. Variable definitions are provided in the Appendix.

Panel A: Full sample: 1981-2020

	Mean	Std. Dev.	P25	P50	P75	# firm-year obs.
I(Green TM)	0.04	0.196	0	0	0	129,966
Green TM count	0.072	0.492	0	0	0	129,966
NonGreen TM count	2.50	8.969	0	0	2	129,966
Subset: Firm-year observations with newly registered green marks						
Green TM count	1.795	1.713	1	1	2	5,218
NonGreen TM count	10.562	22.593	1	3	12	5,218

Panel B: Samples for green mark validation tests: 2001-2020

	Mean	Std. Dev.	P25	P50	P75	# firm-year obs.
Green TM count	0.235	0.969	0	0	0	17,220
NonGreen TM count	6.511	19.095	0	1	6	17,220
Environmental score	0.235	0.262	0	0.134	0.430	17,220
Innovation score	0.174	0.274	0	0	0.349	17,220
Resource use score	0.273	0.325	0	0.106	0.527	17,220
Emission reduction score	0.259	0.312	0	0.101	0.497	17,220
Green TM ratio	0.027	0.109	0	0	0	36,481
Green patent ratio	0.021	0.098	0	0	0	36,481

Panel C: Samples for the firm value analysis: 2001-2020

	Mean	Std. Dev.	P25	P50	P75	# firm-year obs.
I(Green TM)	0.043	0.202	0	0	0	74,800
Ln(Green TM count)	0.042	0.217	0	0	0	74,800
Sale growth (next yr)	0.178	0.832	-0.046	0.06	0.194	74,800
Average sales growth (next 3yrs)	0.201	0.82	-0.012	0.067	0.18	74,800
Firm size (in log)	5.779	2.567	4.086	5.824	7.532	74,800
Book-to-market	0.496	1.16	0.207	0.423	0.745	74,800
ROA	-0.031	0.433	-0.023	0.089	0.148	74,800
Leverage	0.317	0.691	0.013	0.187	0.374	74,800
Cash (in log)	3.722	2.165	2.061	3.729	5.197	74,800
R&D expense (in log)	1.577	1.941	0	0.586	2.917	74,800
Advertising expense (in log)	0.891	1.641	0	0	1.047	74,800
TM stock (in log)	1.505	2.132	0	0	3.258	74,800
Green TM stock (in log)	0.345	0.906	0	0	0	74,800

Panel D: Sample for the negative environmental news analysis using Poisson regression: 2010-2020

Variables	Mean	Std. Dev.	P25	P50	P75	# firm-year obs.
Peer environmental news	0.019	0.137	0	0	0	5,333
Alternative peer env-news1	0.020	0.142	0	0	0	5,333
Alternative peer env-news2	0.021	0.145	0	0	0	5,333
Green TM count (next yr)	0.404	1.021	0	0	0	5,333
Green TM count (next 2yrs)	0.804	1.567	0	0	1	5,333
Firm size	7.343	2.131	6.121	7.500	8.772	5,333
Book-to-market	0.451	0.582	0.220	0.389	0.631	5,333
ROA	0.070	0.282	0.072	0.116	0.161	5,333
Leverage	0.270	0.451	0.088	0.229	0.359	5,333
Cash	4.933	2.051	3.548	5.048	6.274	5,333
R&D expense	2.198	2.340	0	1.683	4.019	5,333
Advertising expense	1.387	2.098	0	0	2.520	5,333
TM stock (in log)	3.180	2.508	0	3.829	5.193	5,333
Green TM stock (in log)	1.181	1.373	0	0.693	2.197	5,333

Table 3
Green marks and environmental scores

The table reports the Poisson regression results examining the relation between corporate environmental performance and green mark production. The sample comprises 17,220 firm-year observations associated with 2,312 unique trademarking firms. *Environmental score* is the average of the three environmental scores provided by Refinitiv: *Innovation score*, *Resource score*, and *Emission reduction score*. Panel A reports the results when the dependent variable is *Green TM count*. Panel B reports the results when the dependent variable is *NonGreen TM count*. Variable definitions are provided in the Appendix. All model specifications include firm fixed effects, year fixed effects, and SIC3-by-year fixed effects. Heteroskedasticity-consistent standard errors clustered at the firm level are reported in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Green marks

	Green TM count			
	(1)	(2)	(3)	(4)
Environmental score	0.366			
	(0.330)			
Innovation score		0.545**		
		(0.217)		
Resource use score			-0.223	
			(0.228)	
Emission reduction score				0.205
				(0.267)
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
SIC3-by-year FE	Y	Y	Y	Y
Pseudo R-squared	0.379	0.380	0.379	0.379
Observations	4,635	4,635	4,635	4,635

Panel B: Non-green marks

	NonGreen TM count			
	(1)	(2)	(3)	(4)
Environmental score	-0.135			
	(0.098)			
Innovation score		-0.052		
		(0.092)		
Resource use score			-0.084	
			(0.062)	
Emission reduction score				-0.085
				(0.073)
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
SIC3-by-year FE	Y	Y	Y	Y
Pseudo R-squared	0.779	0.779	0.779	0.779
Observations	14,744	14,744	14,744	14,744

Table 4
Green marks following green patents

This table reports the Poisson/OLS regression results examining the lead-lag relation between green patents and green marks. The sample comprises 36,481 firm-year observations associate with 3,175 unique innovative firms over the period 2001-2020. The innovative firms are firms with at least one granted patent and at least one registered trademark over the full sample period 1981-2020. The dependent variable in columns (1) and (2) is the number of green marks next year. The dependent variable in columns (3) and (4) is the share of green marks to all marks by a firm in a year next two years. Variable definitions are provided in the Appendix. All model specifications include firm fixed effects, year fixed effects, and SIC3-by-year fixed effects. Heteroskedasticity-consistent standard errors clustered at the firm level are reported in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Green TM count		Green TM ratio	
	(next yr)	(next 2yrs)	(next yr)	(next 2yrs)
	(1)	(2)	(3)	(4)
Green patent ratio	0.401***	0.365***	0.048***	0.017
	(0.142)	(0.132)	(0.016)	(0.021)
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
SIC3-by-year FE	Y	Y	Y	Y
Pseudo R-squared	0.380	0.447	na	na
Adjusted R-squared	na	na	0.209	0.335
Observations	8,548	8,877	32,093	29,070

Table 5
Green marks, sales growth, and firm value

This table reports the OLS regression results examining the relation between firms' green mark production and their sales growth (firm value). The sample period is 2001-2020. In Panel A, the dependent variable in columns (1) and (2) is sales growth next year, and in columns (3) and (4) is average annual sales growth over next three years. In Panel B, the dependent variable in columns (1) and (2) is Tobin's *q* (market value of asset divided by physical capital) next year, and in columns (3) and (4) is the intangible-adjusted Tobin's *q* (market value of firm divided the sum of physical capital and intangible capital, Peters and Taylor (2017) next year. Variable definitions are provided in the Appendix. All model specifications include firm fixed effects and year fixed effects. Robust standard errors clustered at the firm level are reported in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Sales growth

	Sale growth (next yr)		Sale growth (next 3yrs)	
	(1)	(2)	(3)	(4)
I(Green TM)	0.036***		0.018**	
	(0.012)		(0.008)	
Ln(Green TM count)		0.034***		0.017**
		(0.011)		(0.007)
Firm size	-0.047***	-0.047***	-0.133***	-0.133***
	(0.012)	(0.012)	(0.016)	(0.016)
Book-to-market	-0.415***	-0.415***	-0.377***	-0.377***
	(0.040)	(0.040)	(0.051)	(0.051)
ROA	-0.012***	-0.012***	0.001	0.001
	(0.004)	(0.004)	(0.004)	(0.004)
Leverage	-0.041***	-0.041***	-0.043**	-0.043**
	(0.014)	(0.014)	(0.018)	(0.018)
Cash	0.031***	0.031***	0.041***	0.041***
	(0.005)	(0.005)	(0.006)	(0.006)
R&D expense	-0.054***	-0.054***	-0.027*	-0.027*
	(0.011)	(0.011)	(0.014)	(0.014)
Advertising expense	-0.036***	-0.036***	-0.028***	-0.028***
	(0.005)	(0.005)	(0.006)	(0.006)
Trademark stock	0.002	0.002	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)
Green TM stock	-0.004	-0.004	-0.004	-0.004
	(0.005)	(0.005)	(0.004)	(0.004)
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Adjusted R-squared	0.137	0.137	0.365	0.365
Observations	62,825	62,825	62,271	62,271

Panel B: Tobin's *q*

	Tobin's *q* (next yr)		Intangible-adjusted Tobin's *q* (next yr)	
	(1)	(2)	(3)	(4)
I(Green TM)	0.051*		0.157***	
	(0.031)		(0.055)	
Ln(Green TM count)		0.050*		0.162***
		(0.028)		(0.056)
Firm size	-0.613***	-0.613***	-1.338*	-1.338*
	(0.051)	(0.051)	(0.747)	(0.747)
ROA	-0.994***	-0.994***	1.688**	1.688**
	(0.151)	(0.151)	(0.788)	(0.788)
Leverage	0.455***	0.455***	-0.085	-0.085
	(0.072)	(0.072)	(0.058)	(0.058)
Cash	0.129***	0.129***	0.215	0.215
	(0.019)	(0.019)	(0.156)	(0.156)
R&D expense	-0.059*	-0.059*	-0.120	-0.120
	(0.035)	(0.035)	(0.209)	(0.209)
Advertising expense	-0.017	-0.017	0.068	0.068
	(0.017)	(0.017)	(0.136)	(0.136)
Trademark stock	0.020***	0.020***	0.029	0.029
	(0.006)	(0.006)	(0.018)	(0.018)
Green TM stock	-0.050***	-0.050***	-0.106***	-0.108***
	(0.015)	(0.015)	(0.028)	(0.028)
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Adjusted R-squared	0.534	0.534	0.044	0.044
Observations	63,857	63,857	63,307	63,307

Table 6
Peer negative environmental news and green marks

This table reports the Poisson regression results examining the relation between industry peers experiencing negative environmental news and changes in focal firms' green mark production. The sample period is 2010-2020. The dependent variable in columns (1), (3), and (5) is the number of green marks filed next year; the dependent variable in columns (2), (4), and (6) is the number of green marks filed over next two years. *Peer environmental news* is an indicator variable that takes the value of one if a firm's peers have negative environmental news in year *t*, while the firm itself does not have any environmental news in year *t-2*, *t-1*, or *t*, and zero otherwise. *Alternative peer env-news1* is an indicator variable that takes the value of one if a firm's peers have negative environmental news in year *t*, while the firm itself does not have any environmental news in year *t-1* or *t*, and zero otherwise. *Alternative peer env-news2* is an indicator variable that takes the value of one if a firm's peers have negative environmental news in year *t*, while the firm itself does not have any environmental news in year *t*, and zero otherwise. Variable definitions are provided in the Appendix. All model specifications include firm fixed effects and year fixed effects. Robust standard errors clustered at the three-digit SIC industry level are reported in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Green TM count (next yr)	Green TM count (next 2yrs)	Green TM count (next yr)	Green TM count (next 2yrs)	Green TM count (next yr)	Green TM count (next 2yrs)
	(1)	(2)	(3)	(4)	(5)	(6)
Peer environmental news	0.618***	0.449***				
	(0.239)	(0.146)				
Alternative peer env-news1			0.660***	0.542***		
			(0.239)	(0.159)		
Alternative peer env-news2					0.649***	0.483***
					(0.231)	(0.168)
Firm size	-0.024	-0.035	-0.028	-0.038	-0.028	-0.037
	(0.123)	(0.102)	(0.124)	(0.103)	(0.125)	(0.103)
Book-to-market	0.008	-0.006	0.007	-0.007	0.006	-0.007
	(0.096)	(0.081)	(0.096)	(0.080)	(0.097)	(0.080)
ROA	0.502	0.426*	0.509	0.433*	0.507	0.430*
	(0.349)	(0.232)	(0.349)	(0.233)	(0.349)	(0.232)
Leverage	-0.012	-0.012	-0.012	-0.012	-0.013	-0.013
	(0.057)	(0.052)	(0.057)	(0.052)	(0.057)	(0.052)
Cash	0.033	0.058	0.034	0.059	0.035	0.059
	(0.060)	(0.058)	(0.061)	(0.058)	(0.061)	(0.058)
R&D expense	-0.144	-0.167*	-0.144*	-0.169*	-0.143	-0.167*
	(0.087)	(0.087)	(0.087)	(0.087)	(0.087)	(0.087)
Advertising expense	-0.032	-0.036	-0.031	-0.034	-0.035	-0.037
	(0.103)	(0.088)	(0.104)	(0.088)	(0.103)	(0.087)
Trademark stock	-0.066*	-0.045	-0.065*	-0.044	-0.065*	-0.044
	(0.038)	(0.035)	(0.038)	(0.035)	(0.038)	(0.035)
Green TM stock	0.125**	0.068	0.123**	0.067	0.123**	0.066
	(0.055)	(0.047)	(0.055)	(0.047)	(0.055)	(0.047)
Firm FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Pseudo R-squared	0.234	0.282	0.234	0.282	0.234	0.282
Observations	5,333	4,933	5,333	4,933	5,333	4,933

Table 7
Different types of green marks

This table reports the Poisson regression results examining the relation between industry peers experiencing negative environmental news and changes in focal firms' green mark production, focusing on different types of green marks. The sample period is 2010-2020. The dependent variable in column (1)/(2) is the number of exploratory /non-exploratory green marks filed next year. The dependent variable in column (3) is the number of green marks not bearing corporate names filed next year. The dependent variable in column (4) is the number of green marks bearing corporate names filed next year. Variable definitions are provided in the Appendix. Robust standard errors clustered at the three-digit SIC industry level are reported in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Green TM (next yr)		Green TM (next yr)	
	Exploratory	Non-exploratory	Non-name-bearing	Name-bearing
	(1)	(2)	(3)	(4)
Peer environmental news	1.879**	0.483**	0.720**	-0.523*
	(0.857)	(0.223)	(0.290)	(0.301)
Firm size	-0.03	0.013	0.013	-0.604
	(0.251)	(0.149)	(0.117)	(0.376)
Book-to-market	-0.178	0.043	0.019	-0.195
	(0.173)	(0.118)	(0.101)	(0.202)
ROA	1.149	0.28	0.353	5.677**
	(0.795)	(0.410)	(0.346)	(2.536)
Leverage	0.116**	-0.101	-0.015	0.428
	(0.058)	(0.091)	(0.058)	(0.484)
Cash	-0.15	0.084	0.006	0.490***
	(0.178)	(0.077)	(0.066)	(0.181)
R&D expense	-0.282	-0.087	-0.133	-0.026
	(0.343)	(0.092)	(0.098)	(0.181)
Advertising expense	0.416	-0.06	-0.033	0.05
	(0.356)	(0.109)	(0.104)	(0.291)
Trademark stock	-0.117	-0.091**	-0.067*	0.008
	(0.110)	(0.042)	(0.040)	(0.165)
Green TM stock	0.112	0.152**	0.127**	-0.055
	(0.168)	(0.062)	(0.058)	(0.227)
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Pseudo R-squared	0.119	0.226	0.225	0.166
Observations	948	4,342	5,068	570

Table 8
Green marks and the competition motive

This table reports the Poisson regression results examining the roles of firms' market position and green technological expertise in the relation between industry peers experiencing negative environmental news and changes in focal firms' green mark production. The sample period is 2010-2020. The dependent variable is the number of green marks filed next year. *Sales follower* is an indicator variable that takes the value of one if a firm's average sales over past three years are below the corresponding three-digit SIC industry median, and zero otherwise. *Trademark follower* is an indicator variable that takes the value of one if a firm's total number of registered new marks over past three years is below the corresponding three-digit SIC industry median, and zero otherwise. *Green experience* is an indicator variable that takes the value of one if a firm is among the top five green mark producers over past three years in the three-digit SIC industry, and zero otherwise. *Peer environmental news* is an indicator variable that takes the value of one if a firm's peers have negative environmental news in year *t*, while the firm itself does not have any environmental news in year *t-2*, *t-1*, or *t*, and zero otherwise. Variable definitions are provided in the Appendix. Robust standard errors clustered at the three-digit SIC industry level are reported in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Green TM count (next yr)		
	(1)	(2)	(3)
Peer environmental news	0.424	0.480*	-0.440
	(0.278)	(0.249)	(0.395)
Sales follower	0.361*		
	(0.214)		
Peer environmental news × Sales follower	0.762**		
	(0.351)		
Trademark follower		0.340**	
		(0.152)	
Peer environmental news × Trademark follower		1.339**	
		(0.565)	
Green experience			-0.226
			(0.176)
Peer environmental news × Green experience			1.386***
			(0.435)
Firm size	-0.031	-0.046	-0.046
	(0.121)	(0.117)	(0.126)
Book-to-market	-0.003	-0.007	0.012
	(0.094)	(0.083)	(0.100)
ROA	0.508	0.575*	0.511
	(0.344)	(0.313)	(0.346)
Leverage	-0.021	0.008	-0.004
	(0.064)	(0.061)	(0.056)
Cash	0.042	0.036	0.044
	(0.059)	(0.060)	(0.062)
R&D expense	-0.136	-0.115	-0.134
	(0.090)	(0.093)	(0.089)
Advertising expense	-0.019	-0.018	-0.026
	(0.103)	(0.102)	(0.104)
Trademark stock	-0.066*	-0.065*	-0.066*
	(0.038)	(0.037)	(0.038)
Green TM stock	0.125**	0.126**	0.126**
	(0.054)	(0.053)	(0.055)
Firm FE	Y	Y	Y
Year FE	Y	Y	Y
Pseudo R-squared	0.235	0.236	0.235
Observations	5,319	5,311	5,311

Table 9
Green marks and the stakeholder pressure

This table reports the Poisson regression results examining the role of firms' pollution status in the relation between industry peers experiencing negative environmental news and changes in focal firms' green mark production. The sample period is 2010-2020. The dependent variable is the number of green marks filed next year. *High pollution* and *High onsite land pollution* are indicator variables that take the value of one if a firm's total pollution or total onsite land pollution over past three years is above the corresponding three-digit SIC industry median, and zero otherwise. *Peer environmental news* is an indicator variable that takes the value of one if a firm's peers have negative environmental news in year *t*, while the firm itself does not have any environmental news in year *t-2*, *t-1*, or *t*, and zero otherwise. Variable definitions are provided in the Appendix. All model specifications include firm fixed effects and year fixed effects. Robust standard errors clustered at the three-digit SIC industry level are reported in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Green TM count (next yr)	
	(1)	(2)
Peer environmental news	-1.198	-1.101
	(0.784)	(0.909)
High pollution	-0.338***	
	(0.126)	
Peer environmental news × High pollution	2.120***	
	(0.775)	
High onsite land pollution		-0.286
		(0.185)
Peer environmental news × High onsite land pollution		2.016**
		(0.980)
Firm size	0.165	0.192
	(0.230)	(0.237)
Book-to-market	-0.106	-0.076
	(0.166)	(0.178)
ROA	1.833	1.712
	(1.468)	(1.528)
Leverage	-0.160	-0.181
	(0.235)	(0.262)
Cash	0.144	0.134
	(0.093)	(0.097)
R&D expense	-0.258*	-0.232*
	(0.145)	(0.138)
Advertising expense	0.129	0.130
	(0.178)	(0.176)
Trademark stock	0.001	0.003
	(0.064)	(0.065)
Green TM stock	0.088	0.090
	(0.079)	(0.082)
Firm FE	Y	Y
Year FE	Y	Y
Pseudo R-squared	0.262	0.262
Observations	1,928	1,928

Internet Appendix to
"Environmental Scandals and Green Products"

1. Constructing the green trademark dataset
2. Constructing the green patent dataset
3. Robustness checks
4. Supplemental figures and tables
5. The full list of the EUIPO green trademark taxonomy

1. Constructing the green trademark dataset

We construct a new green trademark dataset. Trademarks capture product market activities; our new dataset provides a bird-eye view of green and sustainability-related products and/or services in the US. Our green trademark dataset captures green innovation associated with commercialized products and/or services that is different from what is captured by green patents – primarily technologies. Below, we provide a detailed description of how we compile the green trademark dataset.

1.1. The EUIPO green trademark taxonomy

Trademarks distinguish the products and/or services of a company from those of its competitors. Trademark applications must contain a representation of the mark (typically words, graphic elements, or a combination of the two) and a list of goods and services identification covered by the mark. In 2019, the European Commission established action on climate change as a priority. In 2021, the European Union Intellectual Property Office (EUIPO) (2021) released its first version of the green trademark taxonomy, reflecting the increasing frequency at which goods and services identification of EU trademarks are related to environmental protection and sustainability.[1] In this section, we briefly describe the EUIPO green trademark taxonomy together with its methodology.

A trademark application is required to provide goods and services identification following the Nice Classification.[2] A "term" is a basic unit of goods and services identification that contains words or phrases together with a class (classes) from the Nice Classification. In its online trademark application platform, the EUIPO adopts the Harmonised Database (HDB) that contains 85,00 terms, from which the EUIPO (2021) classifies 904 as green terms. Specifically, the EUIPO experts review the goods and services identification for the presence of any term that could be related to environmental protection and sustainability, such as 'photovoltaic,' 'solar heating,' 'wind energy,' or 'recycling.'[3] The EUIPO (2021) notes that since the HDB is not fully utilized in the EU trademark application system,[4] directly using the green terms to classify green trademarks would result in only a subset of the trademarks being classified (i.e., those use the HDB in their applications). Therefore, the EUIPO (2021) employs an algorithm that combines machine learning with human interventions (see Figure 4 in EUIPO (2021)), and uses the 904 green terms as the training set. The algorithm generates 375 green expressions that can be used to identify green trademarks as long as a trademark's application is in English. Each of those green expressions is assigned a reference number ("Ref.") ranging from 1 to 375. In our study, we call this green term classifier as the "EUIPO green trademark taxonomy."

Arguably, there are other ways to identify green products and/or services such as searching environment-related keywords in a company's disclosed information (e.g., advertisements or websites), which, however, might be prone to greenwashing. The EUIPO green trademark taxonomy,

[1] The report can be downloaded from https://euipo.europa.eu/tunnel-web/secure/webdav/guest/document_library/observatory/documents/reports/2021_Green_EU_trade_marks/2021_Green_EU_trade_marks_FullR_en.pdf

[2] The Nice Classification, administered by the World Intellectual Property Organisation (WIPO), is a system of classifying goods and services for trademark applications. It consists of 45 classes, 34 of which cover goods and 11 services. Each class is represented by a class heading which provides general information about the type of goods or services covered, and a set of terms which define goods or services protected by the trademark application.

[3] The EUIPO identifies 904 green terms by experts. Note that trademarks with terms related to nuclear energy are not classified as green, which is different from the Haščič and Migotto's (2015) OECD green patent taxonomy that identifies green patents, and includes nuclear energy (see page 52; 4.4. NUCLEAR ENERGY; Y02E30).

[4] The use of the HDB was below 50% over the period from 1996 (the first year the EUIPO was established) to 2006, and was 85% in 2020.

by construction, is less subject to greenwashing concerns as it is based on an elaborate keyword search. For example,

Ref	Expression
73	+electric +vehicle −cigarette −door −horn −lock −sunroof−alternator −alarm −temperature −theft −antitheft −washers −7 −37

The above expression (Ref. 73) means: A term is green if it contains the word 'electric' and the word 'vehicle,' and does *not* contain the word 'cigarette' or the word 'door' or the word 'horn' or the word 'lock' or the word 'sunroof' or the word 'alternator' or the word 'alarm' or the word 'temperature' or the word 'theft' or the word 'antitheft' or the word 'washers,' *except* if *Nice Class 7 Machines and Machine Tools, Parts* or *Nice Class 37 Construction, Repair, Cleaning*.

The EUIPO green trademark taxonomy divides green trademarks into thirty-five categories by subject, which are then combined into nine groups. In this example, the expression (Ref. 73) is assigned to the group 'Transportation' and the category 'General transport.' It is clear that the main product associated with this trademark is electric cars and belongs to transportation.

As another example, if we search the keyword "battery" in the taxonomy, four green expressions show up with Ref. 13, 14, 15, and 221 as follows,

Ref	Expression
13	+battery +chargeable −acidulated −telephone −computer −fire.extinguisher −game −cigarette −cutters −cell.phone −mobile.phone −smartphone −wireless
14	+battery +charging −acidulated −telephone −computer −fire.extinguisher −game −cigarette −cutters −cell.phone −mobile.phone −smartphone –wireless
15	+battery +electric −acidulated −telephone −computer −fire.extinguisher −game −cigarette −cutters −cell.phone −mobile.phone −smartphone –wireless
221	+solar +battery

The first expression (Ref. 13) means: A term is green if it contains the word 'battery' and the word 'chargeable,' and does *not* contain the words 'acidulated,' 'telephone,' 'computer,' 'fire extinguisher' (together, and in that order), 'game,' 'cigarette,' 'cutters,' 'cell phone' (together, and in that order), 'smartphone,' or 'wireless.' In this example, the expression (Ref. 13) is assigned to the group 'Energy Conservation' and the category 'Storage of Electricity.' Ref. 14 and 15 green expressions are assigned to the same category as Ref. 13, and Ref. 221 is assigned to the group 'Energy Production' and the category 'Solar Energy.'

1.2. Identifying green marks from the USPTO

The EUIPO green trademark taxonomy is developed to identify green trademarks as long as a mark's goods and/or services identification is in English. We are the first in the literature to adopt the EUIPO taxonomy to identify green trademarks from the USPTO. To account for our context of studying green trademarks applied in the US, we modify the taxonomy and describe our detailed procedure below.

Step 1: We modify the EUIPO green expressions by making use of the British-American-English conversion.[5] We list the entire set of (modified) 375 green expressions at the end of this Appendix.

Step 2: We collect detailed trademark data from the USPTO. For our purpose, we rely on goods and services identification and parse that piece of textual information. Specifically, the textual description for each unique Nice class is separated by semicolons, which gives us the basic unit and is called a "term."[6] We then standardize the description by removing stop words, punctuations, and stemming.[7] Finally, we tokenize the textual information.[8]

Step 3: We perform the same preprocessing step for the 375 green expressions in the (modified) EUIPO green trademark taxonomy.

Step 4: We match the data in Step 2 (at the term level) to each of the expressions in Step 3. We flag "green term" if a term is matched to one of the green expressions. Note that a trademark could have multiple green terms.

Step 5: We code a trademark as a green trademark if its goods and services identification contains at least one green term.

Step 6: We assign a green trademark to a group (and a category). The EUIPO green taxonomy assigns green trademarks to their corresponding groups (nine groups) and categories (35 categories).[9] For a green trademark with a *single* green term, we assign it to the category of that green term. For a green trademark with *multiple* green terms, we take the mode of the categories among the green terms.

1.3. Examples of the USPTO green marks

We manually check the USPTO green marks identified using our approach for four companies, Waste Management Inc., Tesla Inc., Nike Inc., and Clorox Corporation. Some examples are provided below. It shows that our method achieves face validity.

Company 1: Waste Management Inc.

Green mark 1

[5] Some examples of our modifications are as follows: "fertilisers" becomes "fertilizers" (Ref. 209); "refuelling" becomes "refueling" (Ref. 183); "demineralising" becomes "demineralizing" (Ref. 282); "deodorising" becomes "deodorizing" (Ref. 6 and Ref. 107).

[6] A trademark can apply in multiple Nice classes.

[7] We use Python and its *Stop words package* and *Snowball stemming package*. Stop words are a set of commonly used words in a language. Examples of stop words in English are "a," "the," "is," and "are."

[8] After tokenization, single words are separated. For compound words, we implement tokenization in two ways. The first approach is to directly remove hyphen; for example, "self-balancing" becomes "selfbalancing", and "eco-friendly" becomes "ecofriendly". The second approach is to replace the hyphen with a space; for example, "electric-motor" becomes "electric" and "motor". All compound words are tokenized using both approaches.

[9] The nine groups are: (1) Agriculture (Fertiliser alternatives, Other agriculture, and Pesticide alternatives); (2) Climate Change (Carbon brokerage, Carbon monitor, and Environmental services); (3) Energy Production (Biofuels, Other energy, Solar Energy, and Wind Energy); (4) Energy Conservation (Energy management, Energy saving, Low energy lighting, and Storage of electricity); (5) Environmental Awareness (Ecology and Sustainability); (6) Pollution Control (Air purification, Biodegradable, Pollution general, and Water purification); (7) Reusable (Other reusable, Recycling, Refilling cartridge, Reusable bags, and Reusable bottles); (8)Transportation (Electric bike, Electric car, Electric engines, Electric moto, General transport, Hybrid vehicle, Hydrogen vehicle, and Other vehicles); and (9) Waste Management (Process waste and Waste disposal).

Waste Management Inc. applied this trademark on June 5, 1998, and registered it on March 28, 2000. The Word Mark is “WM” with the registration number 2396798.

TSDR ASSIGN Status TTAB Status *(Use the "Back" button of the Internet Browser to return to TESS)*

Word Mark	WM
Goods and Services	IC 037. US 100 103 106. G & S: Waste disposal for others. FIRST USE: 19980717. FIRST USE IN COMMERCE: 19980717
	IC 039. US 100 105. G & S: Refuse collection and transport by truck. FIRST USE: 19980717. FIRST USE IN COMMERCE: 19980717
	IC 040. US 100 103 106. G & S: Recycling. FIRST USE: 19980717. FIRST USE IN COMMERCE: 19980717
	IC 042. US 100 101. G & S: Sorting of waste and recyclable materials. FIRST USE: 19980717. FIRST USE IN COMMERCE: 19980717
Mark Drawing Code	(5) WORDS, LETTERS, AND/OR NUMBERS IN STYLIZED FORM
Serial Number	75496642
Filing Date	June 5, 1998
Current Basis	1A
Original Filing Basis	1B
Published for Opposition	March 28, 2000
Change In Registration	CHANGE IN REGISTRATION HAS OCCURRED
Registration Number	**2396798**
Registration Date	October 24, 2000
Owner	(REGISTRANT) WASTE MANAGEMENT INC. CORPORATION DELAWARE 1001 FANNIN, SUITE 4000 HOUSTON TEXAS 77002
	(LAST LISTED OWNER) WM INTELLECTUAL PROPERTY HOLDINGS, L.L.C. LIMITED LIABILITY COMPANY DELAWARE 1001 FANNIN, SUITE 4000 HOUSTON TEXAS 77002
Assignment Recorded	ASSIGNMENT RECORDED
Attorney of Record	Mark G. Chretien
Disclaimer	NO CLAIM IS MADE TO THE EXCLUSIVE RIGHT TO USE "WM" APART FROM THE MARK AS SHOWN
Description of Mark	The drawing contains lining for the color green (Pantone 349) for the letter "W" of the mark and lining for the color gold (Pantone 131) for the letter "M" of the mark.
Type of Mark	SERVICE MARK
Register	PRINCIPAL
Affidavit Text	SECT 15. SECT 8 (6-YR). SECTION 8(10-YR) 20210115.
Renewal	2ND RENEWAL 20210115
Live/Dead Indicator	LIVE

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In this example, four terms in the goods and services identification are extracted and shown below,

Nice Class	Term	Green Expression Ref.
Nice 37	Waste disposal for others.	Not matched
Nice 39	Refuse collection and transport by truck.	Not matched
Nice 40	Recycling.	189
Nice 42	Sorting of waste and recyclable materials.	189

We then try to match each term above with any of the 375 green expressions. Two out of the four terms are matched to Ref. 189 as follows, and the remainder two terms are not matched,

Ref	Expression	Expression (after removing stop words, stemming, etc.)
189	**+recycle** −cost.price −tyres −tires −animal −wrappin	**+recycl** −cost price −tyre −tire −anim −wrappin

Our method classifies two matched terms as green terms of this trademark, highlighted above. It also assigns the trademark to the group “Reusable” and the category “Recycling.” At the trademark level, this trademark is classified as “green” because its goods and services identification contain at least one green term, regardless of other non-green terms included. In this example, two of the terms are green terms, and two others are not. It is clear that the main activity is related to “Recycling,” and the two other terms are secondary to this main activity.

Green mark 2
Waste Management Inc. applied this trademark on September 3, 2009, and registered it on September 14, 2010. The Word Mark is “SUSTAINABLE PHARMACY” with the registration number 3994472.

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SUSTAINABLE PHARMACY

Word Mark	SUSTAINABLE PHARMACY
Goods and Services	IC 040. US 100 103 106. G & S: Consulting services in the field of waste management; consulting services in the field of hazardous waste management; hazardous waste management services; and waste management services. FIRST USE: 20110504. FIRST USE IN COMMERCE: 20110504
Standard Characters Claimed	
Mark Drawing Code	(4) STANDARD CHARACTER MARK
Serial Number	77819488
Filing Date	September 3, 2009
Current Basis	1A
Original Filing Basis	1B
Published for Opposition	September 14, 2010
Registration Number	**3994472**
Registration Date	July 12, 2011
Owner	(REGISTRANT) WM Healthcare Solutions, Inc. CORPORATION DELAWARE 1001 Fannin Street, Suite 4000 Houston TEXAS 77002
	(LAST LISTED OWNER) WM INTELLECTUAL PROPERTY HOLDINGS, L.L.C. LIMITED LIABILITY COMPANY DELAWARE 800 Capitol St., Suite 3000 HOUSTON TEXAS 77002
Assignment Recorded	ASSIGNMENT RECORDED
Attorney of Record	Mark G. Chretien
Disclaimer	NO CLAIM IS MADE TO THE EXCLUSIVE RIGHT TO USE "PHARMACY" APART FROM THE MARK AS SHOWN
Type of Mark	SERVICE MARK
Register	PRINCIPAL
Affidavit Text	SECT 15. SECT 8 (6-YR). SECTION 8(10-YR) 20211115.
Renewal	1ST RENEWAL 20211115
Live/Dead Indicator	LIVE

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In this example, four terms in the goods and services identification are extracted and shown below,

Nice class	Term	Green Expression Ref.
Nice 40	Consulting services in the field of waste management	267
Nice 40	consulting services in the field of hazardous waste management	267
Nice 40	hazardous waste management services	267
Nice 40	waste management services	267

We then match each term above with any of the 375 green expressions. All four terms are matched to Ref. 267 as follows,

Ref	Expression	Expression (after removing stop words, stemming, etc.)
267	**+waste +management**	**+wast +manag**

Our method classifies all four matched terms as green terms of this trademark, highlighted above. It also assigns the mark to the group “Waste Management” and the category “Process waste.” It is clear that the main activity is related to “Waste Management.”

Company 2: Tesla Inc.

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MODEL Y

Word Mark	MODEL Y
Goods and Services	IC 012. US 019 021 023 031 035 044. G & S: Electric vehicles. FIRST USE: 20200313. FIRST USE IN COMMERCE: 20200313
Standard Characters Claimed	
Mark Drawing Code	(4) STANDARD CHARACTER MARK
Serial Number	87377617
Filing Date	March 20, 2017
Current Basis	1A
Original Filing Basis	1B
Published for Opposition	February 27, 2018
Registration Number	**6075303**
International Registration Number	1370866
Registration Date	June 9, 2020
Owner	(REGISTRANT) Tesla, Inc. CORPORATION DELAWARE 3500 DEER CREEK ROAD PALO ALTO CALIFORNIA 94304
Attorney of Record	Diane M. Lambillotte
Disclaimer	NO CLAIM IS MADE TO THE EXCLUSIVE RIGHT TO USE "MODEL" APART FROM THE MARK AS SHOWN
Type of Mark	TRADEMARK
Register	PRINCIPAL
Live/Dead Indicator	LIVE

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TESLA

Word Mark	TESLA
Goods and Services	IC 042. US 100 101. G & S: Monitoring of solar panels and other equipment for use in converting solar energy into electricity to ensure proper functioning and programming for meeting electricity demands and usage goals; monitoring of efficiency, production levels and other performance data of solar panels and other equipment for use in converting solar energy into electricity. FIRST USE: 20170000. FIRST USE IN COMMERCE: 20170000
Standard Characters Claimed	
Mark Drawing Code	(4) STANDARD CHARACTER MARK
Serial Number	87080898
Filing Date	June 22, 2016
Current Basis	1A
Original Filing Basis	1B
Published for Opposition	June 6, 2017
Registration Number	**6158369**
International Registration Number	1360636
Registration Date	September 22, 2020
Owner	(REGISTRANT) TESLA, INC. CORPORATION DELAWARE 3500 Deer Creek Road Palo Alto CALIFORNIA 94304
Assignment Recorded	ASSIGNMENT RECORDED
Attorney of Record	Anthony V. Lupo
Type of Mark	SERVICE MARK
Register	PRINCIPAL
Live/Dead Indicator	LIVE

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Word Mark	T
Goods and Services	IC 009. US 021 023 026 036 038. G & S: solar energy equipment, namely, photo-voltaic solar modules in the shape of panels or roofing tiles for converting electromagnetic radiation into electrical energy; equipment for use in connection with collecting and converting solar energy into electricity, namely, inverters. FIRST USE: 20180300. FIRST USE IN COMMERCE: 20180300
Mark Drawing Code	(5) WORDS, LETTERS, AND/OR NUMBERS IN STYLIZED FORM
Serial Number	87491067
Filing Date	June 15, 2017
Current Basis	1A
Original Filing Basis	1B
Published for Opposition	October 31, 2017
Registration Number	**6251645**
Registration Date	January 19, 2021
Owner	(REGISTRANT) Tesla, Inc. CORPORATION DELAWARE 3500 Deer Creek Road Palo Alto CALIFORNIA 94304
Attorney of Record	Anthony V. Lupo
Prior Registrations	4226096;4560509;4901891
Description of Mark	Color is not claimed as a feature of the mark. The mark consists of a stylized "T" design.
Type of Mark	TRADEMARK
Register	PRINCIPAL
Live/Dead Indicator	LIVE

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After extracting and matching terms with the green taxonomy, we have the following,

Registration number (Registration date)	Nice class	Green expressions matched Ref.	Mark word	Goods and Services (Term-level)
6075303 (9-Jun-20)	12	73	MODEL Y	Electric vehicles.
6158369 (22-Sep-20)	42	224	TESLA	Monitoring of solar panels and other equipment for use in converting solar energy into electricity to ensure proper functioning and programming for meeting electricity demands and usage goals;
6158369 (22-Sep-20)	42	224	TESLA	monitoring of efficiency, production levels and other performance data of solar panels and other equipment for use in converting solar energy into electricity.
6251645 (19-Jan-21)	9	162	T	solar energy equipment, namely, photo-voltaic solar modules in the shape of panels or roofing tiles for converting electromagnetic radiation into electrical energy;
6251645 (19-Jan-21)	9	224	T	equipment for use in connection with collecting and converting solar energy into electricity, namely, inverters.

Some of the terms are matched to Ref. 73, 162, and 224 and shown below,

Group	Category	Ref	Expression

Transportation	General transport	73	+electric +vehicle −cigarette −door −horn −lock −sunroof −alternator −alarm −temperature −theft −antitheft −washers −7 −37
Energy Production	Solar Energy	162	+photovoltaic
Energy Production	Solar Energy	224	+solar +energy

Company 3: Nike Inc.

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Word Mark	REUSE A SHOE
Goods and Services	(CANCELLED) IC 040. US 100 103 106. G & S: conducting a recycling program for footwear. FIRST USE: 19960304. FIRST USE IN COMMERCE: 19960304
Mark Drawing Code	(3) DESIGN PLUS WORDS, LETTERS, AND/OR NUMBERS
Design Search Code	26.01.02 - Circles, plain single line; Plain single line circles 26.01.09 - Circles having animals as a border; Circles having geometric figures as a border; Circles having humans as a border; Circles having objects as a border; Circles having plants as a border; Geometric figures, objects, humans, plants or animals forming or bordering the perimeter of a circle. 26.11.27 - Oblongs not used as carriers for words, letters or designs 26.17.09 - Bands, curved; Bars, curved; Curved line(s), band(s) or bar(s); Lines, curved 26.17.12 - Angles (geometric); Chevrons
Serial Number	75084222
Filing Date	April 5, 1996
Current Basis	1A
Original Filing Basis	1A
Published for Opposition	August 19, 1997
Registration Number	**2111692**
Registration Date	November 11, 1997
Owner	(REGISTRANT) Nike, Inc. CORPORATION OREGON One Bowerman Drive Beaverton OREGON 97005
Attorney of Record	Joseph J. Quigley
Prior Registrations	0977190;1264529;1284385;1284386;1323342;1323343;AND OTHERS
Type of Mark	SERVICE MARK
Register	PRINCIPAL
Affidavit Text	SECT 15. SECT 8 (6-YR).
Live/Dead Indicator	DEAD
Cancellation Date	August 16, 2008

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MATA NO PEITO

Word Mark	MATA NO PEITO
Translations	The English translation of "MATA NO PEITO" in the mark is "The forest is in my heart".
Goods and Services	(CANCELLED) IC 036. US 100 101 102. G & S: Trading of carbon dioxide and greenhouse gas emission credits, allowances or offsets of others for the purposes of investing in environmental conservation projects. FIRST USE: 20110430. FIRST USE IN COMMERCE: 20110430
Standard Characters Claimed	
Mark Drawing Code	(4) STANDARD CHARACTER MARK
Serial Number	85170096
Filing Date	November 5, 2010
Current Basis	1A
Original Filing Basis	1B
Published for Opposition	July 19, 2011
Registration Number	**4158534**
Registration Date	June 12, 2012
Owner	(REGISTRANT) Nike, Inc. CORPORATION OREGON One Bowerman Drive, DF-4 Beaverton OREGON 97005
Attorney of Record	Jaime M. Lemons
Type of Mark	SERVICE MARK
Register	PRINCIPAL
Live/Dead Indicator	DEAD
Cancellation Date	January 18, 2019

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NIKE BETTER WORLD

Word Mark	NIKE BETTER WORLD
Goods and Services	(CANCELLED) IC 035. US 100 101 102. G & S: Promoting public interest and awareness in the field of sports, sports competitions, physical fitness and training, and relating to humanitarian, community, health, and environmental sustainability issues; providing a website promoting public interest and awareness in the field of sports, sports competitions, physical fitness and training, and relating to humanitarian, community, health, and environmental sustainability issues featuring information on environmentally preferred materials, waste reduction, and other means of reducing environmental impact of consumer products manufacturing and distribution. FIRST USE: 20110101. FIRST USE IN COMMERCE: 20110101
Standard Characters Claimed	
Mark Drawing Code	(4) STANDARD CHARACTER MARK
Serial Number	85213316
Filing Date	January 7, 2011
Current Basis	1A
Original Filing Basis	1B
Published for Opposition	April 5, 2011
Registration Number	**4199300**
Registration Date	August 28, 2012
Owner	(REGISTRANT) Nike, Inc. CORPORATION OREGON One Bowerman Drive, DF-4 Beaverton OREGON 97005
Attorney of Record	Jaime M. Lemons
Type of Mark	SERVICE MARK
Register	PRINCIPAL
Live/Dead Indicator	DEAD
Cancellation Date	March 29, 2019

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After extracting and matching terms with the green taxonomy, we have the following,

Registration number (Registration date)	Nice class	Green expressions matched Ref.	Mark word	Goods and Services (Term-level)
2111692 (11-Nov-97)	40	189	REUSE A SHOE	conducting a recycling program for footwear.
4158534 (12-Jun-12)	36	36	MATA NO PEITO	Trading of carbon dioxide and greenhouse gas emission credits, allowances or offsets of others for the purposes of investing in environmental conservation projects.
4199300 (28-Aug-12)	35	96	NIKE BETTER WORLD	Promoting public interest and awareness in the field of sports, sports competitions, physical fitness and training, and relating to humanitarian, community, health, and environmental sustainability issues;
4199300 (28-Aug-12)	35	238	NIKE BETTER WORLD	providing a website promoting public interest and awareness in the field of sports, sports competitions, physical fitness and training, and relating to humanitarian, community, health, and

	environmental sustainability issues featuring information on environmentally preferred materials, waste reduction, and other means of reducing environmental impact of consumer products manufacturing and distribution.

Some of the terms are matched to Ref. 36, 96, 189, and 238 and shown below,

Group	Category	Ref	Expression
Climate change	Carbon brokerage	36	+carbon +offsetting
Climate change	Environmental services	96	+environmental +information
Reusable	Recycling	189	+recycle −cost.price −tyres −tires −animal −wrappin
Environmental awareness	Sustainability	238	+sustainable

Company 4: Clorox Company.

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ULTRA

Word Mark	ULTRA
Goods and Services	(CANCELLED) IC 011. US 013 021 023 031 034. G & S: FAUCET-MOUNTED WATER FILTRATION SYSTEMS FOR DOMESTIC USE. FIRST USE: 19990605. FIRST USE IN COMMERCE: 19990605
Mark Drawing Code	(1) TYPED DRAWING
Serial Number	75518733
Filing Date	July 14, 1998
Current Basis	1A
Original Filing Basis	1B
Published for Opposition	November 24, 1998
Registration Number	**2286743**
Registration Date	October 12, 1999
Owner	(REGISTRANT) Brita Products Company, The CORPORATION DELAWARE 1221 Broadway Oakland CALIFORNIA 94612
	(LAST LISTED OWNER) BRITA LP LIMITED PARTNERSHIP CANADA PLACE PURY 13 RUE DE MOLE 2-4 NEUCHATEL SWITZERLAND
Assignment Recorded	ASSIGNMENT RECORDED
Attorney of Record	STEPHEN M WESTBROOK
Type of Mark	TRADEMARK
Register	PRINCIPAL
Live/Dead Indicator	DEAD
Cancellation Date	July 22, 2006

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Word Mark	GREEN WORKS
Goods and Services	(CANCELLED) IC 003. US 001 004 006 050 051 052. G & S: Environmentally friendly all-purpose cleaner. FIRST USE: 20140225. FIRST USE IN COMMERCE: 20140225
Mark Drawing Code	(3) DESIGN PLUS WORDS, LETTERS, AND/OR NUMBERS
Design Search Code	05.05.25 - Daffodils ; Iris (flower) ; Other flowers 26.11.21 - Rectangles that are completely or partially shaded 26.11.25 - Rectangles with one or more curved sides 26.17.02 - Bands, wavy ; Bars, wavy ; Lines, wavy ; Wavy line(s), band(s) or bar(s) 26.17.06 - Bands, diagonal ; Bars, diagonal ; Diagonal line(s), band(s) or bar(s) ; Lines, diagonal
Serial Number	86289607
Filing Date	May 22, 2014
Current Basis	1A
Original Filing Basis	1A
Published for Opposition	March 31, 2015
Registration Number	**4754524**
Registration Date	June 16, 2015
Owner	(REGISTRANT) The Clorox Company CORPORATION DELAWARE 1221 Broadway Oakland CALIFORNIA 94612
Attorney of Record	Nina Han
Prior Registrations	3412200;3603530;3974852;AND OTHERS
Disclaimer	NO CLAIM IS MADE TO THE EXCLUSIVE RIGHT TO USE "GREEN" APART FROM THE MARK AS SHOWN
Description of Mark	The color(s) green, white, yellow, orange, and blue is/are claimed as a feature of the mark. The mark consists of the word "GREEN" in white letters with a blue outline above and slightly to the left of the word "WORKS" in white letters with a green outline. Behind the words is a flower with an orange center and yellow petals. Behind the lower flower petals there is a light green horizontal line, and below that is a thicker, darker green horizontal block with rounded corners on the bottom.
Type of Mark	TRADEMARK
Register	PRINCIPAL
Live/Dead Indicator	DEAD
Cancellation Date	December 17, 2021

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After extracting and matching terms with the green taxonomy, we have the following,

Registration number (Registration date)	Nice class	Green expressions matched Ref.	Mark word	Goods and Services (Term-level)
2286743 (12-Oct-99)	11	279	ULTRA	FAUCET-MOUNTED WATER FILTRATION SYSTEMS FOR DOMESTIC USE.
4754524 (16-Jun-15)	3	313	GREEN WORKS	Environmentally friendly all-purpose cleaner.

Some of the terms are matched to Ref. 279 and 313 and shown below:

Group	Category	Ref	Expression
Pollution control	Water purification	279	+water +filtration −electrostatic −sanitary −supply −boxes −chemical.compounds −aquarium −spas −pump −media −devices −units −agricultural −paper −rental
Environmental awareness	Ecology	313	+environmental.friendly

2. Constructing the green patent dataset

We first download patent data from the PatentsView database, a publicly accessible service maintained by the USPTO. We extract patent numbers, grant dates, citations, claims, and patent technology classes for all patents granted. We keep utility patents granted to public firms over the period 1981-2020 using the Kogan, Papanikolaou, Seru, and Stoffman (KPSS) data repository.

We determine whether a patent is related to green technologies following Haščič and Migotto (2015) whose classification scheme was adopted by the Organization for Economic Cooperation and Development (OECD).[10] The classification scheme relies on selected International Patent Classification (IPC) and Cooperative Patent Classification (CPC) classes, grouped into "technological fields" that are important for policy makers in terms of promoting green technologies. The classification scheme seeks to represent technologies directed at four major environmental policy objectives, human health impacts of environmental pollution, addressing water scarcity, ecosystem health, and climate change migration.[11] As a result, there are several search approaches including those directed at (1) the traditional domains of environmental management (air and water pollution waste disposal, etc.) as well as those directed at (2) adaptation to water scarcity, (3) addressing biodiversity threats, and (4) mitigating climate change. In total, there are about 80 technological fields associated with environmental protection.

We focus on patenting firms, i.e., those with at least one granted patent over the period 1981-2020. The sample comprises 2,366,791 patent-level observations associated with 2,310,043 unique patents,[12] of which 107,747 (4.6%) are classified as green. Figure S1 shows that green patents have been increasing steadily since 1981 and had a remarkable increase after 2010. The figure also shows that green patents grow faster than other patents as the share of green patents to all patents also significantly increases over time.

3. Robustness checks

We conduct a number of robustness tests to validate our main findings. Specifically, we vary the composition of our peer set, consider time-varying industry shocks, explore different approaches to clustering standard errors, and employ alternative definitions of environmental news. The results of these robustness tests, detailed in this section and corresponding to the Internet Appendix tables, validate our main findings.

In our first robustness test, we vary the composition of the peer set. In our baseline definition of *Peer environmental news*, we use the top five most similar firms measured by the trademark similarity score to construct our peer set. As alternatives, we also consider peers comprising the top two and top ten most similar firms. The results of these tests, presented in the Internet Appendix Table S6, show consistency with our baseline findings. It is important to note that the number of observations remains unchanged since our sample of firms without any news is the same. These alternative peer definitions affect the value for *Peer environmental news*, especially if we restrict the selection to the top two most similar firms, as the focal firm may not be ranked as similar to the event firms, and therefore may not have peer news.

There may be concerns regarding industry-level shocks that could simultaneously influence the likelihood of environmental news exposure and green mark production patterns within an industry. To

[10] See https://www.oecd-ilibrary.org/environment/measuring-environmental-innovation-using-patent-data_5js009kf48xw-en

[11] Several recent studies have adopted the OECD green patent classification. For example, Cohen et al. (2022) shows that the energy sector is the primary producer of green patents. Bolton, Kacperczyk, and Wiedemann (2022) focus on the determinants and emission impact of corporate green innovation.

[12] A patent may have multiple owners, explaining the sample size greater than unique patents.

address this potential industry-related confounding factor, we conduct a robustness test detailed in the Internet Appendix Table S7, where we replace the year fixed effects with industry-by-year fixed effects. This set of fixed effects allows us to account for any time-varying trends or shocks that are unique to specific industries. By doing so, we aim to isolate the effect of peer environmental news from some broad industry-level influences. The robustness checks are performed in two different ways. We control for SIC3-by-year fixed effects or SIC2-by-year fixed effects. The findings indicate that the positive influence of peer environmental news on the production of green marks by focal firms is not merely a by-product of industry-level shocks.

We also consider the potential influence of regulatory actions at the state level. Such actions could simultaneously increase a company's exposure to negative environmental news in the media and compel additional compliance efforts, possibly leading to an increase in green mark production. To address this concern and rule out the possibility that our findings are driven by local regulatory actions, we account for local time-varying factors in our analysis. Specifically, in columns (5) and (6) of the Internet Appendix Table S7, we replace the year fixed effects with state-by-year fixed effects, where the state refers to the location of a company's headquarters state. This set of fixed effects allows us to account for any state-specific regulatory actions or changes that might affect a firm's environmental practices. The results are largely intact compared with the baseline results, suggesting that the observed increase in green mark production is not a consequence of local regulatory actions.

In our primary analysis, we focus on negative environmental news ranging from medium to high severity. To refine our approach, we now exclusively consider environmental news of high severity. Such high severity news events are quite rare; under this stricter criterion, the average occurrence of *Peer environmental news* in our regression sample drops to a mere 0.032% (in contrast to 1.9% using the baseline definition). Given the low frequency of these events, we present the results considering using explanatory variable of *Peer environmental news* only. These findings are in Internet Appendix Table S8. Despite the infrequent nature of high-severity news, our analysis reveals that these high-severity environmental news still exerts a significant impact on green mark production over the subsequent one or two years.

In another set of our robustness tests, we employ an alternative definition of environmental news sourced from RepRisk. While our baseline model is based on the UNGC definition of environmental news, for this test, we utilized the RepRisk issues to identify negative environmental news. These issues include climate change, GHG emissions, global pollution, impacts on landscapes and biodiversity, local pollution, other ESG issues, overuse and wasting of resources, product-related health and environmental issues, and waste issues. The results of this test are shown in the Internet Appendix Table S9. Using the "RepRisk issues" definition, for column (1), the average level of *Peer environmental news* is 0.021, with a standard deviation of 0.145. This suggests that a one-standard-deviation change in *Peer environmental news*, as defined using "RepRisk issues", is associated with an 11.6% increase in green mark production for the following year, calculated as $((\exp(0.589) - 1) \times 0.145)$. This finding using the "RepRisk issues" definition aligns well with our main findings, further affirming the robustness of our conclusion that peer environmental news significantly impacts focal firms' green mark production.

Next, we examine whether the observed increases in green mark production are specifically driven by environmental news, as opposed to by concurrent social or governance news reported by RepRisk. Given that companies often face multiple ESG challenges simultaneously, it is crucial to distinguish which aspect of their ESG performance—environmental, social, or governance—most significantly influences their green product initiatives. To isolate the impact of environmental news, we exclude environmental news events that occurred in the same year as any social or governance news pertaining to the focal firms. The findings from this refined analysis are presented in the Internet Appendix Table S10. The results confirm that the observed patterns remain unchanged even after excluding these concurrent social or governance news events.

Furthermore, we conduct a placebo analysis, detailed in the Internet Appendix Table S11, where we use social or governance (S&G) news related to peer firms as the event of interest. In this analysis, we examine whether these other types of ESG news could independently influence green mark production. The key variable of interest is *Peer S&G news*, defined analogously to *Peer environmental news*. To control for potential confounding effects from environmental news, we exclude peer S&G news events that take place in the same year as any environmental news related to the focal firms. The results from the Internet Appendix Table S11 indicate that peer firms' S&G news does not impact focal firms' green mark production in the subsequent one or two years. Taken together, the results from the Internet Appendix Tables S10 and S11 support our conclusion that the increase in focal firms' green mark production is primarily driven by their peers' environmental news, rather than by those peers' social or governance news.

4. Supplemental figures and tables

Figure S1
Green marks at the USPTO: US firms vs non-US firms

This figure plots the number of registered green marks by US firms (in dark shade) and non-US firms (in light shade) at the USPTO over the period 1981-2020. The dashed line represents the total number of registered green marks by US firms and non-US firms in each year.

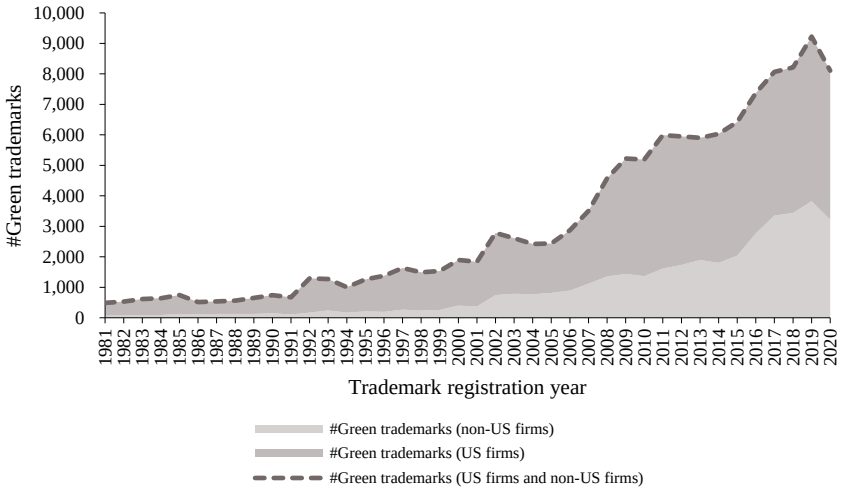

Figure S2
Green patents at the USPTO

This figure plots the number of green patents granted to US firms by the USPTO over the period 1981-2020. The solid line represents the number of green patents granted to US firms each year. The dashed line represents the share of green patents to all patents.

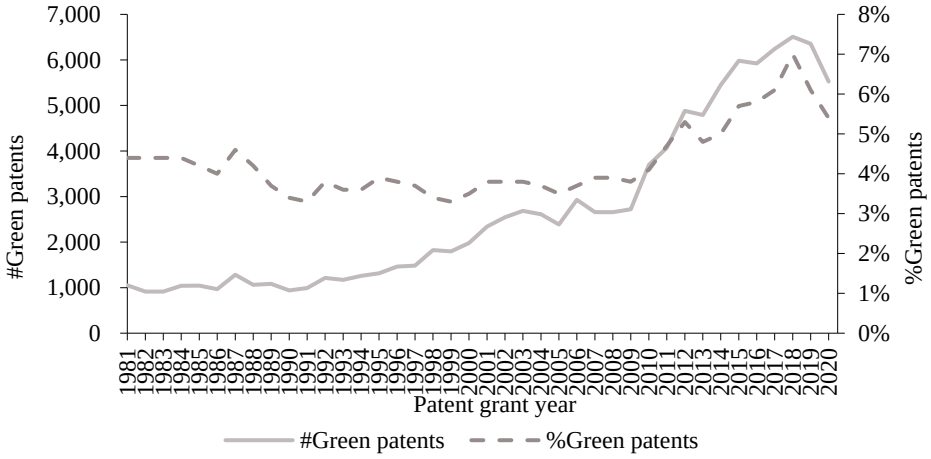

Table S1
Green marks at the USPTO by state

This table reports the number and frequency distribution of 85,516 registered green marks at the USPTO by US firms (both private and public) over the period 1981-2020 based on a mark owner's headquarters state. It lists the top twenty US states based on their number of registered green marks. The last column reports the share of green marks in each state across all states.

Rank	Owner state	#Green marks	%Green marks (across states)
1	California	14,581	17.19%
2	Texas	6,262	7.38%
3	New York	5,646	6.66%
4	Florida	4,774	5.63%
5	Illinois	4,260	5.02%
6	Pennsylvania	3,422	4.03%
7	New Jersey	3,255	3.84%
8	Ohio	2,937	3.46%
9	Massachusetts	2,714	3.20%
10	Georgia	2,346	2.77%
11	Colorado	2,236	2.64%
12	Michigan	2,180	2.57%
13	Virginia	2,160	2.55%
14	Minnesota	2,081	2.45%
15	Maryland	1,695	2.00%
16	Washington	1,673	1.97%
17	Connecticut	1,658	1.95%
18	Wisconsin	1,650	1.95%
19	North Carolina	1,636	1.93%
20	Arizona	1,470	1.73%
21	Missouri	1,457	1.72%
22	Tennessee	1,187	1.40%
23	Delaware	1,139	1.34%
24	Indiana	1,098	1.29%
25	Oregon	1,081	1.27%
26	Nevada	1,007	1.19%
27	Washington, D.C.	940	1.11%
28	Utah	885	1.04%
29	South Carolina	592	0.70%
30	Oklahoma	565	0.67%
31	Kansas	552	0.65%
32	Iowa	525	0.62%
33	Louisiana	523	0.62%
34	Alabama	499	0.59%
35	Kentucky	473	0.56%
36	New Hampshire	440	0.52%
37	Rhode Island	352	0.41%
38	New Mexico	344	0.41%
39	Vermont	299	0.35%
40	Arkansas	282	0.33%
41	Idaho	272	0.32%
42	Nebraska	266	0.31%
43	Maine	242	0.29%
44	Montana	226	0.27%
45	Hawaii	191	0.23%
46	Wyoming	190	0.22%
47	Mississippi	138	0.16%
48	South Dakota	127	0.15%
49	West Virginia	115	0.14%
50	North Dakota	96	0.11%
51	Alaska	90	0.11%

Table S2
Top green trademarking industries

This table reports the frequency distribution of registered green marks at the USPTO over the period 1981-2020 based on a mark owner's two-digit SIC industry. There are a total of 67 unique SIC2 industries. The total number of green marks is 9,368. We list industries based on the number of green marks in descending order.

Rank	SIC2	Industry name	#Green marks	%Green marks (across industries)
1	49	Electric, Gas & Sanitary Services	1,992	21.26%
2	28	Chemicals And Allied Products	1,068	11.40%
3	35	Industrial Machinery & Equipment	984	10.50%
4	36	Electronic & Other Electric Equipment	654	6.98%
5	38	Instruments & Related Products	629	6.71%
6	73	Business Services	538	5.74%
7	37	Transportation Equipment	415	4.43%
8	99	Others	335	3.58%
9	13	Oil And Gas Extraction	254	2.71%
10	48	Communications	191	2.04%
11	34	Fabricated Metal Products	181	1.93%
12	50	Wholesale Trade-Durable Goods	178	1.90%
13	87	Engineering & Management Services	173	1.85%
14	29	Petroleum And Coal Products	165	1.76%
15	20	Food And Kindred Products	151	1.61%
16	59	Miscellaneous Retail	136	1.45%
17	26	Paper And Allied Products	134	1.43%
18	30	Rubber & Misc. Plastics Products	114	1.22%
19	33	Primary Metal Industries	108	1.15%
20	51	Wholesale Trade-Nondurable Goods	84	0.90%
21	39	Misc. Manufacturing Industries	63	0.67%
22	54	Food Stores	59	0.63%
23	27	Printing And Publishing	54	0.58%
24	53	General Merchandise Stores	52	0.56%
25	80	Health Services	49	0.52%
26	16	Heavy Construction, Ex. Building	49	0.52%
27	32	Stone, Clay, And Glass Products	43	0.46%
28	52	Building Materials & Garden Supplies	41	0.44%
29	17	Special Trade Contractors	39	0.42%
30	56	Apparel And Accessory Stores	38	0.41%
31	24	Lumber And Wood Products	37	0.39%
32	14	Nonmetallic Minerals, Except Fuels	35	0.37%
33	57	Furniture And Homefurnishings Stores	31	0.33%
34	25	Furniture And Fixtures	28	0.30%
35	15	General Building Contractors	27	0.29%
36	58	Eating And Drinking Places	26	0.28%
37	22	Textile Mill Products	24	0.26%
38	23	Apparel & Other Textile Products	20	0.21%
39	55	Automotive Dealers & Service Stations	19	0.20%
40	82	Educational Services	15	0.16%
41	12	Coal Mining	13	0.14%
42	72	Personal Services	13	0.14%
43	42	Trucking And Warehousing	13	0.14%
44	79	Amusement & Recreation Services	12	0.13%
45	75	Auto Repair, Services, And Parking	10	0.11%
46	1	Agricultural Production-Crops	10	0.11%
47	70	Hotels And Other Lodging Places	9	0.10%
48	21	Tobacco Products	8	0.09%
49	47	Transportation Services	8	0.09%
50	45	Transportation By Air	7	0.07%
51	46	Pipelines, Except Natural Gas	7	0.07%

52	40	Railroad Transportation	6	0.06%
53	7	Agricultural Services	4	0.04%
54	76	Miscellaneous Repair Services	4	0.04%
55	41	Local & Interurban Passenger Transit	4	0.04%
56	44	Water Transportation	3	0.03%
57	81	Legal Services	2	0.02%
58	10	Metal Mining	1	0.01%
59	78	Motion Pictures	1	0.01%
60	89	Services, Nec	0	0.00%
61	83	Social Services	0	0.00%
62	86	Membership Organizations	0	0.00%
63	31	Leather And Leather Products	0	0.00%
64	2	Agricultural Production-Livestock	0	0.00%
65	8	Forestry	0	0.00%
66	84	Museums, Botanical, Zoological Gargens	0	0.00%
67	9	Fishing, Hunting, And Trapping	0	0.00%

Table S3
Top green trademarking firms

This table lists the top 30 public firms with the largest number of registered green marks over the period 1981-2020.

Rank	Company name	#Green marks
1	General Electric Co	169
2	NextEra Energy Inc	115
3	Xcel Energy Inc.	110
4	Honeywell International Inc	110
5	Ford Motor Co	85
6	Constellation Energy Group Inc.	84
7	Dover Corp	84
8	International Business Machines Corp	79
9	Exelon Corp	76
10	Johnson Controls International Plc	71
11	Southern Co (The)	68
12	Waste Management Inc.	62
13	Baker Hughes Inc	60
14	Pepco Holdings Inc.	58
15	Dominion Energy Inc	58
16	Emerson Electric Co.	57
17	Ecolab Inc.	53
18	Waste Connections Inc.	50
19	Trane Technologies plc	48
20	Quaker Chemical Corp	47
21	E. I. du Pont de Nemours and Co	47
22	Arch Chemicals Inc.	47
23	PPG Industries Inc.	46
24	FirstEnergy Corp.	45
25	Halliburton Co	45
26	Raytheon Technologies Corp	45
27	Anadarko Petroleum Corp	42
28	Edison International	42
29	CenterPoint Energy Inc.	41
30	Thermo Fisher Scientific Inc	41

Table S4
Green marks following green patents

This table reports the Poisson/OLS regression results examining the lead-lag relation between green patents and green marks. We replicate the analysis in Table 4 using a longer sample period 1981-2020, comprising 80,466 firm-year observations associated with 4,918 unique innovative firms. The innovative firms are firms with at least one granted patent and at least one registered trademark over the period 1981-2020. Variable definitions are provided in the Appendix. Robust standard errors clustered at the firm level are reported in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Green TM count		Green TM ratio	
	(next yr)	(next 2yrs)	(next yr)	(next 2yrs)
	(1)	(2)	(3)	(4)
Green patent ratio	0.383***	0.348***	0.029***	0.013
	(0.365)	(0.127)	(0.010)	(0.012)
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
SIC3-by-year FE	Y	Y	Y	Y
Pseudo R-squared	0.365	0.425	na	na
Adjusted R-squared	na	na	0.173	0.278
Observations	17,090	19,080	73,628	68,558

Table S5
Green marks, sales growth, and firm value

This table reports the OLS regression results examining the relation between firms' green mark production and their sales growth (firm value). We replicate the analysis in Table 5 replacing year fixed effects with SIC3-by-year fixed effects. Variable definitions are provided in the Appendix. Robust standard errors clustered at the firm level are reported in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Sales growth

	Sale growth (next yr)		Sale growth (next 3yrs)	
	(1)	(2)	(3)	(4)
I(Green TM)	0.028**		0.017**	
	(0.012)		(0.008)	
Ln(Green TM count)		0.027**		0.015*
		(0.011)		(0.008)
Firm size	-0.043***	-0.043***	-0.138***	-0.138***
	(0.014)	(0.014)	(0.019)	(0.019)
Book-to-market	-0.427***	-0.427***	-0.374***	-0.374***
	(0.041)	(0.041)	(0.053)	(0.053)
ROA	-0.009*	-0.009*	0.002	0.002
	(0.005)	(0.005)	(0.005)	(0.005)
Leverage	-0.038***	-0.038***	-0.041**	-0.041**
	(0.015)	(0.015)	(0.019)	(0.019)
Cash	0.034***	0.034***	0.045***	0.045***
	(0.005)	(0.005)	(0.006)	(0.006)
R&D expense	-0.060***	-0.060***	-0.024	-0.024
	(0.013)	(0.013)	(0.017)	(0.017)
Advertising expense	-0.037***	-0.037***	-0.028***	-0.028***
	(0.005)	(0.005)	(0.007)	(0.007)
Trademark stock	0.004*	0.004*	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Green TM stock	-0.006	-0.006	-0.003	-0.003
	(0.005)	(0.005)	(0.005)	(0.005)
Firm FE	Y	Y	Y	Y
SIC3-by-year FE	Y	Y	Y	Y
Adjusted R-squared	0.104	0.104	0.337	0.337
Observations	62,115	62,115	61,564	61,564

Panel B: Tobin's *q*

	Tobin's *q* (next yr)		Intangible-adjusted Tobin's *q* (next yr)	
	(1)	(2)	(3)	(4)
I(Green TM)	0.071**		0.156***	
	(0.034)		(0.058)	
Ln(Green TM count)		0.062*		0.145***
		(0.033)		(0.055)
Firm size	-0.622***	-0.622***	-1.550*	-1.549*
	(0.054)	(0.054)	(0.919)	(0.919)
ROA	-0.950***	-0.950***	1.992**	1.992**
	(0.153)	(0.153)	(1.009)	(1.009)
Leverage	0.448***	0.448***	-0.062	-0.062
	(0.073)	(0.073)	(0.054)	(0.054)
Cash	0.122***	0.122***	0.225	0.225
	(0.020)	(0.020)	(0.154)	(0.154)
R&D expense	-0.075*	-0.075*	-0.031	-0.031
	(0.039)	(0.039)	(0.309)	(0.309)
Advertising expense	-0.012	-0.012	0.086	0.086
	(0.019)	(0.019)	(0.140)	(0.140)
Trademark stock	0.023***	0.023***	0.027*	0.027*
	(0.007)	(0.007)	(0.015)	(0.015)
Green TM stock	-0.063***	-0.062***	-0.092***	-0.092***
	(0.017)	(0.017)	(0.028)	(0.027)
Firm FE	Y	Y	Y	Y
SIC3-by-year FE	Y	Y	Y	Y
Adjusted R-squared	0.522	0.522	0.022	0.022
Observations	63,187	63,187	62,659	62,659

Table S6
Peer negative environmental news and green marks: alternative definition of peers

This table reports the Poisson regression results examining the relation between industry peers experiencing negative environmental news and changes in focal firms' green mark production. We replicate the analysis in Table 6 using alternative definitions of industry peers. Variable definitions are provided in the Appendix. Robust standard errors clustered at the three-digit SIC industry level are reported in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Peers defined as within a focal firm's top two ranking in trademark similarity

	Green TM count		Green TM count		Green TM count	
	(next yr)	(next 2yrs)	(next yr)	(next 2yrs)	(next yr)	(next 2yrs)
	(1)	(2)	(3)	(4)	(5)	(6)
Peer environmental news	0.808***	0.424*				
	(0.289)	(0.239)				
Alternative peer env-news1			0.830***	0.573***		
			(0.201)	(0.195)		
Alternative peer env-news2					0.926***	0.603***
					(0.164)	(0.176)
Firm size	-0.017	-0.031	-0.022	-0.034	-0.021	-0.033
	(0.124)	(0.101)	(0.126)	(0.103)	(0.127)	(0.103)
Book-to-market	-0.004	-0.009	-0.005	-0.013	-0.009	-0.014
	(0.094)	(0.082)	(0.094)	(0.080)	(0.094)	(0.080)
ROA	0.500	0.419*	0.508	0.427*	0.513	0.428*
	(0.350)	(0.233)	(0.351)	(0.234)	(0.351)	(0.234)
Leverage	-0.015	-0.013	-0.015	-0.013	-0.016	-0.014
	(0.058)	(0.052)	(0.058)	(0.053)	(0.058)	(0.053)
Cash	0.030	0.057	0.031	0.058	0.031	0.058
	(0.061)	(0.058)	(0.062)	(0.059)	(0.062)	(0.059)
R&D expense	-0.147*	-0.168*	-0.147*	-0.170**	-0.148*	-0.171**
	(0.088)	(0.087)	(0.087)	(0.087)	(0.087)	(0.087)
Advertising expense	-0.031	-0.036	-0.031	-0.035	-0.030	-0.034
	(0.103)	(0.088)	(0.103)	(0.088)	(0.104)	(0.088)
Trademark stock	-0.065*	-0.044	-0.064*	-0.044	-0.063*	-0.043
	(0.038)	(0.035)	(0.038)	(0.035)	(0.038)	(0.035)
Green TM stock	0.128**	0.069	0.126**	0.068	0.125**	0.068
	(0.055)	(0.047)	(0.055)	(0.047)	(0.055)	(0.047)
Firm FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Pseudo R-squared	0.233	0.281	0.234	0.282	0.234	0.282
Observations	5,333	4,933	5,333	4,933	5,333	4,933

Panel B: Peers defined as within a focal firm's top ten ranking in trademark similarity

	Green TM count		Green TM count		Green TM count	
	(next yr)	(next 2yrs)	(next yr)	(next 2yrs)	(next yr)	(next 2yrs)
	(1)	(2)	(3)	(4)	(5)	(6)
Peer environmental news	0.481**	0.291***				
	(0.192)	(0.111)				
Alternative peer env-news1			0.510***	0.351***		
			(0.168)	(0.105)		
Alternative peer env-news2					0.452***	0.379***
					(0.172)	(0.125)
Firm size	-0.021	-0.034	-0.023	-0.035	-0.022	-0.033
	(0.122)	(0.101)	(0.123)	(0.102)	(0.122)	(0.101)
Book-to-market	0.017	0.002	0.017	0.002	0.016	0.001
	(0.100)	(0.082)	(0.100)	(0.081)	(0.100)	(0.082)
ROA	0.499	0.422*	0.504	0.427*	0.500	0.427*
	(0.349)	(0.233)	(0.348)	(0.233)	(0.349)	(0.233)
Leverage	-0.004	-0.006	-0.003	-0.005	-0.005	-0.005
	(0.053)	(0.051)	(0.053)	(0.051)	(0.054)	(0.051)
Cash	0.032	0.057	0.033	0.058	0.033	0.057
	(0.061)	(0.058)	(0.061)	(0.058)	(0.061)	(0.058)
R&D expense	-0.144*	-0.166*	-0.145*	-0.167*	-0.143	-0.167*
	(0.087)	(0.087)	(0.087)	(0.086)	(0.087)	(0.087)
Advertising expense	-0.031	-0.036	-0.030	-0.035	-0.033	-0.036
	(0.102)	(0.087)	(0.102)	(0.087)	(0.102)	(0.087)
Trademark stock	-0.065*	-0.044	-0.063*	-0.043	-0.063*	-0.042
	(0.038)	(0.035)	(0.038)	(0.035)	(0.038)	(0.035)
Green TM stock	0.120**	0.065	0.117**	0.063	0.117**	0.062
	(0.055)	(0.047)	(0.056)	(0.047)	(0.056)	(0.047)
Firm FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Pseudo R-squared	0.233	0.281	0.234	0.282	0.234	0.282
Observations	5,333	4,933	5,333	4,933	5,333	4,933

Table S7
Peer environmental news and green marks: including industry-by-year/state-by-year fixed effects

This table reports the Poisson regression results examining the relation between industry peers experiencing negative environmental news and changes in focal firms' green mark production. We replicate the analysis in Table 6 replacing year fixed effects by industry-by-year fixed effects or headquarters state-by-year fixed effects. Variable definitions are provided in the Appendix. Robust standard errors clustered at the three-digit SIC industry level are reported in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Green TM count		Green TM count		Green TM count	
	(next yr)	(next 2yrs)	(next yr)	(next 2yrs)	(next yr)	(next 2yrs)
	(1)	(2)	(3)	(4)	(5)	(6)
Peer environmental news	0.862**	0.479**	0.710**	0.391*	0.6253*	0.5140**
	(0.381)	(0.244)	(0.300)	(0.212)	(0.3675)	(0.2121)
Firm size	-0.015	-0.102	-0.001	-0.047	-0.0043	0.0068
	(0.151)	(0.128)	(0.097)	(0.080)	(0.1251)	(0.0930)
Book-to-market	0.069	0.065	-0.024	0.013	0.0229	-0.0113
	(0.193)	(0.137)	(0.116)	(0.079)	(0.0813)	(0.0720)
ROA	0.344	0.420	0.456**	0.422**	0.3457	0.3894*
	(0.397)	(0.290)	(0.188)	(0.180)	(0.3133)	(0.2195)
Leverage	-0.020	0.010	-0.011	0.008	-0.0038	-0.0149
	(0.052)	(0.066)	(0.079)	(0.062)	(0.0783)	(0.0750)
Cash	0.086	0.113	0.049	0.090	0.1013	0.1030*
	(0.097)	(0.081)	(0.053)	(0.056)	(0.0715)	(0.0589)
R&D expense	-0.254**	-0.270**	-0.161	-0.199	-0.1940**	-0.2087***
	(0.102)	(0.125)	(0.136)	(0.127)	(0.0949)	(0.0801)
Advertising expense	-0.039	-0.047	-0.037	-0.041	0.0172	-0.0420
	(0.174)	(0.145)	(0.156)	(0.125)	(0.0844)	(0.0831)
Trademark stock	-0.058	-0.061	-0.075**	-0.059**	-0.0742*	-0.0472
	(0.046)	(0.044)	(0.037)	(0.029)	(0.0439)	(0.0379)
Green TM stock	0.079	0.072	0.125*	0.082*	0.0928	0.0492
	(0.070)	(0.057)	(0.068)	(0.045)	(0.0662)	(0.0516)
Firm FE	Y	Y	Y	Y	Y	Y
SIC3-by-year FE	Y	Y				
SIC2-by-year FE			Y	Y		
State-by-year FE					Y	Y
Pseudo R-squared	0.299	0.337	0.258	0.306	0.261	0.313
Observations	3,444	3,794	3,444	3,794	4,577	4,591

Table S8

Peer environmental news and green marks: high severity environmental news only

This table reports the Poisson regression results examining the relation between industry peers experiencing negative environmental news and changes in focal firms' green mark production. We replicate the analysis in Table 6 using only high-severity environmental news. *Peer environmental news* is an indicator variable that take the value of one if the industry peers experience negative environmental news in a year, and zero otherwise. News is refined to include high severity news only. Variable definitions are provided in the Appendix. Robust standard errors clustered at the three-digit SIC industry level are reported in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Green TM count	
	(next yr)	(next 2yrs)
	(1)	(2)
Peer environmental news	1.049***	0.376***
	(0.102)	(0.077)
Firm size	-0.002	-0.033
	(0.109)	(0.096)
Book-to-market	0.012	0.010
	(0.100)	(0.084)
ROA	0.378	0.367
	(0.323)	(0.228)
Leverage	-0.000	-0.002
	(0.055)	(0.052)
Cash	0.028	0.045
	(0.055)	(0.060)
R&D expense	-0.104	-0.120
	(0.086)	(0.087)
Advertising expense	-0.021	-0.008
	(0.082)	(0.076)
Trademark stock	-0.051	-0.035
	(0.037)	(0.034)
Green TM stock	0.136***	0.071*
	(0.045)	(0.040)
Firm FE	Y	Y
Year FE	Y	Y
Pseudo R-squared	0.282	0.334
Observations	6,172	5,610

Table S9
Peer environmental news and green marks: alternative definition of environmental news

This table reports the Poisson regression results examining the relation between industry peers experiencing negative environmental news and changes in focal firms' green mark production. We replicate the analysis in Table 6 using an alternative definition of environmental news. *Peer environmental news (RepRisk issues)* and *Alternative peer env-news1/2 (RepRisk issues)* are indicator variables that take the value of one if the industry peers experience negative environmental news in a year, and zero otherwise. News is defined as medium to high severity news by RepRisk under RepRisk issues of climate change, GHG emissions, global pollution, impacts on landscapes and biodiversity, local pollution, other ESG issues, overuse and wasting of resources, product-related health and environmental issues, and waste issues. Variable definitions are provided in the Appendix. Robust standard errors clustered at the three-digit SIC industry level are reported in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Green TM count		Green TM count		Green TM count	
	(next yr)	(next 2yrs)	(next yr)	(next 2yrs)	(next yr)	(next 2yrs)
	(1)	(2)	(3)	(4)	(5)	(6)
Peer environmental news (RepRisk issues)	0.589**	0.447***				
	(0.231)	(0.134)				
Alternative peer env-news1 (RepRisk issues)			0.632***	0.536***		
			(0.234)	(0.150)		
Alternative peer env-news2 (RepRisk issues)					0.624***	0.480***
					(0.226)	(0.160)
Firm size	-0.021	-0.034	-0.025	-0.036	-0.024	-0.036
	(0.123)	(0.102)	(0.124)	(0.103)	(0.124)	(0.103)
Book-to-market	0.006	-0.007	0.006	-0.009	0.004	-0.008
	(0.096)	(0.081)	(0.096)	(0.080)	(0.096)	(0.080)
ROA	0.486	0.418*	0.492	0.424*	0.490	0.421*
	(0.351)	(0.232)	(0.351)	(0.233)	(0.351)	(0.233)
Leverage	-0.012	-0.012	-0.012	-0.013	-0.013	-0.013
	(0.057)	(0.052)	(0.057)	(0.053)	(0.057)	(0.052)
Cash	0.035	0.059	0.036	0.060	0.037	0.060
	(0.060)	(0.058)	(0.061)	(0.058)	(0.061)	(0.058)
R&D expense	-0.147*	-0.168*	-0.148*	-0.170**	-0.147*	-0.168*
	(0.086)	(0.086)	(0.086)	(0.086)	(0.086)	(0.086)
Advertising expense	-0.031	-0.034	-0.030	-0.033	-0.034	-0.036
	(0.104)	(0.088)	(0.104)	(0.088)	(0.103)	(0.088)
Trademark stock	-0.065*	-0.044	-0.064*	-0.043	-0.064*	-0.043
	(0.038)	(0.035)	(0.038)	(0.035)	(0.038)	(0.035)
Green TM stock	0.123**	0.066	0.121**	0.065	0.120**	0.065
	(0.055)	(0.047)	(0.056)	(0.047)	(0.056)	(0.047)
Firm FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Pseudo R-squared	0.234	0.281	0.234	0.282	0.234	0.282
Observations	5,311	4,911	5,311	4,911	5,311	4,911

Table S10
Peer environmental news and green marks: excluding S&G News

This table reports the Poisson regression results examining the relation between industry peers experiencing negative environmental news and changes in focal firms' green mark production. We replicate the analysis in Table 6 excluding focal firms' S&G news. Peer firms' environmental news events that take place in the same year as focal firms' social or governance news are excluded from this analysis. Variable definitions are provided in the Appendix. Robust standard errors clustered at the three-digit SIC industry level are reported in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Green TM count		Green TM count		Green TM count	
	(next yr)	(next 2yrs)	(next yr)	(next 2yrs)	(next yr)	(next 2yrs)
	(1)	(2)	(3)	(4)	(5)	(6)
Peer environmental news	0.688***	0.493***				
	(0.232)	(0.140)				
Alternative peer env-news1			0.642***	0.507***		
			(0.226)	(0.147)		
Alternative peer env-news2					0.753***	0.543***
					(0.192)	(0.135)
Firm size	-0.025	-0.035	-0.027	-0.037	-0.028	-0.037
	(0.123)	(0.102)	(0.124)	(0.103)	(0.125)	(0.103)
Book-to-market	0.007	-0.007	0.008	-0.006	0.005	-0.007
	(0.096)	(0.080)	(0.096)	(0.080)	(0.096)	(0.080)
ROA	0.503	0.426*	0.505	0.430*	0.511	0.432*
	(0.348)	(0.231)	(0.350)	(0.232)	(0.350)	(0.233)
Leverage	-0.012	-0.012	-0.012	-0.012	-0.013	-0.012
	(0.057)	(0.052)	(0.057)	(0.052)	(0.057)	(0.052)
Cash	0.034	0.058	0.034	0.059	0.035	0.059
	(0.060)	(0.058)	(0.061)	(0.058)	(0.061)	(0.058)
R&D expense	-0.144	-0.168*	-0.143	-0.168*	-0.144	-0.168*
	(0.088)	(0.087)	(0.087)	(0.087)	(0.088)	(0.087)
Advertising expense	-0.030	-0.034	-0.030	-0.034	-0.029	-0.033
	(0.104)	(0.088)	(0.104)	(0.088)	(0.104)	(0.088)
Trademark stock	-0.066*	-0.045	-0.066*	-0.044	-0.065*	-0.044
	(0.038)	(0.035)	(0.038)	(0.035)	(0.038)	(0.035)
Green TM stock	0.125**	0.068	0.124**	0.067	0.124**	0.067
	(0.055)	(0.047)	(0.055)	(0.047)	(0.055)	(0.047)
Firm FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Pseudo R-squared	0.234	0.282	0.234	0.282	0.234	0.282
Observations	5,333	4,933	5,333	4,933	5,333	4,933

Table S11
Peer firms' social/governance news and green marks

This table reports the Poisson regression results examining the relation between industry peers experiencing negative social/governance news and changes in focal firms' green mark production. Peer firms' S&G news events that take place in the same year as focal firms' environmental news are excluded from this analysis. The dependent variable in columns (1), (3), and (5) is the number of green marks filed next year; the dependent variable in columns (2), (4), and (6) is the number of green marks filed over next two years. *Peer S&G news* and *Alternative peer S&G-news1/2* are indicator variables that take the value of one if the industry peers experience negative social or governance news in a year, and zero otherwise. Variable definitions are provided in the Appendix. Robust standard errors clustered at the three-digit SIC industry level are reported in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Green TM count		Green TM count		Green TM count	
	(next yr)	(next 2yrs)	(next yr)	(next 2yrs)	(next yr)	(next 2yrs)
	(1)	(2)	(3)	(4)	(5)	(6)
Peer S&G news	0.146	0.077				
	(0.295)	(0.184)				
Alternative peer S&G-news1			0.262	0.211		
			(0.295)	(0.177)		
Alternative peer S&G-news2					0.373	0.275
					(0.293)	(0.173)
Firm size	0.028	-0.016	0.028	-0.016	0.028	-0.016
	(0.116)	(0.103)	(0.116)	(0.103)	(0.116)	(0.103)
Book-to-market	-0.054	-0.058	-0.055	-0.060	-0.056	-0.060
	(0.097)	(0.081)	(0.097)	(0.081)	(0.096)	(0.080)
ROA	0.464	0.452*	0.465	0.454*	0.465	0.454*
	(0.350)	(0.239)	(0.349)	(0.238)	(0.348)	(0.238)
Leverage	-0.025	-0.024	-0.024	-0.023	-0.024	-0.023
	(0.057)	(0.053)	(0.057)	(0.053)	(0.057)	(0.054)
Cash	0.014	0.031	0.014	0.031	0.015	0.031
	(0.060)	(0.067)	(0.059)	(0.067)	(0.059)	(0.067)
R&D expense	-0.124	-0.124	-0.124	-0.125	-0.124	-0.125
	(0.085)	(0.089)	(0.085)	(0.089)	(0.085)	(0.089)
Advertising expense	-0.032	-0.037	-0.030	-0.035	-0.029	-0.035
	(0.108)	(0.094)	(0.107)	(0.094)	(0.107)	(0.094)
Trademark stock	-0.062*	-0.053	-0.062*	-0.053	-0.061*	-0.052
	(0.036)	(0.032)	(0.036)	(0.032)	(0.036)	(0.032)
Green TM stock	0.130***	0.072*	0.130***	0.071*	0.129**	0.071*
	(0.050)	(0.042)	(0.050)	(0.042)	(0.050)	(0.042)
Firm FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Pseudo R-squared	0.252	0.310	0.252	0.311	0.252	0.311
Observations	5,309	4,981	5,309	4,981	5,309	4,981

5. The full list of the EUIPO green trademark taxonomy

The EUIPO's (2021) green trademark taxonomy contains 375 green expressions covering a wide range of environmental protection and sustainability-related issues. Our goal is to identify registered green marks filed with the USPTO. We therefore modify the EUIPO green trademark taxonomy by making the conversion of British English to American English. The entire list of the 375 green expressions is provided below, together with their corresponding groups (nine groups) and categories (35 categories).

Table S12
List of green expressions, sorted by group and category.

Ref.	Group	Category	Green Expression
19	Agriculture	Fertiliser alternatives	+biofertilizer −nitrogen
154	Agriculture	Fertiliser alternatives	+natural +manure
49	Agriculture	Fertiliser alternatives	+compost.fertil
220	Agriculture	Fertiliser alternatives	+soil.erosion +control
31	Agriculture	Fertiliser alternatives	+biostimulant
209	Agriculture	Fertiliser alternatives	+safety +fertilizers.used
210	Agriculture	Fertiliser alternatives	+safety +manures −horticultur
153	Agriculture	Fertiliser alternatives	+natural +fertilizer −chemical
295	Agriculture	Other agriculture	+biodynamic
357	Agriculture	Other agriculture	+regenerative +agriculture
28	Agriculture	Other agriculture	+biological +vegetation
25	Agriculture	Pesticide alternatives	+biological +fungicide
30	Agriculture	Pesticide alternatives	+biopesticide
26	Agriculture	Pesticide alternatives	+biological +herbicide
325	Agriculture	Pesticide alternatives	+integrated.pest +management
66	Climate change	Carbon brokerage	+electr +carbon.sequestr
32	Climate change	Carbon brokerage	+brokerage.carbon.credit
36	Climate change	Carbon brokerage	+carbon +offsetting
299	Climate change	Carbon monitor	+control +carbon +emission
37	Climate change	Carbon monitor	+carbon +recorders −10
55	Climate change	Carbon monitor	+control +carbon +dioxide
297	Climate change	Carbon monitor	+carbon +footprint
35	Climate change	Carbon monitor	+carbon +monitor −10
56	Climate change	Carbon monitor	+control +hydrocarbon +emission
103	Climate change	Environmental services	+environmental.protection
104	Climate change	Environmental services	+environmental.science
100	Climate change	Environmental services	+environmental.engineering
105	Climate change	Environmental services	+environmental.surveys
95	Climate change	Environmental services	+environmental +control −access
98	Climate change	Environmental services	+environmental +system −9
319	Climate change	Environmental services	+environmental.technology
93	Climate change	Environmental services	+environment.software
310	Climate change	Environmental services	+environmental.building
91	Climate change	Environmental services	+environment +information
96	Climate change	Environmental services	+environmental +information
102	Climate change	Environmental services	+environmental.monitoring
208	Climate change	Environmental services	+safety +environment
97	Climate change	Environmental services	+environmental +services
94	Climate change	Environmental services	+environmental +assessment

106	Climate change	Environmental services	+environmental.testing
311	Climate change	Environmental services	+environmental.condition
316	Climate change	Environmental services	+environmental.planning
157	Energy Production	Biofuels	+olive.oils.industrial.purpose
160	Energy Production	Biofuels	+peat.fuel −oils −block
121	Energy Production	Biofuels	+fuel +inhibit +deposition
159	Energy Production	Biofuels	+peanut.oils.industrial.purpose
237	Energy Production	Biofuels	+sunflower.oils +industrial.purpose
18	Energy Production	Biofuels	+biodiesel −fuel
21	Energy Production	Biofuels	+biogas
296	Energy Production	Biofuels	+bioethanol
216	Energy Production	Biofuels	+sesame.oils +industrial.purpose
161	Energy Production	Biofuels	+perilla.oils +industrial.purpose
12	Energy Production	Biofuels	+bagasse +fuel
116	Energy Production	Biofuels	+fish.oils.industrial.purpose
60	Energy Production	Biofuels	+corn.oils +industrial −food
20	Energy Production	Biofuels	+biofuel
146	Energy Production	Biofuels	+linseed.oils +industrial.purpose
24	Energy Production	Biofuels	+biological +fuel
29	Energy Production	Biofuels	+biomass
181	Energy Production	Biofuels	+rapeseed.oil +industrial.purposes
136	Energy Production	Biofuels	+hydrocarbon.fuels.derived +tar
256	Energy Production	Biofuels	+vegetable.wax
27	Energy Production	Biofuels	+biological +reactor
16	Energy Production	Biofuels	+biobased
120	Energy Production	Biofuels	+fuel +ethanol −pharmaceutical −topical −1
180	Energy Production	Biofuels	+rape.oils +industrial.purpose
234	Energy Production	Biofuels	+soybean.oils +industrial.purpose
233	Energy Production	Biofuels	+solid.oxygen.fuel
46	Energy Production	Biofuels	+colza.oils −food −lubricating
142	Energy Production	Other energy	+hydropower
141	Energy Production	Other energy	+hydrogen.fueled
127	Energy Production	Other energy	+generation +electrical.power +waste.heat
365	Energy Production	Other energy	+waste +burning
152	Energy Production	Other energy	+natural +energy
308	Energy Production	Other energy	+energy.alternative
89	Energy Production	Other energy	+energy.power −others −management.systems
137	Energy Production	Other energy	+hydroelectric
324	Energy Production	Other energy	+hydrogen.gas
77	Energy Production	Other energy	+electric.power −payments −generators −tools −windlasses −units −dryers −load.banks −poles −posts −emergency.use −soldering.irons −winches −wheelchairs −9 −11
358	Energy Production	Other energy	+renewable +source
87	Energy Production	Other energy	+energy.generation −leasing −maintenance
139	Energy Production	Other energy	+hydrogen +pump
288	Energy Production	Other energy	+wave +energy
200	Energy Production	Other energy	+research +energy
128	Energy Production	Other energy	+geothermal +energy
130	Energy Production	Other energy	+geothermal +power

76	Energy Production	Other energy	+electric.energy +renewable −nonrenewable.source −non.renewable.source −uninterruptible.power.supplies
244	Energy Production	Other energy	+trash +incineration
129	Energy Production	Other energy	+geothermal +installation
364	Energy Production	Other energy	+using.waste.heat
229	Energy Production	Solar Energy	+solar +power
221	Energy Production	Solar Energy	+solar +battery
162	Energy Production	Solar Energy	+photovoltaic
223	Energy Production	Solar Energy	+solar +collector
226	Energy Production	Solar Energy	+solar +installation
230	Energy Production	Solar Energy	+solar +wafer
228	Energy Production	Solar Energy	+solar +panel
222	Energy Production	Solar Energy	+solar +cell
225	Energy Production	Solar Energy	+solar +heating
232	Energy Production	Solar Energy	+solarpow
371	Energy Production	Solar Energy	+water +heat
224	Energy Production	Solar Energy	+solar +energy
235	Energy Production	Solar Energy	+storag.cell.electr
227	Energy Production	Solar Energy	+solar +module
231	Energy Production	Solar Energy	+solar +water
361	Energy Production	Solar Energy	+thermal +collector
292	Energy Production	Wind Energy	+wind.energi
168	Energy Production	Wind Energy	+power.generation +turbine +blade
291	Energy Production	Wind Energy	+wind +turbine
290	Energy Production	Wind Energy	+wind +power
293	Energy Production	Wind Energy	+windpowered
84	Energy conservation	Energy management	+energy.audit
328	Energy conservation	Energy management	+measuring +electricity +consumption
53	Energy conservation	Energy management	+consultancy +generation +electrical.power
88	Energy conservation	Energy management	+energy.management
329	Energy conservation	Energy management	+monitoring +electricity +consumption
7	Energy conservation	Energy management	+analyzing +electricity +consumption
85	Energy conservation	Energy management	+energy.consumption −others −meters
38	Energy conservation	Energy saving	+carpool
320	Energy conservation	Energy saving	+fuel.saving
119	Energy conservation	Energy saving	+fuel +economizer
34	Energy conservation	Energy saving	+car.pool
167	Energy conservation	Energy saving	+power.efficient
118	Energy conservation	Energy saving	+fuel +economiser
309	Energy conservation	Energy saving	+energy.saving
47	Energy conservation	Energy saving	+combust +promot
356	Energy conservation	Energy saving	+reduction +electricity
123	Energy conservation	Energy saving	+fuelsaving
90	Energy conservation	Energy saving	+energysaving
86	Energy conservation	Energy saving	+energy.efficient
57	Energy conservation	Low energy lighting	+control +light +comput −softwar
10	Energy conservation	Low energy lighting	+audiosensit.control.light
51	Energy conservation	Low energy lighting	+comput.softwar +control.light
52	Energy conservation	Low energy lighting	+computercontrol.light

212	Energy conservation	Low energy lighting	+screen.control.light
58	Energy conservation	Low energy lighting	+control +light +programm
39	Energy conservation	Storage of electricity	+charger.batteri
147	Energy conservation	Storage of electricity	+lithium +ion +batteries
15	Energy conservation	Storage of electricity	+battery +electric −acidulated −telephone −computer −fire.extinguisher −game −cigarette −cutters −cell.phone −mobile.phone −smartphone −wireless
14	Energy conservation	Storage of electricity	+battery +charging −acidulated −telephone −computer −fire.extinguisher −game −cigarette −cutters −cell.phone −mobile.phone −smartphone −wireless
1	Energy conservation	Storage of electricity	+accumulator +electric
183	Energy conservation	Storage of electricity	+rechargeable −acidulated −telephone −computer −fire.extinguisher −refueling −sweepers
199	Energy conservation	Storage of electricity	+rental +batteries
13	Energy conservation	Storage of electricity	+battery +chargeable −acidulated −telephone −computer −fire.extinguisher −game −cigarette −cutters −cell.phone −mobile.phone −smartphone −wireless
83	Environmental awareness	Ecology	+emission.reduction
314	Environmental awareness	Ecology	+environmental.issues
321	Environmental awareness	Ecology	+green +initiative
313	Environmental awareness	Ecology	+environmental.friendly
312	Environmental awareness	Ecology	+environmental.conscious
322	Environmental awareness	Ecology	+green +technology
304	Environmental awareness	Ecology	+ecofriendly
201	Environmental awareness	Ecology	+research +natural.disasters
323	Environmental awareness	Ecology	+greener +choices
374	Environmental awareness	Ecology	+wildlife +reserve
318	Environmental awareness	Ecology	+environmental.responsible
190	Environmental awareness	Ecology	+reduction +carbon +emissions
305	Environmental awareness	Ecology	+ecosystem
333	Environmental awareness	Ecology	+planet +friendly
148	Environmental awareness	Ecology	+mineralbased
133	Environmental awareness	Ecology	+greenhouse +gas
132	Environmental awareness	Ecology	+green +innovation
131	Environmental awareness	Ecology	+global.warming
92	Environmental awareness	Ecology	+environment +protection
99	Environmental awareness	Ecology	+environmental.conservation
362	Environmental awareness	Ecology	+toxin.free
315	Environmental awareness	Ecology	+environmental.matters
306	Environmental awareness	Ecology	+ecotourism
101	Environmental awareness	Ecology	+environmental.exploration
289	Environmental awareness	Ecology	+wildlife +conservation
65	Environmental awareness	Ecology	+ecology
303	Environmental awareness	Ecology	+ecochoice
302	Environmental awareness	Ecology	+ecobiology
45	Environmental awareness	Ecology	+climate +change
330	Environmental awareness	Ecology	+natural +alternative
186	Environmental awareness	Sustainability	+recondit.machin +destroy −engin
367	Environmental awareness	Sustainability	+waste +reducing
301	Environmental awareness	Sustainability	+durable

375	Environmental awareness	Sustainability	+zero.waste
366	Environmental awareness	Sustainability	+waste +prevention
198	Environmental awareness	Sustainability	+renovation +clothing
345	Environmental awareness	Sustainability	+recovering +machine
182	Environmental awareness	Sustainability	+rebuilding +destroyed
327	Environmental awareness	Sustainability	+low.impact
335	Environmental awareness	Sustainability	+rebuilding +worn
23	Environmental awareness	Sustainability	+biological +detergent
238	Environmental awareness	Sustainability	+sustainable
150	Pollution control	Air purification	+mufflers +machine
109	Pollution control	Air purification	+exhaust.gas +analysis
5	Pollution control	Air purification	+air.purifi.prepar −deodoris
219	Pollution control	Air purification	+smokeless −cigarette −tobacco
149	Pollution control	Air purification	+mufflers +engine
151	Pollution control	Air purification	+mufflers +motor
9	Pollution control	Air purification	+atmospheric.oxygen +monitors −11
3	Pollution control	Air purification	+air.pollut
240	Pollution control	Air purification	+toxic.gas
175	Pollution control	Air purification	+purifi +potabl.water
113	Pollution control	Air purification	+filter.air.purifi
249	Pollution control	Air purification	+treatment +gases −thermal.treatment −object
114	Pollution control	Air purification	+filter.engin −air −oil
286	Pollution control	Air purification	+waterpurifying −dispenser −swimming −spas −tanks −aquarium −alum −household
248	Pollution control	Air purification	+treatment +effluent −industrial
111	Pollution control	Air purification	+filter +gases +industrial −part
110	Pollution control	Air purification	+exhaust.gas.treatment
42	Pollution control	Air purification	+cleansing +gases
41	Pollution control	Air purification	+chemic.prepar +petroleum
144	Pollution control	Air purification	+industri.air.purifi
4	Pollution control	Air purification	+air.purifi +commerci.use
6	Pollution control	Air purification	+airpurifying −wearable −stroller −cyclone −electric −vehiclemounted −automobile −deodorizing −household
115	Pollution control	Air purification	+filter.motor −oil −air
171	Pollution control	Air purification	+purif.gase −1 −11
108	Pollution control	Air purification	+exhaust.extractors −fans
155	Pollution control	Air purification	+oil.emission +testers
48	Pollution control	Air purification	+combust.enhanc
172	Pollution control	Air purification	+purif.machin −gas −air
17	Pollution control	Biodegradable	+biodegradable −implants −prostheses
62	Pollution control	Pollution general	+detoxification +hazardous.materials
334	Pollution control	Pollution general	+pollution +alarm
176	Pollution control	Pollution general	+purification −swimming.pools −clean.air −proteins −minerals −refrigerant.fluids −alum −synthesis.gas −olefin −membrane −carbonaceous −osmosis −boxes −solvent −planning −substances −tanks −units −desalination −gas −portable −ambient −salt −chemical −gases −agent −preparation −machin
294	Pollution control	Pollution general	+anti.pollution −9
166	Pollution control	Pollution general	+pollution +treatment
211	Pollution control	Pollution general	+sampling +contamination

59	Pollution control	Pollution general	+control +spillage
207	Pollution control	Pollution general	+safety +chemicals.used
8	Pollution control	Pollution general	+antipollution −9
213	Pollution control	Pollution general	+sealing +stopping +leakage +oil
252	Pollution control	Pollution general	+treatment +radioactive
197	Pollution control	Pollution general	+remove +organic.contaminant
54	Pollution control	Pollution general	+containment +pollutants
64	Pollution control	Pollution general	+dissolve.poison
163	Pollution control	Pollution general	+pollution +control
156	Pollution control	Pollution general	+oilspill +treatment
247	Pollution control	Pollution general	+treatment +contamination
2	Pollution control	Pollution general	+advice +pollution.damage
169	Pollution control	Pollution general	+prevention +environmental +damage
165	Pollution control	Pollution general	+pollution +sensor
317	Pollution control	Pollution general	+environmental.pollution
164	Pollution control	Pollution general	+pollution +detection
218	Pollution control	Pollution general	+silencer −firearm −rifle −gun −shotgun −pistol
246	Pollution control	Pollution general	+treat +poison
331	Pollution control	Pollution general	+nontoxic −enamels
43	Pollution control	Pollution general	+clearance +chemical +pollution
298	Pollution control	Pollution general	+chemical.free
253	Pollution control	Pollution general	+treatment +toxic
174	Pollution control	Pollution general	+purifi +plant
44	Pollution control	Pollution general	+clearance +oil +pollution
239	Pollution control	Pollution general	+testing +hazardous.material
61	Pollution control	Pollution general	+decontamination −showers −metal −portable −chambers −sterilization −11
177	Pollution control	Pollution general	+purifying +apparatus −tapwater −aquarium −bathwater −cyclone −membrane −vehiclemounted −industrial.purposes −household
332	Pollution control	Pollution general	+oil.spill +treatment
280	Pollution control	Water purification	+water +process −transportable
68	Pollution control	Water purification	+electr.water.purifi
284	Pollution control	Water purification	+water.purifi.agent
282	Pollution control	Water purification	+water +treatment −hot −chlorinating −gravimetric −ion −ionization −carbonate −phosphate −ultraviolet −swimming −spas −demineralizing −softening −bilge −sterilization −tanks −medical −preparation −substance −agent −filter
254	Pollution control	Water purification	+treatment.water −apparatus
40	Pollution control	Water purification	+chemic +purif.water −swim
22	Pollution control	Water purification	+biolog +water.treatment
287	Pollution control	Water purification	+watersav
278	Pollution control	Water purification	+water +filter +apparatus +industri
145	Pollution control	Water purification	+instal.purifi.water
283	Pollution control	Water purification	+water.purifi +industri −mainten
276	Pollution control	Water purification	+water +education.service −safety
178	Pollution control	Water purification	+rainwat −dispers −plastic −nonmetal −drainag
281	Pollution control	Water purification	+water +treating −ion −cooling
369	Pollution control	Water purification	+waste +water −tanks −guttering −planning
112	Pollution control	Water purification	+filter +waste.gas
279	Pollution control	Water purification	+water +filtration −electrostatic −sanitary −supply

			−boxes −chemical.compounds −aquarium −spas −pump −media −devices −units −agricultural −paper −rental
285	Pollution control	Water purification	+water.purifi.instal
277	Pollution control	Water purification	+water +filter −electrostatic −sanitary −supply −boxes −chemical.compounds −aquarium −spas −pump −media −devices −units −agricultural −paper −rental −industrial −household −treatment −domestic
372	Pollution control	Water purification	+water +clarification −chemical.compounds
236	Pollution control	Water purification	+substanc.purifi.water
11	Pollution control	Water purification	+bacteria +water.treatment
173	Pollution control	Water purification	+purifi +chemic +water −swim
274	Pollution control	Water purification	+wastewater +filter
370	Pollution control	Water purification	+water +clarification
179	Pollution control	Water purification	+rainwat +nonmetal −dispers −trap
196	Pollution control	Water purification	+regeneration +water
275	Pollution control	Water purification	+wastewater +treatment −tanks
373	Pollution control	Water purification	+water +save
353	Reusable	Other reusable	+recovering +solvent
194	Reusable	Other reusable	+regenerated +cellulose
188	Reusable	Other reusable	+recovering +metal
359	Reusable	Other reusable	+reusable +plastic
339	Reusable	Other reusable	+recovering +catalytic
340	Reusable	Other reusable	+recovering +chemical
341	Reusable	Other reusable	+recovering +chlorofluorocarbon
187	Reusable	Other reusable	+recovering +gases
349	Reusable	Other reusable	+recovering +paper
245	Reusable	Other reusable	+trash +separator
205	Reusable	Other reusable	+reusable +silicone
195	Reusable	Other reusable	+regenerated +fiber
255	Reusable	Other reusable	+upcycling
343	Reusable	Other reusable	+recovering +crushing
204	Reusable	Other reusable	+reusable +ice.cube
351	Reusable	Other reusable	+recovering +rubber
348	Reusable	Other reusable	+recovering +packaging
342	Reusable	Other reusable	+recovering +clothing
184	Reusable	Other reusable	+reclaim +cellulos −wrap
185	Reusable	Other reusable	+reclaim.rubber
350	Reusable	Other reusable	+recovering +plastic
352	Reusable	Other reusable	+recovering +scrap
337	Reusable	Other reusable	+recovering +agents
336	Reusable	Other reusable	+recovering +aerosol
346	Reusable	Other reusable	+recovering +material
355	Reusable	Other reusable	+recovering +waste
347	Reusable	Other reusable	+recovering +organic
344	Reusable	Other reusable	+recovering +fluid
189	Reusable	Recycling	+recycle −cost.price −tyres −tires −animal −wrappin
300	Reusable	Recycling	+downcycle
191	Reusable	Refilling cartridge	+refilling +cartridges −cigarette −ink.pen −ballpoint
354	Reusable	Refilling cartridge	+recovering +toner

202	Reusable	Reusable bags	+reusable +bags
203	Reusable	Reusable bottles	+reusable +bottle
338	Reusable	Reusable bottles	+recovering +bottles
74	Transportation	Electric bike	+electric.bicycle −lock −washers
75	Transportation	Electric car	+electric.car −washers
82	Transportation	Electric car	+electriccar −washers
70	Transportation	Electric engines	+electric +motor −gear −wheelchairs −alternator −checking −washers −7 −11 −37
71	Transportation	Electric moto	+electric +scooters −washers −self.balancing −selfbalancing
73	Transportation	General transport	+electric +vehicle −cigarette −door −horn −lock −sunroof −alternator −alarm −temperature −theft −antitheft −washers −7 −37
81	Transportation	General transport	+electricallypowered −payments −generators −tools −windlasses −units −dryers −load.banks −poles −posts −emergency.use −soldering.irons −winches −wheelchairs −9 −11
135	Transportation	Hybrid vehicle	+hybrid +vehicle
134	Transportation	Hybrid vehicle	+hybrid +car
140	Transportation	Hydrogen vehicle	+hydrogen +vehicle
138	Transportation	Hydrogen vehicle	+hydrogen +car
122	Transportation	Hydrogen vehicle	+fuel.cell.cars
78	Transportation	Other vehicles	+electric.railway −washers
72	Transportation	Other vehicles	+electric +truck −washers −reach
214	Transportation	Other vehicles	+self.balanc +unicycl
307	Transportation	Other vehicles	+electric.tractor −washers
80	Transportation	Other vehicles	+electric.unicycle −washers
215	Transportation	Other vehicles	+selfbalanc +onewheel +scooter
69	Transportation	Other vehicles	+electric +buses −washers
79	Transportation	Other vehicles	+electric.train −washers
263	Waste Management	Process waste	+waste +extraction
126	Waste Management	Process waste	+garbage +incinerator +purpose
251	Waste Management	Process waste	+treatment +liquids −hydrocarbons −objects
143	Waste Management	Process waste	+incineration +gases
107	Waste Management	Process waste	+enzyme +waste −deodorizing
259	Waste Management	Process waste	+waste +converter
268	Waste Management	Process waste	+waste +material −collection
243	Waste Management	Process waste	+trash +destruction
273	Waste Management	Process waste	+waste +treatment −tanks −repair.animal.waste
267	Waste Management	Process waste	+waste +management
269	Waste Management	Process waste	+waste +reprocessing
264	Waste Management	Process waste	+waste +incineration −disposal
117	Waste Management	Process waste	+food.waste
33	Waste Management	Process waste	+burning +refuse
250	Waste Management	Process waste	+treatment +hazardous
265	Waste Management	Process waste	+waste +installation −sanitary
217	Waste Management	Process waste	+sewage +treatment −plants
170	Waste Management	Process waste	+process +waste
270	Waste Management	Process waste	+waste +services −chute −transport −cleaning
261	Waste Management	Process waste	+waste +destruction
206	Waste Management	Waste disposal	+rubbish +compactor
260	Waste Management	Waste disposal	+waste +crushing

272	Waste Management	Waste disposal	+waste +trash
258	Waste Management	Waste disposal	+waste +compacting
262	Waste Management	Waste disposal	+waste +disposal +toxic −plastic.bags −vessels
63	Waste Management	Waste disposal	+disposal +residues
192	Waste Management	Waste disposal	+refuse +compacting +machines
50	Waste Management	Waste disposal	+compress.garbag
326	Waste Management	Waste disposal	+junk +clearance
266	Waste Management	Waste disposal	+waste +machine −shredding −gas −shredder −disposal
125	Waste Management	Waste disposal	+garbage +compactor
193	Waste Management	Waste disposal	+refuse +crushing +machines
124	Waste Management	Waste disposal	+garbage +compacting
360	Waste Management	Waste disposal	+rubbish +track
257	Waste Management	Waste disposal	+waste +binding
368	Waste Management	Waste disposal	+waste +residues
271	Waste Management	Waste disposal	+waste +settler
67	Waste Management	Waste disposal	+electr +garbag.dispos
241	Waste Management	Waste disposal	+trash +compacting −industrial
242	Waste Management	Waste disposal	+trash +compactor
363	Waste Management	Waste disposal	+trash +storage −transport
158	Waste Management	Waste disposal	+organic +waste