Internet Appendix for "The Eco-Gender Gap in Boardrooms" by Po-Hsuan Hsu, Kai Li, and Yihui Pan

Figure IA1. The share of female directors over time

This figure plots the temporal trend in the share of female directors over time. The horizontal axis indicates the fiscal year. The vertical axis is the average *Female director ratio* across sample firms in a fiscal year. Our sample comprises 21,695 firm-year observations representing 3,040 firms over the period 2001–2020.

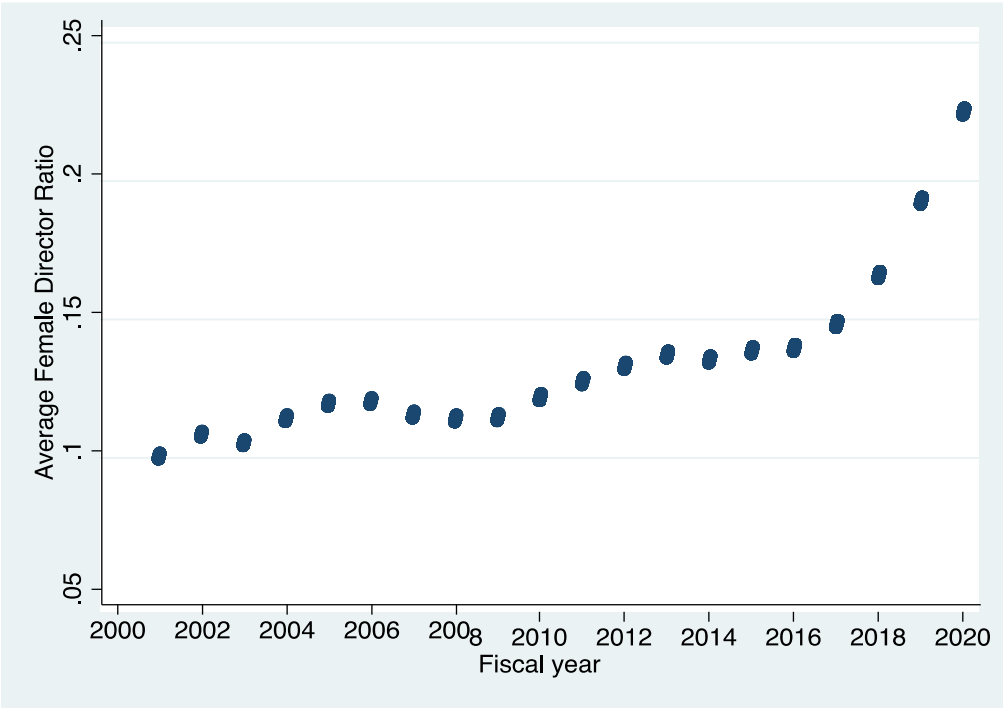


Table IA1. Variable definitions

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

Variable	Definition
Environmental performance measures	
E score	Average of emissions reduction score, resource use score, and innovation score. The emissions reduction score measures a company's commitment and effectiveness towards reducing environmental emissions in its production and operational processes. The resource use score measures 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. The innovation score measures 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 through eco-designed products. (Source: Refinitiv ESG)
#Source reduction practices (facility-level)	The total number of a facility's source reduction activities (i.e., activities a facility implements to prevents pollution) applied to each different toxic chemical in a year. For example, if a facility implements two source reduction practices W1 and W2 in a year (both W1 and W2 are applied to toxic chemicals A and B, and W2 is applied to toxic chemical Z), then its *#Source reduction practices* is 5. The value is winsorized at the 1st and 99th percentiles. The value is collected from TRI File Type 2A Form (more details are provided in the Internet Appendix Section IA.2). (Source: EPA Pollution Prevention (P2))
#Source reduction practices (firm-level)	The sum of #source reduction practices across all facilities of a firm in a year. The value is winsorized at the 1st and 99th percentiles. (Source: EPA Pollution Prevention (P2))
Environmental news	A firm's number of negative environmental news items violating United Nations Global Compact's (UNGC) "Principle 7: Businesses should support a precautionary approach to environmental challenges," Principle 8: undertake initiatives to promote greater environmental responsibility," or "Principle 9: encourage the development and diffusion of environmentally friendly technologies" tagged by RepRisk. This number is weighted by the severity score (that takes the value of 1, 2, or 3) and the reach score (that takes the value of 1, 2, or 3). (Source: RepRisk)
Production waste (in million pounds)	A facility's total quantity of production-related waste (i.e., toxic chemicals) (in millions of pounds) in a year. (Source: EPA TRI)
SG&A	Selling, general, and administrative expenses (in million dollars) reported by a firm in a year. (Source: Compustat)
ADV	Advertising expenses (in million dollars) reported by a firm in a year. Missing values are set as zero. (Source: Compustat)
RD	R&D expenses (in million dollars) reported by a firm in a year. (Source: Compustat)
Firm characteristics	
Female director ratio	Number of female directors scaled by board size. (Source: BoardEx)
Board governance	Sum of three indicator variables: 1) Board size indicator takes the value of one if a firm's board size is not in the top quartile of BoardEx firms in a fiscal year, and zero otherwise; 2) Board independence indicator takes the value of one if a firm's board

	independence ratio is in the top quartile of BoardEx firms in a fiscal year, and zero otherwise; and 3) Board busyness indicator takes the value of one if a firm's board busyness measure is not in the top quartile of BoardEx firms in a fiscal year, and zero otherwise. (Source: BoardEx)
Female CEO	Indicator variable that takes the value of one if a firm has a female CEO, and zero otherwise. (Source: BoardEx)
Big3 institutions	Fraction of shares outstanding held by BlackRock, Vanguard, and State Street. (Source: WRDS Thomson 13F)
UN PRI institutions	Fraction of shares outstanding held by UN PRI signatories (Source: WRDS Thomson 13F, PRI)
Non UN PRI institutions	Fraction of shares outstanding held by non-PRI institutional investors (Source: WRDS Thomson 13F, PRI)
M/B	Market value of equity scaled by book value of equity. (Source: Compustat)
Firm size	Natural logarithm of total assets. (Source: Compustat)
ROA	Net income after subtracting expenses or losses, including extraordinary items scaled by total assets. (Source: Compustat)
Leverage	Sum of long-term debt and debt in current liabilities scaled by total assets. (Source: Compustat)
Cash holdings	Cash and short-term investments scaled by total assets. (Source: Compustat)
Facility characteristics	
Sales (in millions of dollars)	Estimated sales (in millions of dollars) of a facility in a year. (Source: NETS)
#Employees	Reported number of employees working in a facility in a year. (Source: NETS)
Credit score	The maximum Dun & Bradstreet PayDex Score, a 100-point indexing system that captures trade experience reported to NETS, compares payment to terms of sale, and scores the overall manner of payment. The index is dollar-weighted by the amount of credit involved. A PayDex Score of 80 indicates that, on average, a business pays its bills in a "Prompt" manner. (Source: NETS)
Director and board characteristics	
Director-level	
Female	Indicator variable that takes the value of one if a director is a female, and zero otherwise. (Source: BoardEx)
Age	Director age. (Source: BoardEx)
Tenure	Director tenure. (Source: BoardEx)
Field_arts	Indicator variable that takes the value of one if a director has earned a degree in arts (e.g., BA, AB, MA, MPhil), and zero otherwise. (Source: BoardEx)
Field_business	Indicator variable that takes the value of one if a director has earned a degree in economics or business (e.g., MBA, BBA, BCOM, DBA) or has professional designation as chartered accountant, or chartered financial analyst, and zero otherwise. (Source: BoardEx)
Field_STEM	Indicator variable that takes the value of one if a director has earned a degree in science (e.g., BS, BSc, Bachelor of Engineering, MSc), and zero otherwise. (Source: BoardEx)

Field_law	Indicator variable that takes the value of one if a director has earned a degree in law (e.g., JD, LLB, LLM), and zero otherwise. (Source: BoardEx)
Field_medicine	Indicator variable that takes the value of one if a director has earned a degree in medicine (e.g., MD), and zero otherwise. (Source: BoardEx)
#Fields	Sum of a director's fields of study. (Source: BoardEx)
Highest degree	Highest degree received by a director. It takes the value of 3 for PhD, 2 for MBA, JD, MD, or other master's degree, or 1 for bachelor's degree, and zero otherwise. (Source: BoardEx)
Frac exposure to env reg	Fraction of directors with exposure to environmental regulations in a firm-year (Source: BoardEx)
Frac industry experience	Fraction of directors on a board with experience in the focal firm's industry (Source: BoardEx)
Skill_academic	Indicator variable that takes the value of one if a director has worked at universities and her prior job roles contain any of the following key words—professor, lecturer, faculty, instructor, dean, director, chair, provost, chancellor, principal, or president, and zero otherwise. (Source: BoardEx)
Skill_government & policy	Indicator variable that takes the value of one if a director has worked at government agencies, or her prior job roles or descriptions contain any of the following key words—commissioner, council member, senior advisor, director, regulatory, policy, policies, government, public policy, ambassador, public sector, enforcement, or lobby, and zero otherwise. (Source: BoardEx)
Skill_risk management	Indicator variable that takes the value of one if a director has experience in risk management, and zero otherwise. A director has such experience if her prior job roles or job descriptions contain any of the following key words: risk, cyber, or information security. (Source: BoardEx)
Skill_scientific	Indicator variable that takes the value of one if a director has experience in scientific research or research and development, and zero otherwise. A director has such experience if her prior job roles or job descriptions contain any of the following key words: researcher, scientist, scientific, research & development, R&D, clinical research, research fellow, or research investigator. (Source: BoardEx)
Skill_technology	Indicator variable that takes the value of one if a director has experience in technology, and zero otherwise. A director has such experience if her prior job roles or job descriptions contain any of the following key words: technology, technologist, technologies, CIO, chief information officer, CTO, chief technology officer, innovation, IT, or information technology. (Source: BoardEx)
Skill_sustainability	Indicator variable that takes the value of one if a director has experience in environmental and/or sustainability issues, and zero otherwise. A director has such experience if her prior job roles or job descriptions contain any of the following key words: environment, safety, sustainability, sustainable, or ESG. (Source: BoardEx)
Skill_community	Indicator variable that takes the value of one if a director has worked at charities, or her prior job roles or job descriptions contain any of the following key words—community, non-profit, nonprofit, philanthropic, philanthropy, social, CSR, feminine care, family care, PR, public relation, public affair, charity, or charities, and zero otherwise. (Source: BoardEx)
Skill_finance accounting & econ	Indicator variable that takes the value of one if a director has experience in finance, accounting, or economics, and zero otherwise. A director has such experience if her prior job roles or job descriptions contain any of the following key words: 4srael4, CFO, accountant, accounting, auditing, auditor, bank, investment, securities, economist, economic, banker, private bank, equity research, private equity,

	equity analyst, fixed income, bond, debt, loan, capital market, account manager, account management, accounts, trader, credit analyst, security analyst, credit officer, tax, underwriter, portfolio manager, treasury, treasurer, capital market, comptroller, controller, trading, trader, real estate, wealth, corporate accounts, enterprise account, asset management, holdings, lending, mortgage, high growth markets, quantitative analyst, CFA, or CPA. (Source: BoardEx)
Skill_management	Indicator variable that takes the value of one if a director has management experience, and zero otherwise. A director has such experience if her prior job roles or job descriptions contain any of the following key words: executive officer, president, CEO, CFO, COO, CIO, CTO, CPO, CCO, managing, or management. (Source: BoardEx)
Skill_entrepreneurship	Indicator variable that takes the value of one if a director has experience in entrepreneurship, and zero otherwise. A director has such experience if her prior job roles or job descriptions contain any of the following key words: entrepreneur, evaluating business, innovative idea, start-up, startup, venture, founder, co founder, co-founder, founding, owner, or small business. (Source: BoardEx)
Skill_international	Indicator variable that takes the value of one if a director has international experience, and zero otherwise. A director has such experience if her prior job roles or job descriptions contain any of the following key words: global, international, multinational, worldwide, north america, latin america, europe, asia, asia pacific, americas, middle east, africa, australia, china, japan, india, canada, united kingdom, UK, great britain, france, germany, new zealand, foreign, korea, emerging markets, brazil, ireland, mexico, turkey, colombia, americas region, poland, malaysia, taiwan, italy, hong kong, or israel. (Source: BoardEx)
Skill_legal	Indicator variable that takes the value of one if a director has legal experience, and zero otherwise. A director has such experience if her prior job roles or job descriptions contain any of the following key words: attorney, lawyer, legal, litigation, law, intellectual property, general counsel, patent counsel, law clerk, senior counsel, or corporate counsel. (Source: BoardEx)
Skill_manufacturing	Indicator variable that takes the value of one if a director has experience in manufacturing, and zero otherwise. A director has such experience if her prior job roles or job descriptions contain any of the following key words: industrial, manufactured, manufacturing, production, process, or quality. (Source: BoardEx)
Skill_marketing	Indicator variable that takes the value of one if a director has marketing experience, and zero otherwise. A director has such experience if her prior job roles or job descriptions contain any of the following key words: marketing, mktg, market, CMO, advertising, brand, sales, salesman, merchandising, merchandise, retail, product strategy, consumer, customer, channel, communication, user experience, client, media, investor relation, investor service, or analyst relation. (Source: BoardEx)
Skill_strategic planning	Indicator variable that takes the value of one if a director has experience in strategic planning, and zero otherwise. A director has such experience if her prior job roles or job descriptions contain any of the following key words: business planning, business planner, business-planning, business solutions, decision making, decision-making, problem solving, problem-solving, strategic, strategies, strategy, strategist, business intelligence, business development, business affairs, business analyst, corporate development, planner, corporate affairs, organization development, organizational development, alliance, or change management. (Source: BoardEx)
Skill_HR	Indicator variable that takes the value of one if a director has HR experience, and zero otherwise. A director has such experience if her prior job roles or job descriptions contain any of the following key words: human resource, HR, recruitment, recruiter, recruiting, talent, staffing, compensation, employee relation, labor, people operations, diversity, or DEI. (Source: BoardEx)
Skill_operations	Indicator variable that takes the value of one if a director has experience in operations, and zero otherwise. A director has such experience if her prior job roles or job descriptions contain any of the following key words: operations, COO, logistics, supply chain,

	supply-chain, business operations, supply, procurement, sourcing, buyer, commodity manager, distribution, project, quality assurance, global sourcing, product line manage, or OPS. (Source: BoardEx)
Skill_M&As	Indicator variable that takes the value of one if a director has experience in M&As, and zero otherwise. A director has such experience if her prior job roles or job descriptions contain any of the following key words: M&A, M & A, merger and acquisition, merger & acquisition, mergers and acquisitions, mergers & acquisitions, merger, or acquisition. (Source: BoardEx)
#Skills	Sum of a director's skills. (Source: BoardEx)
Chairman of the Board	Indicator variable that takes the value of one if a director is Chairman of the Board, and zero otherwise. (Source: BoardEx)
Lead director	Indicator variable that takes the value of one if a director's role contains any of the following key words—lead independent director, lead independent chairman, presiding lead independent director, lead independent corporate director, lead independent vice chairman, lead director, vice chairman (lead independent director), or lead independent outside director, and zero otherwise. (Source: BoardEx)
Audit committee	Indicator variable that takes the value of one if a director sits on audit committee in a year, and zero otherwise. (Source: BoardEx)
Compensation committee	Indicator variable that takes the value of one if a director sits on compensation committee in a year, and zero otherwise. (Source: BoardEx)
CSR committee	Indicator variable that takes the value of one if a director sits on CSR committee in a year, and zero otherwise. A board committee is responsible for ESG if its committee name contains any of the following key words: CSR, ESG, environ*, social, or sustain*. (Source: BoardEx)
Nomination committee	Indicator variable that takes the value of one if a director sits on nomination committee in a year, and zero otherwise. (Source: BoardEx)
Firm-level	
HHI age	Herfindahl-Hirschman index (HHI) of the share of directors in each age quartile of directors in BoardEx. (Source: BoardEx)
HHI tenure	HHI of the share of directors in each board tenure quartile of directors in BoardEx. (Source: BoardEx)
HHI field	HHI of the share of directors with different academic fields. The filed categories include arts, business, STEM, law, and medicine. (Source: BoardEx)
HHI skill	HHI of the share of directors with different skills due to work experience and job roles. The skill categories include academic, government, risk management, scientific, technology, sustainability, community, finance, accounting & economics, management, entrepreneurship, international, legal, manufacturing, marketing, strategic planning, HR, operations, and M&As. (Source: BoardEx)
HHI sector	HHI of the share of directors with different sector-specific experience, as defined by BoardEx. (Source: BoardEx)
HHI college	HHI of the share of directors attending different undergraduate colleges. (Source: BoardEx)
HHI ethnicity	HHI of the share of directors with different ethnicities, as defined by ISS. The ethnicity categories include Caucasian/white, Black/African American, Asian, Hispanic/Latin American, Middle-eastern/North African, Native American/Alaskan Native, Native Hawaiian/other Pacific Islander, and Other. (Source: ISS)

ESG-linked compensation	Indicator variable that takes the value of one if a firm has an executive compensation policy that takes into account its ESG performance, and zero otherwise. The data item from Refinitiv is as follows: "Does the company have an extra-financial performance oriented compensation policy that includes remuneration for the CEO, executive directors, non-board executives, and other management bodies based on ESG or sustainability factors?" (Source: Refinitiv)
E&S reporting	Indicator variable that takes the value of one if a firm publishes a separate CSR/Health and Safety/Sustainability report or publishes a section in its annual report on CSR/Health and Safety/Sustainability, and zero otherwise. (Source: Refinitiv)

Table IA2. Sample formation

This table lists the steps taken and filters applied to form the samples used in our analyses. Panel A reports the steps and filters applied to form our firm-level OLS sample for *E score* over the period 2002–2021, Poisson sample for *#Source reduction practices* over the period 2002–2020, and Poisson sample for *Environmental news* over the period 2007–2020. Panel B reports the steps and filters applied to form our facility-level Poisson sample for *#Source reduction practices* and OLS sample for *Production waste* over the period 2002–2020.

Panel A1: Firm-level OLS sample for *E score*

	#firm-year obs.	#firm-year obs. removed	#unique firms
WRDS Refinitiv ESG, 2002–2021	24,525		3,588
Remove observations with missing data from BoardEx	23,535	990	3,477
Remove observations with missing data form Compustat	23,343	192	3,450
Remove observations with missing data form WRDS Thomson 13F	23,279	64	3,445
Remove observations without Augmented 10-X Header Data	23,036	243	3,320
Remove observations due to fixed effects in OLS regressions	21,695	1,341	3,040
Final sample	21,695		3,040

Panel A2: Firm-level Poisson sample for *#Source reduction practices*

	#firm-year obs.	#firm-year obs. removed	#unique firms
WRDS Refinitiv ESG, 2002–2021	24,525		3,588
Remove observations with missing data from BoardEx	23,535	990	3,477
Remove observations with missing data form Compustat	23,343	192	3,450
Remove observations with missing data form WRDS Thomson 13F	23,279	64	3,445
Remove observations without Augmented 10-X Header Data	23,036	243	3,320
Remove observations due to fixed effects in Poisson regression	6,006	17,030	441
Final sample	6,006		441

Panel A3: Firm-level Poisson sample for *Environmental news*

	#firm-year obs.	#firm-year obs. removed	#unique firms
WRDS Refinitiv ESG, 2002–2021	24,525		3,588
Remove observations with missing data from BoardEx	23,535	990	3,477
Remove observations with missing data form Compustat	23,343	192	3,450
Remove observations with missing data form WRDS Thomson 13F	23,279	64	3,445
Remove observations without Augmented 10-X Header Data	23,036	243	3,320
Remove observations due to fixed effects in Poisson regression	7,639	15,397	796
Final sample	7,639		796

Panel B1: Facility-level Poisson sample for *#Source reduction practices*

	#firm-year obs.	#firm-year obs. removed	#unique firms
TRI facility-year observations matched to GVKEY (1991–2020)	166,453		14,008
Remove observations with missing information used in our firm-year obs. (BoardEx, Compustat, etc.)	90,193	76,260	8,551
Remove observations without NETS information	52,406	37,787	5,403
Remove observations due to fixed effects in Poisson regression	15,103	37,303	1,406
Final sample	15,103		1,406

Panel B2: Facility-level OLS sample for *Production waste*

	#firm-year obs.	#firm-year obs. removed	#unique firms
TRI facility-year observations matched to GVKEY (1991–2020)	166,453		14,008
Remove observations with missing information used in our firm-year obs. (BoardEx, Compustat, etc.)	90,193	76,260	8,551
Remove observations without NETS information	52,406	37,787	5,403
Remove observations due to fixed effects in OLS regressions	48,373	4,033	4,662
Final sample	48,373		4,662

Table IA3. Summary statistics

This table provides the summary statistics for our firm and facility samples. Panel A presents the summary statistics for the firm sample. The OLS sample for *E score* comprises 21,695 firm-year observations associated with 3,040 firms over the period 2002–2021. The Poisson sample for *#Source reduction practices* comprises 6,006 firm-year observations associated with 441 firms over the period 2002-2020. The Poisson sample for *Environmental news* comprises 7,639 firm-year observations associated with 796 firms over the period 2007–2020 (the sample reduction is due to the drop of firms with all-zero dependent variables in Poisson regressions). Panel B presents the summary statistics for the facility sample. The Poisson sample for *#Source reduction practices* comprises 15,103 facility-year observations associated with 1,406 facilities of 358 firms over the period 2002–2020. The OLS sample for *Production waste* comprises 48,373 facility-year observations associated with 4,662 facilities of 618 firms over the period 2002–2020. Panel B contains two subpanels that correspond to the analysis for *#Source reduction practices* and *Production waste*. Definitions of the variables are provided in Internet Appendix Table IA1.

Panel A: Summary statistics for the firm-level sample

	Mean	SD	P5	Median	P95
	(1)	(2)	(3)	(4)	(5)
OLS sample for *E score*					
E score	0.210	0.253	0.000	0.093	0.738
Female director ratio	0.150	0.107	0.000	0.143	0.333
Board governance	1.869	0.569	1.000	2.000	3.000
Female CEO	0.038	0.191	0.000	0.000	0.000
Big3 institutions	0.145	0.081	0.021	0.145	0.284
UN PRI institutions	0.268	0.194	0.000	0.266	0.584
Non UN PRI institutions	0.460	0.220	0.102	0.442	0.846
M/B	3.453	5.700	0.506	2.229	11.952
Firm size	8.136	1.932	4.866	8.147	11.286
ROA	-0.005	0.189	-0.347	0.027	0.155
Leverage	0.269	0.221	0.000	0.239	0.689
Cash holdings	0.171	0.219	0.005	0.080	0.712
Ln(SG&A)	5.694	1.606	3.147	5.682	8.676
Poisson sample for *#Source reduction practices*					
#Source reduction practices	2.382	3.351	0.000	1.000	10.000
Female director ratio	0.114	0.094	0.000	0.111	0.286
Board governance	1.841	0.610	1.000	2.000	3.000
Female CEO	0.025	0.157	0.000	0.000	0.000
Big3 institutions	0.114	0.077	0.008	0.106	0.246
M/B	2.986	4.452	0.642	2.237	7.906
Firm size	7.849	1.783	4.977	7.804	10.822
ROA	0.042	0.094	-0.092	0.051	0.145
Leverage	0.256	0.166	0.000	0.249	0.543
Cash holdings	0.116	0.118	0.007	0.080	0.356
Poisson sample for *Environmental news*					
Environmental news	4.886	16.435	0.000	0.000	24.000
Female director ratio	0.141	0.106	0.000	0.133	0.333
Board governance	1.840	0.553	1.000	2.000	3.000
Female CEO	0.037	0.189	0.000	0.000	0.000
Big3 institutions	0.137	0.079	0.002	0.146	0.263
M/B	3.014	5.052	0.414	2.061	9.805
Firm size	8.761	1.910	5.798	8.660	11.917

ROA	0.032	0.110	-0.098	0.036	0.152
Leverage	0.290	0.192	0.004	0.281	0.621
Cash holdings	0.104	0.128	0.002	0.060	0.354

Panel B: Summary statistics for the facility-level sample

	Mean	SD	P5	Median	P95
	(1)	(2)	(3)	(4)	(5)
Poisson sample for *#Source reduction practices*					
#Source reduction practices	1.052	2.054	0.000	0.000	6.000
Female director ratio	0.127	0.084	0.000	0.125	0.273
Board governance	1.607	0.750	0.000	2.000	3.000
Female CEO	0.020	0.139	0.000	0.000	0.000
Big3 institutions	0.118	0.074	0.009	0.115	0.239
M/B	3.261	4.075	0.947	2.585	8.028
Firm size	9.041	1.957	5.928	8.970	12.602
ROA	0.056	0.066	-0.031	0.056	0.148
Leverage	0.265	0.147	0.042	0.241	0.539
Cash holdings	0.096	0.082	0.009	0.075	0.250
ln(Sales +1)	17.774	1.600	14.915	17.889	20.192
ln(#Employees +1)	5.324	1.459	2.398	5.525	7.601
Credit score	73.558	5.212	64.000	74.000	80.000
OLS sample for *Production waste*					
ln(Production waste + 1)	0.371	0.711	0.000	0.044	2.202
Production waste (in million pounds)	1.270	3.882	0.000	0.045	8.045
Female director ratio	0.136	0.086	0.000	0.133	0.286
Board governance	1.661	0.743	0.000	2.000	3.000
Female CEO	0.029	0.168	0.000	0.000	0.000
Big3 institutions	0.124	0.077	0.009	0.129	0.247
M/B	2.996	4.299	0.874	2.272	7.840
Firm size	9.132	1.925	6.200	9.009	12.801
ROA	0.047	0.066	-0.043	0.047	0.136
Leverage	0.283	0.145	0.060	0.270	0.550
Cash holdings	0.087	0.079	0.006	0.067	0.234
ln(Sales +1)	17.640	1.664	14.627	17.792	20.291
ln(#Employees +1)	5.114	1.529	2.303	5.303	7.390
Credit score	73.741	5.526	64.000	75.000	80.000

Table IA4. Correlation matrices for different firm and facility samples

This table provides the correlation matrices for key variables in our firm and facility samples. Panel A1 presents the correlation matrices for key variables in the firm-level OLS sample for *E score* over the period 2002–2021. Panel A2 presents the correlation matrices for key variables in the firm-level Poisson sample for *#Source reduction practices* over the period 2002–2020. Panel A3 presents the correlation matrices for key variables in the firm-level Poisson sample for *Environmental news* over the period 2007–2020. Panel B1 presents the correlation matrices for key variables in the facility-level Poisson sample for *#Source reduction practices* over the period 2002–2020. Panel B2 presents the correlation matrices for key variables in the facility-level Poisson sample for *Production waste* over the period 2002–2020. Definitions of the variables are provided in Internet Appendix Table IA1. ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

Panel A1: Correlation matrix of the firm-level OLS sample for *E score*

		1	2	3	4	5	6	7	8	9	10
1	E score	1.000									
2	Female director ratio	0.252***	1.000								
3	Board governance	-0.093***	0.030***	1.000							
4	Female CEO	0.033***	0.248***	0.025***	1.000						
5	Big3 institutions	0.286***	0.288***	0.142***	0.029***	1.000					
6	M/B	0.007	0.029***	0.007	0.016**	-0.009	1.000				
7	Firm size	0.506***	0.151***	-0.257***	-0.026***	0.171***	-0.127***	1.000			
8	ROA	0.201***	0.056***	-0.082***	-0.031***	0.168***	-0.044***	0.402***	1.000		
9	Leverage	0.114***	0.057***	0.056***	0.006	0.116***	-0.064***	0.124***	-0.009	1.000	
10	Cash holdings	-0.202***	-0.046***	0.081***	0.035***	-0.154***	0.217***	-0.491***	-0.468***	-0.266***	1.000

Panel A2: Correlation matrix of the firm-level Poisson sample for *#Source reduction practices*

		1	2	3	4	5	6	7	8	9	10
1	#Source reduction practices	1.000									
2	Female director ratio	0.058***	1.000								
3	Board governance	-0.155***	-0.033**	1.000							
4	Female CEO	-0.020	0.211***	-0.019	1.000						
5	Big3 institutions	-0.027**	0.373***	0.097***	0.052***	1.000					
6	M/B	0.020	0.114***	-0.040***	0.022*	0.077***	1.000				
7	Firm size	0.258***	0.371***	-0.268***	0.055***	0.377***	0.100***	1.000			
8	ROA	0.052***	0.081***	-0.047***	0.021	0.119***	0.155***	0.152***	1.000		
9	Leverage	0.042***	0.128***	0.009	-0.041***	0.083***	0.092***	0.263***	-0.162***	1.000	
10	Cash holdings	-0.094***	-0.118***	0.024*	0.025*	-0.022*	0.084***	-0.149***	0.005	-0.324***	1.000

Panel A3: Correlation matrix of the firm-level Poisson sample for *Environmental news*

		1	2	3	4	5	6	7	8	9	10
1	Environmental news	1.000									
2	Female director ratio	0.088***	1.000								
3	Board governance	-0.078***	0.001	1.000							
4	Female CEO	0.047***	0.262***	-0.003	1.000						

5	Big3 institutions	0.081***	0.370***	0.100***	0.042***	1.000					
6	M/B	-0.008	0.057***	-0.031***	0.040***	0.012	1.000				
7	Firm size	0.324***	0.314***	-0.226***	0.041***	0.306***	-0.008	1.000			
8	ROA	0.044***	0.109***	-0.067***	0.003	0.085***	0.093***	0.187***	1.000		
9	Leverage	-0.019*	0.013	0.062***	-0.012	0.019*	0.027**	-0.022*	-0.124***	1.000	
10	Cash holdings	-0.039***	0.002	-0.024**	-0.007	-0.057***	0.116***	-0.144***	-0.043***	-0.234***	1.000

Panel B1: Correlation matrix of facility-level Poisson sample for *#Source reduction practices*

		1	2	3	4	5	6	7	8	9	10	11	12	13
1	#Source reduction practices	1.000												
2	Female director ratio	-0.044***	1.000											
3	Board governance	-0.009	-0.051***	1.000										
4	Female CEO	-0.023***	0.163***	-0.012	1.000									
5	Big3 institutions	-0.078***	0.364***	0.215***	0.047***	1.000								
6	M/B	0.001	0.131***	-0.013	0.061***	0.083***	1.000							
7	Firm size	-0.012	0.400***	-0.421***	0.068***	0.194***	0.049***	1.000						
8	ROA	0.006	0.117***	-0.037***	0.047***	0.099***	0.231***	0.121***	1.000					
9	Leverage	0.037***	0.067***	0.061***	-0.011	0.059***	0.141***	0.044***	-0.227***	1.000				
10	Cash holdings	-0.031***	-0.017**	0.000	0.049***	0.079***	0.017**	-0.002	0.131***	-0.276***	1.000			
11	ln(Sales +1)	-0.017**	0.144***	-0.110***	0.031***	0.077***	0.047***	0.277***	0.077***	-0.020**	0.062***	1.000		
12	ln(#Employees +1)	-0.045***	0.076***	-0.083***	0.014*	0.011	0.046***	0.119***	0.029***	-0.011	0.051***	0.907***	1.000	
13	Credit score	0.013	-0.043***	0.093***	-0.005	0.020**	-0.018**	-0.125***	0.008	0.025***	0.031***	-0.095***	-0.101***	1.000

Panel B2: Correlation matrix of facility-level OLS sample for *Production waste*

		1	2	3	4	5	6	7	8	9	10	11	12	13
1	ln(Production waste + 1)	1.000												
2	Female director ratio	0.028***	1.000											
3	Board governance	0.015***	0.006	1.000										
4	Female CEO	-0.022***	0.181***	-0.002	1.000									
5	Big3 institutions	0.030***	0.402***	0.217***	0.055***	1.000								
6	M/B	-0.020***	0.087***	0.007	0.041***	0.066***	1.000							
7	Firm size	0.113***	0.375***	-0.395***	0.086***	0.163***	-0.012***	1.000						
8	ROA	-0.007	0.048***	-0.030***	0.035***	0.067***	0.177***	0.059***	1.000					
9	Leverage	0.058***	0.126***	0.051***	-0.020***	0.110***	0.109***	0.081***	-0.237***	1.000				
10	Cash holdings	-0.057***	-0.062***	-0.055***	0.016***	-0.009*	0.030***	-0.026***	0.105***	-0.279***	1.000			
11	ln(Sales +1)	0.128***	0.112***	-0.091***	0.029***	0.030***	0.033***	0.241***	0.027***	0.058**	0.022***	1.000		
12	ln(#Employees +1)	0.056***	0.025***	0.016**	-0.022***	-0.051***	0.049***	0.078***	0.002	0.044***	0.037***	0.907***	1.000	
13	Credit score	0.028***	0.008*	0.070***	0.026***	0.029***	-0.039***	-0.038***	0.032***	-0.021***	-0.007	-0.024***	-0.057***	1.000

Table IA5. Female directors and corporate environmental performance: Various fixed effects

This table conducts robustness checks on the regression analysis in Table 2 Panels A and B. It examines the relation between the share of female directors on a board and corporate environmental performance by including firm fixed effects, industry times year fixed effects, headquarters state times year fixed effects, and incorporation state × year fixed effects. Definitions of the variables are provided in Internet Appendix Table IA1. Standard errors (in parentheses) are clustered at the firm level. ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

	E score	#Source reduction practices	Environmental news
	(1)	(2)	(3)
Female director ratio	0.053**	1.728***	-0.610*
	(0.025)	(0.620)	(0.372)
Board governance	0.002	-0.004	-0.027
	(0.003)	(0.040)	(0.053)
Female CEO	-0.007	0.496*	0.156
	(0.017)	(0.294)	(0.160)
Big3 institutions	-0.040	0.885	-0.569
	(0.040)	(0.944)	(0.729)
M/B	-0.000	0.001	-0.016**
	(0.000)	(0.007)	(0.007)
Firm size	0.025***	0.091	0.474***
	(0.005)	(0.116)	(0.080)
ROA	-0.010	-0.648**	-0.191
	(0.009)	(0.330)	(0.276)
Leverage	-0.019	-0.277	-0.430
	(0.014)	(0.290)	(0.338)
Cash holdings	0.024	1.023**	0.763
	(0.019)	(0.484)	(0.488)
Industry × Year Fixed Effects	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
Headquarters state × Year Fixed Effects	Yes	Yes	Yes
Incorporation state × Year Fixed Effects	Yes	Yes	Yes
Intercept	Yes	Yes	Yes
Obs.	19,108	5,282	7,024
Adj-R^2	0.854	0.623	0.848

Table IA6. Additional analyses related to California's SB 826

This table conducts additional analyses related to California's SB 826. Panel A repeats the DID analysis in Table 3 Panel B using California firms with at least two female directors in 2018 as the control group. Panel B repeats the DID analysis using the compliant firms as treated firms. The compliant firms are public firms that did not have a female director before September 30th, 2018 but had at least one female director the year after, headquartered (and stayed) in California, and without TRI-reporting facilities in California. We find the closest control firm for each treated firm by matching on (three-digit SIC) industry, firm size, and *E score*. Panel C repeats the DID analysis using 2016 as the pseudo-event year. *Post* is an indicator variable that takes the value of one for the post-event window (2019 to 2021), and zero for the pre-event window (2015 to 2017). Definitions of the variables are provided in Internet Appendix Table IA1. Standard errors (in parentheses) are clustered at the state level. ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

Panel A: DID analysis using California firms with at least two female directors in 2018 as the control group

	Female director ratio	E score
	(1)	(2)
Treated × Post	0.122***	0.025***
	(0.032)	(0.004)
Firm-level controls	Yes	Yes
Industry × Year Fixed Effects	Yes	Yes
Firm Fixed Effects	Yes	Yes
Intercept	Yes	Yes
Obs.	430	430
Adj-R²	0.830	0.526

Panel B: DID analysis using the compliant firms (51 treated firms)

	Female director ratio	E score
	(1)	(2)
Treated × Post	0.086***	0.033***
	(0.011)	(0.006)
Firm-level controls	Yes	Yes
Industry × Year Fixed Effects	Yes	Yes
Firm Fixed Effects	Yes	Yes
Intercept	Yes	Yes
Obs.	455	456
Adj-R²	0.762	0.645

Panel C: DID analysis using 2016 as the pseudo-event year

	Female director ratio	E score
	(1)	(2)
Treated × Post	0.011	0.008
	(0.010)	(0.012)
Firm-level controls	Yes	Yes
Industry × Year Fixed Effects	Yes	Yes
Firm Fixed Effects	Yes	Yes
Intercept	Yes	Yes
Obs.	367	367
Adj-R²	0.559	0.712

Table IA7. The second phase of SB 826

This table examines changes in both the share of female directors on a board and corporate environmental performance between the treated and control firms around the second phase of SB 826. The bill further required that by the end of 2021, all public firms in California have at least two female directors if a board has five members, and three female directors if a board has six members or more. We identify treated firms as those with "shortfalls" according to the 2021 follow-up rule following Hwang et al. (2021) and Gertsberg et al. (2023). The rest of California firms are control firms. We conduct a DID analysis around 2021. Due to the recency of this more stringent requirement, we examine a shorter event window [-2, +2] from 2019 to 2023 (or [-1, +2] from 2020 to 2023). *2021 shortfall* is an indicator variable that takes the value of one for a California firm whose number of female directors did not meet the requirement of the second phase of the bill, and zero otherwise. *Post* is an indicator variable that takes the value of one for the post-event window (2021 to 2023), and zero for the pre-event window (2019 to 2020, or 2020). Definitions of the variables are provided in Internet Appendix Table IA1. Standard errors (in parentheses) are clustered at the state level. ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

	Female director ratio	Female director ratio	E Score	E Score
	(1)	(2)	(3)	(4)
	[2019, 2023]	[2020, 2023]	[2019, 2023]	[2020, 2023]
2021 shortfall × Post	0.025***	0.021**	0.021*	0.019*
	(0.009)	(0.010)	(0.011)	(0.010)
Industry × Year Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
Firm-level controls	Yes	Yes	Yes	Yes
Intercept	Yes	Yes	Yes	Yes
Obs.	2,065	1,595	1,681	1,335
Adj-R^2	0.772	0.770	0.953	0.969

Table IA8. The Big Three's campaigns

This table examines changes in both the share of female directors on a board and corporate environmental performance between the treated and control firms around the Big Three's campaigns in 2017. Following Gormley et al. (2023), we use a firm's ownership by the Big Three asset managers as of 2016 as a measure of its treatment intensity. *Post* is an indicator variable that takes the value of one for the post-event window (2017 to 2019), and zero for the pre-event window (2014 to 2016). Definitions of the variables are provided in Internet Appendix Table IA1. Standard errors (in parentheses) are clustered at the firm level. ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

	Female director ratio	E score
	(1)	(2)
Big3 institutions (2016) × Post	0.024**	0.194**
	(0.009)	(0.052)
Firm-level controls	Yes	Yes
Industry × Year Fixed Effects	Yes	Yes
Firm Fixed Effects	Yes	Yes
Intercept	Yes	Yes
Obs.	9,238	9,238
Adj-R^2	0.779	0.909

Table IA9. SG&A and M/B

This table examines the relation between SG&A and firm value change measured by a firm's annual change in market-to-book ratio. Definitions of the variables are provided in Internet Appendix Table IA1. Standard errors (in parentheses) are clustered at the firm level. ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

	$\Delta(M/B)_t$	$\Delta(M/B)_{t+1}$
	(1)	(2)
ln(SG&A)	-0.264*	0.378***
	(0.142)	(0.136)
Board governance	0.025	0.013
	(0.058)	(0.060)
Female CEO	-0.227	0.134
	(0.269)	(0.273)
Big3 institutions	-1.324*	0.906
	(0.775)	(0.793)
M/B	0.833***	-0.833***
	(0.019)	(0.020)
Firm size	0.214*	-0.693***
	(0.129)	(0.126)
ROA	-1.615***	0.217
	(0.343)	(0.366)
Leverage	-0.061	-0.222
	(0.426)	(0.475)
Cash holdings	-0.041	0.544
	(0.364)	(0.411)
Industry × Year Fixed Effects	Yes	Yes
Firm Fixed Effects	Yes	Yes
Intercept	Yes	Yes
Obs.	40,695	40,695
Adj-R^2	0.381	0.379

Table IA10. Summary statistics of director and board characteristics

This table provides the summary statistics of director and board characteristics for our director and firm samples. Panel A presents the summary statistics of director characteristics. The sample comprises 207,045 director-year observations associated with 3,040 firms over the period 2001–2020. Panel B presents the summary statistics of board characteristics. The sample comprises 21,695 firm-year observations associated with 3,040 firms over the period 2001–2020. Definitions of the variables are provided in Internet Appendix Table IA1.

Panel A: Summary statistics for the director sample

	Mean	SD	P5	Median	P95
	(1)	(2)	(3)	(4)	(5)
Female	0.179	0.383	0.000	0.000	1.000
Age	62.249	8.744	47.000	63.000	76.000
Tenure	7.917	7.366	0.600	5.700	22.600
Field_arts	0.389	0.487	0.000	0.000	1.000
Field_business	0.533	0.499	0.000	1.000	1.000
Field_STEM	0.451	0.498	0.000	0.000	1.000
Field_law	0.136	0.343	0.000	0.000	1.000
Field_medicine	0.033	0.179	0.000	0.000	0.000
#Fields	1.542	0.686	0.000	2.000	2.000
Highest degree	1.757	0.642	1.000	2.000	3.000
Exposure to env reg	0.100	0.300	0.000	0.000	1.000
Industry experience	0.470	0.500	0.000	0.000	1.000
Skill_academic	0.130	0.336	0.000	0.000	1.000
Skill_government & policy	0.188	0.390	0.000	0.000	1.000
Skill_risk management	0.016	0.124	0.000	0.000	0.000
Skill_scientific	0.043	0.204	0.000	0.000	0.000
Skill_technology	0.084	0.277	0.000	0.000	1.000
Skill_sustainability	0.018	0.135	0.000	0.000	0.000
Skill_community	0.069	0.254	0.000	0.000	1.000
Skill_finance accounting & economics	0.463	0.499	0.000	0.000	1.000
Skill_management	0.861	0.346	0.000	1.000	1.000
Skill_entrepreneurship	0.300	0.458	0.000	0.000	1.000
Skill_international	0.262	0.440	0.000	0.000	1.000
Skill_legal	0.095	0.293	0.000	0.000	1.000
Skill_manufacturing	0.072	0.258	0.000	0.000	1.000
Skill_marketing	0.267	0.442	0.000	0.000	1.000
Skill_strategic planning	0.179	0.383	0.000	0.000	1.000
Skill_HR	0.044	0.205	0.000	0.000	0.000
Skill_operations	0.228	0.420	0.000	0.000	1.000
Skill_M&As	0.033	0.179	0.000	0.000	0.000
#Skills	3.352	1.736	1.000	3.000	6.000
Chairman of the Board	0.101	0.302	0.000	0.000	1.000
Lead director	0.046	0.209	0.000	0.000	0.000
Audit committee	0.438	0.496	0.000	0.000	1.000
Compensation committee	0.358	0.479	0.000	0.000	1.000
CSR committee	0.033	0.180	0.000	0.000	0.000
Nomination committee	0.277	0.447	0.000	0.000	1.000

Panel B: Summary statistics for the board sample

	Mean (1)	SD (2)	P5 (3)	Median (4)	P95 (5)
HHI age	0.127	0.036	0.080	0.119	0.204
HHI tenure	0.125	0.035	0.080	0.119	0.186
HHI field	0.335	0.076	0.254	0.319	0.469
HHI skill	0.155	0.044	0.105	0.145	0.236
HHI sector	0.130	0.079	0.060	0.107	0.284
HHI college	0.150	0.077	0.083	0.136	0.265
HHI ethnicity	0.812	0.167	0.520	0.802	1.000
ESG-linked compensation	0.248	0.432	0.000	0.000	1.000
E&S reporting	0.275	0.446	0.000	0.000	1.000

Table IA11: California's SB 826 with more controls

This table conducts robustness checks on the analysis in Table 3 Panel B column (2) by including director demographic, skill, and board diversity measures. Definitions of the variables are provided in Internet Appendix Table IA1. Standard errors (in parentheses) are clustered at the state level. ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

	E score	
	(1)	(2)
Treated × Post	0.027***	0.030***
	(0.009)	(0.007)
Age	-0.002	
	(0.002)	
Tenure	0.002	
	(0.002)	
Field_arts	0.121**	
	(0.053)	
Field_business	-0.012	
	(0.033)	
Field_law	0.004	
	(0.087)	
Field_STEM	0.079*	
	(0.046)	
Field_medicine	-0.031	
	(0.050)	
Frac exposure to env reg	-0.011	
	(0.021)	
Frac industry experience	-0.095***	
	(0.021)	
Skill_academic	-0.088**	
	(0.033)	
Skill_government & policy	-0.059*	
	(0.034)	
Skill_risk management	-0.167**	
	(0.080)	
Skill_scientific	0.012	
	(0.058)	
Skill_technology	-0.000	
	(0.076)	
Skill_sustainability	0.140**	
	(0.059)	
Skill_community	-0.108**	
	(0.049)	
Skill_finance accounting & econ	-0.004	
	(0.021)	
Skill_management	0.017	
	(0.043)	
Skill_entrepreneurship	0.011	
	(0.014)	
Skill_international	0.098**	
	(0.043)	
Skill_legal	0.109	
	(0.109)	
Skill_manufacturing	-0.089**	
	(0.034)	
Skill_marketing	-0.030	
	(0.049)	
Skill_strategic planning	0.005	
	(0.022)	
Skill_HR	-0.050	
	(0.085)	

Skill_operations	0.010	
	(0.018)	
Skill_M&As	-0.057	
	(0.074)	
HHI field		-0.147***
		(0.029)
HHI skill		0.152
		(0.094)
HHI age		-0.219*
		(0.111)
HHI tenure		0.308**
		(0.142)
HHI sector		0.013
		(0.060)
HHI college		0.008
		(0.023)
Firm-level controls	Yes	Yes
Industry × Year Fixed Effects	Yes	Yes
Firm Fixed Effects	Yes	Yes
Intercept	Yes	Yes
Obs.	530	530
Adj-R^2	0.714	0.698

Table IA12: California's SB 826 and E&S-related governance measures: Robustness check

This table repeats the DID analysis in Table 8 using California firms with at least two female directors in 2018 as the control group, which are not required to add additional female directors. Definitions of the variables are provided in Internet Appendix Table IA1. Standard errors (in parentheses) are clustered at the state level. ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

Panel A: The effect of SB 826 on E&S-related governance measures

	ESG-linked compensation	E&S reporting
	(1)	(2)
Treated × Post	0.097***	0.011
	(0.012)	(0.008)
Firm-level controls	Yes	Yes
Industry × Year Fixed Effects	Yes	Yes
Firm Fixed Effects	Yes	Yes
Intercept	Yes	Yes
Obs.	389	389
Adj-R^2	0.865	0.246

Panel B: The effect of SB 826 on *E score* controlling for E&S-related governance measures

	E score	E score
	(1)	(2)
Treated × Post	0.026***	0.016**
	(0.005)	(0.004)
ESG-linked compensation		0.075***
		(0.016)
E&S reporting		0.309***
		(0.013)
Firm-level controls	Yes	Yes
Industry × Year Fixed Effects	Yes	Yes
Firm Fixed Effects	Yes	Yes
Intercept	Yes	Yes
Obs.	389	389
Adj-R^2	0.390	0.644

Section IA1. Introduction to the GPSS survey and relevant survey questions

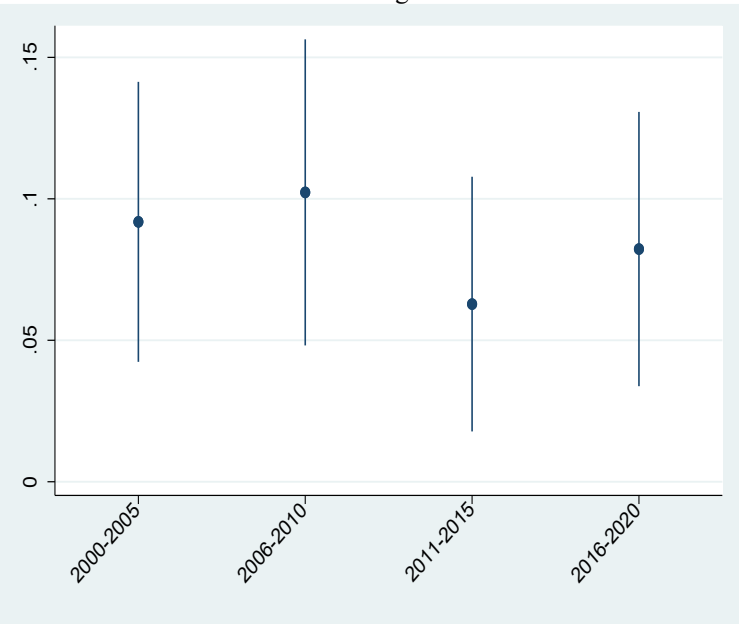
Gallup samples landline and cellphone numbers using random-digit-dial methods, then weights its final sample to match the U.S. population according to gender, age, race, ethnicity, education, region, population density, and phone status. The core questions in the March survey center around the environment, with about 1,000 respondents each year. We use the two questions under the "trade-offs" category. The first question asks: "With which one of these statements about the environment and the economy do you most agree—protection of the environment should be given priority, even at the risk of curbing economic growth (or) economic growth should be given priority, even if the environment suffers to some extent?" The response "protect environment" is coded as 3, "equal priority" as 2, and "economic growth priority" as 1. The second question asks: "With which one of these statements about the environment and energy production do you most agree—protection of the environment should be given priority, even at the risk of limiting the amount of energy supplies—such as oil, gas and coal—which the United States produces—(or) development of U.S. energy supplies—such as oil, gas and coal—should be given priority, even if the environment suffers to some extent?" The responses are similarly coded with higher values for protecting the environment over energy supplies.

Figure IA2 plots the temporal trend in gender differences in viewing the tradeoff between environmental and economic benefits, again controlling for respondents' age, education, and political party. We group the survey results from 2011 to 2020 into four equal time periods: 2001–2005, 2006–2010, 2011–2015, and 2016–2020, and then we plot the estimated coefficient on gender for each period, in regressions with the controls mentioned above. We note that gender differences in viewing the tradeoff appear to be stable over the 20-year survey period.

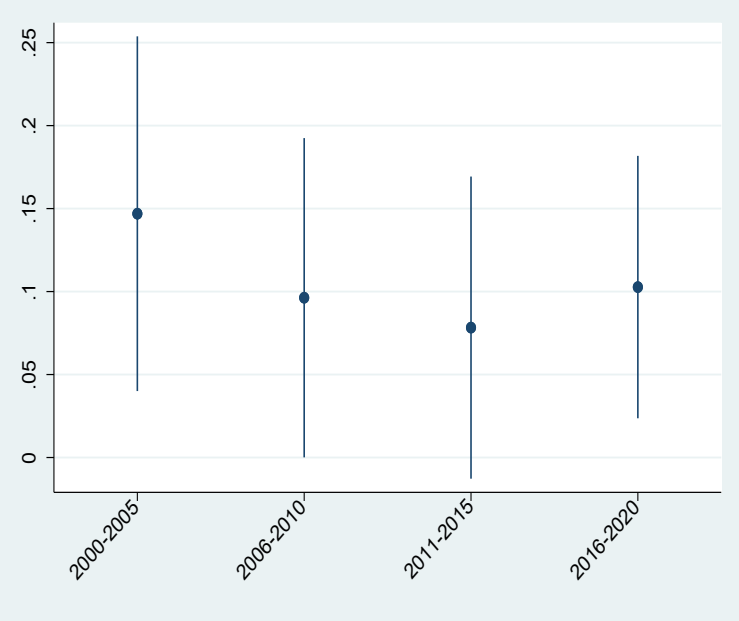
Figure IA2. Gender differences in viewing the tradeoff between environmental and economic benefits

This figure plots the temporal trend in gender differences in viewing the tradeoff between environmental and economic benefits using data from the Gallup Poll Social Series (GPSS). Introduced in 2001, the core questions in the March survey each year center around the environment. We use the two questions under the "trade-offs" category. The first question asks: "With which one of these statements about the environment and the economy do you most agree—protection of the environment should be given priority, even at the risk of curbing economic growth (or) economic growth should be given priority, even if the environment suffers to some extent?" The response "protect environment" is coded as 3, "equal priority" as 2, and "economic growth priority" as 1. The second question asks: "With which one of these statements about the environment and energy production do you most agree—protection of the environment should be given priority, even at the risk of limiting the amount of energy supplies—such as oil, gas and coal—which the United States produces (or) development of U.S. energy supplies—such as oil, gas and coal—should be given priority, even if the environment suffers to some extent?" The responses are similarly coded with higher values for protecting the environment over energy supplies. Panel A plots the temporal trend in gender differences (with 95% confidence intervals) in viewing the tradeoff between environmental protection and economic growth over four five-year periods (2001–2005, 2006–2010, 2011–2015, and 2016–2020) controlling for a respondent's age, education, and political party. Panel B plots the temporal trend in gender differences (with 95% confidence intervals) in viewing the tradeoff between environmental protection and energy supplies over four five-year periods (2001–2005, 2006–2010, 2011–2015, and 2016–2020) controlling for a respondent's age, education, and political party. The left-hand-side plot uses the full sample, and the right-hand-side plot uses only the top income tercile.

Panel A: Gender differences in viewing the tradeoff between environmental protection and economic growth over time

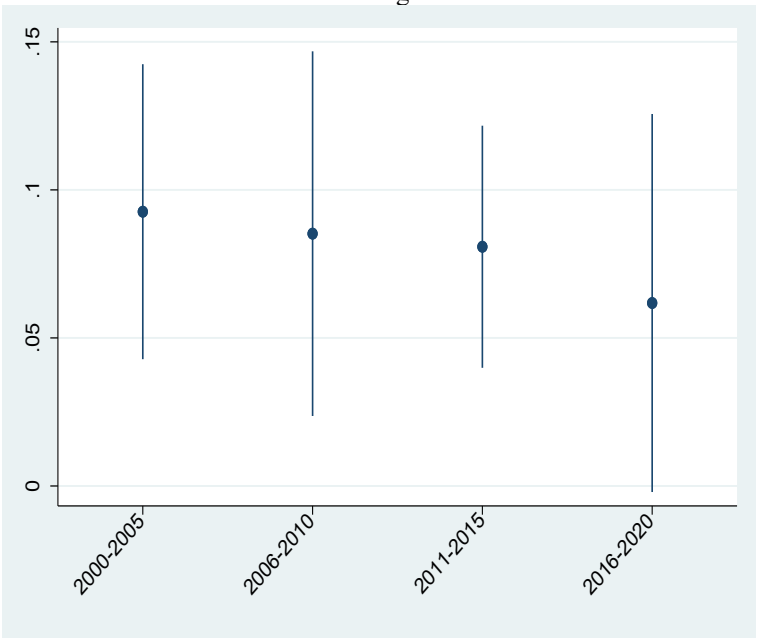


The full sample

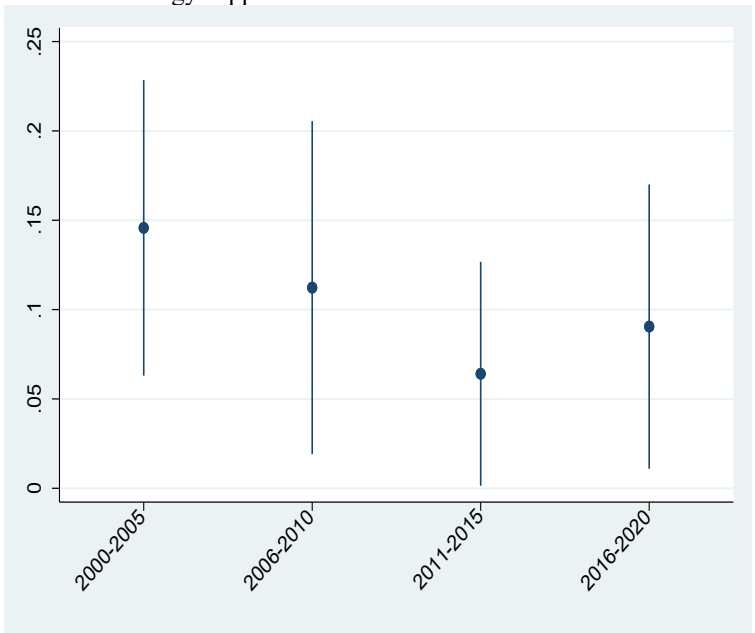


The top income tercile

Panel B: Gender differences in viewing the tradeoff between environmental protection and energy supplies over time



The full sample



The top income tercile

Section IA2. Databases for measuring corporate environmental performance

Refinitiv

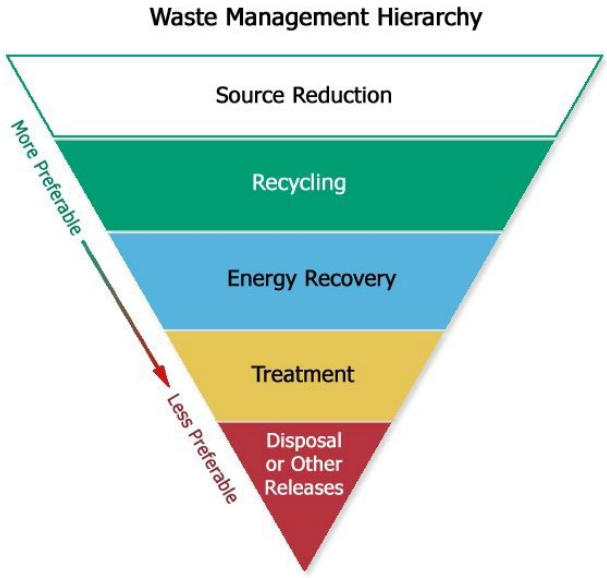
To measure corporate environmental performance, Refinitiv develops emissions reduction, innovation, and resource use scores. The emissions reduction score measures a company's commitment and effectiveness towards reducing environmental emissions in its production and operational processes. The resource use score measures 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. The innovation score measures 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 through eco-designed products.

EPA's TRI database

A. The Pollution Prevention (P2) database

The Pollution Prevention Act (P2 Act), approved by Congress in 1990, authorized the EPA to gather and disseminate information on pollution prevention activities (also known as source reduction activities). Such actions are compiled under the TRI database (in File Type 2A: https://www.epa.gov/toxics-release-inventory-tri-program/tri-basic-plus-data-files-calendar-years-1987-present). Facilities satisfying the following criteria are required to report to the TRI database: (1) in the mining, utility, manufacturing, publishing, hazardous waste, or federal industry; (2) manufacturing, processing, or otherwise using a TRI-listed chemical in quantities above certain threshold levels set by the EPA in a given year; and (3) having ten or more full-time equivalent employees.

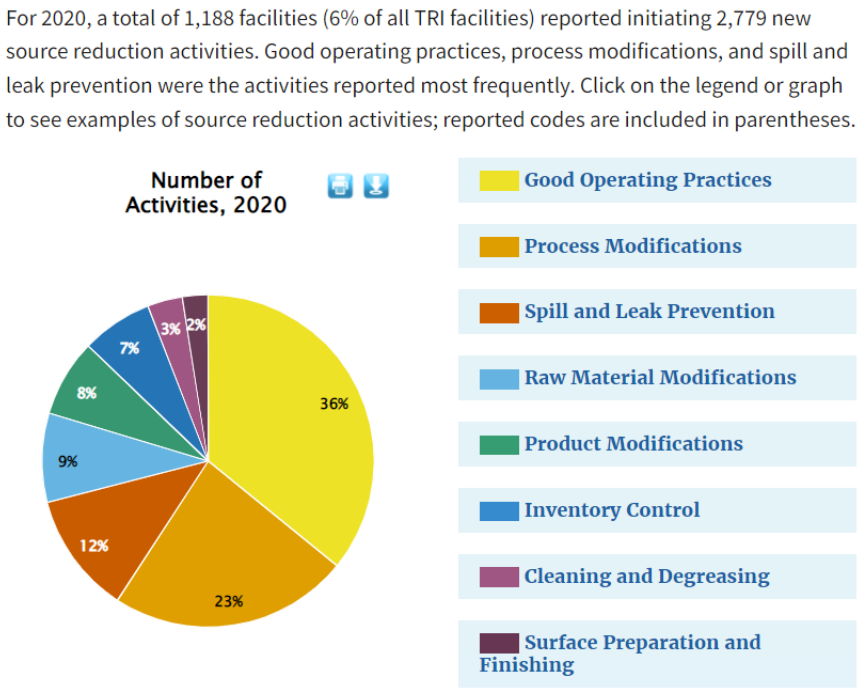
Facilities are required to disclose any source reduction practices implemented at their facilities to reduce production waste in the reporting year. Source reduction practices denote the first layer of the waste management hierarchy (see the figure below): Once potential production waste is reduced, firms do not need to recycle, recover, treat, and release it.



Source: https://www.epa.gov/trinationalanalysis/pollution-prevention-and-waste-management

Facilities report these newly implemented source reduction practices by selecting one or more predefined codes (W-codes) that describe specific practices within the eight categories: raw material modifications, product modifications, cleaning and degreasing, surface preparation and finishing, process modifications, spill and leak prevention, inventory control, and good operating practices (detailed definitions are provided at https://www.epa.gov/toxics-release-inventory-tri-program/pollution-prevention-p2-and-tri). Note that, since 2021, the classification of reduction practices has been changed to a system of S-codes, as seen in Appendix D of the following document: https://www.epa.gov/system/files/documents/2021-08/file_type_2a_0.pdf

The following pie chart illustrates the frequencies of eight categories of source reduction practices:



Source: https://www.epa.gov/toxics-release-inventory-tri-program/pollution-prevention-p2-and-tri

B. The Toxics Release Inventory (TRI) database

The TRI program was established by the EPA due to the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986. The TRI reporting started with the 1987 reporting year (first TRI reports due July 1st, 1988) and has continued to the present. In terms of coverage, we find more comprehensive coverage since 1991. By August 2022, the TRI toxic chemical list contains 775 individually listed chemicals and 33 chemical categories.

Each TRI-reporting facility reports the production and ultimate outlets of each chemical (see: https://www.epa.gov/toxics-release-inventory-tri-program/common-tri-terms). "Production waste" denotes the amount of all chemicals produced along with the production process. The outlets of those wastes include recycling, energy recovery, treatment, and releases (definitions are provided in the above link). The releases include air releases, water release, and land release (also defined in the above link).

After collecting all facility-level release data from the EPA website (https://www.epa.gov/toxics-release-inventory-tri-program), we use the link between facility id (TRIFD) and Compustat GVKEY, established by Chen, Hiseh, Hsu, and Ross (2022) based on matching facility names and parent company names.

In the TRI database, production waste captures the amount of TRI chemicals produced in the production procedure. Production waste will be treated, recycled, or released to the environment (air, water, or land). We focus on production waste because it better captures how many pollutants are produced, despite some may be treated or recycled later. See https://www.epa.gov/toxics-release-inventory-tri-program/common-tri-terms.

RepRisk

RepRisk data collection involves systematic screening of over 100,000 sources, including traditional and online media, NGOs, government bodies, regulators, and social media. We capture negative environmental news by focusing on news about a firm's violation of UNGC Principle 7 (supporting a precautionary approach to environmental challenges), Principle 8 (undertaking initiatives to promote greater environmental responsibility), or Principle 9 (encouraging the development and diffusion of environmentally friendly technologies).

Environmental news is the number of negative environmental news items, classified by the United Nations Global Compact (UNGC) and weighted by severity and reach scores. For example, if a firm has two events (A and B) related to the RepRisk classification in a year, and if Event A (B) is assigned of a severity score of 2 and a reach score of 2 (a severity score of 3 and a reach score of 1), then its Environmental news (RepRisk) is $2 \times 2 + 3 \times 1 = 7$ in the year.

Section IA3. Literature review of papers focusing on California's SB 826

This Appendix describes our process of conducting a literature review on SB 826, and synthesizes our findings.

In December 2024, We searched SSRN for papers with "SB 826" or "California Board Gender" in their title, abstract, or keywords. We identified 15 relevant papers, including 7 finance/business papers, and 8 law papers, that were posted before or around the time we posted our paper (November 2022). The table below lists their titles (with SSRN links), authors, main topics, and the number of citations. We also found 13 new finance or law papers (posted after November 2022, not listed in the table). The finance papers mainly focused on understanding the stock market responses to SB 826, as well as labor market conditions and director outcomes.

Heath, Ringgenberg, Samadi, and Werner (2023) and Cronqvist, Ladika, Pazaj, and Sautner (2024) discuss the compound exclusion restriction assumption for "re-used" quasi-natural experiments. Prior studies on, for example, how a regulatory shock affects firm policies other than what the focal paper studies, need to be considered and "compound" the overall exclusion restriction required. More prior studies on the same quasi-natural experiment, with different economic channels, make the overall compound exclusion restriction assumption harder to satisfy (from the perspective of required statistical significance).

Heath et al. (2023, p. 2343) suggest that "a good heuristic is that a new hypothesis should have a t-statistic of at least 2.5 if there are five prior findings and 3.0 if there are 20 prior findings using the same setting." Our DID results, reported in Table 3 Panel A, have t-stats > 3 (between 3.7 and 6.9). Given the strong statistical significance of our results, and few prior studies on corporate policy changes due to SB 826, we believe that the compound exclusion restriction assumption is likely satisfied in our context.

Finance papers				
	Title	Topic/Finding	Authors	SSRN Citations
1	Do Board Gender Quotas Affect Firm Value? Evidence from California Senate Bill No. 826	Stock market reactions and board changes following SB 826	Greene, Intintoli, and Kahle	49
2	How Deep is the Labor Market for Female Directors? Evidence from Mandated Director Appointments	Director qualification post SB 826	Greene, Intintoli, and Kahle	3
3	As California Goes, So Goes the Nation? Board Gender Quotas and Shareholders' Distaste of Government Interventions	Understanding stock market responses to SB 826 and its repeal	von Meyerinck, Niessen-Ruenzi, Schmid, and Solomon	9
4	Mandating Women on Boards: Evidence from the United States	SB 826 lowered shareholder value, increased credit risk, and reduced earnings forecasts, driven by supply constraints.	Hwang, Shivdasani and Simintzi	15
5	Gender Quotas and Support for Women in Board Elections	Shareholder support for board nominees under SB 826, and how it relates to market reactions	Gertsberg, Mollerstrom, and Pagel	0
6	Women on Boards of Public Companies Headquartered in California - 2018	Descriptive paper without hypothesis testing	Barret	0
7	Gender Quota and CEO PAY Performance Sensitivity: Evidence from the California Gender Quota Law	Effect of SB 826 on CEO-board dynamics	Qiu and Zhen	0

Law papers				
1	Mandating Gender Diversity in the Corporate Boardroom: The Inevitable Failure of California's SB 826	Legal assessment of SB 826	Grundfest	6
2	Board Gender Diversity: A Path to Achieving Substantive Equality in the U.S.	U.S. vs. EU board gender diversity efforts, advocating for constitutional reforms to achieve true equality in the U.S.	Houser and Williams	0
3	*Centros*, California's 'Women on Boards' Statute and the Scope of Regulatory Competition	EU's Centros decision vs. California's SB 826	Fisch and Solomon	0
4	Mandating Board Diversity	Legal assessment of California's board diversity laws	Kim	0
5	Board Diversity by Term Limits?	Term limits may improve board gender diversity by increasing turnover	Nili and Rosenblum	0
6	Gender and Corporate Crime : Do Women on the Board of Directors Reduce Corporate Bad Behavior?	Gender diversity on boards improves corporate compliance	Lazar, Baum, and Gafni	0
7	The Contested Edges of Internal Affairs	California's gender diversity law challenge Delaware's dominant role in corporate governance	Manesh	1
8	California Dreaming?	Legal assessment of SB 826	Rosenblum	1