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PLEADING PATTERNS AND THE ROLE OF LITIGATION AS A DRIVER OF FEDERAL CLIMATE CHANGE LEGISLATION

Juscelino F. Colares and Kosta Ristovski

ABSTRACT: Based on a variant of the Elliott-Ackerman-Millian theory that variable, potentially inconsistent and costly litigation outcomes induce industry to seek federal preemptive legislation to reign in such costs, we collect data on climate change-related litigation to determine whether litigation might motivate major greenhouse gas emitters to accept a preemptive, though possibly carbon-restricting, legislative compromise. We conduct a spectral cluster analysis on 178 initial federal and state judicial filings to reveal the most relevant groupings among climate change-related suits and their underlying pleading patterns. Besides exposing the general content and structure of climate change-related filings, this study identifies major specific pleading trends, such as the low frequency of tort claim pleading and the high level of segregation of state and federal causes of action. These data also allow investigating how generally applicable litigation doctrines have influenced pleading patterns, even subduing the impact of the two major U.S. Supreme Court rulings in this area. These findings lead us to conclude that this type of litigation has not induced, and is not likely to induce, major emitters to embrace preemptive emissions legislation as a risk-reducing compromise.

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Not unlike prior episodes of corporate opposition to regulatory action (for example, resistance to lead, asbestos, tobacco controls, and so forth), corporate lobbying against federal climate legislation has worked to undermine climate change mitigation efforts.¹ Although one should be careful not to overrate the role of lobbying expenditures or discount that of ideology in blocking passage of emission abatement legislation,² it is quite clear that such blockage has led to delayed action under otherwise suboptimal policy.³ Yet, a strategy that relies solely on legislative blockage may be of limited efficacy when climate change-related storm surges, coastal erosion, landslides, and other ancillary harms become more frequent and severe. Harmed individuals, businesses, and local and state governments may resort to litigation against the biggest greenhouse gas (GHG) emitters.

Litigation stakes and risks only rise further when one considers that common insurance policies, such as commercial general liability (CGL), may not cover defense or indemnity claims for climate change-related damages. The Supreme Court of Virginia recently held in *AES Corp. v. Steadfast Ins. Co.* that an insurer is not obligated to provide coverage to an insured defending a climate change-related nuisance claim where the alleged damages “were the natural and probable consequences of [the insured’s] intentional emissions.”⁴ AES, the insured power company and declaratory judgment defendant, was also one the defendants in a contemporaneous federal case filed by a native Alaskan village, Kivalina, located on an Alaskan barrier island.⁵ In that suit, the governing bodies of an Inupiat Eskimo village sought federal and state common law damages in federal court for various climate change-related harms, including erosion and uninhabitable conditions caused by rising sea

1. See, e.g., Juscelino F. Colares, *Paths to Carbon Stabilization: How Foreign Carbon-Restricting Reforms Will Affect US Industry, Climate Policy and the Prospects of a Binding Emission Reduction Treaty*, 47 J. WORLD TRADE 281, 292–98 (2013) (quantifying corporate lobbying the last time the U.S. Congress considered broad climate change legislation and positing that lobbying by some companies that publicly supported carbon-restricting legislation may have been public relations-motivated when their top officials sat in boards of trade groups that were lobbying contemporaneously against the bill); UNION OF CONCERNED SCIENTISTS, A CLIMATE OF CORPORATE CONTROL: HOW CORPORATIONS HAVE INFLUENCED THE U.S. DIALOGUE ON CLIMATE SCIENCE AND POLICY (2012), available at http://www.ucsusa.org/assets/documents/scientific_integrity/a-climate-of-corporate-control-report.pdf (providing empirical evidence of corporate feigned support for climate action and pointing to evidence of a concerted effort toward generating favorable public opinion).

2. See Colares, *supra* note 1, at 298 (describing the significant role ideology played in the failure of the 2009 climate bill).

3. In fact, once some threshold level of GHG concentrations is exceeded, delayed action likely increases marginal abatement costs and economic losses. See, e.g., Robert N. Stavins, *Policy Instruments for Climate Change: How Can National Governments Address a Global Problem?*, 1997 U. CHI. LEGAL F. 293, 314 (citing William D. Nordhaus, *The Cost of Slowing Climate Changes: A Survey*, 12 ENERGY J. 37, 61–63 (1991)). Moreover, the inexistence of a strong price signal for emissions in current federal law—whether through a carbon tax or cap-and-trade scheme—only exacerbates the suboptimality of pursuing carbon-restrictive action in the absence of a binding global emissions reduction treaty.

4. 725 S.E.2d 532, 620 (Va. 2012).

5. See *Native Vill. of Kivalina v. ExxonMobil Corp.*, 663 F. Supp. 2d 863, 869 (N.D. Cal. 2009).

levels and increasing coastal waves and surges.⁶ Once impleaded, Steadfast, the insurer, provided AES litigation coverage, but only “under a reservation of rights,” and filed for declaratory judgment action in Virginia state court, claiming that “it did not owe AES a defense or indemnity coverage for damage allegedly caused by AES’s contribution to global warming”⁷

In the state court action, Steadfast’s major argument was that its policy covered property damage only arising from an “occurrence.”⁸ The court explained that state courts had construed “occurrence,” under Virginia law, to mean harm that is objectively unforeseeable, not harm that is the foreseeable result of intentional conduct.⁹ Because the Kivalina plaintiffs alleged that “AES intentionally released carbon dioxide into the atmosphere as a regular part of its energy-producing activities,” and their complaint stated that “there is a clear scientific consensus that the natural and probable consequence of such emissions is global warming and damages such as Kivalina suffered,” the court concluded, “the natural or probable consequence of that intentional act is not an accident under Virginia law.”¹⁰ Simply put, AES and other similarly situated GHG emitters can no longer rely on traditional CGL policies to manage their litigation risks.

As the anthropogenic causes of climate change¹¹ gain wider policymaker and public recognition, and climate change effects materialize,¹² major GHG emitters are likely to find themselves the target of lawsuits for their intentional emissions just as their conduct falls outside the scope of ordinary, accident-focused insurance policies. Of course, new insurance products that provide broader climate change-related risk coverage are in the works. These products should help managing risk, but only at the cost of higher premia: insurance

6. *Id.* at 868. The Kivalina plaintiffs, appearing later as petitioners, alleged the absence of timely relief under the Clean Air Act (CAA) justified their request for relief under federal common law. *See* Petition for Writ of Certiorari at i, 16, *Native Vill. of Kivalina v. ExxonMobil Corp.*, 133 S. Ct. 2390 (2013) (No. 12-1072).

7. *AES Corp. v. Steadfast Ins. Co.*, 725 S.E.2d 532, 533 (2012).

8. *Id.* at 534.

9. *See id.* at 538.

10. *Id.* at 536–37.

11. *See, e.g.*, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS. CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE IPCC 10 (S. Solomon et al. eds., 2007), available at http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4_wg1_full_report.pdf (“Most of the observed increase in globally averaged temperatures since the mid-20th century is *very likely* [that is, 90–95% likely] due to the observed increase in anthropogenic greenhouse gas concentrations.”).

12. A recent study shows that the climate change-related sea level rise from 1950 to 2012 exacerbated the “extreme-event inundation” and economic losses in the area affected by Hurricane Sandy’s “abnormal” westward strike heading, and suggested that “events of less and less severity (from less powerful storms) will produce similar events.” *See* William Sweet et al., *Hurricane Sandy Inundation Probabilities Today and Tomorrow*, in EXPLAINING EXTREME EVENTS OF 2012 FROM A CLIMATE PERSPECTIVE, 94.9 BULL. AMER. METEOR. SOC. S17, S18–20 (2013), available at <http://www.ametsoc.org/2012extremeeventsclimate.pdf> (citation omitted). *But see, e.g.*, Elisabeth A. Barnes et al., *Model Projections of Atmospheric Steering of Sandy-Like Superstorms*, 110 PNAS 15211, 15211 (2013) (forecasting “a decrease in the frequency and persistence of the westward flow that led to Sandy’s unprecedented track, implying that future atmospheric conditions are less likely than at present to propel storms westwards into the coast”).

risk analysts are connecting growing GHG concentrations with the increasing frequency and cost of climate change-related events.¹³

This article seeks to explain the structure of climate change-related litigation to determine whether litigation can induce emitter support for federal preemptive, though possibly carbon-restricting, legislation. Relying on a variant of the Elliott-Ackerman-Millian (EAM) theory that the imposition of variable, potentially inconsistent and more costly litigation outcomes induces industry to seek preemptive federal legislation to reign in such costs,¹⁴ we examine whether the risk associated with diffuse litigation in state and federal courts—rather than inconsistent state regulations, as in the original theory—might motivate major GHG emitters to embrace preemptive emissions legislation as a risk-reducing compromise.

Because emitting industries take their cues from the evolving litigation environment, a catastrophic litigation loss need not occur before emitters abandon their aversion to legislation in response to an increase in perceived risk. Rising trends in litigation, if accompanied by industry-impacting injunctions and debilitating damages, would impose the kind of forward-looking risk on major GHG emitters that might justify a change in strategy.¹⁵ By contrast, a low volume of complaints that are not likely to produce such damaging, industry-wide outcomes may be no more than a nuisance that can be absorbed as the cost of conducting business as usual, thus leading to a refutation of our modified EAM theory. Thus, understanding the current structure and levels of climate change-related litigation is critical to determining where the potential sources of litigation risk lie and whether they may become substantial enough to change major GHG emitters' distaste for carbon-restricting legislation.

Part I provides a brief introduction to climate change-related civil litigation and develops a strategy for obtaining relevant information from initial complaints and appellate briefs filed before state and federal courts from 1990 to 2013. Data collected on causes of action pled in each of 178 original judicial filings (that is, original complaints and appellate briefs) allow us to perform a cluster analysis. Besides revealing the general structure of climate

13. See, e.g., CHASING ICE (Diamond Docs et al. 2012) (“[O]ur activities, primarily [GHG] emissions are already contributing to more intense and more events—it cannot be explained by just better reporting, it has to be explained by changes in the atmospheric conditions.” (according to Peter Hoeppe, Head of Geo Risks Research, Munich Reinsurance)); Evan Mills, *The Role of U.S. Insurance Regulators in Responding to Climate Change*, 26 UCLA J. ENVTL. L. & POLICY 129, 132 (2007) (positing that “rising weather-related losses are expected [and] will have adverse impacts on insurance affordability and availability”).

14. See E. Donald Elliott et al., *Toward a Theory of Statutory Evolution: The Federalization of Environmental Law*, 1 J.L. ECON. & ORG. 313–40 (1985). Elliott and his coauthors were interested in solving the puzzle created by the wave of environmental statutes approved in the 1965–1970 period, when the environmental movement was “not yet well-organized as a conventional interest group in Washington,” which “seem[ed] to contradict the usual wisdom that statutes are passed in response to political activity by well-organized pressure groups.” *Id.* at 313. “Preemptive federalization” was one of the theories the triad proposed.

15. For an example of how litigation can have a deep impact on an entire industry, see ANDREW P. MORRIS ET AL., *Tobacco Litigation*, in REGULATION BY LITIGATION, 126–59 (2009).

change-related filings, these data also help us detect some specific, major pleading trends, such as the low frequency of tort claim pleading, and the high level of segregation of state and federal causes of action in suits brought in this area (Part II). We take further advantage of these rich data to test a few hypotheses, including whether the displacement of federal common law claims in *AEP v. Connecticut*¹⁶ has led to an increase in the number of state law-based causes of action raised in more recent complaints (Part III). Although preliminary tests reveal that plaintiffs seem to be adjusting to *AEP* by pleading more state law-based causes of action, we anticipate standing and state law preemption challenges will become harder to overcome as the scope and pace of EPA's regulatory work under the existing CAA structure increases. Because neither state or federal litigation is likely to produce levels of legal uncertainty or catastrophic liability risk strong enough to persuade major GHG emitters to shift in favor federal preemptive legislation, we rule out our "litigation *qua* preemptive federalization" thesis (Part IV). Thus, notwithstanding the liberal pleading philosophy in the United States, generally applicable litigation doctrines are likely to continue restricting climate change pleading, even subduing the impact of major U.S. Supreme Court rulings in this area.

I. CLIMATE CHANGE-RELATED LITIGATION

A. Overview

To date, climate change-related litigation does not appear to have been more than a minor "nuisance" to major GHG emitters. Federal common law nuisance suits have been infrequent, and plaintiffs in the only four reported cases have not had any success.¹⁷ Cases pursuing different causes of action have been dismissed on threshold grounds (for example, standing, displacement, and political question).¹⁸ While displacement of federal common law

16. See *AEP v. Connecticut*, 131 S. Ct. 2527, 2537 (2011) (holding that the CAA and the EPA action under the Act's authorization displaces any federal right to seek CO₂ emission-based nuisance abatement from stationary sources).

17. *AEP v. Connecticut*, 131 S. Ct. 2527, 2537 (2011) (holding that the CAA and the EPA action under the Act's authorization displaces any federal right to seek CO₂ emission-based nuisance abatement from stationary sources); *Native Vill. of Kivalina v. ExxonMobil Co.*, 696 F.3d 849, 857–58 (9th Cir. 2012) (holding that the Clean Air Act and the EPA actions it authorizes displace federal common law causes of action as well as any federal damage remedy asserted for harm caused by past GHG emissions), *cert. denied*, 133 S. Ct. 2390 (2013) (No. 12-1072); *People of State of California v. Gen. Motors Corp.*, No. C06-05755 MJJ, 2007 WL 2726871, at *13 (N.D. Cal. Sep. 17, 2007) (granting defendants' motion to dismiss plaintiff's complaint on nonjusticiable, political question grounds); *Korsinsky v. EPA*, No. 05 Civ. 859(NRB), 2005 WL 2414744, at *2–3 (S.D.N.Y. Sep. 29, 2005) (granting defendants' motion to dismiss because plaintiff's alleged injuries were too hypothetical and speculative to confer standing).

18. See, e.g., *Amigos Bravos v. BLM*, 816 F. Supp. 2d 1118, 1128–29 (D.N.M. 2011) (holding that plaintiffs failed to establish standing because there was no scientific evidence that climate change would lead to the kinds of harms alleged or that climate change created an imminent threat of harm); *Foundation on Econ. Trends v. Watkins*, 794 F. Supp. 395 (D.D.C. 1992) (holding that the plaintiff did not suffer a distinct injury for standing purposes from the defendant's failure to comply with NEPA); *Ctr. for Biological Diversity v. U.S. Dept. of Interior*, 563 F.3d 466, 480 (D.C. Cir. 2009) (holding that one of plaintiff's claims was not ripe for review because approval of a lease for offshore drilling had not reached the "critical stage where an irreversible and irretrieva-

claims remains a serious obstacle to nuisance claims, alternative climate change-related causes of action under existing federal environmental statutes and under state law remain open to willing plaintiffs.¹⁹ The recent *Kivalina* decision reiterated this point. While the Ninth Circuit focused its ruling on federal issues (that is, separation of powers, displacement of federal common law and the applicability of displacement regardless of the type of remedy asserted),²⁰ it recognized plaintiffs' right to pursue their state law-based claims in state court, which the district court had dismissed.²¹

Yet when plaintiffs have reached the merits, generally they have not been successful.²² As of this writing, one major exception stands out: in *Friends of the Earth et al. v. Mosbacher*, a group of environmental activists and cities sued two U.S. agencies for funding and insuring fossil fuel projects without considering their environmental impacts, which they claimed constituted a violation of the National Environmental Policy Act (NEPA).²³ Plaintiffs charged that Overseas Private Investment Corporation (OPIC) and Export-Import Bank of the United States (Ex-Im Bank) loans as well as other financial "assistance for fossil fuel projects . . . will result in . . . emissions equivalent to

ble commitment of resources ha[d] occurred"); *Comer v. Murphy Oil*, 839 F.Supp.2d 849, 864 (S.D. Miss. 2012) (holding that the political question doctrine precludes the court from making determinations regarding the reasonableness of the CO₂ emissions and that that such determinations should be left to the EPA, the delegated agency).

19. However, these claims and related remedies remain open to plaintiffs only to the extent they are "not preempted by federal law." See AEP, 131 S. Ct. at 2540 (citing and quoting *Int'l Paper Co. v. Ouellette*, 479 U.S. 481, 489, 491, 497 (1987) (holding that the Clean Water Act does not preclude aggrieved individuals from bringing a "nuisance claim pursuant to the law of the source State") (emphasis on the original).

20. See *Kivalina*, 696 F.3d at 856–57.

21. *Id.* at 866 (Pro, J., concurring) ("Kivalina may pursue whatever remedies it may have under state law to the extent their claims are not preempted.").

22. See, e.g., *Peters v. Am. Honda Motor Co., Inc.*, No. 11S002156, 2012 WL 1654112, at *1, *2 (Cal. Sup. Ct. May 8, 2012) (holding that a vehicle producer is not obligated to compensate vehicle purchasers for reliance on incorrect fuel economy ratings); *League of Wilderness Defenders-Blue Mountains Biodiversity Project v. Martin*, No. 2:10-CV-1346-BR, 2011 WL 2493765, at *1–11 (D. Or. June 23, 2011) (deferring to the U.S. Forest Service's discretion in determining whether to prepare an environmental assessment as opposed to an environmental impact statement to address the potential impacts of climate change); *Okeson v. City of Seattle*, 78 P.3d 1279 (Wash. 2003) (holding that utility ratepayers are not obligated to bear the costs of climate change-related harms and other maintenance expenses from the use of electricity for public streetlights); *Seattle Audubon Soc'y. v. Lyons*, 871 F.Supp. 1291 (W.D. Wash. 1994) (upholding defendant's regulatory compliance defense and explaining that should be the case even where, as plaintiff alleged, compliance was inadequate to appropriately combat the harmful effects of climate change); *City of Los Angeles v. NHTSA*, 912 F.2d 478 (D.C. Cir. 1990) (holding that, while the plaintiffs had standing, the defendant's decision to refrain from preparing environmental impact statements did not conflict with the relevant law).

23. *Friends of the Earth, Inc. v. Mosbacher*, 488 F. Supp. 2d 889, 892 (N.D. Cal. 2007). The challenged agencies were the Overseas Private Investment Corporation (OPIC) and the Export-Import Bank of the United States (Ex-Im Bank). Other settlements include the *Tennessee Valley Authority Clean Air Act Settlement*, U.S. ENVTL. PROT. AGENCY (Apr. 14, 2011), <http://www2.epa.gov/enforcement/tennessee-valley-authority-clean-air-act-settlement> (outlining the settlement agreement requiring defendant agency to invest in clean energy projects).

almost two-thirds of U.S. annual” GHG emissions.²⁴ After the district court denied cross-motions for summary judgment,²⁵ the parties reached a settlement that required each agency to offer at least \$250 million in financing for renewable energy projects for a period of ten years.²⁶

At first glance, litigation volume appears rather low in the climate change area. Yet, frequency of litigation can be a poor proxy for litigation risk, particularly if one considers how a single major legal development may affect a defendant’s expected liability.²⁷ Corporate boardrooms have probably not forgotten the fast turn of events leading to the tobacco settlement following the Supreme Court decision in *Cipollone v. Liggett Group, Inc.*²⁸ A breakthrough on preemption doctrine, *Cipollone*’s displacement of federal common law suits led to state attorneys general’s healthcare-cost-reimbursement suits against the tobacco companies and their subsequent catastrophic loss, known as the tobacco settlement.²⁹ As in *Cipollone*, the displacement of federal common law remedies in *AEP* is hardly the death knell for state common law claims resulting from climate change effects associated with GHG emissions. However, while major GHG emitters may have reason to anticipate a rise in state law-based claim pleading, the unequivocal federal occupation of this area, illustrated by the incremental growth in the climate change regulatory framework

24. Complaint for Declaratory and Injunctive Relief (Second Amended) at 2, *Friends of the Earth, Inc. v. Mosbacher*, 488 F. Supp. 2d 889 (N.D. Cal. 2007) (No. 3-02CV04106).

25. *Mosbacher*, 488 F. Supp. 2d at 920.

26. See, e.g., LISE JOHNSON, ADDRESSING CLIMATE CHANGE MITIGATION AND ADAPTATION THROUGH INSURANCE FOR OVERSEAS INVESTMENTS: THE EXAMPLE OF THE U.S. OVERSEAS PRIVATE INVESTMENT CORPORATION (OPIC) 7–8 (2012), available at http://www.iisd.org/sites/default/files/pdf/2012/opic_agriculture_mitigation.pdf (describing the settlement agreement between Friends of the Earth and OPIC); Settlement Agreement Export-Import Bank of the United States Ex. A, at § 4a(1)(b), *Friends of the Earth, Inc. v. Mosbacher*, 488 F. Supp. 2d 889 (N.D. Cal. 2007) (No. 3-02CV04106), ECF No. 217-1 (outlining the February 6, 2009 settlement agreement between Friends of the Earth and Ex-Im Bank). The federal district court dismissed the complaint with prejudice pursuant to the settlement agreement. Order for Dismissal with Prejudice, *Friends of the Earth, Inc. v. Mosbacher*, 488 F. Supp. 2d 889 (N.D. Cal. 2007) (No. 3-02CV04106), ECF No. 217. There have been other, though much less prominent, exceptions. See Negotiated Resolution of Consolidated Civil Action, Coal. for Env’tl. Integrity in Yucca Valley v. Town of Yucca Valley, No. CIVSS 810232 (San Bernardino Co. Sup. Ct. Mar. 4, 2010) (outlining the settlement agreement requiring defendant to take additional GHG mitigation measures); Order regarding Settlement at 2–3, *California v. San Bernardino County*, No. CIVSS 0700329 (San Bernardino Co. Sup. Ct. Aug. 28, 2007) (approving settlement agreement that required San Bernardino County to identify GHG emissions resulting from city plans, evaluate the effect of these GHG emissions on climate change and mitigate the effects of anticipated GHG emissions); *Nw Env’tl. Def. Ctr. v. Owens Corning Corp.*, 434 F. Supp. 2d 957 (D. Or. 2006) (preceding a subsequent settlement requiring defendants to abstain from emission of harmful GHGs).

27. Of course, a defendant’s litigation risk is also affected by potential plaintiffs’ expected litigation value, which, in turn, is a function of their expected pecuniary returns and perceived stake in a dispute. See Theodore Eisenberg & Henry S. Farber, *The Litigious Plaintiff Hypothesis: Case Selection and Resolution*, 28 RAND J. ECON. S92, S93–94 (1997).

28. 505 U.S. 504, 511 (1992).

29. See, e.g., Robert L. Rabin, *Reassessing Regulatory Compliance*, 88 GEO. L.J. 2049, 2054–55 (1999) (stating that “the opinion was so closely tied to the particular statute under consideration [that is, the Federal Labeling Act] that no generalizable preemption principles could be gleaned from its language.”).

(for example, EPA establishment of emission, fuel economy and performance standards, and so forth),³⁰ leaves doubts about the extent to which state law can significantly increase those risks. Moreover, risk associated with a growing number of state-based claims is likely to be diminished because of formidable standing challenges facing such plaintiffs, a topic we discuss in Part II.A.³¹

In sum, the generally applicable doctrines of standing, federal common law displacement and state law preemption, among other threshold defenses, give major GHG emitters some peace of mind as far as litigation risk is concerned. Although an expanding regulatory framework may increase costs to these entities (including the cost associated with fighting such regulations), the litigation risk associated with regulatory suits is small relative to the risk from suits for imminent destruction of property due to climate change effects, as in *Kivalina*. Litigation over regulatory compliance is certainly much narrower, involving, typically, more focused inquiry into defendants' compliance with prewritten rules rather than adherence to abstract liability standards, which can become unwieldy for corporate defendants.³² Arguably, a rise in riskier tort litigation would induce such defendants to be more favorable towards reform, and would increase the political prospects of federal climate legislation. Theo-

30. See, e.g., Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66,496 (Dec. 15, 2009) (to be codified at 40 C.F.R. ch.1) (EPA's original Endangerment Finding under the CAA); Reconsideration of Interpretation of Regulations that Determine Pollutants Covered by Clean Air Act Permitting Programs, 75 Fed. Reg. 17,004 (Apr. 2, 2010) (to be codified at 40 C.F.R. pt. 50, 51, 70, and 71) (Timing Rule); Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards, 75 Fed. Reg. 25,324 (May 7, 2010) (to be codified at 49 C.F.R. pt. 531, 533, 536, 537, and 538) (Tailpipe Rule); Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, 75 Fed. Reg. 31,514 (June 3, 2010) (to be codified at 40 C.F.R. pt. 51, 52, 70, and 71) (Tailoring Rule); Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles, 76 Fed. Reg. 57,106 (Sept. 15, 2011) (to be codified at 40 C.F.R. pt. 85, 86, 600, 1033, 1036, 1037, 1039, 1065, 1066, and 1068; and 49 CFR pt. 523, 534, and 535); Standards of Performance for Greenhouse Gas Emissions for New Stationary Sources: Electric Utility Generating Units, 77 Fed. Reg. 22,392 (proposed Apr. 13, 2012) (to be codified at 40 C.F.R. pt. 60) ("proposed 'new source performance standards' (NSPS) rule" for new fossil-fuel-fired power plants rated at more than 24 megawatts); Oil and Natural Gas Sector: New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants Reviews, 77 Fed. Reg. 49,490 (Aug. 16, 2012) (to be codified at 40 C.F.R. pt. 60, and 63) (new rules that regulate volatile organic compound (VOC) emissions from gas wells and storage vessels, including leaking components at onshore natural and shale gas processing plants and that will go into effect in 2015).

31. Specifically, the traceability (that is, causation) prong remains the major hurdle for climate change plaintiffs.

32. Of course, regulatory claims can be brought together with tort claims, and regulatory compliance *alone* may not shield corporate defendants from tort-based theories of liability. See Restatement (Third) of Torts: Products Liability § 4 cmt. e (1997) ("standards set by most product safety statutes or regulations generally are only minimum standards" that "leave open the question of whether a higher standard of product safety should be applied."). Yet, not infrequently, courts find compliance with "a particular product standard set by statute or regulation" to be conclusive against tort liability where the standard at issue "adequately serves the objectives of tort law" *Id.*

retical musings aside, what data did we use to study climate change-related litigation and what did such data reveal?

B. Causes of Action and Pleading

To study this area of litigation, we chose causes of action as our unit of analysis. Before explaining the methodological reasons for this choice, we first note that the term “cause of action” is a term of art meant to loosely describe “the ‘legal theory,’ or substantive right” associated with a grouping of facts that a plaintiff alleges as the basis for her request for legal relief.³³ Although the U.S. Supreme Court has cautioned against broad, sweeping use of the term “unrelated to the *function* which [sic] the concept serves in a particular situation,”³⁴ our use of the term is uncontroversial. Because we are not concerned with the scope of issue or claim preclusion—where a broad construction of “cause of action” or factual groupings can lead to preclusive effects—we are comfortable with using cause of action interchangeably with “claim,” as the latter term is used throughout Rules 8 and 18 of the Federal Rules of Civil Procedure (Federal Rules), to liberally designate a plea for relief grounded on facts that call for the application of a legal theory.

Due to the Federal Rules’ liberal provision for joinder of multiple claims under Rules 8 and 18, federal judges’ high threshold for applying Rule 11 sanctions and res judicata principles, plaintiffs have traditionally had strong incentives to plead as many causes of action as they deem fit. The same incentives appear in the procedural law of many states, which, under the influence of the Second Restatement of Judgments’ transactional approach, induces plaintiffs to plead broadly and avoid splitting claims, because it may result in preclusion. The only major long-term check on state plaintiffs’ pleading creativity has been the federal removal statute.³⁵ This statute allows defendants to remove suits containing causes of action arising under federal law, also allowing out-of-state defendants to remove suits containing state law-based causes of action that satisfy federal diversity jurisdiction.³⁶ The upshot is that removal dampens state court plaintiffs’ interest in pleading some causes of action—particularly those within the original jurisdiction of federal courts—and joining out-of-state defendants. That plaintiffs’ win rate in removed cases is lower than their win rate in state court cases (and even cases originating in federal court) illustrates how removal diminishes plaintiffs’ forum advantage.³⁷ Argu-

33. See RICHARD H. FIELD ET AL., MATERIALS FOR A BASIC COURSE IN CIVIL PROCEDURE 46 (10th ed. 2010).

34. *United States v. Dickinson*, 331 U.S. 745, 748 (1947) (emphasis added) (citation and quotation omitted).

35. See 28 U.S.C. § 1441(a)–(b) (2011).

36. Note that claims not within the original or supplemental jurisdiction of the federal courts must be remanded upon removal. See 28 U.S.C. § 1441(c)(2) (2011).

37. See, e.g., Kevin M. Clermont & Theodore Eisenberg, *Do Case Outcomes Really Reveal Anything about the Legal System? Win Rates and Removal Jurisdiction*, 83 CORNELL L. REV. 581, 593–94 tbl.1, 597–606 (1998) (indicating that the win rate in original diversity cases is 71 percent, but for removed diversity cases is only 34 percent, and demonstrating, through several regressions, that, while case selection influences this result, removal does have a direct effect on outcomes).

ably, this would motivate plaintiffs to plead more carefully and occasionally reduce the number of causes of actions in a complaint.

Besides removal, a recent U.S. Supreme Court decision on pleading standards has likely suppressed plaintiffs' selection of causes of action for litigation and thus possibly affected the number of causes of action we detect in our study. After a succession of lower federal court rulings that tightened pleading requirements,³⁸ the Court, in *Bell Atlantic v. Twombly*, upheld dismissal on a preanswer Rule 12(b)(6) motion of plaintiffs' allegations of parallel conduct in support of illegal conspiracy claims in violation of antitrust laws. The Court held that plaintiffs' conclusory factual assertions of parallel conduct, though conceivable, lacked the factual detail to make their conspiracy allegations "plausible" and thus did not meet the Rule 8(a)(2) pleading standard.³⁹ While five-decade-old Supreme Court precedent interpreting Rule 8(a)(2)'s "short and plain statement of the claim" language adopted the conception of bare bones "notice pleading,"⁴⁰ *Twombly* effectively created a new standard that requires "testing factual strength at the pleading stage," to determine a complaint's "convincingness."⁴¹ This new, more searching test has likely suppressed a number of causes of action that would survive the prior standard.⁴² In a recent study that used cause-of-action level data obtained from complaints filed in federal courts, Christina Boyd and her coauthors detected a net reduction in the number of causes of action pled in civil complaints.⁴³ Whether

38. See, e.g., Christopher M. Fairman, *The Myth of Notice Pleading*, 45 ARIZ. L. REV. 987, 1003–04 n. 114 (2003) (citing *Goad v. Mitchell*, 297 F.3d 497, 504 (6th Cir. 2002) and *Judge v. City of Lowell*, 160 F.3d 67, 74 (1st Cir. 1998) as examples of appellate court decisions requiring "a plaintiff to plead—pre-discovery—specific facts concerning the defendant's state of mind irrespective of Rule 9(b), which allows state of mind to be alleged generally."). But see, e.g., *Swierkiewicz v. Sorema, N.A.*, 534 U.S. 506, 514–15 (2002) (holding unanimously that Rule 8(a)(2)'s notice standard does not require a complaint to provide particularized fact-based allegations in support of an employment discrimination claim). Note that as late as *Sorema*, the Court had indicated that requiring greater factual specificity at the pleading stage would have to come "by amending the Federal Rules, and not by judicial interpretation." See *id.* at 515 (citations omitted).

39. See *Bell Atlantic Corp. v. Twombly*, 550 U.S. 544, 556 (2007). To clear out remaining doubts about the general applicability of *Twombly*, the Court expressly held two years later that "*Twombly* expounded the pleading standard for 'all civil actions,' and it applies to antitrust and discrimination suits alike." See *Ashcroft v. Iqbal*, 556 U.S. 662, 684 (2009) (citation omitted).

40. See *Conley v. Gibson*, 355 U.S. 41, 47–48 (1957) (explaining that "all the Rules require is 'a short and plain statement of the claim' that will give the defendant fair notice of what the plaintiff's claim is and the grounds upon which it rests . . ." and that "[s]uch simplified 'notice pleading' is made possible by the liberal opportunity for discovery and the other pretrial procedures established by the Rules to disclose more precisely the basis of both claim and defense and to define more narrowly the disputed facts and issues.") (citations omitted).

41. See FIELD ET AL., *supra* note 33, at 43.

42. For a critical approach to *Twombly*'s heightened pleading standard and careful theoretical analysis of its likely claim-suppressing effect on pleading and repercussions regarding motion practice see Arthur R. Miller, *From Conley to Twombly to Iqbal: A Double Play on the Federal Rules of Civil Procedure*, 60 DUKE L.J. 1 (2010).

43. Christina Boyd et al., *Building a Taxonomy of Litigation: Clusters of Causes of Action in Federal Complaints*, 10 J. EMPIRICAL LEGAL STUD. 253, 273–74 (2013). Boyd and her coauthors worked with a large sample of complaints containing causes of action in 19 diverse issue areas. *Id.* at 260.

Twombly has caused plaintiffs in climate change-related suits to plead fewer causes of action will be discussed in Part III.B, when we examine the impact of two major U.S. Supreme Court decisions on plaintiffs' selection of causes of action in climate change-related complaints. With these preliminary comments on pleading and the concept of cause of action in mind, we now explain how we compiled data on causes of action from complaints filed in state and federal courts.

C. Data and Methodology

1. The Data

To obtain information regarding litigation involving climate change-related issues, we conducted some initial prospective searches in Westlaw for complaints and decisions involving climate change-related disputes. Although we wanted to focus only on cases where climate change issues were relevant and material to the pleadings and final outcomes of litigation, we started by conducting searches that were broad enough to capture all well-known "climate change" complaints and opinions (for example, *Massachusetts v. EPA*, *Comer v. Murphy Oil USA, Inc.*, *Connecticut v. AEP*, *Kivalina v. Exxon*, and so forth), but not so broad as to capture an unmanageable amount of cases where terms, such as climate change, were merely incidental or used to refer to the broader legal concepts discussed in those famous cases.

For this study, "relevant" climate change-related complaints or opinions occur where plaintiffs raise one or more causes of action arising under either statutory, regulatory or common law that, under the facts alleged, could lead to judicial relief (for example, injunctive, declaratory, and compensatory) associated with climate change or its effects. Furthermore, because the object of this study is to determine whether a rise in litigation risk will affect GHG emitters' interest in federal legislation, we discarded cases where the latter challenged environmental statutes and regulations. In these industry-initiated cases,⁴⁴ a win would decrease GHG emitters' present or projected costs, which is the opposite of what this study attempts to gauge.⁴⁵ In sum, we only collected complaints that *raise* GHG emitters' litigation risk *ex ante*. We did so because, under our modified EAM theory, only risk-increasing adjudication (among all climate change-related adjudication), with its possibility of creating variable

44. In some of these excluded cases, plaintiffs can be industry-sympathetic state governments, small government supporters and industry groups, such as the National Association of Manufacturers and the U.S. Chamber of Commerce. *See, e.g., Coal. for Responsible Regulation, Inc. v. EPA*, Nos. 09-1322 et al., 2010 WL 5509187 (D.C. Cir. Dec. 10, 2010) (per curiam) (denying and granting different motions made by plaintiffs who challenged EPA's 2009 Endangerment Finding). Although this particular rule did not itself increase costs for GHG emitters, it was the necessary precursor to regulations that, once finalized, would. *See* sources cited *supra* note 30. Therefore, because this type of filing was an attempt to reduce GHG emitters' costs, we did not include it in our dataset.

45. For a prior empirical discussion of general outcomes in climate change cases regardless of their risk implication for major GHG emitters, see David Markell & J.B. Ruhl, *An Empirical Assessment of Climate Change in the Courts: A New Jurisprudence or Business as Usual?*, 64 FLA. L. REV. 15 (2012).

and potentially inconsistent standards, could alter major GHG emitters' structure of incentives, leading them to choose preemptive, though possibly carbon-restricting, legislation over costly and inconsistent litigation.

Thus defined, we began collecting data on climate change-related litigation (complaints and judicial opinions) that occurred from January 1, 1990 to June 30, 2013. After fine-tuning earlier overinclusive searches and witnessing some gaps in the available databases, we settled on the following strategy: (1) searching for judicial opinions;⁴⁶ (2) determining and coding the relevant opinions; (3) using the opinions to find as many initial judicial filings as possible (for example, original complaints filed in courts of first resort and original briefs filed in appellate courts following initial administrative proceedings);⁴⁷ and (4) realizing that opinions are only a subset of the larger population of complaints, undertaking an exclusively complaint-focused search (that is, regardless of the occurrence of any case disposition).⁴⁸ The goal was also to extract information (for example, types, frequency, co-occurrence of causes of action pleaded, and dates of initial filings) embedded in the universe of climate change-related civil complaints, which is not fully reflected in judicial opinions, the latter representing only the *filtered* accounts of adjudication.⁴⁹ Furthermore, obtaining complaint data would be helpful in restricting case selection effects from tainting future analysis of case outcomes (the topic of a subsequent study), with the added advantage of giving us the best possible

46. This opinion-focused search, conducted in WestlawNext, targeted cases with at least one disposition or opinion. It contained the following terms: "g.h.g. (greenhouse /3 gas /3 emi!) (chang! /3 climate) ("global warming") & DA(aft 12-31-1989) % industry." An overinclusive original effort, this search produced 609 cases. After weeding out irrelevant disputes we obtained 126 opinions. Cross-referencing the results of this search with an available online database maintained by Michael B. Gerrard, Senior Counsel, Arnold & Porter, LLP (New York, NY), we detected 18 missing opinions, which were then included in the database. Gerrard's database is available at <http://climatecasechart.com>. In contrast, this opinion-based search detected 12 relevant opinions that do not appear in Gerrard's database. A subsequent complaint-based search (see step (iv)) would produce 12 additional opinions, bringing the opinion total to 156.

47. We obtained these original filings (hereinafter broadly referred to as "complaints") from the opinions detected by clicking on the "Filings" tab in WestlawNext. As empirical legal researchers are aware, Westlaw has many but not all original complaints. We located a few missing complaints by using Bloomberg Law's "Search Dockets" feature in the "Litigation and Dockets" tab.

48. This complaint-focused search was conducted in WestlawNext and contained the following terms: "g.h.g. (greenhouse /3 gas /3 emi!) (chang! /3 climate) ("global warming") & ("environmental law") & DA(aft 12-31-1989)." This search contained 169 entries, which yielded about 110 relevant complaints, 24 of which had not appeared in previous opinion-focused searches and databases. In addition, this search led to the discovery of 12 new relevant opinions. See *supra* note 46. When appellate briefs were the original judicial filing of interest, we chose not to search for the original agency petitions due to the limited and inconsistent availability of such filings in electronic databases.

49. See, e.g., Kevin M. Clermont & Theodore Eisenberg, *Litigation Realities*, 88 CORNELL L. REV. 119, 138 (2002) (explaining how win-rate data generated from judicial opinions "reveals little about the underlying, variegated mass of disputes and cases."). See generally George L. Priest & Benjamin Klein, *The Selection of Disputes for Litigation*, 13 J. LEGAL STUD. 1 (1984) (explaining how doctrinal information focused only on case outcomes discloses little about how legal rules affect behavior or affect the generation of legal disputes).

estimate of currently pending or inactive climate change-related cases in the state and federal court systems.

To account for mismatches between opinions without complaints and complaints without opinions and fill occasional gaps in the Westlaw and Bloomberg Law databases, we turned to PACER (for federal cases), different state court databases, and, as a last resort, environmental nongovernmental organizations (NGOs), corporate or government defendants, and original plaintiffs' attorneys.⁵⁰ Throughout this exercise, the goal was to obtain the population of relevant climate change-related complaints and available opinions. After collection and coding, we have 178 of 182 total detected complaints. Table 1 summarizes the complaints we found.

Table 1. Status of Complaints

Status	Number of Observations
Fully Coded	178
Not Fully Coded	4
Total	182

While we are very confident that this mixed strategy captured the entire population of relevant climate change-related original judicial filings, it is possible we missed an occasional complaint. A few undetected complaints are not likely to change the overall composition of the data nor the conclusions reached regarding the status and structure of climate change-related litigation.

2. Coding Causes of Action in Complaints

After cataloging all state and federal complaints, we coded the causes of action for each complaint. To conduct spectral cluster analysis and hypothesis testing, we developed the following cause of action extraction protocol. For each complaint, we identified causes of action based on the claims or counts plaintiffs alleged. We excluded pure request for remedies, such as attorneys' fees, damages, declaratory judgment or injunctions, commonly phrased as separate "counts," "claims" or expressly "causes of action," to ensure we only captured *substantive* causes of action. Although we had some preexisting expectations regarding the main categories of causes of action based on our familiarity with pleading practice in this field, the final list of categories

50. For the seven complaints we knew were missing but could not obtain electronically, we contacted attorneys and asked for their original filings. The authors thank James P. Peters, Esq. (Glenwood, MN) (one complaint) and John McClendon, Esq. (Laguna Hills, CA) (two complaints) for kindly responding to our requests and sending us electronic copies of the complaints they filed on behalf of their plaintiff clients. As of this writing, four requests remain unanswered.

remained open until we coded the last complaint. Thus, out of 178 complaints coded, we extracted 360 individual causes of action, which we classified under 21 general categories. Table 2 lists these categories, and the two columns on the right provide their percentages and frequencies:

Table 2. Cause of Action Categories⁵¹

Main Category	Subcategories	% of Causes of Action	Raw #
F. Ag. Reg.	Bureau of Land Management Regulations, Fish & Wildlife Service Regulations	1.39%	5
F. APA	N/A	13.06%	47
F. CAA	N/A	4.44%	16
F. CWA	N/A	1.67%	6
F. ESA	N/A	9.44%	34
FLMPA	N/A	2.78%	10
F. FOIA	N/A	1.39%	5
F. NEPA	N/A	19.44%	70
F. NHPA	N/A	1.94%	7
F. NFMA	N/A	1.94%	7
F. Tort	Nuisance	1.11%	4
Other F. Non-Reg.	5th & 14th Amendment Due Process, Exec. Encroachment on Legislative Authority, Equal Protection Clause, Civil Action for Deprivation of Rights, RICO, Civil Conspiracy, Concert of Action	1.67%	6
Other F. Reg.	Transportation Act, Energy Policy Act, Misc. F. Conservation Statutes	6.11%	22
S. Adm. Proc.	N/A	1.67%	6
S. NEPA	N/A	16.94%	61
S. Tort	Fraudulent Misrepresentation, Nuisance, Trespass	1.94%	7
S. Water Stat.	N/A	1.39%	5
S. Zoning	N/A	2.50%	9
Other S. C-L	Public Trust, Unjust Enrichment, Property Damage, Indemnification	3.33%	12
Other S. Non-Reg.	S. Constitutional, S. RICO, Civil Conspiracy, Concert of Action	1.67%	6
Other S. Reg.	S. Air Quality, S. FOIA, S. ESA, S. Agency, Seismic Hazards Act	4.17%	15

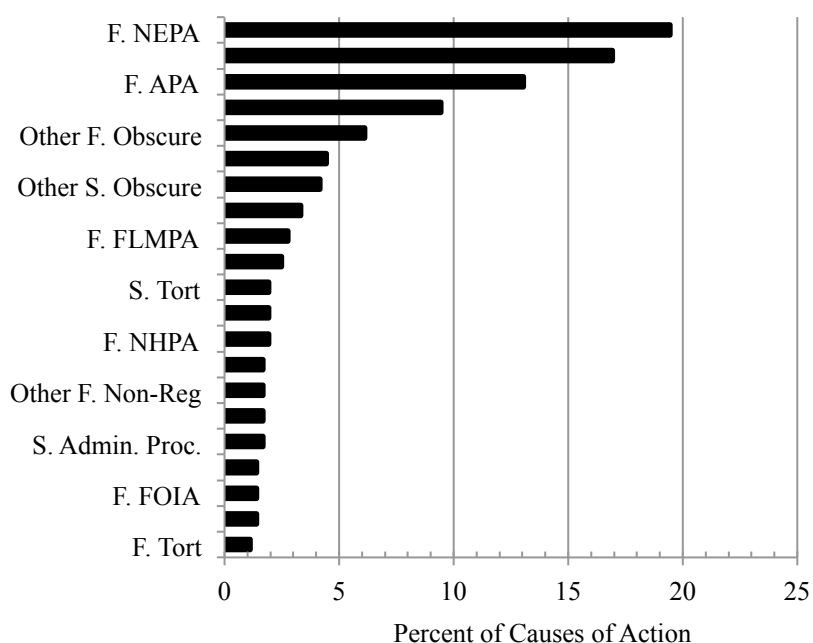
Note: The middle column contains an exhaustive list of cause of action subcategories. Subcategories for "Other F. Reg." and "Other S. Reg." were summarized due to space constraints.

Figure 1 reports the relative percentage for each cause of action category (that is, out of 360 total causes of action) in the data. Clearly, regulatory causes of action dominate. Specifically, federal regulatory causes of action amount

51. A detailed explanation of these 21 cause of action categories is provided in Appendix A.

to 63.6 percent of the combined observations, while state regulatory causes of action account for 26.67 percent. The remaining causes of action pleaded amount to approximately 10 percent of the data, with tort causes of action representing only a marginal 1.11 (federal) and 1.94 (state) percent. The predominance of regulatory causes of action and the dearth of tort claims provides the first empirical illustration of plaintiffs' adjustment to the difficulties involved in proving the latter. The diffuse nature of anthropogenic climate change sources and the widespread effects of climate change make it particularly difficult for plaintiffs to establish that emissions from a specific GHG facility should be abated or that the operator of such facility be found liable for climate change-related harms. Conversely, prosecuting regulatory causes of action is generally simpler.

Figure 1. The distribution of coded causes of action, by category, in data.



Note: See Table 2 for further details on the coding of the causes of action.

Plaintiffs' attorneys may also prefer pleading regulatory causes of action because of litigation costs, which tend to be lower than prosecuting tort claims, with costly depositions, discovery, and other expenses typically associated with civil litigation.⁵² Environmental advocacy groups or firms that specialize

52. We are grateful to the anonymous reviewer who asked us to make this point more forcefully. Unfortunately, external constraints make it unfeasible for us, at this time and with current resources, to undertake further research on whom exactly are the lawyers bringing these cases (for example, environmental NGO lawyers, tort-bar-plaintiff firms, self-represented plaintiffs, and so

in representing them, not climate change victims, tend to be the more common plaintiffs. Furthermore, the NGO bar may be more inclined to bring regulatory claims not only because of their lower costs and “more manageable burdens of proof, but also because those are the kinds of claims [they] are accustomed to bringing.”⁵³ Indeed, NGOs subsist primarily on donor funding, unlike plaintiff-side tort firms to whom the possibility of recovering substantial fees from prosecuting environmental tort claims only occasionally makes good business sense. In other words, the need to limit litigation costs accounts for the NGO bar’s accumulated expertise and, arguably, preference for pleading regulatory claims. Thus, the industrial organization of legal practice in this area helps explain the distribution of claims we have detected so far and may influence how causes of action in climate change-related complaints can be grouped or clustered together. The detection of patterns in cause of action groupings—patterns that reflect the pleading constraints to which different climate change attorneys are subjected and the particular way in which their industry is organized—can help us identify trends that allow better predictions about the future of this type of litigation and its implications.

3. Methodology

a. Use of Cluster Analysis in the Legal Field

Usage of cluster analysis to distinguish among features and identify potentially meaningful groupings in a dataset is widespread in legal information systems.⁵⁴ Cluster analysis is not a unified statistical technique but a collection of quantitative methods “that can be used to group (i.e., cluster) data meaningfully.”⁵⁵ These methods seek to isolate homogenous groups among otherwise diverse observations, while ensuring that such groups are as distinct from each other as possible due to the presence or absence of certain attributes.⁵⁶ In legal information systems, case text indexing followed by the identification of case groupings that share a common attribute through clustering techniques allows for the collection of closely related groups of

forth) Despite not being able to report concrete figures, an eyeball review of the list of complaints and plaintiff names indicates that lawyers in the NGO bar brought the majority of these cases.

53. This astute observation came in the form of another suggestion by the same anonymous reviewer.

54. See Erich Schweighofer and Dieter Sheithauer, *The Automatic Generation of Hypertext Links in Legal Documents*, in INTERNATIONAL CONFERENCE ON DATABASE AND EXPERT SYSTEMS APPLICATIONS (1996); Erich Schweighofer et al., *Information Filtering: The Computation of Similarities in Large Corpora of Legal Texts*, in INTERNATIONAL CONFERENCE ON ARTIFICIAL INTELLIGENCE AND LAW 119 (1995); Howard Turtle, *Text Retrieval in the Legal World*, 3 ARTIFICIAL INTELLIGENCE & L. 5, 6 (1995).

55. See Jonathan A. Lesser & Emma Nicholson, *Abandon All Hope? FERC’s Evolving Standards for Identifying Comparable Firms and Estimating the Rate of Return*, 30 ENERGY L.J. 105, 125 (2009) (citing G. David Garson, *Cluster Analysis*, <http://faculty.chass.ncsu.edu/PA765/cluster.htm>). Although the Garson web page cited by Lesser and Nicholson is no longer posted and not accessible via the Internet Archive index, the work has since been published. See G. DAVID CARSON, CLUSTER ANALYSIS 552 (2012).

56. *Id.*

cases, thus facilitating legal research.⁵⁷ “Headnotes” in Westlaw and “KeyCite” in Lexis result from a combination of text indexing algorithms and clustering methods that allow for the identification of numerous cases and statutes that cover a common legal doctrine or concept.

In academic legal writing, researchers have applied clustering techniques to reveal grouping patterns in opinions from courts as distinct as supranational⁵⁸ and national, subject-matter-based courts.⁵⁹ Consultants and scholars have also used cluster analysis to identify and sort groups of actors that operate in widely different legal settings. Lesser and Nicholson examined data on regulated electric companies and natural gas pipelines that faced different rates of return and risk to identify proxy groups of financially comparable entities to optimize agency rate-setting criteria.⁶⁰ Cross and Lindquist developed a clustering method for identifying federal appellate judge groupings according to similarities (and dissimilarities) in decision making that allow policymakers and others to evaluate judges according to the characteristics that fit their own preferred judicial model.⁶¹ More recently, Boyd and her coauthors applied cluster analysis to a dataset containing a sample of civil complaints filed in federal court between 2000 and 2008 and identified eight major cause-of-action clusters.⁶² Because our study’s primary unit of analysis (that is, causes of action) and source of data (that is, filed civil complaints) closely mirror Boyd and her coauthor’s, our grouping technique (that is, spectral clustering) is inevitably similar. Occasional differences between Boyd and her coauthor’s and our methodological choices (for example, cluster algorithm properties and so forth) are attributable to inherent differences in our data (for example, different number of cause of action categories, nonredundant recording of causes of action appearing in different counts within the same complaint, smaller dataset, and so forth).⁶³

b. Clustering Complaints

To classify and group the complaints in the data according to their similarities in causes of action, we used the Jaccard coefficient, which distributes observations into prespecified numbers of categories using a

57. See Dieter Merkl & Erich Schweighofer, *En Route to Data Mining in Legal Text Corpora: Clustering, Neural Computation, and International Treaties*, in PROCEEDINGS OF THE INTERNATIONAL WORKSHOP ON DATABASE AND EXPERT SYSTEM APPLICATIONS 465, 465–70 (IEEE CS Press 1997), available at <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.40.4183&rep=rep1&type=pdf>.

58. See Yonatan Lupu & Erik Voeten, *Precedent in International Courts: A Network Analysis of Case Citations by the European Court of Human Rights*, 42 BRIT. J. POL. SCI. 413 (2012).

59. See Michael J. Bommarito II et al., *An Empirical Survey of the Population of the U.S. Tax Court Written Decisions*, 30 VA. TAX REV. 523 (2011).

60. See Lesser & Nicholson, *supra* note 55, at 125–28.

61. See Frank B. Cross & Stefanie Lindquist, *Judging the Judges*, 58 DUKE L.J. 1383, 1425–26 (2009).

62. See Boyd et al., *supra* note 43, at 258.

63. See *id.* at 262–64.

method that takes into account similarities among pairs of complaints.⁶⁴ We specified the number of k clusters based on our prior knowledge of this area of litigation and on inferences we derived from the data.⁶⁵ For example, we expected (based on prior knowledge and from information in Table 2 and Figure 1) two large regulatory clusters (one state, one federal), a pair of mixed state-federal regulatory clusters, a couple of smaller mixed regulatory-nonregulatory clusters and, possibly, a small state-federal tort cluster.

To reduce subjectivity when deciding upon the optimum number of clusters, we pursued a stability-based method of clustering by varying k (that is, the number of clusters) and comparing clustering outcomes from pairs of subsamples generated from the data.⁶⁶ Specifically, we generated 100 such sample pairs for each arbitrary k and observed the similarity of the clustering results between pairs of subsamples. Our measure of similarity for a subsample pair from a given k ranged from 0 (no similarity) to 1 (perfect similarity). Having 100 pairs, we generated similarity distributions for each k . When the sample distributions produced a significant drop-off away from 1, we knew we had split a real cluster, so we were ready to decide on a k . In our data, the largest drop-off in the distribution of similarities occurred when we increased k from six to seven. Accordingly, we determined the optimum number of clusters to be six.

By way of illustration, Figure 2 shows a plot of the similarity matrices of complaints obtained before and after clustering, with brighter pixels illustrating higher similarities. Looking at Figure 2(a), the patched, though random, spread of complaints displayed before clustering illustrates the dichotomous nature of our data (that is, federal and state complaints).⁶⁷ Despite Figure 2(a)'s interesting pattern, Figure 2(b) is much more revealing, with its display of six square blocks along a main diagonal that indicates a high simi-

64. This partition clustering method has been intuitively described as "an analysis of variance (ANOVA) exercise[d] backwards" that partitions data into "groups that minimize 'within-group' variation while maximizing 'between-group' variation." See Lesser & Nicholson, *supra* note 55, at 126 n.125 (citation omitted).

65. For a more detailed description of the k -means clustering method, see ROBERT B. BURNS & RICHARD A. BURNS, BUSINESS RESEARCH METHODS AND STATISTICS USING SPSS 557–58 (2009) (e-version with extra chapters), available at <http://www.uk.sagepub.com/burns/website%20material/Chapter%2023%20-%20Cluster%20Analysis.pdf>. Empirical scholars have used other methods to determine cluster membership, arguably due to theoretical reasons or to address the particular characteristics and size of their datasets. See, e.g., Cross & Lindquist, *supra* note 61, at 1383 (Ward's Method); Lesser & Nicholson, *supra* note 55, at 125–26 (Squared Euclidean Distance).

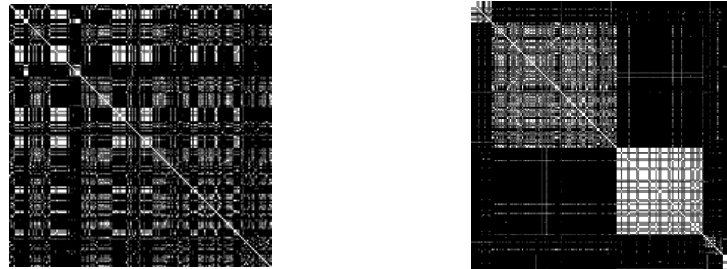
66. See Asa Ben-Hur et al., *A Stability Based Method for Discovering Structure in Clustered Data*, 17 PAC. SYMP. ON BIOCOMPUTING 6 (2002).

67. No potentially risk-increasing complaints in our dataset were removed from state to federal court. Some complaints originally filed in federal court may eventually be refiled in state court, due to lack of subject matter jurisdiction. In *Kivalina*, for example, the federal district judge dismissed plaintiffs' state nuisance claims without prejudice (probably under 28 U.S.C. § 1367(c)(3)), a ruling that the Ninth Circuit upheld. See *Native Village of Kivalina v. Exxon Mobil Corp.*, 663 F. Supp. 2d 863, 882–83 (N.D. Cal. 2009), *aff'd*, 696 F.3d 849, 866 (9th Cir. 2012), *cert. denied*, 133 S. Ct. 2390 (2013) (No. 12-1072). These plaintiffs have yet to file their state law-based claims in state court.

larity among cases in the six identified clusters. Notably, the sizes of the square-clusters differ according to the number of complaints in each cluster. As expected, two big clusters dominate and four smaller clusters of varying sizes capture the remaining groupings.

**Figure 2. Similarity Matrices among Complaints
Prior to and Following Spectral Clustering**

(a) Similarity matrix of the data before clustering (b) Similarity matrix of the clustered data



Note: Brighter pixels on gray scale images represent higher similarity while dark ones indicate low similarity. Figure 2(a) is made with a random arrangement of the cases in the dataset while data points in Figure 2(b) are arranged in cluster order, with the six light boxes on the diagonal indicating the clusters.

D. Results

1. Cluster Analysis

Although the generally liberal nature of pleading in the United States makes a large number of complaint clusters a theoretical possibility, pressures ranging from the specialized nature of climate change-related litigation to the industrial organization of legal practice (for example, greater representation of NGO plaintiff-attorneys, who may be more comfortable bringing fewer, lower-cost, administrative claims than expensive-to-litigate tort claims; law firm practice that follows a business-driven approach to litigation cost; and likelihood of recovery) combine to constrain plaintiffs' pleading strategies. Furthermore, the concern with loss of reputation and the possibility of monetary penalties for frivolous claims do seem to influence attorneys' pleading strategies.⁶⁸ The result, as Table 3 illustrates, is a small number of co-occurring

68. See, e.g., Theodore Eisenberg et al., *The Decision to Award Punitive Damages: An Empirical Study*, 2 J. LEGAL ANALYSIS 577, 592 & 595–96 (2010) (positing that the desire to appear credible to judges restrains plaintiffs' counsel from pursuing punitive damages in states where punitive damages are permitted and demonstrating that "state rules restricting punitive damages are significantly associated with the rate at which punitive damages are sought."). For an illustration of how counsel for defendants also make far fewer motions to dismiss for failure to state a claim under Rule 12(b)(6) than one would expect of unrestrained advocates see generally JOE S. CECIL ET AL., FED. JUDICIAL CTR., MOTIONS TO DISMISS FOR FAILURE TO STATE A CLAIM AFTER *IQBAL*: REPORT TO THE JUDICIAL CONFERENCE ADVISORY COMMITTEE ON CIVIL RULES 10 (2011), available at <http://www.uscourts.gov/uscourts/RulesAndPolicies/rules/Publications/motion>

complaint groupings. As explained, each cluster contains the most frequently occurring causes of action in related complaints. Table 3 columns show the raw frequencies and relative percentages for each of the six clusters detected. Statistics regarding the distribution of the 21 causes of action across different complaint clusters are displayed in rows.

**Table 3. Distribution of 21 Cause of Action Categories
Among Six Complaint Clusters**

<i>Cause of Action</i>	<i>Clusters</i>						<i>Total</i>
	<i>#1</i>	<i>#2</i>	<i>#3</i>	<i>#4</i>	<i>#5</i>	<i>#6</i>	
F. Ag. Reg.	20.00% (1)	80.00% (4)	0.00% (0)	0.00% (0)	0.00% (0)	0.00% (0)	100.00% (5)
F. APA	4.26% (2)	91.49% (43)	0.00% (0)	2.13% (1)	2.13% (1)	0.00% (0)	100.00% (47)
F. CAA	81.25% (13)	12.50% (2)	0.00% (0)	6.25% (1)	0.00% (0)	0.00% (0)	100.00% (16)
F. CWA	16.67% (1)	83.33% (5)	0.00% (0)	0.00% (0)	0.00% (0)	0.00% (0)	100.00% (6)
F. ESA	0.00% (0)	97.06% (33)	0.00% (0)	0.00% (0)	2.94% (1)	0.00% (0)	100.00% (34)
F. FLMPA	0.00% (0)	100.00% (10)	0.00% (0)	0.00% (0)	0.00% (0)	0.00% (0)	100.00% (10)
F. FOIA	0.00% (0)	20.00% (1)	0.00% (0)	0.00% (0)	80.00% (4)	0.00% (0)	100.00% (5)
F. NEPA	0.00% (0)	94.29% (66)	5.71% (4)	0.00% (0)	0.00% (0)	0.00% (0)	100.00% (70)
F. NHPA	0.00% (0)	85.71% (6)	14.29% (1)	0.00% (0)	0.00% (0)	0.00% (0)	100.00% (7)
F. NFMA	0.00% (0)	100.00% (7)	0.00% (0)	0.00% (0)	0.00% (0)	0.00% (0)	100.00% (7)
F. Tort	0.00% (0)	0.00% (0)	0.00% (0)	100.00% (4)	0.00% (0)	0.00% (0)	100.00% (4)
Other F. Non-Reg.	0.00% (0)	50.00% (3)	16.67% (1)	33.33% (2)	0.00% (0)	0.00% (0)	100.00% (6)
Other F. Reg.	0.00% (0)	100.00% (22)	0.00% (0)	0.00% (0)	0.00% (0)	0.00% (0)	100.00% (22)
S. Adm. Proc.	50.00% (3)	16.67% (1)	33.33% (2)	0.00% (0)	0.00% (0)	0.00% (0)	100.00% (6)
S. NEPA	0.00% (0)	3.28% (2)	95.08% (58)	0.00% (0)	0.00% (0)	1.64% (1)	100.00% (61)
S. Tort	0.00% (0)	0.00% (0)	0.00% (0)	85.70% (6)	14.30% (1)	0.00% (0)	100.00% (7)
S. Water Stat.	0.00% (0)	20.00% (1)	60.00% (3)	0.00% (0)	0.00% (0)	20.00% (1)	100.00% (5)

iqbal.pdf (showing extremely low estimates of the likelihood that a motion under Rule 12(b)(6) will be filed within the first 90 days); JOE S. CECIL ET AL., FED. JUDICIAL CTR., UPDATE ON RESOLUTION OF RULE 12(b)(6) MOTIONS GRANTED WITH LEAVE TO AMEND: REPORT TO THE JUDICIAL CONFERENCE ADVISORY COMMITTEE ON CIVIL RULES 4 (2011), *available at* [http://www.fjc.gov/public/pdf.nsf/lookup/motioniqbal2.pdf/\\$file/motioniqbal2.pdf](http://www.fjc.gov/public/pdf.nsf/lookup/motioniqbal2.pdf/$file/motioniqbal2.pdf) (confirming results from earlier report).

Pleading Patterns and the Role of Litigation

S. Zoning	0.00% (0)	0.00% (0)	100.00% (9)	0.00% (0)	0.00% (0)	0.00% (0)	100.00% (9)
Other S. C-L	0.00% (0)	8.33% (1)	0.00% (0)	8.33% (1)	0.00% (0)	83.33% (10)	100.00% (12)
Other S. Non-Reg.	0.00% (0)	16.67% (1)	16.67% (1)	66.67% (4)	0.00% (0)	0.00% (0)	100.00% (6)
Other S. Reg.	13.33% (2)	0.00% (0)	53.33% (8)	13.33% (2)	13.33% (2)	6.67% (1)	100.00% (15)
Federal cause of action percentage falling within cluster	77.27%	97.12%	6.90%	38.10%	66.67%	0.00%	100%
Total causes of action falling within cluster	6.11% (22)	57.78% (208)	24.17% (87)	5.83% (21)	2.50% (9)	3.61% (13)	100% (360)

About four-fifths of our complaints fell into Cluster 2 (57.78 percent) and Cluster 3 (24.17 percent), each dominated by federal and state regulatory claims, respectively. Remarkably, nine of the twelve federal regulatory causes of action (for example, F. Ag. Reg., F. APA, F. CWA, F. ESA, F. FLPMA, F. NEPA, F. NHPA, F. NFMA and Other F. Reg.) appearing in Cluster 2 had very high frequencies of occurrence in that cluster (that is, ranging from 80 to 100 percent). Most of the remaining causes of action in Cluster 2 were also federal regulatory claims, which shows this is an essentially federal regulatory cluster. That this cluster alone contains nearly three-fifths of all causes of action pled in climate change-related complaints demonstrates the dominance of federal regulatory law in this field. Curiously, the dominance of federal regulatory law notwithstanding, the second largest cluster, Cluster 3, is just as homogenous. State causes of action are predominant (93.10 percent), with state regulatory claims dominating the cluster, which contains all state zoning claims, nearly all state NEPA claims (95.08 percent),⁶⁹ 60 percent of state-based water claims and over half of Other S. Reg. claims (53.33 percent).

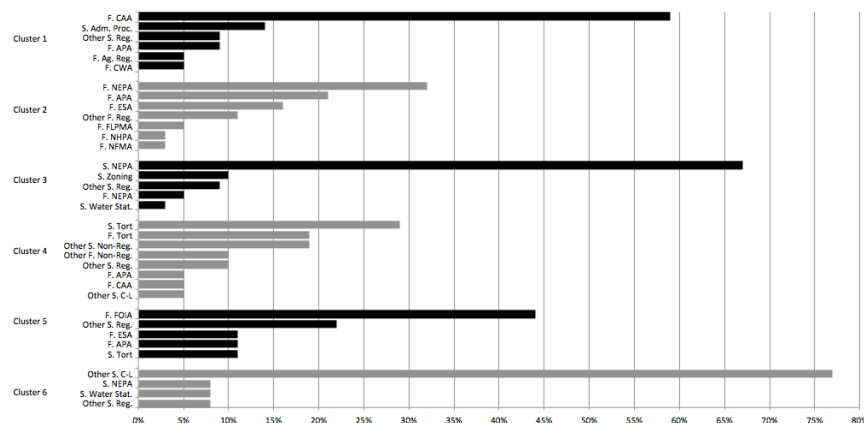
Despite the high concentration of complaints within two clusters, the remaining four smaller clusters provide an enriched perspective on plaintiffs' pleading strategies in climate change-related litigation. Lower-incidence clusters indicate that plaintiffs are less keen to plead (or actually avoid pleading) certain cause of action groupings, perhaps due to the greater difficulty and cost of litigating them or because of a perceived lower success rate in adjudicating them. For instance, proving causation in tort claims is generally more complex than proving noncompliance with a given regulatory requirement. The multiple anthropogenic sources of GHG emissions, their fungibility and resulting difficulty in connecting specific harms to specific sources create the greatest obstacle to "proving that a particular source of GHG emissions should be held legally responsible for contributing to climate

69. Although we recognize the incongruence of referring to *state* NEPA claims (NEPA after all designates a *national* (that is, federal) statute), we use S. NEPA to identify state statutes that are the counterparts to the nearly eponymous federal statute.

change.”⁷⁰ These legal difficulties along with factors associated with the industrial organization of environmental law practice, as discussed in Part I.C.2, explain why plaintiffs rarely plead tort causes of action (see Table 3). We detected this grouping of rare claims in Cluster 4. All F. Tort claims and over four-fifths (85.70 percent) of S. Tort claims appear in this cluster. Other significant pairings in the remaining smaller clusters are as follows: four-fifths of F. CAA claims and half of S. Adm. Proc. claims appear in Cluster 1; four-fifths of F. FOIA claims and 13.33 percent of Other S. Reg. claims, a category that includes the state FOIA claims, appear in Cluster 5; and over four-fifths of Other S. C-L claims (83.33 percent) and one-fifth of S. Water Stat. claims (20 percent, which is the second highest percentage of all claims in this grouping) appear in Cluster 6.

Although describing differences in relative cluster sizes and compositions can be enlightening, visualizing cluster compositions allows for easier detection of pleading patterns in climate change-related complaints. As Figure 3 illustrates, Clusters 1, 3, 5 and 6 are each dominated by a single cause of action

Figure 3. Causes of Action in Each Cluster



Note: Causes of action composing two percent or less of a cluster are excluded for readability purposes.

(F. CAA, S. NEPA, F. FOIA & Other S. C-L, respectively) whose frequency far exceeds that of other causes of action in the cluster, while Clusters 2 and 4

70. Kirsten H. Engel, *Harmonizing Regulatory and Litigation Approaches to Climate Change Mitigation: Incorporating Tradable Emissions Offsets into Common Law Remedies*, 155 U. PA. L. REV. 1563, 1585 (2006). See also David A. Grossman, *Warming up to a Not-So-Radical Idea: Tort-Based Climate Change Litigation*, 28 COLUM. J. ENVTL. L. 1, 23 (2003) (noting that, “generally speaking, courts have not considered statistical associations like those produced by epidemiological studies to be adequate proof of specific causation”); Thomas W. Merrill, *Global Warming as a Public Nuisance*, 30 COLUM. J. ENVTL. L. 293, 297 (2005) (indicating that “defendants will argue that they are responsible for a small portion of the world’s greenhouse gas emissions, so small that it cannot fairly be said that they are ‘the cause’ of global climate change.”).

are more balanced around two or three causes of action, despite having a clearly dominant cause of action. Spectral analysis reveals the presence of regulatory claims in *every* cluster, with regulatory groupings largely segregated according to subject matter and sovereign source. However, the much less frequent tort claims appear mostly together in a *single* cluster (Cluster 4), regardless of whether they arise under state or federal law.

Closer examination of the composition of each cluster reveals the following trends in pleading.

- Cluster 1: This is a diverse regulatory cluster that contains a large percentage of federal Clean Air Act claims (nearly 60 percent of causes of action) and a scattering of federal and state regulatory claims.
- Cluster 2: This cluster is exclusively composed of federal regulatory claims and contains nine causes of action, the greatest number of causes of action groupings in a single cluster. It is the most homogenous and biggest cluster (see Table 3), with plaintiffs favoring F. NEPA, F. APA, F. ESA over all other claims.
- Cluster 3: This cluster is dominated by state regulatory claims. It is the second biggest (see Table 3) and second most disproportionate cluster. S. NEPA makes up approximately 67 percent of the cluster, while each of the remaining causes of action amount to at most 10% of the cluster.
- Cluster 4: Although this is the most diverse cluster, it is dominated by tort claims, which make up nearly 50 percent of its causes of action. Nearly all tort claims appear here, along with state and federal regulatory claims and one state common law claim (see Table 3).
- Cluster 5: Although diverse, nearly 90 percent of this cluster is made up of federal and state regulatory claims, with claims arising under F. FOIA dominating the cluster (44 percent). Containing only nine causes of action, one of which is a state tort, it is also the smallest cluster (see Table 3).
- Cluster 6: This cluster is exclusively composed of state regulatory and a large number of Other S. C-L (that is, nontort) claims. These common-law claims represent nearly 80 percent of the cluster, with each of the remaining causes of action amounting to at most eight percent. This ten-fold difference in frequency makes this the most disproportionate cluster.

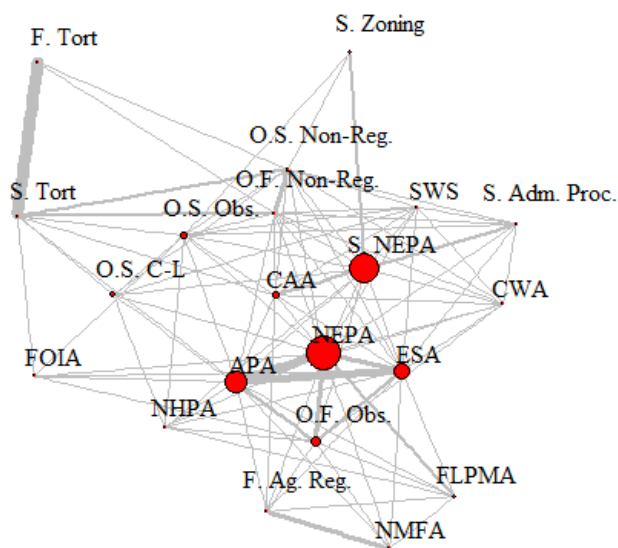
In sum, two complaint clusters perfectly segregate federal causes of action (Cluster 2) from state causes of action (Cluster 6), two other clusters are quite mixed (Clusters 4 and 5) and the remaining ones (Clusters 1 and 3) are lopsided, with federal or state regulatory claims dominating in each. Most telling, perhaps, is the general low frequency of state and federal tort causes of action in a sea of federal and state regulatory claims. Even Cluster 4, the “torts clus-

ter,” contains state and federal regulatory causes of action, a further illustration of plaintiffs’ tendency to plead regulatory claims in this area of litigation.⁷¹

2. Beyond Clusters: Visualizing Relationships among Causes of Action

Although clustering allows sorting out complaints into different groups according to certain shared attributes (for example, state vs. federal, mixed, regulatory vs. nonregulatory, and so forth), thus permitting the detection of clear-cut pleading patterns in the data, clustering does not reveal much about the interactions among causes of action *within* complaints. Because causes of action raised in the same complaint are necessarily grounded on a common set of facts that must plausibly establish an entitlement to relief, one intuitively expects the data to also contain some patterns in the joinder of causes of action within complaints. In Figure 4, we depict such interactions spatially by means of a Fruchterman-Reingold force-directed graph that enables straightforward visualization and allows some interesting conclusions.⁷²

Figure 4. Fruchterman-Reingold Force Directed Graph Layout for Causes of Action



Note: The figure results from a Fruchterman-Reingold force directed graph layout for weighted graphs.

71. As explained above, whether plaintiffs succeed by joining these additional nontort claims and, more generally, what are the outcomes of climate change litigation will be the topic of a future study.

72. This graph layout, created in R, arranges spatial representations of causes of actions in the data according to their co-occurrence and similarity. To calculate the similarity among causes of action, we used the Jaccard coefficient, which we calculated by representing each cause_of_action, ($i = 1, \dots, 21$), as a binary vector, with value 1 at position j , denoting the appearance of cause of action “ i ” in complaint “ j ” ($j = 1, \dots, 178$).

To understand the graph in Figure 4, bear in mind that the nodes (that is, black dots) illustrate the relative location of each cause of action (see Table 2) raised in the coded complaints. The *size* of each node reflects the raw frequency of each cause of action in the data. The *thickness* of the line connecting two nodes represents how likely they are to appear together in the same complaint. For example, the line connecting F. Tort and S. Tort is thick because these causes of action are pled almost invariably together, yet the size of their respective nodes is small, reflecting their low individual frequencies in the data. Finally, the *distance* between any two nodes is directly proportional to how similar they are in terms of their connections. Thus, the thickness of connecting lines and proximity of the causes of action arising under the federal APA, NEPA and ESA statutes reflect their high co-occurrence within complaints and connection similarity. Their large node sizes denote their high individual frequency of pleading.

Figure 4 also illustrates the extent to which some causes of action are isolated from others. For example, S. Zoning appears at the top, isolated and with few outward relationships, the strongest of which being with S. NEPA. Indeed, this spatial representation illustrates in a different way what we witnessed before: the presence of all S. Zoning causes of action in a single cluster (Cluster 3)⁷³ along with nearly all S. NEPA causes of action (95 percent) in that cluster. Although appearing in the same cluster, the connecting line between these two is not as thick as that between F. Tort and S. Tort because they did not appear as frequently in the *same* complaint. In contrast, other centrally located, more frequent causes of action, such as S. NEPA, CAA and O.S. Obs. have weak relationships, demonstrated by their comparatively large number of thin, outward connections. These numerous thin connections show that the latter causes of action have no discernable patterns of interaction, in sharp distinction to the also centrally located APA, NEPA, ESA triad, discussed above.

3. Beyond Clusters: Detecting Co-Occurrence of Causes of Action

We now examine the co-occurrence of causes of action to determine which pairs are most (and least) likely to appear in the same complaint. First, we display such pairings without regard to the relative incidence of a particular cause of action in the data. Figure 5(a) displays the top ten most frequently paired causes of action, and Figure 5(b) displays the top ten least frequently paired ones.⁷⁴ One should approach Figure 5 results with caution. For instance, despite infrequent pleading of F. Tort and S. Tort causes of action in the data, the F. Tort-S. Tort pairing ranks as the top cause-of-action pair, with a near 60

73. See *supra* Table 3 and Figure 3.

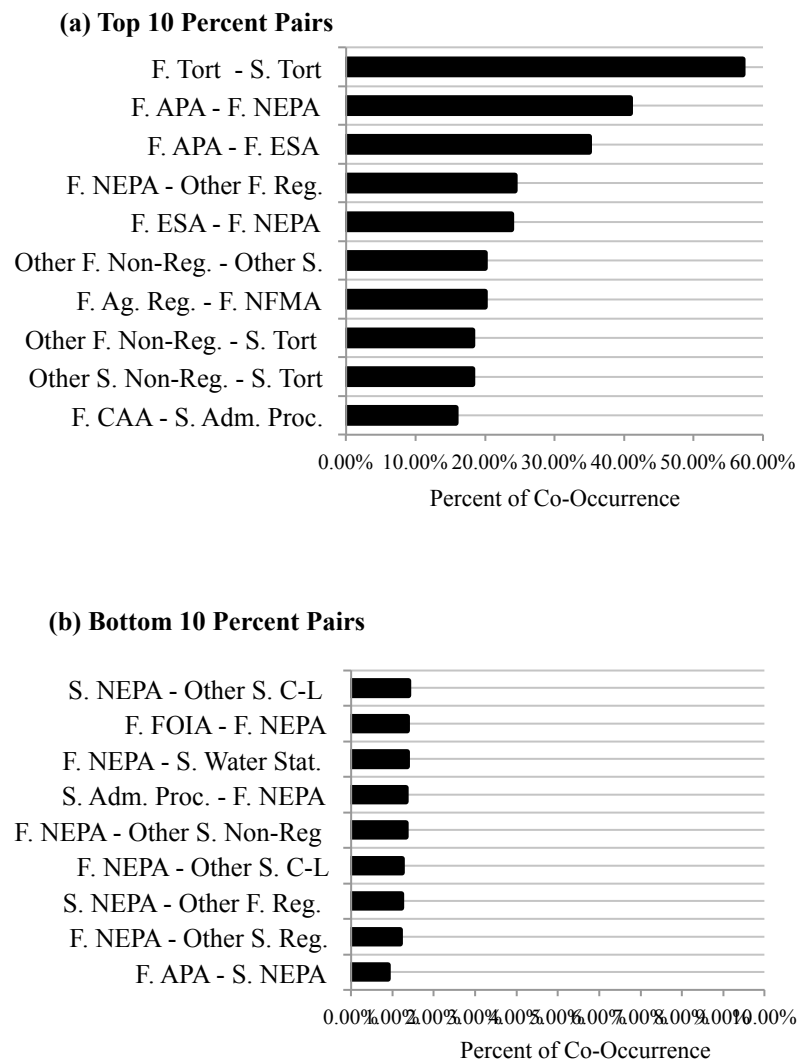
74. To calculate the likelihood of co-occurrence of these causes of action (without considering their overall frequency in the data), we used the formula: $|a \cap b| / |a \cup b|$, where “a” and “b” denote different causes of action. This formula gives the ratio of the number of complaints in which two causes of action appear together over the number of complaints in which they appear.

percent co-occurrence rate.⁷⁵ While indicating that when plaintiffs plead tort claims, they are more likely to plead F. Tort and S. Tort claims together than otherwise, this result obviously does not take into account how infrequently the two causes of action appear in the data, and thus can be misleading.

To perform a more robust co-occurrence analysis, we developed a *t*-distributed statistic that tests the statistical significance of cause-of-action pairs, while accounting for the frequency of individual causes of action in the data. Through a Bernoulli trial, we randomly generated pairs of causes of action and then compared these random estimates with the actual pairs we observed in the 178 complaints in the data (see Appendix B for a detailed explanation). Table 4 reports the ten most and least significant co-occurrences according to observed *t* (one tailed) and *p* values. Remarkably, Table 4 shows the F. Tort-S. Tort pair is the last statistically significant pair in the data ($t = 1.94$; $p < .05$), an illustration of how our test discounts the lower individual occurrence of these causes of action and still captures strong absolute co-occurrences. It is also noteworthy that, other than the F. Tort-S. Tort pair, no federal-state pair is statistically significant. Indeed, nine out of the ten most statistically significant pairs—some of which were not significant at the .05 level—are federal claims paired with other federal claims and a single set of paired state claims. Again, this reflects the tendency toward homogeneity we detected in spectral clustering: complaints do not frequently contain both federal and state causes of action. The lower half of Table 4 shows that seven of the ten bottom co-occurrences are federal-state claim pairings, which further demonstrates plaintiffs' general lack of interest in filing mixed complaints.

75. Of the seven separate complaints that alleged tort causes of action, five combined federal and state tort claims. See Complaint for Damages Demand for Jury Trial, *Native Village of Kivalina v. Exxon Mobil Corp.*, 696 F.3d 849 (9th Cir. 2012), *cert. denied*, 133 S. Ct. 2390 (2013) (No. 12-1072); Complaint, *AEP v. Connecticut*, 131 S. Ct. 2527 (2011) (No. 104CV05669); SF Chapter of A. Phillip Randolph Institute v. EPA, No. C-07-4936-CRB, 2008 WL 859985 (N.D. Cal. Mar. 28, 2008); Second Amended Complaint for Damages and Declaratory Judgment, *People of State of California v. Gen. Motors Corp.*, No. C06-05755 MJJ, 2007 WL 2726871, at *16 (N.D. Cal. Sep. 17, 2007) (No. C06-05755 EMC); *Korsinsky v. EPA*, No. 05 Civ. 859 (NRB), 2005 WL 2414744, at *2-3 (S.D.N.Y. Sep. 29, 2005). The remaining two complaints alleged *only* state tort causes of action. See Class Action Complaint, *Comer v. Murphy Oil*, 839 F. Supp. 2d 849 (S.D. Miss. 2012) (No. 11CV00220); First Amended Complaint for Declaratory and Injunctive Relief, *Complaint, Musicraft, Inc. v. City of Ann Arbor*, No. 09-945 CZ (Washtenaw Co. Cir. Ct. Aug. 11, 2009).

Figure 5. Co-Occurrence of Cause of Action Pairs



Note: Percent of co-occurrence in (a) and (b) are reported on different scales.

Table 4. Statistical Significance for Cause-of-Action Co-occurrence

Top Co-occurrences	<i>t</i> (calculated value)	<i>p</i> value
F. APA – F. NEPA	2.9586	0.0017
F. APA – F. ESA	2.7935	0.0029
F. NEPA – Other F. Reg.	2.3241	0.0107
S. NEPA – S. Zoning	2.0237	0.0224
FLMPA – F. NEPA	1.9750	0.0252
F. Tort – S. Tort	1.9433	0.0270
F. NEPA – F. NFMA	1.6378	0.0516
F. NEPA – F. NHPA	1.6378	0.0516
F. ESA – F. NEPA	1.5734	0.0587
F. APA – F. CWA	1.5495	0.0615
Bottom Co-occurrences	<i>t</i> (calculated value)	<i>p</i> value
F. CAA – F. ESA	-2.0620	0.9796
F. APA – S. Zoning	-2.9690	0.9982
F. CAA – F. NEPA	-3.0522	0.9986
Other S. C-L – S. NEPA	-3.1211	0.9989
F. NEPA – Other S. C-L	-3.7296	0.9998
F. NEPA – S. Zoning	-4.9127	0.9999
S. NEPA – Other F. Reg.	-6.5578	1
F. ESA – S. NEPA	-6.8634	1
F. NEPA – S. NEPA	-7.4709	1
F. APA – S. NEPA	-15.1494	1

II. MAJOR IMPLICATIONS FOR PLEADINGS

A. Tort vs. Regulatory Pleading

One of the most striking results from the above empirical analysis is the low frequency of tort claim pleading in climate change suits. Evidence of the rarity of tort pleading appeared in both complaint clustering and within complaint co-occurrence analyses. Closer examination of the data (see Table 3) reveals that from a universe of 360 causes of action (culled from 178 complaints), tort claims (seven state, four federal) amounted to 3.06 percent of all claims, which appeared in only seven complaints or 3.93 percent of all complaints. Similarly, plaintiffs pled a low volume of nontort common law claims. Specifically, they failed to plead a single nontort federal common law

claim and only pled 12 such state-based claims (3.33 percent) in 12 complaints or 6.74 percent of all complaints. On the other hand, plaintiffs' tendency to plead regulatory claims stands in sharp contrast, as demonstrated by greater the pleading rates for federal (63.61 percent) and state (26.67 percent) regulatory causes of action and frequencies of such causes of action in complaints (58.99 percent and 40.45 percent). Overall, plaintiffs pled regulatory claims 92.7 percent of the time.⁷⁶

Arguably, the observed high frequency of pleading regulatory causes of action relative to torts can be attributed to plaintiffs' recognition of the difficulty in proving causation in the latter. It may also be the result of wider, underlying forces currently constraining potential plaintiffs' choices regarding whether to file such causes of action. Current doctrines on standing, particularly the traceability-causation requirement, and federal common law displacement have likely had a claim-suppressing effect. Indeed, having to demonstrate that one's injury is "fairly . . . trace[able] to the challenged action of the defendant, and not . . . th[e] result [of] the independent action of some third party not before the court," is especially difficult when the diffuse nature of anthropogenic climate change sources and the widespread effects of climate change are considered.⁷⁷ On the preemption side, the presence in the CAA of a variety of regulatory enforcement mechanisms, through states,⁷⁸ EPA⁷⁹ and even private citizen suits,⁸⁰ has been construed to displace federal common law nuisance abatement (that is, *injunctive*) claims.⁸¹ More recently, the Ninth Circuit adopted an expanded conceptualization of displacement by holding that *AEP* had interpreted congressional action in passing the CAA as extinguishing plaintiffs' federal common law public nuisance *damage* claims (that is, for harms caused by past emissions), "along with federal common law public nuisance *abatement* actions."⁸² Under this interpretation and in light of the absence of a specific federal damages action under the CAA, plaintiffs are left with state nuisance law as the sole "available option [and] only to the

76. We determined the actual percentage of federal and state regulatory causes of action in all complaints by performing the following calculation: $|a \cup b| - |a \cap b| / n$, where a and b are the raw frequencies of each type of cause of action and n is the total number of complaints.

77. See *Pritikin v. Dep't of Energy*, 254 F.3d 791, 797 (9th Cir. 2001) (quoting *Lujan v. Defenders of Wildlife*, 504 U.S. 555, 560 (1992)).

78. See 42 U.S.C. § 7607(b) (2012) (allowing states and private parties to petition EPA to set an emission standard if EPA has not done so); *accord*

79. See 42 U.S.C. § 7602(g) (2012) (providing the definition of "air pollutant"). See also *Massachusetts v. EPA*, 549 U.S. 497, 532 (2007) (holding that GHG emissions from new motor vehicles qualify as air pollutants and that, as such, EPA has the statutory authority to regulate them).

80. See 42 U.S.C. § 7604(a) (2012) (allowing "any person" to enforce emission standards in federal court).

81. See *Am. Elec. Power, Inc. v. Connecticut*, 131 S. Ct. 2527, 2538 (2011). It might be useful to remind the reader that in *AEP*, a number of states, a city and three private land trusts sought to enjoin the five GHG-emitter defendants by requesting judicial imposition of emissions caps. *Id.* at 2534.

82. See *Native Vill. of Kivalina v. ExxonMobil Corp.*, 696 F.3d 849, 847 (9th Cir. 2012) (Pro, J., concurring) (emphasis added).

extent it is not preempted by federal law.”⁸³ Although one can certainly surmise that federal standing and displacement-preemption doctrines have suppressed tort claims, it is difficult to quantify the magnitude of the suppression because information regarding the nonfiling of complaints and causes of action is nearly impossible to obtain.⁸⁴ Regardless, common sense and a basic understanding of how legal institutions and stare decisis operate compel one to conclude that trends in doctrine and litigation outcomes influence potential plaintiff’s incentives and decisions on whether to sue and what to plead.⁸⁵

One may be tempted to hypothesize that such a screening effect also explains why plaintiffs pleading federal or state common law tort claims tend to include regulatory causes of action in their pleadings (see Figure 4 and Table 3). Surely, the liberal pleading philosophy behind the Federal Rules—especially R. 8(d)(2)–(3), allowing parties to plead claims in the alternative and “regardless of consistency”—and the transactional approach to claim preclusion of the Restatement (Second) of Judgments § 24 (1982)—requiring plaintiffs to plead all transactionally related claims in one action—provide plaintiffs with strong incentives to join all claims and forms of relief available in their initial complaints.⁸⁶ Yet, pleading regulatory causes of action with tort claims does not free plaintiffs from the difficulty of overcoming defensive challenges based on displacement of federal common law-based claims, preemption of state law-based claims, and standing. As the scope and pace of EPA’s GHG emission regulations increase, nuisance claims for emission abatement are more likely to be perceived as arguments for emission standards *different* from those mandated by EPA, just as claims for economic damages

83. *Id.* at 866 (Pro, P., concurring). Note, however, that the Ninth Circuit’s ruling in *Kivalina* that displacement of federal common law claims for injunctive relief necessarily means displacement of federal common law claims for damages has no bearing on the question of state common law preemption. *See, e.g.,* *Cipollone v. Liggett Group, Inc.*, 505 U.S. 504, 511 (1992) (holding that while state law claims for *injunctive* relief (that is, requiring tobacco companies to provide additional warnings and labeling) were preempted by the Federal Cigarette Labeling Act, state common law claims for *damages* from smoke-related injuries were not preempted).

84. *See, e.g.,* Theodore Eisenberg & James A. Henderson, Jr., *Inside the Quiet Revolution in Products Liability*, 39 UCLA L. REV. 731, 755 (1992) (indicating the difficulty of obtaining documentation regarding disputes terminated at the pre-filing stages of litigation); Eisenberg & Farber, *supra* note 27, at S92, S93–97 (proposing a “theoretical framework for understanding the operation of th[e] suit-selection process and its relationship to the underlying distribution of potential claims and claimants.”).

85. For a specific empirical illustration of how different states’ rules regarding punitive damages affect attorneys’ pleading habits and influence them to restrain themselves see Eisenberg et al., *supra* note 68, at 611–15.

86. That liberal pleading under the Federal Rules and the broad approach to claim preclusion of Section 24 would give tort claimants’ incentives to also plead regulatory claims appears plausible in this context. Of the seven complaints that included state tort causes of action six were filed in federal court. *See* cases cited *supra* note 75. Even if state court complaints alleging state tort claims were numerous, this reasoning would mostly apply because the Federal Rules and their pleading philosophy have influenced the procedural law of most states. *See* FIELD ET AL., *supra* note 33, at 34–35 n.b (indicating also that “some populous states [though not the majority] remain importantly distinctive.”) (citations omitted). The same can be said regarding the “considerable and increasing case support” for the broad transactional approach to claim preclusion of Section 24. *Id.* at 706.

associated with the widespread harms of climate change might be viewed as threatening the overall purpose of the federal regulatory scheme. Construed broadly, these different types of relief would directly clash with the CAA's current enforcement mechanisms.⁸⁷ Thus, adding regulatory claims to federal common law nuisance claims does not help plaintiffs address common law displacement challenges nor does it obviate the need to satisfy the traceability prong of standing. In sum, rather than a strategy to improve plaintiffs' chances of overcoming expected preemption and standing challenges, the joinder of regulatory claims with tort claims only helps avoid claim preclusion. The same applies to plaintiffs joining regulatory claims with state common law claims: they may avoid defenses grounded on preclusion—and displacement would obviously not apply—but they still must overcome likely standing and preemption-based challenges.

B. Federal vs. State Claim Pleading

The other major trend detected in the clustering and co-occurrence analyses is the extent to which plaintiffs' risk-increasing, climate change-related causes of action are either federal-law based or state-law based, instead of mixed. This is also illustrated by Table 5, which provides the breakdown of initial filings according to court type and filing content. The fact that over a quarter (27.53 percent) of plaintiffs' original judicial filings are appellate briefs partly explains this phenomenon. The result of prior litigation at the agency level, appellate briefs are likely to only include claims arising under the laws and regulations invoked before the challenged state or federal agencies, hence the infrequency of hybrid claims at the appellate level. The existence of parallel tracks of administrative adjudication before state and federal agencies explains this phenomenon. In regard to actual complaints (72.47 percent of all initial judicial filings), the parallel existence of diversity jurisdiction and general jurisdiction in federal and state courts, respectively, attenuates the tendency that disputes arising under the law of one class of sovereign be necessarily decided by courts of that sovereign. In other words, because plaintiffs face less subject-matter-based restrictions when filing complaints versus when filing appellate briefs, they are more likely to file mixed-content complaints. This is illustrated by the higher percentage of federal (and total) mixed filings. That said, plaintiffs still file mixed complaints in only a minority of the cases. As Table 5 demonstrates, plaintiffs only filed eight mixed complaints in federal court (4.49 percent) and only a single mixed complaint in state court (0.56 percent). Thus, the overall regulatory nature of climate change-related litigation (recall that plaintiffs plead regulatory claims 92.7 percent of the time) and the two-tiered structure of government exert a powerful channelling effect, influencing plaintiffs to file their grievances under either federal or state law.

87. See discussion *supra* Part II.A and accompanying notes 78–80.

Table 5. Initial Filings and Federal-State Diversity

Initial Filing Type	No. of Filings (% of total)	No. of Mixed Filings (% of total)
Actual Complaints		
Filed in Federal Court	99 (55.62)	8 (4.49)
Filed in State Court	30 (16.85)	1 (0.56)
Total	129 (72.47)	9 (5.06)
Appellate Briefs		
Filed in Federal Court	10 (5.62)	0 (0.00)
Filed in State Court	39 (21.91)	3 (1.69)
Total	49 (27.53)	3 (1.69)

III. HYPOTHESIS TESTING

The discussion above shows that legal doctrines applicable to general litigation and the federal structure of government in the United States seem to influence plaintiffs' pleading strategies in climate change-related litigation. We also wanted to investigate the extent to which U.S. Supreme Court rulings in the climate change area have affected plaintiffs' selection of causes of action for litigation in the risk-increasing cases that are the focus of this study. A prior study empirically assessed the effect of at least one of the two most relevant cases in this area: *Massachusetts v. EPA*.⁸⁸ While concluding that, in post-*Massachusetts* litigation, courts have not shown a preference for pro- or anti-regulation "positions," this result is likely plagued by selection bias due to its focus on win-rate data generated from judicial opinions. For instance, it is possible that, following *Massachusetts*, plaintiffs' counsel adjusted their pleadings by filing more complaints or including more regulatory claims than they would have before, thus filing "weaker" complaints. Defense counsel, adept at recognizing weaker complaints, could easily react to this trend by settling less and pursuing full victory at trial.⁸⁹ Together, these factors may explain why one would find courts favoring more "anti-regulation" positions. In other words, studying post-*Massachusetts* win rates will not fully capture how that

88. See Markell & Ruhl, *supra* note 45, at 21–22. The other most significant decision in this area is *AEP v. Connecticut*, 131 S. Ct. 2527, 2537 (2011), which we discuss *supra* Part I.A and *infra* Part III.C.

89. See, e.g., Kevin M. Clermont & Theodore Eisenberg, *Do Case Outcomes Reveal Anything about the Legal System? Win Rates and Removal Jurisdiction*, 83 CORNELL L. REV. 581 (1997) ("the settlement process . . . produces a residue of litigated cases for which the win rate might indicate nothing more than the percentage of successful plaintiffs in this peculiar and non-random sample of cases.").

decision affected subsequent court decisions, much less account for the content of complaints that are filed and prosecuted in federal and state courts.

This is not to say that trends in litigation outcomes do not influence plaintiffs' pleading strategies or whether they file at all.⁹⁰ All we are saying is that a less selected or biased data can give a more accurate picture of the reality of litigation in this area. One way to reduce selection bias is to collect data from earlier, less filtered stages of litigation and then conduct tests on such data. Thus, coding complaints according to causes of action allows us not only to conduct spectral clustering but determine whether plaintiffs adjust the content of their pleadings to relevant decisions regarding climate change.

A. *Massachusetts* and Federal Plaintiffs' Pleading Strategy

Aware of the *Massachusetts* ruling, plaintiffs' attorneys may react by pleading more regulatory causes of action arising under the CAA and other federal environmental statutes. They would do so in the hope that *Massachusetts* might influence the lower courts to uphold agencies' authority to address the effects of GHG emissions across broader regulatory areas. Thus, causes of action arising under *other* sources of law, such as the United States Constitution, other federal statutes or common law, and state law might seem relatively less appealing. On balance, assuming *ceteris paribus* conditions, one would expect an increase in pleading CAA and other federal regulatory causes of action following *Massachusetts*. Hypothesis 1 describes this conjecture:

H₁: Supreme Court recognition of EPA's statutory authority to regulate GHG emissions under the CAA has led plaintiffs to plead more federal regulatory causes of action.

Although binding on state courts, *Massachusetts*' influence on pleading is far more relevant to litigants in federal courts, where nearly all federal regulatory causes of action (98.25 percent) are filed.⁹¹ Thus, to determine whether *Massachusetts* has impacted plaintiffs' selection of federal regulatory causes of action, we considered exclusively federal court filings. These filings (109) are not distributed evenly: 28 complaints (25.69 percent) were filed before *Massachusetts*, while 81 complaints (74.31 percent) were filed after. Despite this unevenness, we are confident that there are enough earlier complaints (and causes of action) to provide a good before-and-after comparison.

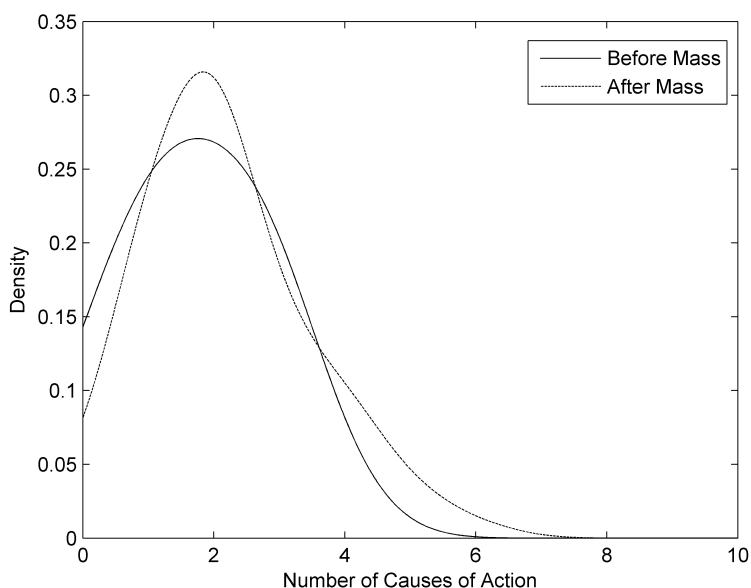
To test this hypothesis, we plot the kernel density of the number of federal regulatory causes of action filed per complaint before and after *Massachusetts*.

90. See Clermont & Eisenberg, *supra* note 49, at 138 (explaining that litigants operate "in light of their knowledge of the applicable law," which obviously includes knowledge of what judge-made law is in a given area).

91. Only four of 229 federal regulatory causes of action coded appeared in complaints filed in state court. See *San Diego Navy Broadway Complex v. City of San Diego*, 185 Cal. App. 4th 924 (2010); *Longleaf Energy Associates, Inc. v. Friends of the Chattahoochee, Inc.*, 298 Ga. App. 753 (2009); *Complaint, Musicraft, Inc. v. City of Ann Arbor*, No. 09-945 CZ (Washtenaw Co. Cir. Ct. Aug. 11, 2009); *Utah Chapter of the Sierra Club v. Air Quality Bd.*, 148 P.3d 960 (2006). These filings were not included due to our focus on the potential effect of *Massachusetts* on federal plaintiffs' pleading strategy.

Figure 6 shows that the pre-*Massachusetts* distribution of the number of causes of action is concentrated between one and four per complaint. In contrast, complaints filed after *Massachusetts* have a wider distribution that spans from one to five causes of action per complaint. The probability density associated with the post-*Massachusetts* complaints also tails off more gradually as the number of causes of action increases. Although this graph appears to indicate a post-*Massachusetts* increase in the number of regulatory causes of action pled, pre- and post-*Massachusetts* complaints have the same median number of causes of action (two). Because this data is not normally distributed, we ran a Wilcoxon rank-sum test ($z = -1.29$; $p = 0.10$) and conclude that these distributions are not statistically different from each other. Worse, the negative value for the calculated test statistic—although not statistically significant—suggests that any *Massachusetts* “effect” might be correlated with a *decrease* in the number of regulatory causes of action pled, the opposite of what we theorized. In sum, post-*Massachusetts* plaintiffs have simply not plead more regulatory causes of action than before. Why did we not detect a *Massachusetts* effect?

Figure 6. Kernel Density Plot of the Number of Regulatory Causes of Action per Complaint Following *Massachusetts*



B. Did *Twombly* Subdue the Potential Impact of *Massachusetts*?

Only a few weeks after deciding *Massachusetts* (April 2, 2007), the Court announced *Twombly* (May 21, 2007), which, as discussed in Part I.B, replaced

pleading enough facts to put defendants on notice⁹² with pleading “enough facts to state a claim to relief that is *plausible* on its face” as the pleading standard under Rule 8(a)(2).⁹³ Since then, to survive this heightened inquiry, claimants must ensure the factual strength of their pleadings “nudge[s] their claims across the line from conceivable to plausible.”⁹⁴ Because *Twombly* applies to all federal civil litigation, disfavoring broad, multiclaime allegations that lack the requisite factual strength, one can surmise that potential federal plaintiffs took note of this greater stringency. Likewise, counsel involved in drafting climate change-related complaints presumably responded by selecting causes of action that can be supported with detailed facts, while pleading fewer causes of action that are supported by scarce information at that early stage of litigation.

As discussed in Part I.B, Boyd and her coauthors, who also coded causes of action from complaints filed in federal courts, found preliminary support for this hypothesis in all civil litigation.⁹⁵ If plaintiffs have reduced the number of causes of action pled in civil complaints generally, it is possible that the announcement of *Twombly* so soon after *Massachusetts* may have nullified or suppressed the latter ruling’s expected claim-increasing impact on climate change-related pleading. Because pre- and post-*Massachusetts* complaint data almost perfectly overlap with pre- and post-*Twombly* complaint data—only three relevant complaints were filed in the interim⁹⁶—it is perhaps impossible to untangle their presumably opposite effects. With the passage of time, more filings and a growing database of causes of action, further testing of this kind (for example, kernel density plots, rank-sum tests) and the addition of regression analyses may clarify present uncertainties regarding climate change-related pleading.

Figure 7 provides the yearly average of causes of action in federally filed, climate change-related complaints in the period of study. Because no such complaints were filed between 1990 and 1992, or between 1994 and 2001, we focus on the post-2001 period.

92. See *Conley v. Gibson*, 355 U.S. 41, 47–48 (1957); *Swierkiewicz v. Sorema, N.A.*, 534 U.S. 506, 514–15 (2002).

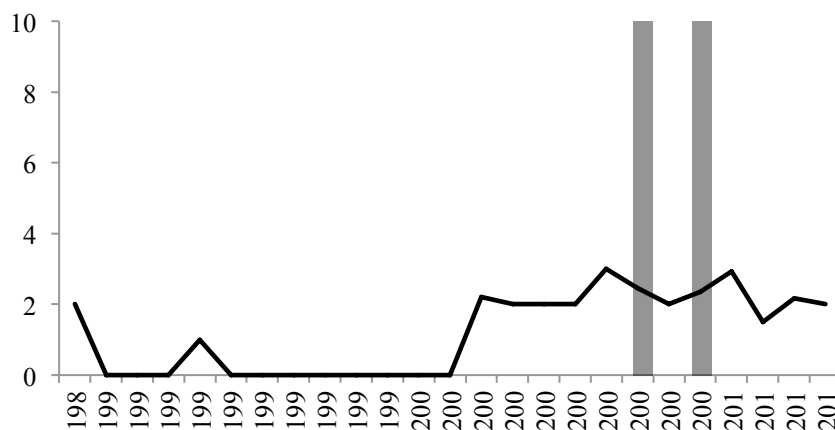
93. See *Bell Atlantic Corp. v. Twombly*, 550 U.S. 544, 570 (2007) (emphasis added).

94. See *id.*

95. See Boyd et al., *supra* note 43, at 258, 273–74.

96. See *Alaska Wilderness League v. Kempthorne*, 548 F.3d 815, 819–20 (9th Cir. 2008) (identifying the causes of action petitioners filed on their original April 13, 2007 petition); Complaint for Injunctive Relief Under the Freedom of Information Act at 2, *California v. EPA*, No. C 07-2055 JSW (JL), 2008 WL 5384623, at 2 (N.D. Cal. Dec. 22, 2008) (identifying the sole cause of action the state of California filed in its April 11, 2007 complaint); Petition for Writ of Mandate, *People v. County of San Bernardino*, No. CIV.SS700329 (San Bernardino Super. Ct. Apr. 13, 2007), available at http://ag.ca.gov/globalwarming/pdf/SanBernardino_complaint.pdf (identifying the sole cause of action the state of California filed in its April 13, 2007 complaint).

Figure 7. Average Number of Causes of Action per Complaint in Federal Courts



Notes: Yearly data reflects the average frequency of causes of action per complaint. The shaded areas indicate the U.S. Supreme Court rulings in *Twombly* (2007) and *Iqbal* (2009).

Although Figure 7 should be interpreted with caution, taking note of fluctuations in the calculated yearly means, there is a slight overall declining trend in the average number of federal causes of action filed per complaint since 2007. In particular, the 2007–2008 decline in yearly means mirrors the 2007–2008 general decline in the number of all federally pled causes of action per complaint detected in Boyd and her coauthor’s 2013 study. While this simultaneous decline might be mere coincidence, the final consolidation of pleading doctrine that came with *Iqbal*⁹⁷ may account for the apparent slight downward trend observed here.⁹⁸ In sum, the resulting *Twombly-Iqbal* tighter pleading regime may have led federal plaintiffs to plead fewer causes of action, which would help explain why a post-*Massachusetts* regulatory claim-increasing effect never materialized.

Thus, the argument that *Massachusetts* operated a major change as far as climate change-related pleading is concerned requires some nuance. It may help explain why plaintiffs have consistently preferred pleading regulatory

97. As discussed *supra* note 39, *Iqbal* clarified remaining doubts regarding the *Twombly* pleading standard. See *Ashcroft v. Iqbal*, 556 U.S. 544, 684.

98. A period of instability in pleading doctrine occurred between *Twombly* and *Iqbal*. Merely two weeks after *Twombly*, uncertainty mounted over the general applicability of the new pleading standard when the Court vacated a district court dismissal of a prisoner’s civil rights claim. See *Erickson v. Pardus*, 551 U.S. 89 (2007). Without referring to any plausibility standard, the Court repeatedly cited *Twombly* for the proposition that “specific facts are not necessary,” implying that it stood for notice pleading. See *id.* at 93. While the low range of variability of the average number of causes of action per complaint and relatively small size of our dataset do not allow us to test statistically the effect of doctrinal instability, such instability may be a plausible explanation for the fluctuation that followed *Twombly*. For a discussion on the instability of pleading doctrine between *Twombly* and *Iqbal* see FIELD ET AL., *supra* note 33, at 42–46.

causes of action to nonregulatory ones, a point we made following our discussion on clustering. Yet, the conjecture that *Massachusetts* increased the number of regulatory causes of action per complaint cannot be corroborated. Rather, as discussed in Part II.A, it seems that overarching legal doctrines, such as standing and displacement—and possibly pleading—have constrained plaintiffs’ selection of causes of action.

C. *AEP* and State Plaintiffs’ Pleading Strategy

State court filings provide another way of testing whether plaintiffs have adjusted the content of their pleadings in response to shifts in climate change-related precedent. One particular U.S. Supreme Court ruling, *AEP*, bears the most relevance to plaintiffs filing state law-based climate change-related claims.⁹⁹ In *AEP*, the Court held that plaintiffs’ (several state attorneys general) federal common law nuisance abatement claim based on defendants’ GHG emissions was displaced even before EPA had set emission standards.¹⁰⁰ The Court further noted: “The critical point is that Congress delegated to EPA the decision whether and how to regulate carbon-dioxide emissions from power plants; the delegation is what displaces federal common law.”¹⁰¹

Thus conceived, displacement is inherently an issue of separation of powers, where evidence of congressional delegation is generally enough to take away judicial power to grant relief under federal common law. Of course, displacement also implicates the general post-*Erie* skepticism regarding federal court authority to deploy federal common law.¹⁰² This skepticism however, neither restrains plaintiffs’ ability to bring *state* common law causes of action before any court nor necessarily implies that such actions will be preempted.¹⁰³ To such plaintiffs, so long as their state causes of action do not interfere with subjects within the national legislative power, they will not be preempted. Therefore, the displacement of federal common law in this area gives plaintiffs incentives to attempt other types of causes of action. Other things being equal, plaintiffs’ counsel may have reacted to *AEP* by pleading

99. Because the procedural law of most states tracks the Federal Rules, it is possible that federal precedent on pleading standards influences pleading doctrine at the state level. However, a relationship between *Twombly* and changes in pleading at the state level would be harder to detect as state law governs procedure, subject only to state constitutional law and to the outer limit set by the Federal Constitution’s 14th Amendment. See, e.g., *Cullen v. Auto-Owners Ins. Co.*, 189 P.3d 344, 348 (Ariz. 2008) (en banc) (retaining notice pleading and vacating the portion of the Arizona Court of Appeals’ opinion that cited *Twombly*).

100. See *AEP v. Connecticut*, 131 S. Ct. 2527, 2538 (2011) and discussion in *supra* Part II.A.

101. See *AEP*, 131 S. Ct. at 2538.

102. See *Erie R.R. Co. v. Tompkins*, 304 U.S. 64, 78 (1938) (holding that federal courts entertaining state law-based claims cannot displace otherwise constitutionally valid state substantive law to apply the “federal general common law” they might perceive as the better law). This skepticism, however, is suspended where “[t]he new federal common law addresses subjects within the national legislative power where Congress has so directed or where the basic scheme of the Constitution so demands.” *AEP*, 131 S. Ct. at 2535 (citation and quotations omitted).

103. See *Native Vill. of Kivalina v. ExxonMobil Co.*, 696 F.3d 849, 866 (9th Cir. 2012) (Pro, J., concurring).

more state common law causes of action (including state law-based torts), as described in Hypothesis 2 below:

*H*₂: Displacement of federal common law causes of action has led plaintiffs to plead more state common law causes of action, including torts.

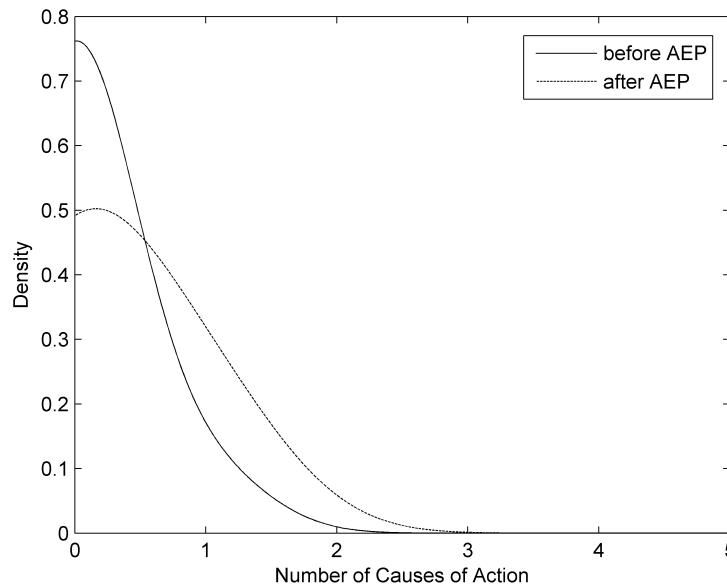
To test *H*₂, we used only state-filed complaints to minimize the impact of federal-specific doctrines (for example, on pleading, and so forth).¹⁰⁴ State-filed complaints are not evenly distributed around the *AEP* ruling. Of 69 complaints containing a total of 111 causes of action, 56 (81.16 percent) were filed before *AEP* was announced, the remaining 13 (18.84 percent) were filed after. That the Supreme Court decided *AEP* quite recently helps explain this unevenness and invites caution in interpreting results. Furthermore, the relatively small number of post-*AEP* complaints and low variation in the number of complaints that make up our data make it harder to corroborate *H*₂.

With these caveats in mind and in keeping with our methodology, we test this hypothesis by plotting the kernel density of the number of state common law causes of action (including torts) filed per complaint before and after *AEP*. Figure 8 shows that the pre-*AEP* distribution of the number of causes of action is concentrated between zero and one and a half per complaint. In contrast, complaints filed after *AEP* have a wider distribution, concentrated between zero and two. Post-*AEP* complaints also have a probability density curve that tails off more gradually as the number of causes of action increases, a possible indicator of a post-*AEP* increase in the number of state common law claims pled. Although pre- and post-*AEP* complaints have the same median number of causes of action, zero each, a Wilcoxon rank-sum test ($z = 1.82$; $p < 0.05$) indicates the distribution of the pre- and post-*AEP* complaint populations is not equal.¹⁰⁵

104. Of the six complaints containing state tort causes of action filed in federal courts, two came after *AEP*: the *Kivalina* and *Comer* complaints. See cases cited *supra* note 75. We did not include these six complaints in this test because we wanted to conduct an apples-to-apples comparison between pre- and post-*AEP* state court filings.

105. For an explanation of why the Wilcoxon test can produce statistically different rank sums, despite having equal medians, see *FAQ: Why Is the Mann-Whitney Significant When the Medians Are Equal?*, INST. FOR DIGITAL RESEARCH & EDUC. (IDRE)—UCLA, http://www.ats.ucla.edu/stat/mult_pkg/faq/general/mann-whitney.htm (last visited Aug. 6, 2014).

Figure 8. Kernel Density Plot of the Number of Causes of Action per Complaint Following AEP



Although this result is preliminary due to the recency of *AEP*, it shows that post-*AEP* filed complaints do contain more state common law causes of action than before, the first indication in the literature that plaintiffs in climate change-related cases might be changing the content of their state court pleadings in response to a particular U.S. Supreme Court decision. Should this issue-area-specific finding be confirmed as additional data becomes available over time, it may alter the climate change litigation landscape currently dominated by federal filings. However, in light of the difficulty plaintiffs have had in overcoming threshold and merit-based challenges, such as preemption and causation, we remain skeptical of the possibility that state court activity will amount to much.

IV. CLIMATE CHANGE LITIGATION'S MUTED EFFECT

In this article, we used a new cause-of-action-based dataset constructed from complaints filed in state and federal courts. A subset of all climate change-related filings, these complaints share one thing in common: they were drafted by plaintiffs seeking to have courts impose damages or tighter controls on activities associated with GHG emissions. The defendants in these suits were not always major GHG emitters. Some were federal-state government agencies or local governments being urged to take mitigating action or stop taking action perceived as contributing to GHG emissions. Regardless, as filed, these complaints would invariably raise GHG emitters' costs if they obtained relief authorized for the causes of actions pled.

We focused on potentially risk-increasing complaints because we wanted to test whether variable, potentially inconsistent and more costly litigation outcomes (court-imposed standards, injunctions, damage awards, and so forth) could induce at least a sufficient portion of GHG emitters to support action on climate legislation. After empirical testing, the results we found were surprising because they tell a consistent and perhaps (to some) boring story. Judging from the number, content and structure of risk-increasing complaints filed so far, state and federal climate change-related litigation occurs within the confines of overarching legal doctrines that constrain filings mostly to regulatory pleadings due to the high barriers to recovery they impose on other forms of climate change-related litigation (for example, common law causes of action). Thus, the circumscribed nature and high frequency of regulatory pleadings are unlikely to produce the transformative outcomes that would justify a switch to preemptive federal legislation.

This muted effect also extends to the U.S. Supreme Court's two major rulings involving climate change: *Massachusetts* and *AEP*. Whereas the potential claim-increasing effect of *Massachusetts* never materialized—perhaps partly due to the countervailing effect of *Twombly*'s tightening of federal pleading standards—*AEP*'s nod to state common law claims is of limited significance, because nuisance claims for emission abatement and claims for damages under state common law are increasingly likely to be perceived as threatening the overall purpose of EPA's expanding GHG emission regulations. Whatever litigation advantage plaintiffs may gain by remaining in state court—assuming removal is not a possibility due to plaintiff willingness to limit their causes of action to state law claims—may be lost when they face a preemption challenge. All too frequently, state law-based climate change litigation may be viewed as a waste of resources. Indeed, state and federal plaintiffs pled regulatory claims 92.7 percent of the time.¹⁰⁶



While the liberal pleading philosophy behind the Federal Rules and the modern approach to claim preclusion may provide plaintiffs with strong incentives to join as many colorable claims as they may seem fit, generally applicable legal doctrine, pleading standards, and cues from the litigation environment do constrain their pleadings. Here, a study of pleading practice in the climate change-related area leads to the conclusion that generally applicable litigation doctrines—including standing, displacement, preemption, and perhaps tighter pleading standards—seem to be influencing pleading patterns, even subduing the impact of the two major U.S. Supreme Court rulings in this area. These findings indicate that this type of litigation has not, and is not likely to, induce major GHG emitters to support federal preemptive

106. See *supra* Table 3 and discussion *infra* Parts I.C.2, II.A.

emissions legislation as a risk-reducing compromise. Indeed, EPA's expanding mitigation regulations, not state common law actions, are the bigger threat.¹⁰⁷

Considering the level of ideological opposition to and feigned support for carbon-restricting legislation in Congress, the absence of an anti-litigation incentive suggests that GHG emitters will not abandon direct or stealth legislative blockage. To the extent that the CAA (last amended in 1990) and other environmental statutes need refining amendments "to keep pace with science, technology and administrative practice," blockage means the continuation of suboptimal policy.¹⁰⁸ Although the political system did overcome inherent opposition of special interests in the past, passing environmental statutes that created public goods,¹⁰⁹ one is left to speculate what developments outside risk-increasing litigation might have legislative-forcing potential.

107. Although in its latest pronouncement under the CAA the Court struck down EPA's claimed power to tailor expressly prescribed statutory numerical thresholds that would trigger GHG-specific permitting obligations for all covered stationary sources, the Court upheld EPA's broad authority to require stationary sources that are already required to control emissions of conventional air pollutants (that is, large stationary sources) to also meet EPA-promulgated GHG-emission thresholds. See *Util. Air Regulatory Grp. v. Env'tl. Prot. Agency et al.*, 134 S. Ct. 2427, 2446–47 (2014), *aff'g in part, rev'g in part* *Coal. for Responsible Regulation, Inc. v. EPA*, 684 F.3d 102 (2012) (per curiam). While the decision that a source may not be subject to permitting requirements on the sole basis of its GHG emissions did curtail the scope of EPA power under the CAA, the Court itself recognized that, effectively, EPA's authority to reach GHG emissions from stationary sources remains nearly intact. See e.g., *Util. Air Regulatory Grp.*, 134 S. Ct. at 2438–39 (noting that EPA's broad interpretation would account for 86 percent of U.S. stationary GHG emissions, but adding that limiting permit requirements to "anyway" sources would cover "roughly 83 percent" of such emissions).

108. See Richard Lazarus, *As Congress Stalls, the Courts Step In*, 30 ENVTL. F. May–June 2013 at 12.

109. See Daniel A. Farber, *Politics and Procedure in Environmental Law*, 8 J.L. ECON. & ORG. 59 (1992).

APPENDIX A. CAUSE OF ACTION CATEGORY REFERENCE TABLE

Full Name	Abbreviation	Figure 4 Abbreviation	Explanation
Federal Agency Regulation	F. Ag. Reg.	F. Ag. Reg.	Plaintiff alleges agency violation of its own regulations
Federal Administrative Procedure Act, ch. 324, 60 Stat. 237 (1946) (codified as amended at 5 U.S.C. §§ 551-570a (2011))	F. APA	APA	Plaintiff alleges violation of the general federal agency procedural statute
Federal Clean Air Act, ch. 360, 69 Stat. 322 (1955) (codified as amended at 42 U.S.C. §§ 7401-7671q (2011))	F. CAA	CAA	Plaintiff alleges violation of federal air quality statute
Federal Clean Water Act, ch. 758, 86 Stat. 816 (1948) (codified as amended at 33 U.S.C. §§ 1251-1387 (2011))	F. CWA	CWA	Plaintiff alleges violation of federal water quality statute
Federal Endangered Species Act of 1973, ch. 35, 87 Stat. 884 (codified as amended at 16 U.S.C. §§ 1531-1544 (2011))	F. ESA	ESA	Plaintiff alleges violation of federal endangered species protection statute
Federal Land Policy and Management Act of 1976, ch. 35, 90 Stat. 2743 (codified as amended at 43 U.S.C. §§ 1701-1787 (2011))	FLPMA	FLPMA	Plaintiff alleges violation of federal land usage regulation
Federal Freedom of Information Act, ch. 5, 80 Stat. 250 (1966) (codified as amended at 5 U.S.C. §§ 552-559 (2011))	F. FOIA	FOIA	Plaintiff alleges violation of federal transparency statute
Federal National Environmental Policy Act of 1969, ch. 55, 83 Stat. 852 (codified as amended at 42 U.S.C. §§ 4331-4370h (2011))	F. NEPA	NEPA	Plaintiff alleges violation of federal environmental protection statute
Federal National Historic Preservation Act, ch. 1A, 80 Stat. 915 (1966) (codified as amended at 16 U.S.C. §§ 470-470x-6 (2011))	F. NHPA	NHPA	Plaintiff alleges violation of federal historical protection statute

Pleading Patterns and the Role of Litigation

Full Name	Abbreviation	Figure 4 Abbreviation	Explanation
Federal tort	F. Tort	F. Tort	Plaintiff alleges civil wrongdoing under federal common law
Other federal nonregulatory	Other F. Non-Reg.	O. F. Non-Reg.	Plaintiff alleges violation of federal constitution, federal conspiracy, concert of action, or RICO statutes
Other federal regulatory	Other F. Reg.	O. F. Obs.	Plaintiff alleges violation of less common federal regulatory statutes (i.e., less than five challenges per given statute)
State administrative procedure	S. Adm. Proc.	S. Adm. Proc.	Plaintiff alleges violation of state administrative procedure statute (e.g., Florida's Government-in-the-Sunshine Law, Michigan's Administrative Procedure Act)
State environmental protection act	S. NEPA	S. NEPA	Plaintiff alleges violation of state environmental protection statute (e.g., California Environmental Quality Act, Minnesota Environmental Policy Act)
State tort	S. Tort	S. Tort	Plaintiff alleges civil wrongdoing under state common law
State water statute	S. Water Stat.	SWS	Plaintiff alleges violation of state water quality statute (e.g., California Water Code, Texas Water Code, etc.)
State zoning	S. Zoning	S. Zoning	Plaintiff alleges violation of state zoning laws, codes, etc.
Other state common law	Other S. C-L	O. S. C-L	Plaintiff alleges violation of state common law other than state

Full Name	Abbreviation	Figure 4 Abbreviation	Explanation
			torts (e.g., public trust, unjust enrichment, property damage, indemnification, etc.)
Other state nonregulatory	Other S. Non-Reg.	O. S. Non-Reg.	Plaintiff alleges violation of state constitution or state conspiracy, concert of action, or RICO statute
Other state regulatory	Other S. Reg.	O. S. Obs.	Plaintiff alleges violations of less common state regulatory statutes (i.e., less than five challenges per given statute)

**APPENDIX B. A *t*-TEST
FOR CAUSE-OF-ACTION CO-OCCURRENCE**

We think of the set of 178 complaints as containing a sequence of pairs of two particular causes of action: CoA_i and CoA_j. Thus conceived, complaints are random variables that take on the value 1 when the pair CoA_i-CoA_j occurs in the complaint, and 0, otherwise. We calculate the probability of occurrence for each CoA_i and CoA_j as the ratio of their frequency of occurrence to the total number of complaints:

$$P(\text{CoA}_i) = f(\text{CoA}_i) / N; \text{ and}$$

$$P(\text{CoA}_j) = f(\text{CoA}_j) / N$$

The null hypothesis states that occurrences of CoA_i and CoA_j are independent. The research hypothesis posits the opposite.

$$H_0: P(\text{CoA}_i, \text{CoA}_j) = P(\text{CoA}_i) * P(\text{CoA}_j) = [f(\text{CoA}_i) * f(\text{CoA}_j)] / N^2$$

The process of randomly generating pairs of causes of action—assigning 1 to the complaint where CoA_i and CoA_j co-occur and 0 to all other complaints—is in effect a Bernoulli trial with probability $P(\text{CoA}_i, \text{CoA}_j) = [f(\text{CoA}_i) * f(\text{CoA}_j)] / N^2$. The mean of this distribution is $\mu = P(\text{CoA}_i, \text{CoA}_j) = [f(\text{CoA}_i) * f(\text{CoA}_j)] / N^2$ and variance $\sigma^2 = P(\text{CoA}_i, \text{CoA}_j) * (1 - P(\text{CoA}_i, \text{CoA}_j))$.

The sample mean, calculated as the ratio of complaints in which the pair CoA_i-CoA_j occurs to the total number of complaints, is obtained by:

$$\bar{x} = f(\text{CoA}_i, \text{CoA}_j) / N$$

The sample variance is:

$$s^2 = \bar{x} (1 - \bar{x}).$$

We calculate the t-values according to the following formula:

$$t = \frac{\bar{x} - \mu}{\sqrt{s^2 / N}}$$

For purposes of significance testing, we compare the calculated t to the critical t-value (one-tailed test), with n-1 degrees of freedom (i.e., df = 177). For example, the critical t-value for a 95% confidence level equals 1.653.