NYPIRG NEW YORK PUBLIC INTEREST RESEARCH GROUP

TESTIMONY
OF THE
NEW YORK PUBLIC INTEREST RESEARCH GROUP
BEFORE THE JOINT HEARING OF THE
SENATE FINANCE, ENERGY & TELECOMMUNICATION AND
ENVIRONMENTAL CONSERVATION COMMITTEES
REGARDING THE LEGISLATIVE AND BUDGETARY ACTIONS NECESSARY TO IMPLEMENT THE CLIMATE ACTION COUNCIL FINAL SCOPING PLAN
January 19, 2023
Albany, N.Y.

Good morning. My name is Blair Horner, and I am the Executive Director for the New York Public Interest Research Group (NYPIRG). NYPIRG is a non-partisan, not-for-profit research and advocacy organization. Consumer protection, environmental preservation, public health, healthcare quality, higher education affordability, and governmental reforms are our principal areas of concern. We appreciate the opportunity to submit testimony on your examination of the legislative and budgetary actions necessary to implement the Climate Action Council Final Scoping Plan.

The recommendations of the Climate Action Council embodied in the Final Scoping Plan are critically important in achieving the Climate Leadership & Community Protection Act (CLCPA or the Climate Act) goals. The planet and the public's health have never been so imperiled. The U.N. Secretary General António Guterres made it abundantly clear what is at stake if the world fails to act aggressively on the climate crisis:

> "... [It is] *code red for humanity*. The alarm bells are deafening, and the evidence is irrefutable: greenhouse gas (GHG) emissions from fossil-fuel burning and deforestation are choking our planet and putting billions of people at immediate risk. Global heating is affecting every region on Earth, with many of the changes becoming irreversible."[1]

The United Nations International Panel on Climate Change (IPCC) 2022 report resulted in a clarion call from the report's co-chair: "*It's now or never, if we want to limit global warming to 1.5°C (2.7°F); without immediate and deep emissions reductions across all sectors, it will be impossible*."[2] [Emphasis added.]

. In response to the existential threat the world is facing, in 2019 New York State adopted one of the most ambitious laws in the nation to address the climate crisis, the Climate Leadership & Community Protection Act (Climate Act or CLCPA). The law established goals for reducing the state's greenhouse gas emissions (GHG) and prioritized just transition worker protections and social justice principles, with at least 35% of the Climate Act's benefits directed to Disadvantaged Communities. The details of the Climate Act's implementation was to be developed through the Climate Action Council, a group of state agency leaders and stakeholders. That plan was released in December 2022.

[1] United Nations, UN News, UN News Global perspective Human stories, "IPCC report: 'Code red' for human driven global heating, warns UN chief," August 9, 2021, https://news.un.org/en/story/2021/08/1097362.
[2] Jim Skea, Co-Chair of IPCC Working Group III, which released the report *2022: Mitigation of Climate Change*, quoted in UN News, *Climate Report: It's 'Now or Never' to Limit Global Warming to 1.5 Degrees*, United Nations, April 4, 2022. Accessed at https://news.un.org/en/story/2022/04/1115452.

At its heart, the law requires the state to meet science based GHG reduction and renewable energy goals:

- 2030 40% reduction in statewide GHG
- 2030 70% of electric produced in the state through renewable energy
- 2040 100% zero-emission electric generation
- 2050 85% reduction in statewide GHG (net zero emissions)

The Climate Catastrophe Is Real And Requires Action

Recently, the United Nations stated that the world must reduce GHG emissions by 43% by 2030 or civilization will be devastated (using 2019 as a baseline year).[3] *2030 is only 7 years away*. The UN declaration is in line with New York's goals and thus the state's climate goals set the floor – not the ceiling – for action. Missing those goals ignores climate science and puts New York on a trajectory that could lead to unnecessary deaths, human suffering, and staggering costs from flooding, storms, and heatwaves.

New York is already facing enormous costs from climate catastrophes.

A 2022 federal report found New York State experienced 27 severe storms, 11 tropical cyclones, 6 winter storms, 4 droughts, and 3 flooding disaster events that each cost at least a billion dollars due to the climate crisis from 2000 to 2021. Together, these events cost the State between $50 to $100 billion dollars, with up to $20 billion in 2021 alone.[4] The think tank *Rebuild By Design* has conservatively estimated that New York faces $55 billion in climate-related expenses during this decade alone.[5] In addition, the U.S. Army Corps of Engineers has estimated that it will cost $52 billion to protect New York Harbor *alone*.[6]

And reality has borne out those estimates: "Super Storm Sandy" caused 53 deaths and $19 billion in damages.[7] Hurricane Irene devastated the state and resulted in ten deaths and over $1.3 billion in damages.[8] Tropical Storm Lee brought drenching rains that resulted in over $1 billion in damages.[9] Hurricane Ida shattered those records, causing 18 deaths from tragically drowning New Yorkers in their own cars and homes.[10]

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[3] United Nations Climate Change, "Climate Plans Remain Insufficient: More Ambitious Action Needed Now," October 26, 2022, https://unfccc.int/news/climate-plans-remain-insufficient-more-ambitious-action-needed-now#:~:text=The%20UN's%20Intergovernmental%20Panel%20on,be%20cut%2043%25%20by%202030.

[4] National Centers for Oceanic & Atmospheric Administration, https://www.ncei.noaa.gov/access/billions/events/NY/2000-2021.

[5] Rebuild By Design, "Resilient Infrastructure For New York State," https://rebuildbydesign.org/wp-content/uploads/2021/12/1329.pdf.

[6] U.S. Army Corps of Engineers, NY & NJ Harbor & Tributaries Focus Area Feasibility Study (HATS) https://www.nan.usace.army.mil/Missions/Civil-Works/Projects-in-New-York/New-York-New-Jersey-Harbor-Tributaries-Focus-Area-Feasibility-Study/.

[7] *2014 New York Hazard Mitigation Plan*, NYS Division of Homeland Security & Emergency Services, January 4, 2014, www.dhses.ny.gov/oem/mitigation/documents/2014-shmp/Section-3-12-Hurricane.pdf. https://www.usatoday.com/story/news/2013/05/23/superstorm-sandy-deaths-red-cross-cdc-drowning/2354559/

[8] Hurricane Irene One Year Later, *Associated Press*, August 27, 2012. www.nydailynews.com/new-york/hurricane-irene-year-storm-cost-15-8-damage-florida-new-york-caribbean-article-1.1145302.

[9] *Tier Flood Damage $1 Billion*, *Press-Sun Bulletin*, February 1, 2012, www.pressconnects.com/article/20120201/NEWS01/202010330/Tier-flood-damage-estimate-1-billion.

[10] https://www.cnn.com/2021/09/03/weather/ida-eastern-us-flooding-friday/index.html

The Climate Crisis Is Already Harming Us and Getting Worse

- Extreme heat is the number one weather-related killer in America, responsible for over 130 deaths in New York City per year, which could increase to over 3,300 deaths annually by 2080 if action is not taken.[11]
- From 2010 to 2039, the City is projected to increase the number of days reaching 90°F or more—from an average of 18 per year (1971 to 2000)—up to 33 days per year by this 2020 decade.[12] Extreme heat leads to a substantial increase in medical costs, ER visits, illnesses, and deaths.
- Low-income and communities of color are hit first and worst: either by displacement from hurricanes, hospitalizations from heatwaves, or death from chronic air pollution. A Harvard study found "worldwide, air pollution from burning fossil fuels is responsible for about 1 in 5 deaths—roughly NYC's population."[13]
- Sea level rise, storm surges, and erosion contributes to an increase in coastal flooding, including the frequency of "100-year floods."[14] Extreme precipitation events will increase the risk of waterborne illnesses from sewage overflows and pollutants entering the water supply.[15]

Even if New York meets its science-based climate targets, the costs to the state's infrastructure will grow. Inaction will only make those costs dramatically higher.

The Climate Action Council's Scoping Plan

With Washington mired in gridlock and the hobbling of the U.S. Environmental Protection Agency by the U.S. Supreme Court, it is clearer than ever that the states must lead on climate. New York has the tools, know-how, and policy proposals to lead the nation with the implementation of its landmark Climate Act.

NYPIRG supports the general thrust of the Climate Action Council's Scoping Plan. There are areas in which it can be strengthened and those measures require legislation.

Issue an Annual Scorecard, Progress Report and a 2022-2050 Climate Action Plan Based on Sector-by-Sector Benchmarks to Track the State's Progress in Achieving the Climate Act Goals.

"We are drowning in information but starved for knowledge."
John Naisbitt, *Megatrends*, 1982

The amount of information and data on climate and energy is *overwhelming*. Much of it is highly technical. It includes myriad sources talking about issues differently, uses different yardsticks to measure the same things; for the lay public the jargon is akin to a new language. This undermines public understanding of climate issues, dilutes public confidence and ultimately makes it harder to get everyone pulling in the same direction. In the absence of clear understanding, the public's response may be disinterest or perhaps worse: resistance. Presenting clear, understandable information and analysis is *essential* to maximizing public support, cooperation and beneficial participation among New Yorkers.

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[11] "NYC Could See Thousands of Heat Deaths by 2080," Scientific American, June 23, 2016, https://www.scientificamerican.com/article/new-york-city-could-see-thousands-of-heat-deaths-by-2080/.
[12] The City of New York, "A Stronger, More Resilient New York: Climate Analysis," http://www.nyc.gov/html/sirr/downloads/pdf/final_report/Ch_2_ClimateAnalysis_FINAL_singles.pdf.
[13] Environmental Research, February 9, 2021, https://www.hsph.harvard.edu/c-change/news/fossil-fuel-air-pollution-responsible-for-1-in-5-deaths-worldwide/.
[14] The City of NY, "A Stronger, More Resilient New York: Climate Analysis," http://www.nyc.gov/html/sirr/downloads/pdf/final_report/Ch_2_ClimateAnalysis_FINAL_singles.pdf. and
[15] The Climate Institute, "Human Health," http://www.climate.org/topics/health.html.

Beyond public understanding and participation, New Yorkers are entitled to and deserve accurate, understandable information on climate progress. This is particularly true because in the past New York State has a poor record of meeting climate and energy goals. The public's understanding and active support is absolutely critical. Releasing annual progress Scorecard summaries, and a more detailed Report, will educate and help to engage and activate the public. People can assess whether the state is reaching the Climate Act goals, and if not, bolster support for the tough policy choices required.

Inclusion of an annual *Scorecard* and *CLCPA Progress Report* are crucial government accountability measures that must be required to help ensure the State achieves the annual requirements needed to meet the CLCPA's legally mandated goals.

The CAC recognizes this need, stating "The State needs to ensure that there are sufficient data collected over time to measure progress and inform policy." In addition, the CAC argues for regular reporting of collected data, "Every four years, DEC will issue a report, after consultation with the Climate Action Council (Council) and the Climate Justice Working Group (CJWG), on the implementation of GHG reduction measures, as required by the Climate Act. The first implementation report will be released no later than January 1, 2028."[16]

There needs to be a clear mandate to create an easy-to-use, public "dashboard" measuring the state's progress toward its climate goals. The public needs to know that any sacrifices that it is making in order to achieve climate success, is in fact moving the state toward achieving its goals. In addition, annual public reporting provides motivation to government agencies to act quickly and decisively.

Over the past three years, in our efforts to motivate New York to move quickly toward its climate goals, NYPIRG has published its own "scorecards" relying on information that was publicly available (and much of which was very difficult to find).[17]

New York State has far more resources and tools at its disposal to offer a more comprehensive scorecard. The public's access to this information will be key to pushing New York State to implement critically important legislative, funding, regulatory and administrative actions to achieve the CLCPA goals. NYPIRG urges that the Legislature pass a policy that requires annual public reporting on the state's progress. Moreover, we urge that it include a requirement to publish the location of such information on notices published by regulated energy entities and promote it widely to the public.

The absence of such a requirement diminishes the CLCPA chances for success. The CAC should look to the work of NYSERDA, which issues annual reports on their renewable energy progress, and add to it by setting benchmarks, and annual adjustments to ensure goals are achieved. It is also incumbent on the CAC to require a 90 day public comment period on the implementation reports (starting in 2028) on the 2022-2050 Climate Action Plan, and annual Scorecards and Progress Reports, to ensure the State includes the critical component of public accountability.

It bears repeating: There is a long history of broken promises on the environment – whether it be never realizing the climate goals set by Governors Pataki, Spitzer and Paterson; the 1988 statutory hierarchy to reduce, reuse and recycle solid waste; policies to eradicate lead decontamination in low-income housing; policies to remediate State Superfund and Brownfield sites in a timely manner, or reduce the use of pesticide

[16] New York State Climate Action Council Final Scoping Plan, p. 429, https://climate.ny.gov/-/media/project/climate/files/NYS-Climate-Action-Council-Final-Scoping-Plan-2022.pdf.
[17] NYPIRG's most recent "scorecard" can be found at, https://www.nypirg.org/pubs/202207/Climate_Act_2022_Scorecard_final.pdf.

and herbicides.[18] As of now there is no instrument for the public to adequately monitor and hold accountable the state's progress in achieving statutory GHG emission reductions.

Strengthen The Plan To Require That All New Buildings Be Powered By Electricity, Not Fossil Fuels. The CAC's recommendation that new building construction be powered by electricity is the correct one but must be strengthened. The building sector is the largest GHG emitter representing 32% of the state's GHG emissions. The Scoping Plan recommends adopting zero-emission state building construction code and cites New York City carbon dioxide (CO_2) emission limits that effectively prohibit fossil fuel combustion equipment for heating, hot water, and most appliances in new construction, beginning in 2024 for low rise residential, and by 2027 for commercial and large multifamily. The Plan argues that the "state should adopt comparable codes, applicable to all municipalities, to prohibit fossil fuel combustion systems and fossil fuel combustion equipment in new construction."[19]

NYPIRG urges that the Legislature pass the *All-Electric New Buildings Act* (AEBA). S.562A this session[20] This legislation would make New York one of the first states to end fossil fuel use in new building construction. New buildings could rely on heat pumps for heating, cooling, and greater energy efficiency. Heat pumps do not combust fossil fuels; they are highly efficient and electric-powered. And this electricity is increasingly powered by wind, solar, and other renewable sources. Everything from deeply affordable housing to skyscrapers are being built fossil free. The legislation requires a responsible start date of 2024 for low-rise buildings of seven floors or under, and 2027 for high rise buildings, and has the support of over 220 national, state, and regional organizations, and businesses. CAC member Robert Warren Howarth, Ph.D., The David R. Atkinson Professor of Ecology & Environmental Biology of Cornell University in his December 19, 2022 public statement, wrote:

> "The building sector is the largest single source of greenhouse gas emissions … Therefore, the greatest priority for meeting the goals of the CLCPA should be to reduce emissions from the building sector. I urge the Assembly and Senate to act to mandate that the State move away from fossil fuels more quickly than called for in the Council's Scoping Plan., using the guidance from the December 2021 draft Scoping Plan [with a 2024 start date for low-rise buildings consistent with the New York City law.]."

He wrote that by his calculations the building sector represents 40% of the state's GHG emissions, underscoring the urgency to start electrifying buildings as soon as possible. (See attached.) State agencies recommended at a Fall meeting that the CAC delay the start date to 2025 due to the delay of an international ICC code. However, if the bill passes this session, codes for low-rise buildings can *only* be developed by the Department of State and approved by the Codes Council in 2023; in time to start this important climate policy in January of 2024.

The Renewable Heat Now Campaign of over forty organizations urged the Governor to support a 2024 start date in response to her State of the State announcement on electrifying new buildings. The coalition, of which NYPIRG is a member, stated that: "Consumers are being forced to spend billions on expanding climate-warming energy infrastructure, and our homes are being built with outdated appliances that we know harms our health. Buildings built with equipment for fossil-fueled heating and cooling will become *"stranded assets"* in the future, requiring expensive retrofitting, and the current "obligation to serve" means

[18] This is certainly true on the Federal level as well -- *e.g.*, the Clean Water Act and Clean Air Act goals are in some cases *decades* behind statutory and/or promised timelines.
[19] New York State Climate Action Council Final Scoping Plan, p.185.
[20] See Senate bill 6843C/Assembly bill 8431 of 2022.

that ratepayers are expanding gas infrastructure using their hard-earned money. The cheapest time to electrify a building is when it is being built. "[21]

Two Key Fiscal Policy Reforms in Relation to the Climate Act
The End Climate Polluter Handouts Act, S.7438/A.8483, is an important application of the Climate Act on the state's fiscal policy. The State provides over $1.5 billion annually to the climate crisis contributors—the fossil fuel industry.[22] Ending state subsidies to the polluting fossil fuel industry is critical to help meet the Climate Act goals as the State is undermining the law by subsidizing the very industry that created this crisis. To the detriment of its citizens, the State is "talking out of both sides of its mouth" by providing funds to the polluting industrial sector it has statutorily declared needs to be phased out.

The bill repeals the most egregious fossil fuel subsidies and saves the state approximately $336 million annually.[23] It signals that the State is seriously and consistently abiding by the goals of the CLCPA and taking actions to transition to a climate-healthy future. For example, the bill ends: $118 million in airline fuel tax exemptions; $89 million in fossil fuel research and development and certain property tax exemptions; $65 million in petroleum gas tax exemptions; and limits subsidies in a number of economic development programs. After a careful review, the legislative sponsors focused on eliminating these subsidies first as they have a limited impact on consumers.

Another important bill that would eliminate a long-standing subsidy for the gas industry is the New York Home Energy Affordable Transition (HEAT) Act, S. 8198 of 2022. The bill eliminates subsidies for new gas hookups, the notorious "100-foot rule". It facilitates and enables neighborhood scale building decarbonization by eliminating the "obligation to serve" for gas. It also protects low- and moderate-income families by ensuring no household pays more than 6% of their income for energy.

NYPIRG urges the Legislature to pass the End Climate Polluter Handout Act and the NY HEAT Act this session.

The Scoping Plan Recommends Timely Action To Reduce Solid Waste.
The CAC recommends action in reducing the state's generation of solid waste citing its role in the generation of greenhouse gases. The CAC states, "GHG emissions from the waste sector represent about 12% of statewide emissions, including landfills (78%), waste combustion (7%), and wastewater treatment (15%). Most of these emissions represent the long-term decay of organic materials buried in a landfill, which will continue to emit methane at a significant rate for more than 30 years."[24]

The CAC goes on to recommend that in order "To reduce emissions to achieve the required 2030 GHG emission reductions, significant increased diversion from landfills as well as emissions monitoring and leak reduction will be needed. A circular economy approach to materials management is understood and employed."[25] Specifically, the CAC recommends that the state should:

- enact legislation to implement expanded deposit container programs where feasible and needed (if not covered by Extended Producer Responsibility [EPR] programs), and.[26]

[21] Renewable Heat Now Campaign Statement, 1/13/23, https://renewableheatnow.org/nys-governor-hochul-takes-a-stand-on-climate-health-and-energy-affordability-endorses-closing-the-curtain-on-new-fossil-fuel-equipment-in-state-of-state-speech/.
[22] Assembly Sponsor Memorandum, A. 8483, Feb. 2022, Bill Search and Legislative Information | New York State Assembly (nyassembly.gov)
[23] Ibid. Memorandum cites NYS Division of Budget FY 2022 Annual Report on New York State Tax Expenditures.
[24] New York State Climate Action Council Final Scoping Plan, p.316.
[25] New York State Climate Action Council Final Scoping Plan, p.319.
[26] New York State Climate Action Council Final Scoping Plan, p.326.

- should enact and implement new legislation in 2023 that creates an EPR/Product Stewardship framework. Alternatively, individual legislation should be enacted targeting products with the greatest GHG impact (such as packaging and printed paper, carpet, tires, textiles, solar panels, wind turbines, batteries, appliances, especially those containing refrigerants, and mattresses).[27]

NYPIRG recommends that the Legislature pass legislation this session in these two areas.

Strengthening The State's Bottle Deposit Law. 2023 is the 40th anniversary of initial implementation of the state's Returnable Container Act, affectionately called the *"Bottle Bill*." The 'Bottle Bill' requires a 5-cent refundable deposit on eligible beverage containers to encourage their return to avoid litter and waste. New York's Bottle Bill has been the state's most effective recycling and litter prevention program. In recognition of this fact, in a seminal 2010 report on solid waste, the Department of Environmental Conservation (DEC) recommended its expansion:

> "10.1.4 Expand the Returnable Container Law … To support enhanced materials recovery and revenue generation, the Department of Environmental Conservation will advance proposed legislation to expand the Returnable Container Law *to include all beverage containers*."[28]

After its four-decades of success, the time is long overdue to modernize the Bottle Bill by expanding the law to include popular non-carbonated beverages, wine, spirits, and hard cider and increase the redeemable deposit value to 10-cents to increase the rate of recovery.

Over its 40-year history, the Bottle Bill has proven to be a highly effective program in reducing litter and increasing recycling rates. In 2020, New York's redemption rate was at 64%.[29] The Bottle Bill reduces roadside container litter by 70%, and in 2020, 5.5 billion containers were recycled in the state.[30]

China, which had been accepting massive amounts of America's plastic waste, stopped accepting plastic waste imports in January 2018.[31] This resulted in severe strains on municipal recycling programs, which led to some municipalities charging consumers for recycling. Such programs are also struggling with glass containers in their recycling streams as when glass breaks in curbside containers it can render other materials unrecyclable or "contaminated". The expansion of the Bottle Bill to include wine, spirits, and hard cider would take a significant amount of the containers that municipalities are struggling with off their hands.

Additionally, states with bottle deposit laws have better recycling rates than non-deposit states. According to the Container Recycling Institute, states with bottle deposit laws have a beverage container recycling rate of around 60%, while non-deposit states only reach about 24%. Michigan and Oregon have already increased their deposit to 10 cents, leading to an immediate increase in recycling redemption rates.

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[27] New York State Climate Action Council Final Scoping Plan, p.329.
[28] *Beyond Waste Plan*, NYS Dept. of Environmental Conservation, 2010, Pg. 235. https://www.dec.ny.gov/docs/materials_minerals_pdf/frptbeyondwaste.pdf
[29] Container Recycling Institute, Bottle Bills in the USA: New York, https://www.bottlebill.org/index.php/current-and-proposed-laws/usa/new-york.
[30] New York State Department of Environmental Conservation, "New York's Bottle Bill," http://www.dec.ny.gov/chemical/8500.html, Accessed October 2021.
[31] Watson, Sara, "China Has Refused To Recycle The West's Plastics. What Now?," NPR, June 28, 2018, www.npr.org/sections/goatsandsoda/2018/06/28/623972937/china-has-refused-to-recycle-the-wests-plastics-what-now.

It is essential that New York addresses its waste issues with a fully modernized Bottle Bill in the state budget—one that increases the deposit and includes additional containers. The Bigger, Better Bottle Bill needs to include the following provisions.

- Expand the program to include wine, spirits, hard cider, and most non-carbonated beverages. A deposit system dramatically reduces litter and solid waste that would otherwise be discarded. Many other states have already added these containers to their laws. For example, Maine's law covers all beverages except dairy products and unprocessed cider.[32]
- Increase the deposit from a nickel to a dime and use revenues to support recycling equity. States with higher deposit fees have higher redemption rates than states with a nickel fee. Vermont has a 15-cent deposit on liquor bottles and the redemption rate for liquor containers was 83% in 2020.[33] Increasing the deposit can generate more revenues for the state, that can be used to address limits on redemption options in low-income communities and other litter and solid waste problems in such communities. The impact of the nickel deposit approved in 1982 has eroded over time. An inflation update would likely make it 15-cents. It's past time for the State to raise its deposit to a dime.

Legislation has been introduced to modernize this law, NYPIRG urges your support and passage this session.[34]

NYPIRG strongly supports the principle to hold producers (or manufacturers) responsible for taking care of their product and packaging waste and has been a longtime supporter of extended producer responsibility (EPR) policies. One of the most successful recycling and litter reduction programs in New York, the Bottle Deposit Law, is an extended producer responsibility policy.

The CAC strongly recommended that the state fully implement the 1988 Solid Waste Management law. Specifically, the Plan recommended:

> "The Solid Waste Management Act's requirements were intended to ensure that both State and local governments work actively toward establishing environmentally sound solid waste management systems that integrate the hierarchy of solid waste management methods and emphasize waste reduction [reuse] and recycling, using landfills only for materials that could not be managed in a more productive way…"[35]

The CAC also stated that: "No new solid waste combustion facilities are envisioned,"[36] or needed as such facilities are a source of GHG emissions to be avoided. To implement the solid waste law, the CAC outlined a comprehensive plan or vision on the solid waste sector.

> ***"Vision for 2030.*** For solid waste management and WRRFs [water resource recovery facility], the major contributors to emissions are associated with landfill emissions, though sources are also found at WRRFs and other facilities. To reduce emissions to achieve the required 2030 GHG emission reductions, significant increased diversion from landfills as well as emissions monitoring and leak reduction will be needed. A circular economy approach to materials management is understood and employed.

[32] Container Recycling Institute, "Redemption Rates and Other Features of 10 U.S. State Deposit Programs," 2021. https://www.bottlebill.org/images/PDF/BottleBill10states_Summary41321.pdf.
[33] Ibid.
[34] See Senate bill 9164/Assembly bill 10184 of 2022.
[35] New York State Climate Action Council Final Scoping Plan, p.323
[36] Ibid.

> ***Vision for 2050:*** The Climate Act requires a more dramatic decrease in GHG emissions by 2050, achieving at least an 85% reduction (compared with 1990 levels). For solid waste and WRRFs, this necessitates a dramatic shift in the way waste is managed, to the point that landfills and combustors are only used sparingly for specific waste streams, and reduction and recycling are robust and ubiquitous ... "

A key approach to realizing the Visions for 2030 and 2050 is through product stewardship or extended producer responsibility (EPR). NYPIRG supports the comprehensive EPR or product stewardship approach based on ten key principles or elements of environmental sustainability, such as environmental standards for packaging. Attached please find a memo describing these key elements by the national groups Beyond Plastics and Just Zero. An EPR policy ensures corporations are on the hook for a "cradle-to-grave" approach to take care of their packaging waste in an environmentally sustainable way. A significant contributor to the state's waste and plastic pollution crisis is the fact that consumer brand-owners have no financial responsibility for the solid waste management of their product packaging. They have no requirements or incentives to reduce packaging waste, utilize reusable or recycled material and boost market demand by using more recycled content. EPR requires companies to be financially responsible for mitigating the environmental impacts of their product packaging, through reduction, reuse, and recycling.

Legislation has been introduced to tackle this growing problem, the *Packaging Waste Reduction Act.*[37] The bill requires companies to gradually reduce their packaging by 50% over 10 years, while transitioning 90% of their remaining packaging over 12 years to be either reusable, recyclable, compostable, or made of recycled content. Further, it eliminates toxic chemicals, including PFAS, mercury, lead, and formaldehyde. It also prohibits the practice of pyrolysis. These are primarily waste-to-fuel facilities, almost always placed in low-income and/or communities of color. The plastics industry argues this is not incineration, however such facilities, called pyrolysis units, burn hazardous plastics as low-grade fuel.

Crucially, the bill transfers the financial responsibility for managing packaging waste from taxpayers to the companies that created the problem, putting the economic burden where it belongs. The bill provides funding to local governments for waste reduction, recycling, and waste disposal programs through the use of new fees on manufacturers, which are adjusted based on the environmental impacts of the packaging. Key to this producer-funded model is strong oversight and enforcement, and strong benchmarks and goals. The state wouldn't allow ExxonMobil to set climate standards, it can't allow manufacturers to set their reduction, reuse and recycling requirements. NYPIRG urges the Legislature to pass this bill this session.

Funding Resiliency Through A Climate Change Superfund Act. The thrust of the CLCPA is to move New York toward a "greener" economy while drastically reducing its greenhouse gas emissions. Yet the state faces staggering costs to adapt to a world in which the planet continues to heat up, forcing investments in a much more resilient infrastructure.

As the CAC properly observes, "Even with strong and innovative strategies in place to curb greenhouse gas (GHG) emissions, the impacts of climate change are already being felt and are only projected to accelerate. Climate change mitigation strategies alone are not sufficient to prepare for the impacts of present and future climate change. Therefore, New York State must take bold action to adapt to climate change and enhance resilience in communities, infrastructure, and systems."[38] The CAC further notes that "The costs of dealing with the effects of climate change will be significant and will continue to rise as the planet warms."[39]

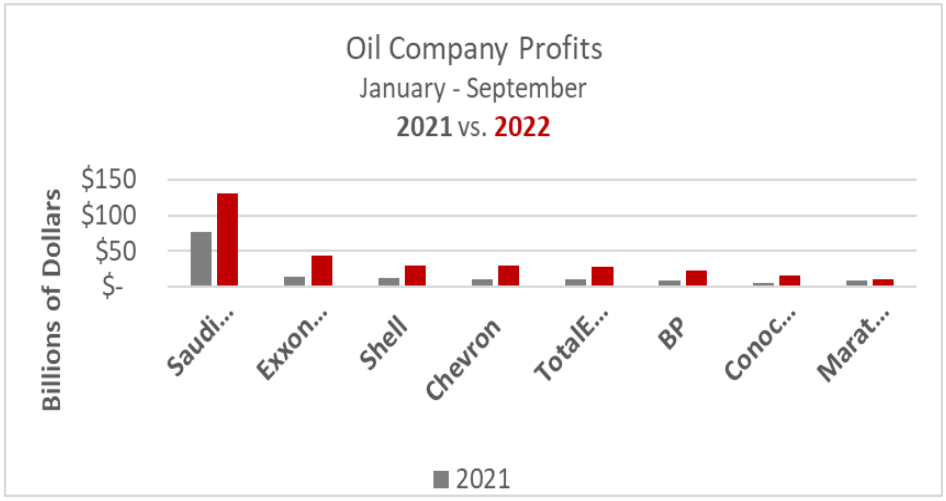
[37] See Senate bill 9493/Assembly bill10185 of 2022
[38] New York State Climate Action Council Final Scoping Plan, p.404.
[39] New York State Climate Action Council Final Scoping Plan, p.411.

Yet the Plan does not offer a funding stream adequate to meet the infrastructure challenges associated with adapting to a hotter world. Currently, those costs will be borne by New York taxpayers, likely with some federal support. But those costs will be enormous.

Legislation has been introduced to ensure that the oil, coal, and gas industries are held financially responsible for the rising costs of the climate catastrophe that all of us already are—and will continue—enduring.[40] Those industries' decisions led to global warming; justice requires that they—not New York's other taxpayers—be financially responsible for the tragically enormous climate crisis impacts that they created.

As you know, New York State—and the nation—is facing an existential threat posed by a rapidly heating planet. The climate changes resulting from the burning of fossil fuels are costing New Yorkers tens of billions of dollars in damages due to extremely powerful storms and flooding, escalating and frequent heat waves, and increased air pollution. Moreover, oil, coal, and gas companies are now benefiting from windfall profits as consumers pay higher heating and transportation costs. It is time for some of those profits to be directed to community protection, mitigation and remedial programs to address damages caused by the climate crisis.

As seen below, for example, the United States' biggest oil companies – ExxonMobil and Chevron – reported a fourth consecutive quarter of robust profits on the back of high oil and natural gas prices and strong chemical and refining earnings. ExxonMobil's profit of nearly $20 billion from operations topped the previous quarter's $17.9 billion. The oil company's latest quarterly profit was nearly *triple* what it made in the same period last year. The cumulative takings for the seven biggest private sector oil drillers during the first nine months of 2022 could hit $173 billion.[41] Saudi oil giant Aramco, dwarfed them all with a reported $42 billion profit in the third quarter *alone*, making its profits so far in 2022 at $130.3 billion, compared to $77.6 billion in 2021.[42]



[40] See Senate bill 9417/Assembly bill 10556 of 2022.
[41] "Profits at world's seven biggest oil firms soar to almost £150bn this year. Bumper earnings prompt calls for overhaul of UK windfall tax after Shell admission it will not pay any this year," *The Guardian*, October 27, 2022, https://www.theguardian.com/business/2022/oct/27/profits-at-worlds-seven-biggest-oil-firms-soar-to-almost-150bn-this-year-windfall-tax.
[42] Oil Giant Saudi Aramco Has $42.4B Profit in Third Quarter, US News & World Report, November 1, 2022, https://www.usnews.com/news/business/articles/2022-11-01/oil-giant-saudi-aramco-has-42-4b-profit-in-third-quarter#:~:text=It%20put%20its%20profits%20so,to%20%2477.6%20billion%20in%202021.

It is clear from historical records that for the better half of the late 20th Century, oil companies knew burning fossil fuels was warming the planet. Nevertheless, starting in the 1980s, the industry championed an aggressive climate change denial campaign opposing any policy proposals and undermining climate science. Their success in bamboozling many Americans has pushed the planet to the brink.

New York State must take the nation's lead in developing and implementing a responsible and fair approach to fund critically important mitigation, adaptation, and community protection programs to respond to accelerating storms, floods, extreme heat, and other serious impacts of global warming. The "Climate Change Superfund Act" ensures that those responsible for greenhouse gas (GHG) emissions—the oil, gas, and coal industries—are responsible for the state's climate-related environmental costs.

New York has a strong history in holding the polluting industry accountable for the contamination they created. Both the Federal and State Superfund and the Oil Spill Fund are based on the "polluter pays principle," with funding coming from annual fees placed on the oil and chemical industry for hazardous waste generated, and for their use of toxic chemicals and petroleum. These precedents provide a fitting and appropriate model for the fossil fuel industry—climate crisis contributors should be responsible for the costs related to the growing catastrophe from GHG emissions. There is broad public support for the "polluter pays" principle. New York State polling by the Data for Progress found over 70 percent of New Yorkers support holding climate polluters financially responsible for programs to fight climate change.[43]

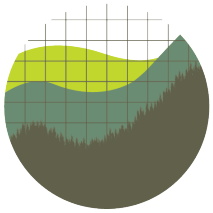
The Climate Change Superfund Act places the oil, coal, and gas industries squarely on the financial hook for the costs New York faces in addressing the worsening climate crisis. The Act extends the "polluter pays" principle to greenhouse gas pollution released into the atmosphere from the combustion of fossil fuel, the primary cause of climate change from global warming. This fund could finance statewide upgrades to roads and bridges, subways and transit systems; upgrades to storm water drainage, sewage treatment. and other water systems; preparing the power grid and improving emergency response programs to deal with stronger hurricanes and other severe storms; protecting residents from more frequent and deadly heat waves with new programs (such as ensuring that air conditioning exists in all schools); and responding to environmental and public health threats, such as algal blooms and drought caused by a rapidly heating planet.

The climate crisis poses an immediate, grave threat to the state's communities, health, environment, and economy. NYPIRG urges that the Legislature pass the Climate Change Superfund Act this session. The legislation would make New York a national leader with this first-in-the-nation, just and fair approach to ensure the state's efforts to respond to global warming are appropriately funded by the industry that profited from and is responsible for the climate crisis. The bill was included in the New York Renews (NYR) coalition's prominent *Climate, Jobs & Justice* legislative package.

Two concerns that have been raised about the Act are whether the state has the authority to enact it and whether the costs will be passed onto the consuming public. Attached you will find analyses by the think tank, Institute for Public Integrity that answer both of those concerns. Put simply, the state has the authority and the costs cannot be passed onto consumers.

Thank you for the opportunity to testify.

[43] Data For Progress poll being released January 19, 2023.



Institute *for*
Policy Integrity
NEW YORK UNIVERSITY SCHOOL OF LAW

M E M O R A N D U M

TO: Interested parties
FROM: Rachel Rothschild, Legal Fellow, Institute for Policy Integrity
DATE: 4/16/2022
RE: State Polluter Pays Climate Superfund Program

I. Introduction

This memorandum examines the legality of a State Polluter Pays Climate Superfund Program. The Program would require companies that profited from greenhouse gas pollution to pay a portion of the state's climate change driven spending, specifically infrastructure projects designed to avoid, moderate, or repair damage caused by climate change. It is based on the longstanding legal doctrine known as the "polluter-pays" principle, which stipulates that the entities responsible for pollution should be financially liable for the resulting harms.[1] Companies that emitted greenhouse gases above a specified threshold would be deemed "responsible parties" and required to pay compensation to the state. The amount of each company's financial contribution would be determined proportionally to their share of worldwide greenhouse gas emissions during a covered period, such as January 1, 2000 through December 31, 2018.

The Program could be designed and implemented in accordance with the U.S. Constitution and federal law, notably the Clean Air Act (CAA). Nevertheless, there are several potential legal challenges that a Climate Superfund Program could face. Fossil fuel companies may argue that the law 1) is preempted by the CAA; 2) violates the Constitution's Due Process Clause; or 3) violates the Constitution's Commerce Clause. The most applicable precedent concerns federal and state laws that hold companies liable for damages from improper hazardous waste disposal, notably the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), which a Climate Superfund Program would be modeled after. Recent state tort litigation against fossil fuel companies is also relevant to the issues of preemption and due process. Based on caselaw in these areas, the memorandum assesses the persuasiveness of arguments that the Program is preempted and/or unconstitutional and suggests ways to minimize litigation risk.

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[1] Boris N. Mamlyuk, *Analyzing the Polluter Pays Principle through Law and Economics*, 18 SOUTHEASTERN ENV'T L.J. 39, 41-42 (2009) ("In domestic law, the polluter pays principle states that polluting entities are legally and financially responsible for the harmful consequences of their pollution.").

II. Questions Presented and Brief Answers

1) Would the CAA preempt a State Climate Superfund Program?

Short Answer: It is very unlikely that a court would find that the CAA preempts a State Climate Superfund Program. The text and legislative history of the CAA as well as significant judicial precedent support state authority to control air pollution more stringently than the federal government, so long as state actions do not interfere with the federal regulatory scheme. Furthermore, the Climate Superfund Program involves retroactive liability for greenhouse gas emissions and only imposes liability for in-state damages. It would thus pose no obstacle to an EPA permitting process nor improperly seek to control emissions from out-of-state sources.

2) Would a State Climate Superfund Program violate the Constitution's Due Process Clause, either because of its extension of jurisdiction over out-of-state parties or because of its retroactivity?

Short Answer: While it is highly improbable that a court would find the program is unconstitutional because of its retroactivity, it is possible that a court would be skeptical of a state extending jurisdiction over out-of-state companies, particularly if responsible parties are defined solely based on their contributions to worldwide greenhouse gas emissions. If a responsible party has sufficient minimum contacts with the state, such as engaging in the marketing, sale, or distribution of fossil fuels to in-state purchasers, it is likely that a court would find jurisdiction proper given the relationship between fossil fuels and climate change harms. A responsible party who has not engaged in such activities will have a stronger due process claim, though there is some precedent suggesting that the discharge of harmful pollutants into a state is sufficient to satisfy due process requirements.

3) Would a State Climate Superfund Program violate the Constitution's Commerce Clause?

Short Answer: There is no relevant precedent suggesting that the program would violate the Commerce Clause. It does not discriminate between in-state and out-of-state activities, nor does it appear to be overly burdensome on interstate economic activity as compared to the local benefits. The Program should ensure, however, that the cost recovery demands are proportional to the specific harms experienced within the state.

III. Discussion

a. Federal Preemption

Under the Constitution's Supremacy Clause, federal law will override state statutes when Congress intends to preempt state authority to regulate.[2] Preemption may be explicit, when Congress clearly states that federal legislation will supersede state law, or implicit, when a court finds that state law is preempted even though there is no statutory language directly on point.[3] Cases of express preemption typically involve statutes that prohibit states from establishing standards different from those at the federal level, such as safety requirements for motor vehicles.[4] Implied preemption can occur: 1) when the federal regulatory apparatus is so pervasive that a court concludes Congress intended to "occupy the field" in that area; 2) when there is a direct conflict between state and federal laws; or 3) when a state law would prove an obstacle to implementing a federal law, known as "obstacle preemption."[5]

There are no federal laws that would expressly preempt a state from creating a State Climate Superfund Program. However, responsible parties could seek to challenge the law on the grounds that the CAA *implicitly* preempts such state action. In the 2011 case *American Electric Power v. EPA*, the Supreme Court held that the CAA displaced federal common law tort claims over climate change harms.[6] However, the opinion left open the question of whether the CAA preempted state regulations and state tort claims seeking to limit greenhouse gas emissions or secure compensation from polluters.[7] In recent state tort suits against fossil fuel companies over their contributions to climate change, defendants have repeatedly argued that the CAA preempts states from acting to address the problem.[8] No court has ruled to date on the question of preemption, with much of the current litigation mired in disputes over whether the cases should proceed in federal or state courts.[9]

While the CAA's preemptive effect on state climate change regulations is still unsettled, current precedent suggests that the CAA would not prevent the establishment of a State Climate Superfund Program. In any analysis of preemption, courts follow a doctrine known as the

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[2] *See* United States v. Bass, 404 U.S. 336, 349 (1971); s*ee also* Rice v. Santa Fe Elevator Corp., 331 U.S. 218, 230 (1947); Jones v. Rath Packing Co., 430 U.S. 519, 525 (1977).

[3] *See* Catherine M. Sharkey, *Products Liability Preemption: An Institutional Approach*, 76 GEO. WASH. L. REV. 449, 455–56 (2008).

[4] *See, e.g.*, Geier v. Am. Honda Motor Co., 529 U.S. 861, 867 (2000).

[5] Samuel Issacharoff & Catherine M. Sharkey, *Backdoor Federalization*, 53 UCLA L. REV. 1353, 1366 n.40 (2006). The Supreme Court has noted that these categories are not "rigidly distinct." *See* Crosby v. Nat'l Foreign Trade Council, 530 U.S. 363, 372 n.6 (2000).

[6] *See* Am. Elec. Power Co. v. Connecticut, 564 U.S. 410, 411 (2011)

[7] *See id.* at 429 ("In light of our holding that the Clean Air Act displaces federal common law, the availability vel non of a state lawsuit depends, inter alia, on the preemptive effect of the federal Act . . . None of the parties have briefed preemption or otherwise addressed the availability of a claim under state nuisance law. We therefore leave the matter open for consideration on remand.").

[8] *See, e.g.*, Notice of Removal by Defendants Chevron Corporation and Chevron U.S.A., Inc. at 4, County of San Mateo v. Chevron Corp., No. 17-cv-04929-MEJ (N.D. Cal. July 17, 2017), http://blogs2.law.columbia.edu/climate-change-litigation/wp-content/uploads/sites/16/case-documents/2017/20170824_docket-317-cv-04929-MEJ_notice-1.pdf.

[9] *See* Rachel Rothschild, *State Nuisance Law and the Climate Change Challenge to Federalism*, 27 NYU ENV'T L. J. 412 (2019); *see also* Jonathan Adler, *Displacement and Preemption Of Climate Nuisance Claims* (working draft, 2021), *available at* https://scholarlycommons.law.case.edu/cgi/viewcontent.cgi?article=3123&context=faculty_publications.

"presumption against preemption" of state laws, which has been consistently applied in cases of federal statutes dealing with environmental pollution.[10] Courts that have examined the preemptive effect of the CAA have thus typically found that it does not implicitly preempt state environmental laws. No court has found that EPA has so extensively occupied the area of air pollution regulations that further state actions are preempted.[11] Nor is it likely a court would find that there is a direct conflict between the CAA and a State Climate Superfund Program.[12] The CAA is designed to have a "cooperative federalism" approach to environmental protection,[13] and Congress expressly preserved state authority to set more stringent in-state pollution controls than the federal government in Section 116 of the CAA.[14]

The only potentially problematic caselaw concerns state actions that seek to control pollution emissions in other states. The Supreme Court has held that allowing states such authority would pose an obstacle to implementing the CAA by subjecting emitters to a multitude of permitting restrictions, creating a "chaotic regulatory structure" of numerous state laws.[15] For this reason, state lawsuits over pollution discharges from neighboring states must be brought under the law of the "source" state; claims brought under the common law of states receiving pollution are preempted by federal law.[16] Similarly, in 2003 the U.S. Court of Appeals for the Second Circuit found that the CAA preempted New York's Air Pollution Mitigation law because the state legislation restricted the sale of sulfur dioxide pollution allowances to upwind states,[17] directly violating the 1990 CAA amendments.[18] In finding preemption, the Second Circuit extensively relied on legislative history from the 1990 amendments that detailed Congress's intent to create a nationwide trading scheme without geographic restrictions as well as EPA regulations stipulating that states were not to "restrict or interfere" with allowance trading.[19] The court also noted that New York's law was not preserved under the CAA because it tried to

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[10] *See, e.g.*, Env't Encapsulating Corp. v. New York, 855 F.2d 48, 58, 60 (2d Cir. 1988) (noting that "[i]nference and implication will only rarely lead to the conclusion that it was the clear and manifest purpose of the federal government to supersede the states' historic power to regulate health and safety"); s*ee also* Jason J. Czarnezki & Mark L. Thomsen, *Advancing the Rebirth of Environmental Common Law,* 34 B.C. ENV'T AFF. L. REV. 1, 8–11 (2007) (finding that there are very narrow situations where courts have held federal environmental statutes, such as the CAA and CERCLA, preempt state environmental law).

[11] *See* Holly Doremus & W. Michael Hanemann, *Of Babies and Bathwater: Why the Clean Air Act's Cooperative Federalism Framework Is Useful for Addressing Global Warming*, 50 ARIZ. L. REV. 799, 817 (2008) ("The Clean Air Act was the first modern federal environmental statute to employ a 'cooperative federalism framework,' assigning responsibilities for air pollution control to both federal and state authorities.").

[12] *See* Wyeth v. Levine, 555 U.S. 555, 589–90 (2008) (Thomas, J., concurring) (noting the Supreme Court has "articulated a very narrow 'impossibility standard'").

[13] Bell v. Cheswick Generating Station, 734 F.3d 188, 197–98 (3d Cir. 2013); s*ee also* J.J. England, *Saving Preemption in the Clean Air Act: Climate Change, State Common Law, and Plaintiffs Without a Remedy*, 43 ENV'T. L. 701, 733 (2013).

[14] *See* 42 U.S.C.S. § 7416 (stating that, aside from exceptions regarding motor vehicle emission limits, nothing in the CAA "shall preclude or deny the right of any State or political subdivision thereof to adopt or enforce (1) any standard or limitation respecting emissions of air pollutants or (2) any requirement respecting control or abatement of air pollution").

[15] Int'l Paper Co. v. Ouellette, 479 U.S. 481, 496 (1987).

[16] *Id.* at 492.

[17] *See* Clean Air Mkts. Grp. v. Pataki, 338 F.3d 82, 85 (2d Cir. 2003) (finding New York's law "actually conflicts" with the CAA by creating "an obstacle to the accomplishment and execution of the full purposes and objectives of Congress").

[18] *See* 42 U.S.C. § 7651b(b) (specifying that allowances "may be transferred . . . [to] any other person who holds such allowances").

[19] Clean Air Mkts. Grp., 388 F.3d at 88 ("These regulations were adopted over the objection of New York State, which argued vigorously in favor of a scheme that permitted allowance trading to be geographically restricted.").

control emissions from other states, which the CAA and Supreme Court precedent do not allow.[20]

These decisions, however, do not suggest that the CAA preempts a State Climate Superfund. The program would not interfere with any current federal regulatory program, nor seek to control greenhouse gas emissions from other states.[21] It would simply impose liability for damages within a single state in an effort to ensure polluters pay for the harms they caused from historic contributions to climate change.[22] Under their general police powers, states have authority to legislate to protect the health and safety of their citizens,[23] and New York is expected to incur significant harms from climate change. As detailed in the most recent report from the New York State Department of Environmental Conservation (DEC) on climate change vulnerabilities, the DEC notes that average temperatures have increased about 0.6°F per decade since 1970, with winter warming exceeding 1.1°F.[24] As a consequence, New Yorkers have experienced more frequent episodes of severe precipitation, poorer air quality, and greater risk of insect-borne diseases. By 2080, annual average temperatures are projected to rise 4.1°F to 6.1°F, with dire consequences throughout New York.[25] Experts anticipate that these temperature increases will lead to more extreme weather events, sea level rise, coastal erosion and floods.[26] The state therefore has an incredibly strong basis for seeking financial compensation from polluters to mitigate these effects.

In addition, it is not clear how extensively EPA will be able to regulate greenhouse gases given the Supreme Court's scrutiny of the agency's legal authority under the CAA. Recent Supreme Court rulings have found portions of the CAA do not apply to greenhouse gas pollutants.[27] And during this term, the Supreme Court seems poised to further limit EPA's ability to regulate greenhouse gas emissions using section 111(d) in *West Virginia v. EPA*.[28] While the petitioners have not challenged EPA's authority to regulate greenhouses per se under section 111(d), they have sought to restrict the agency from imposing a far-reaching regulation without direct authorization from Congress.[29] Previously, the Supreme Court found that section 111(d) indicated that Congress sought to confer EPA with the authority to regulate greenhouse gases

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[20] *See id.* at 89.

[21] While imposing liability on a party for conduct in one state may have an indirect effect on its activities in other states, this is consistent with the normal operation of tort law and liability regimes like CERCLA. *See, e.g.*, Kyle Logue, *Coordinating Sanctions in Tort*, 31 CARDOZO L. REV. 2313, 2314 (2010) (noting that the view of tort law as "a system of deterrence or regulation is now standard within the legal literature").

[22] *See id.* at 2315 (explaining that greenhouse gas emissions are a "quintessential example of a negative externality" and arguing that liability should not be imposed multiple times for the same emissions).

[23] *See, e.g.*, Env't Encapsulating Corp. v. New York, 855 F.2d 48, 53 (2d Cir. 1988) (finding that federal law did not preempt New York restrictions on asbestos use that were intended to safeguard public health).

[24] *See* NEW YORK DEP'T OF ENV'T CONSERVATION, OBSERVED AND PROJECTED CLIMATE CHANGE IN NEW YORK STATE: AN OVERVIEW 3 (Aug. 2021), https://www.dec.ny.gov/docs/administration_pdf/ccnys2021.pdf.

[25] *See id.*

[26] *See id.* at 6–10.

[27] *See* Util. Air Regulatory Grp. v. EPA, 573 U.S. 302 (2014).

[28] *See* Transcript of Oral Argument, West Virginia v. EPA (2022) (No. 20-1530), https://www.supremecourt.gov/oral_arguments/argument_transcripts/2021/20-1530_p8k0.pdf.

[29] *See, e.g.*, Brief for Petitioners at 12–14, West Virginia v. EPA, No. 20-1530 (S. Ct. Dec. 13, 2021) (arguing that EPA should not be allowed to exercise "transformative power" over the power industry by enacting regulations that would "force plants to shut down" and "decide major questions implicating hundreds of billions of dollars").

from power plants.[30] Any limitations on EPA's regulatory powers would therefore bolster arguments that EPA has not sufficiently occupied the field of greenhouse gas regulations.

Even if the Supreme Court preserves EPA's ability to meaningfully regulate greenhouse gas emissions from power plants under section 111(d), and the agency subsequently adopts a permitting scheme for these pollutants, a State Climate Superfund Program would still not appear to pose an obstacle to its implementation. The responsible parties are defined as major fossil fuel companies that have contributed to the buildup of greenhouse gas emissions over a set period, rather than power plants themselves.[31] Therefore, the state legislation is targeting different entities than a potential federal permitting scheme. It is also seeking to address past emissions rather than regulating future activities. Given these distinctions, it will be quite difficult for responsible parties to successfully argue that a State Climate Superfund Program would pose an obstacle to complying with a potential future EPA permitting scheme for greenhouse gas emissions.[32]

b. Due Process

i. Jurisdiction

A company that falls within a State Climate Superfund Program's definition of a "responsible party" may try to claim that the state does not have proper jurisdiction over it, or in the alternative, that the exercise of this jurisdiction violates the Due Process Clause of the Fourteenth Amendment to the U.S. Constitution. A state will have general jurisdiction over all companies that are considered "at home" in the state because of "continuous and systematic" operations within the forum.[33] For example, a company would be considered "at home" where it is headquartered or incorporated.[34] In the absence of general jurisdiction, a state can exert specific jurisdiction over parties whose conduct falls under the state's "long arm" statute.[35] This requires a court to first find that the responsible parties have committed a tort, meaning that they 1) had a duty, 2) breached that duty, and 3) the breach proximately caused an injury.[36] The

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[30] *See* Am. Elec. Power Co. v. Connecticut, 564 U.S. 410, 411–12 (2011) ("Once EPA lists a category, it must establish performance standards for emission of pollutants from new or modified sources within that category, § 7411(b)(1)(B), and, most relevant here, must regulate existing sources within the same category, § 7411(d). . . [t]he Act itself thus provides a means to seek limits on emissions of carbon dioxide from domestic powerplants--the same relief the plaintiffs seek by invoking federal common law. There is no room for a parallel track.").

[31] *See* Rothschild, *supra* note 9, at 451–52.

[32] In fact, more conservative justices on the Supreme Court have found similar arguments over CERCLA's preemptive effects on state remedies for hazardous waste unconvincing. *See* Atl. Richfield Co. v. Christian, 140 S. Ct. 1335, 1367 (2020) (Gorsuch, J., concurring) ("CERCLA sought to add to, not detract from, state law remedial efforts. It endorsed a federalized, not a centralized, approach to environmental protection.").

[33] Goodyear Dunlop Tires Operations, S.A. v. Brown, 564 U.S. 915, 919 (2011) (explaining that general jurisdiction is likely to be found when a corporation has its principal place of business within the state or is incorporated in the state).

[34] Daimler AG v. Bauman, 571 U.S. 117, 137 (2014) (stating that a company's place of incorporation and principal place of business are paradigmatic bases for general jurisdiction).

[35] Nielsen v. Sioux Tools, Inc., 870 F. Supp. 435, 438 (D. Conn. 1994) (noting that the first issue in determining whether an out-of-state company could be liable under CERCLA is whether "the defendant's alleged contamination of property soil and groundwater may be construed as 'tortious conduct'" under the state's longarm statute).

[36] *See* Martin A. McCrory, *Hazardous Jurisdiction/Chatham Steel Corporation v. Brown: A Note on Personal Jurisdiction and CERCLA*, 44 CLEVELAND ST. L. REV. 473, 483 (1996), https://engagedscholarship.csuohio.edu/cgi/viewcontent.cgi?article=1589&context=clevstlrev.

release of pollutants and hazardous substances that harm the environment is indisputably a tort under state common law,[37] but whether and how liability can attach to non-resident parties over their extraction and distribution of fossil fuels is a separate inquiry.

The relevant provisions of New York State's long-arm statute for jurisdiction over responsible parties would be either § 302(a)(1) or (a)(3).[38] The first prong allows jurisdiction over an entity who "transacts any business within the state or contracts anywhere to supply goods or services in the state."[39] The second prong allows jurisdiction over tortious acts committed outside the state by a non-resident entity, when the entity either 1) regularly does or solicits business, or engages in any other persistent course of conduct, or derives substantial revenue from goods used or consumed or services rendered, in the state, or 2) expects or should reasonably expect the act to have consequences in the state and derives substantial revenue from interstate or international commerce.[40]

Depending on the responsible party, jurisdiction under the first prong may be sufficient. For example, if a responsible party sold fossil fuel products in the state, a court would likely find jurisdiction appropriate under § 302(a)(1).[41] The state could also exert jurisdiction over responsible parties who did not directly sell fossil fuels to New York consumers under the second prong. In that case, it would be necessary to either demonstrate that the companies earned substantial revenue from fossil fuel consumption in New York or, alternatively, establish that the companies should have reasonably expected their sale of fossil fuel products to cause harm in the state and derived substantial revenue from interstate or international commerce.[42] In the latter case, the requisite knowledge of potential harm could be proven through historical documentation of a responsible party's knowledge about the risks of climate change.[43] It is therefore likely that New York's long arm statute will encompass most, if not all, potentially responsible parties.

Once a court determines that the long-arm statute has properly conferred jurisdiction over an entity, it must then ensure that the exercise of that jurisdiction does not violate the Due Process Clause.[44] Supreme Court precedent requires that parties have "certain minimum

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[37] *See* Nielsen, 870 F. Supp. at 439 (finding that "the defendant's alleged contamination of soil and groundwater may be construed as 'tortious conduct' within the meaning of the Connecticut long arm statute").
[38] *See* N.Y. C.P.L.R. § 302 (2022).
[39] *Id.* at § 302(a)(1).
[40] *See* Suez Water N.Y., Inc. v. E.I. du Pont de Nemours & Co., No. 20-cv-10731 (LJL), 2022 U.S. Dist. LEXIS 1483, at *21 (S.D.N.Y. Jan. 4, 2022) (noting that these requirements can be more stringent than the jurisdictional limits of the Constitution's Due Process Clause).
[41] *See id.* at *26 (finding New York has jurisdiction over out-of-state chemical manufacturers for alleged harms from PFAS contamination, since they engaged in "repeated direct sales into New York to New York customers, over a lengthy and continuous period of time").
[42] *See* Stone v. Ranbaxy Pharm., Inc., No. JFM-10-CV-08816, 2011 U.S. Dist. LEXIS 64221, at *9 (S.D.N.Y. June 16, 2011) (holding that jurisdiction over an Indian pharmaceutical company was proper because of an exclusive relationship with an American distributor); Ikeda v. J Sisters 57, Inc., No. 14-cv-3570 (ER), 2015 U.S. Dist. LEXIS 87783, at *13-14 (S.D.N.Y. July 6, 2015) (finding that New York's long arm statute allowed jurisdiction over a British company who sold a hair product to a subsidiary who subsequently served New York consumers, but that jurisdiction would violate due process because there were insufficient contacts).
[43] *See, e.g.*, Neera Banerjee, *Exxon's Oil Industry Peers Knew About Climate Dangers in the 1970s, Too*, INSIDECLIMATENEWS (Dec. 22, 2015), https://insideclimatenews.org/news/22122015/exxon-mobil-oil-industry-peers-knew-about-climate-change-dangers-1970s-american-petroleum-institute-api-shell-chevron-texaco/.
[44] *See* McCrory, *supra* note 36, at 485.

contacts" with a forum state that wishes to exert specific jurisdiction over them, and that the exercise of jurisdiction does not offend traditional notions of "fair play and substantial justice."[45] Recent caselaw has affirmed that these standards mean a court must find that a party has engaged in some act by which it "purposefully avails itself of the privilege of conducting activities within the forum State."[46] Furthermore, the harm at issue must be connected to these activities and contacts within the state.[47]

There are only a limited number of cases that have required courts to grapple with the Supreme Court's due process precedents in the context of specific jurisdiction over out-of-state polluters.[48] The disputes in these cases can be roughly divided into two general categories: 1) challenges to specific jurisdiction where a party claims the environmental harm at issue is insufficiently connected to the party's activities and contacts within the state, and 2) challenges to specific jurisdiction where a party's only contact with the state was the transport of harmful pollution.

Fossil fuel producers have advanced the first type of argument in recent climate tort suits against fossil fuel companies.[49] In several of these cases, the defendants have tried to argue that they are not subject to a state's specific jurisdiction because the harms from greenhouse gases are unrelated to their activities within forum states.[50] Similar claims could be brought by responsible parties under a Climate Superfund Program.[51]

Yet a recent Supreme Court decision makes it unlikely that responsible parties who sold or marketed their products in a state could avoid liability on these grounds.[52] In *Ford Motor Co. v. Montana Eighth Judicial District Court*, the Supreme Court held that a party's in-state activities must merely "relate to" the alleged harm in order for state jurisdiction to comply with

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[45] International Shoe Co. v. State of Washington, 326 U.S. 310, 316–17 (1945).
[46] J. McIntyre Mach., Ltd. v. Nicastro, 564 U.S. 873, 877 (2011).
[47] *See* Bristol-Myers Squibb Co. v. Superior Court, 137 S. Ct. 1773, 1780 (2017) (finding that jurisdiction must "arise out of or relate to the defendant's contacts" with the forum state).
[48] *See, e.g.*, Branch Metal Processing v. Bos. Edison Co., 952 F. Supp. 893, 908 (D.R.I. 1996) ("While a substantial body of law has developed to assist courts in deciding personal jurisdiction issues, this court has discovered few cases that address the doctrine of personal jurisdiction in the context of CERCLA. Indeed, no circuit court has heretofore addressed the issue, and the few district courts that have addressed it have reached different conclusions."). Most cases involving out-of-state generators appear to find personal jurisdiction through transactions over the waste at issue. *See, e.g.*, Va. St. Fidelco, L.L.C. v. Orbis Prods. Corp., No. 11-2057 (KM), 2016 U.S. Dist. LEXIS 102641, at *39 (D.N.J. Aug. 3, 2016) (finding personal jurisdiction where the defendant loaned money to clean up the property).
[49] *See, e.g.*, Decision, State of Rhode Island v. Chevron Corp., et al., No. PC-2018-4716 (R.I. Super. Ct., filed Aug. 13, 2020), http://climatecasechart.com/climate-change-litigation/wp-content/uploads/sites/16/case-documents/2020/20200813_docket-PC-2018-4716_decision.pdf.
[50] *See, e.g.*, Memorandum of Law in Support of Defendants' Joint Motion to Dismiss for Lack of Personal Jurisdiction at 15–16, State of Rhode Island v. Chevron Corp., et al., No. PC-2018-4716 (R.I. Super. Ct., Jan. 13, 2020), http://climatecasechart.com/climate-change-litigation/wp-content/uploads/sites/16/case-documents/2020/20200113_docket-PC-2018-4716_memorandum-of-law.pdf.
[51] Similar claims have been brought by out-of-state companies held liable under CERCLA. *See, e.g.*, Chatham Steel Corp. v. Brown, 858 F. Supp. 1130, 1144 (N.D. Fla. 1994).
[52] *See* Ford Motor Co. v. Mont. Eighth Judicial Dist. Court, 141 S. Ct. 1017, 1021 (2021). While the decision was unanimous, Justices Alito, Gorsuch, and Thomas concurred in the judgment only. Justice Barrett did not participate in the case. *See id.* at 1022, 1032, 1034.

the Due Process Clause.[53] As Justice Kagan explained in the majority opinion, specific jurisdiction attaches "when a company cultivates a market for a product in the forum State and the product malfunctions there."[54] A court need not find that the claim arose "because of the defendant's in-state conduct" in a *causal* manner.[55] Nor did it matter that the products at issue were manufactured and initially sold outside the state, since "[b]y every means imaginable—among them, billboards, TV and radio spots, print ads, and direct mail" the defendant had urged state citizens to buy its products.[56] And since the defendant company conducted so much business within the relevant states, it clearly "enjoy[ed] the benefits and protection of [their] laws—the enforcement of contracts, the defense of property, the resulting formation of effective markets."[57] The *Ford Motor Co.* opinion has thus provided a pathway for a state to exercise specific jurisdiction over fossil fuel producers who engage in advertising, sales, or distribution of their products within the state.[58]

Fossil fuel producers who have not cultivated a market in New York and have few contacts with the state could bring a more plausible due process challenge.[59] For example, while it is likely that American companies such as Exxon Mobil or Chevron have marketed or sold fossil fuel products into New York, foreign entities such as Saudi Aramco or the National Iranian Oil Company may not have engaged in such practices.[60] The Supreme Court has not directly examined the constitutionality of a state exerting jurisdiction over an out-of-sate polluter that has no other contacts with the forum. And while there is a long history of state courts hearing transboundary pollution claims, the defendant polluters subject to specific jurisdiction in these cases typically reside in neighboring states rather than in a different part of the country or outside the U.S.[61]

There is some caselaw, however, suggesting that a state can exercise jurisdiction over a polluter simply because it discharged harmful substances into the forum state. The most recent, relevant litigation on this issue involved a Canadian lead and zinc smelter that illegally dumped millions of tons of industrial waste into the Columbia River, damaging an Indian reservation in Washington State.[62] The Canadian facility sought to avoid liability by claiming that it was

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[53] *Id.* at 1021.
[54] *Id.*
[55] *Id.* at 1026.
[56] *Id.* at 1028.
[57] *Id.* at 1029.
[58] *See* Ellen M. Gilmer, *High Court Ruling on Jurisdiction Thaws Some Climate Cases (1)* , BLOOMBERG L. (Mar. 25, 2021), https://news.bloomberglaw.com/environment-and-energy/supreme-court-ruling-on-jurisdiction-thaws-some-climate-cases.
[59] *See* Ikeda v. J Sisters 57, Inc., No. 14-cv-3570 (ER), 2015 U.S. Dist. LEXIS 87783, at *23 (S.D.N.Y. July 6, 2015) (finding that plaintiffs had not made a prima facie showing of specific jurisdiction under the Due Process Clause because they had not presented sufficient evidence demonstrating that the defendants had made a specific effort to sell products in New York); *but see* Suez Water N.Y., Inc. v. E.I. du Pont de Nemours & Co., No. 20-cv-10731 (LJL), 2022 U.S. Dist. LEXIS 1483, at *32–37 (S.D.N.Y. Jan. 4, 2022) (finding that the defendant chemical companies had sufficient "minimum contacts" with New York in light of evidence that the they sold their products to industrial manufacturers, downstream distributors, and individual customers in New York, and the court's exercise of this jurisdiction would not offend traditional notions of fair play and substantial justice).
[60] For a historical analysis of the top greenhouse gas producers, see B. Ekwurzel et al., *The Rise in Global Atmospheric CO_2, Surface Temperature, and Sea Level from Emissions Traced to Major Carbon Producers*, 144 CLIMATIC CHANGE 579 (2017).
[61] *See* Rothschild, *supra* note 9, at 425–26.
[62] *See* Pakootas v. Teck Cominco Metals, Ltd., 905 F.3d 565, 571 (9th Cir. 2018).

improper for the state to exercise jurisdiction since it had not "expressly aimed" its waste at Washington State.[63] In *Pakootas v. Teck Cominco Metals*, the U.S. Court of Appeals for the Ninth Circuit found that the facility could be said to have "expressly aimed" its waste at Washington, satisfying the relevant test for personal jurisdiction, given decades of internal documents showing that the company knew river currents were carrying its waste to Washington State.[64]

A similar, though distinct, approach adopted by a few courts applies a different jurisdictional standard to hazardous pollution since it is not "an ordinary product."[65] Under this reasoning, the inherent dangerousness of toxic substances as well as the fact that polluters operate "in a nationally regulated industry" is enough to show purposeful availment of the forum state.[66] These opinions also emphasize that states have a special stake in overseeing remediation of its land and natural resources, further weighing in favor of jurisdiction.[67] Should the courts adopt a comparable approach to greenhouse gases, it may be possible to extend jurisdiction over responsible parties whose only connection to a state involves extraction and production of fossil fuels that subsequently warm the planet and cause damages in the state. But it is more legally tenuous than for parties who have sold, marketed, or advertised fossil fuel products in the state.

Given the risk that a party may be able to bring a successful as-applied due process challenge, a state could opt to specify that an entity qualifies as a responsible party only if it sold, advertised, or otherwise cultivated a market in the state. The law could still apportion liability based on contributions to global greenhouse gas emissions. Alternatively, the law could make specific findings regarding the ways in which potentially responsible parties urged state citizens to use their products, such as through advertising, or conducted other business activities within its borders. This would help demonstrate that the responsible parties purposely availed themselves of the privilege of conducting activities in the state.

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[63] *Id.* at 577.

[64] *Id.* at 578 ("It is no defense that Teck's wastewater outfalls were aimed only at the Columbia River, which in turn was aimed at Washington. Rivers are nature's conveyor belts."). It's important to note that the Ninth Circuit has a higher bar for finding personal jurisdiction in tort suits, known as the "Calder effects" test. *See* Jonathan Remy Nash, *Special Edition Response, Personal Jurisdiction in Climate Change Common Law Litigation Post-Ford*, GEO. WASH. L. REV. ON THE DOCKET (Oct. 6, 2021), https://www.gwlr.org/personal-jurisdiction-in-climate-change-common-law-litigation-post-ford.

[65] O'Neil v. Picillo, 682 F. Supp. 706, 718 (D.R.I. 1988); *see also* Metro Container Grp. v. AC&T Co., No. 18-3623, 2021 U.S. Dist. LEXIS 234447, at *79 (E.D. Pa. Dec. 6, 2021) (stating that the personal jurisdiction analysis in the *O'Neil* case is "is useful for assessing the unique specific personal jurisdiction issues that arise in CERCLA cases," and subsequently allowing discovery to determine whether out-of-state generators could be potentially responsible parties).

[66] O'Neil, 682 F. Supp. at 718, *citing* Asahi Metal Ind. v. Superior Court of Cal., 107 S. Ct. 1026, 1038 (1987) (Stevens, J., White, J., and Blackmun, J., concurring) ("Whether or not . . . conduct rises to the level of purposeful availment requires a constitutional determination that is affected by the volume, the value, and the *hazardous* character of the components.") (emphasis added).

[67] *See* Members of the Beede Site Grp. v. Fed. Home Loan Mortg. Corp., No. 09-370 S, 2010 U.S. Dist. LEXIS 131038, at *21 (D.N.H. Dec. 7, 2010) ("New Hampshire's strong sovereign interest in protecting its lands and its citizenry provides it with an indisputable stake in overseeing litigation that will result in the clean-up of a toxic superfund pollution site within its boundaries.").

If responsible parties are defined solely in reference to worldwide emissions, a state could defend this approach by analogizing to cases like *Pakootas v. Teck Cominco Metals*.[68] Similarly to that case, fossil fuel companies had clear knowledge that pollution from their products would accumulate in the atmosphere, raise global temperatures, and subsequently harm state natural resources. As noted above, some courts have also relied on the distinctly harmful nature of pollution and knowledge about its hazards in employing a more lenient jurisdictional test. While it may be more challenging to advance such arguments in the climate change context, the overwhelming scientific consensus about the effects of greenhouse gas emissions could persuade the judiciary that a comparable standard is warranted for jurisdiction over fossil fuel companies.

ii. Retroactivity

Occasionally, laws that impose economic liability retroactively have not survived judicial scrutiny.[69] However, there are numerous examples of retroactive liability laws that have withstood constitutional challenges under the Due Process Clause,[70] including CERCLA. Though the Supreme Court has never directly reviewed CERCLA's constitutionality, no courts that have addressed the question have found that the law violated the Due Process Clause.[71]

One key difference between retroactive liability laws that violate the Due Process Clause and those that do not is whether the government has shown that such application has a "legitimate legislative purpose furthered by rational means."[72] In the case of CERCLA liability, courts have unanimously found that pollution remediation is a legitimate government purpose, and that it is rational to impose liability for these costs upon parties who "created and profited" from activities that caused the pollution.[73] In addition, some courts have assessed whether the liability imposed is "severely disproportionate" to the parties contributions to the problem or the

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[68] 905 F.3d 565, 571 (9th Cir. 2018) (finding that the district court properly exercised personal jurisdiction over the defendant, a Canadian company, because it purposefully directed its activities towards Washington State by dumping waste into the Columbia River with the knowledge that river currents would carry it to Washington State).
[69] *See* General Motors Corp. v. Romein, 503 U.S. 181, 191 (1992) (finding that "[r]etroactive legislation . . . presents problems of unfairness that are more serious than those posed by prospective legislation, because it can deprive citizens of legitimate expectations and upset settled transactions"); *see also* Bowen v. Georgetown Univ. Hosp., 488 U.S. 204, 208 (1988) (noting that retroactivity is generally disfavored in the law).
[70] *See e.g.*, Usery v. Turner Elkhorn Mining Co., 428 U.S. 1 (1976).
[71] *See* United States v. Monsanto Co., 858 F.2d 160, 174 (4th Cir. 1988) ("Many courts have concluded that Congress intended CERCLA's liability provisions to apply retroactively to pre-enactment disposal activities of off-site waste generators. They have held uniformly that retroactive operation survives the Supreme Court's tests for due process validity."); United States v. Olin Corp., 927 F. Supp. 1502, 1507 (S.D. Ala. 1996) (noting that "of those federal decisions which have directly addressed the issue of CERCLA's retroactivity, none have declined to apply CERCLA on retroactivity grounds"), *rev'd*, 107 F.3d 1506 (11th Cir. 1997) (reversing the lower court's decision not to apply CERCLA retroactively as well as its conclusion that the law violated the Commerce Clause).
[72] *Compare* E. Enters. v. Apfel, 524 U.S. 498, 549 (1998) ("The remedy created by the Coal Act bears no legitimate relation to the interest which the Government asserts in support of the statute.") *with* Pension Benefit Guar. Corp. v. R. A. Gray & Co., 467 U.S. 717, 729 (1984) ("Provided that the retroactive application of a statute is supported by a legitimate legislative purpose furthered by rational means, judgments about the wisdom of such legislation remain within the exclusive province of the legislative and executive branches."); *see also* United States v. Alcan Aluminum Corp., 49 F. Supp. 2d 96, 101 (N.D.N.Y. 1999) (explaining that "economic legislation enjoys a 'presumption of constitutionality' that can be overcome only if the challenger establishes that the legislature acted in an arbitrary and irrational way").
[73] *See, e.g.*, United States v. Ne. Pharm. & Chem. Co., 810 F.2d 726, 734 (8th Cir. 1986); O'Neil v. Picillo, 883 F.2d 176, 183 n.12 (1st Cir. 1989).

harm incurred.[74] Finally, several opinions have analyzed whether the regulated party "could have reasonably expected that it would be subject to regulation" by examining 1) whether the company was operating in a highly regulated industry, 2) whether the company knew of the problem when it engaged in the activity, and 3) the regulatory environment at the time of the activity.[75]

A State Climate Superfund Program would almost certainly survive judicial scrutiny under any of these tests. Like CERCLA, the program is intended to address the effects of environmental pollution, and it imposes costs on those that profited from the activities that caused the problem. Nor is liability "severely disproportionate" to the harm caused or to the parties' contributions to climate change, as the cost recovery provision apportions payments according to a responsible party's relative share of greenhouse gas emissions. A *de minimis* threshold would also establish a lower limit below which emitters will not be deemed "responsible parties" under the Program, which alleviates the potential issue of small producers falling under its purview. Furthermore, liability could be limited to greenhouse gas emissions after a specified year, such as 2000, when the reality of climate change was already well-accepted within the scientific community. Fossil fuel companies certainly knew of the problem and had been operating in a highly regulated industry at that time. It was also evident that federal or state governments could impose costs on fossil fuel companies for greenhouse gas pollution given the extensive past regulation of air pollution.[76] For these reasons, it is extremely unlikely that a State Climate Superfund Program could be successfully challenged as a violation of due process because of its retroactive application to past polluting activities.

c. Commerce Clause

Though the Constitution's Commerce Clause only refers to the regulatory power of Congress, the Supreme Court has held that it also bars states from overly burdening interstate economic activity.[77] States can violate the Commerce Clause in two general ways: 1) by explicitly discriminating against out-of-state economic interests, or 2) by regulating interstate commerce so excessively that "the burden imposed on such commerce is clearly excessive in relation to the putative local benefits."[78]

Environmental statutes that treat in-state and out-of-state activities differently, whether explicitly or in their practical effects, are likely to violate the Commerce Clause.[79] These include

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[74] *See, e.g.*, Commonwealth Edison Co. v. United States, 271 F.3d 1327, 1347 (Fed. Cir. 2001) (rejecting a due process challenge to the 1992 Energy Policy Act and noting that the responsible parties were only liable for a portion of the cleanup costs from uranium processing).

[75] *Id.* at 1347; *see also* Monsanto Co., 858 F.2d at 174 ("While the generator defendants profited from inexpensive waste disposal methods that may have been technically 'legal' prior to CERCLA's enactment, it was certainly foreseeable at the time that improper disposal could cause enormous damage to the environment.").

[76] *See* Commonwealth Edison Co., 271 F.3d at 1357 ("The critical question is whether extension of existing law could be foreseen as reasonably possible.").

[77] *See, e.g.,* Or. Waste Sys. v. Dep't of Env't Quality, 511 U.S. 93, 98 (1994) (holding that the Commerce Clause prohibits a state surcharge on the disposal of solid waste generated out of state).

[78] *Id.* at 99 (quoting from Pike v. Bruce Church, Inc., 397 U.S. 137, 142 (1970)).

[79] *See, e.g.*, C & A Carbone v. Town of Clarkstown, 511 U.S. 383, 392 (1994) ("Discrimination against interstate commerce in favor of local business or investment is per se invalid, save in a narrow class of cases in which the municipality can demonstrate, under rigorous scrutiny, that it has no other means to advance a legitimate local

taxes and fees that are discriminatorily imposed on out-of-state entities for pollution and waste.[80] However, to date it appears that no court has invalidated a state environmental law that treats in-state and out-of-state parties the same, on the grounds that its effects are overly burdensome on interstate economic activity as compared to the local benefits.[81] The Supreme Court has recently granted certiorari in a case involving a California law banning the sale of pork products within the state unless out-of-state farmers comply with certain space requirements for the animals.[82] But while the decision could lead the Justices to revisit the "dead letter" state of the Dormant Commerce Clause,[83] it is doubtful that the case will have any impact on the legality of a State Climate Superfund Program given differences between the two laws and skepticism towards Dormant Commerce claims among the court's more conservative Justices.[84]

A State Climate Superfund Program would therefore not pose problems under current Commerce Clause precedents. It would not differentiate between responsible parties that reside in-state or out-of-state, but instead would impose liability proportionally to an entity's greenhouse gas emissions. Nor does the legislation's burden on energy commerce appear excessive in relation to the local state benefits from a Climate Superfund Program.[85] The state will be able to make a persuasive case that the costs of climate adaptation are likely to be extensive, and the program could greatly assist the state with these financial demands.

Prior to passing the bill, however, it would be prudent for the state legislature to assess the liability costs to companies that are likely to be deemed "responsible parties" under the law in order to ensure that the program does not impose financial burdens that are disproportionate to

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interest); Alliance for Clean Coal v. Miller, 7th Cir. 1995 (finding that an Illinois Statute that discriminated against out-of-state coal violated the Commerce Clause).

[80] *See* Chemical Waste Management, Inc. v. Hunt, 504 U.S. 334 (1992) (invalidating an Alabama statute that imposed an additional fee on hazardous waste generated outside the state that was subsequently disposed of within Alabama).

[81] Indeed, most laws survive scrutiny under the second test. *See* Dep't of Revenue v. Davis, 553 U.S. 328, 339 (2008). *See also* Alexandra B. Klaas & Elizabeth Henley, *Energy Policy, Extraterritoriality, and the Dormant Commerce Clause*, 5 SAN DIEGO J. CLIMATE & ENERGY L. 127, 129 (2014) (arguing that the Dormant Commerce Clause should not prevent state regulation of the energy sector to address climate change given the constitutional validity of "the hundreds of other health, safety, and environmental protection laws that influence companies selling light bulbs, appliances, and other products in interstate markets"); Tanner Hendershot, *The United States of California: Ninth Circuit Tips the Dormant Commerce Clause Scales in Favor of the Golden State's Animal Welfare Legislation*, 49 PEPP. L. REV. 469, 482 (2022) (examining the failure of dormant commerce clause challenges to California's environmental and animal welfare laws).

[82] *See* Petition for Writ of Certiorari, Nat'l Pork Producers Council v. Karen Ross, No. 21-468, https://www.supremecourt.gov/DocketPDF/21/21-468/193744/20210927102549231_NPPC%20v%20Ross%20Petition%20for%20Cert%20PDFA.pdf.

[83] *Nat'l Pork Producers Council v. Ross*, No. 20-55631, 2021 U.S. App. LEXIS 22337, at *26 (9th Cir. July 28, 2021) ("While the dormant Commerce Clause is not yet a dead letter, it is moving in that direction.").

[84] Some of the court's more conservative Justices, notably Neil Gorsuch and Clarence Thomas, have expressed skepticism that the Dormant Commerce Clause has a basis in the constitution. *See, e.g.*, United Haulers Ass'n v. Oneida-Herkimer, 550 U.S. 330, 349 (2007) (Thomas, J., concurring in judgment) "The negative Commerce Clause has no basis in the Constitution and has proved unworkable in practice."); Energy & Env't Legal Inst. v. Epel, 793 F.3d 1169, 1171 (10th Cir. 2015) (While on the U.S. Court of Appeals for the Tenth Circuit, Justice Gorsuch noted that "[d]etractors find dormant commerce clause doctrine absent from the Constitution's text and incompatible with its structure," but stated that, as an inferior court, they must "take Supreme Court precedent as we find it").

[85] *See* Pike v. Bruce Church, Inc., 397 U.S. 137 (1970) (holding that an Arizona law regulating food packaging violated the Dormant Commerce Clause because the local benefits did not outweigh the burden on interstate commerce).

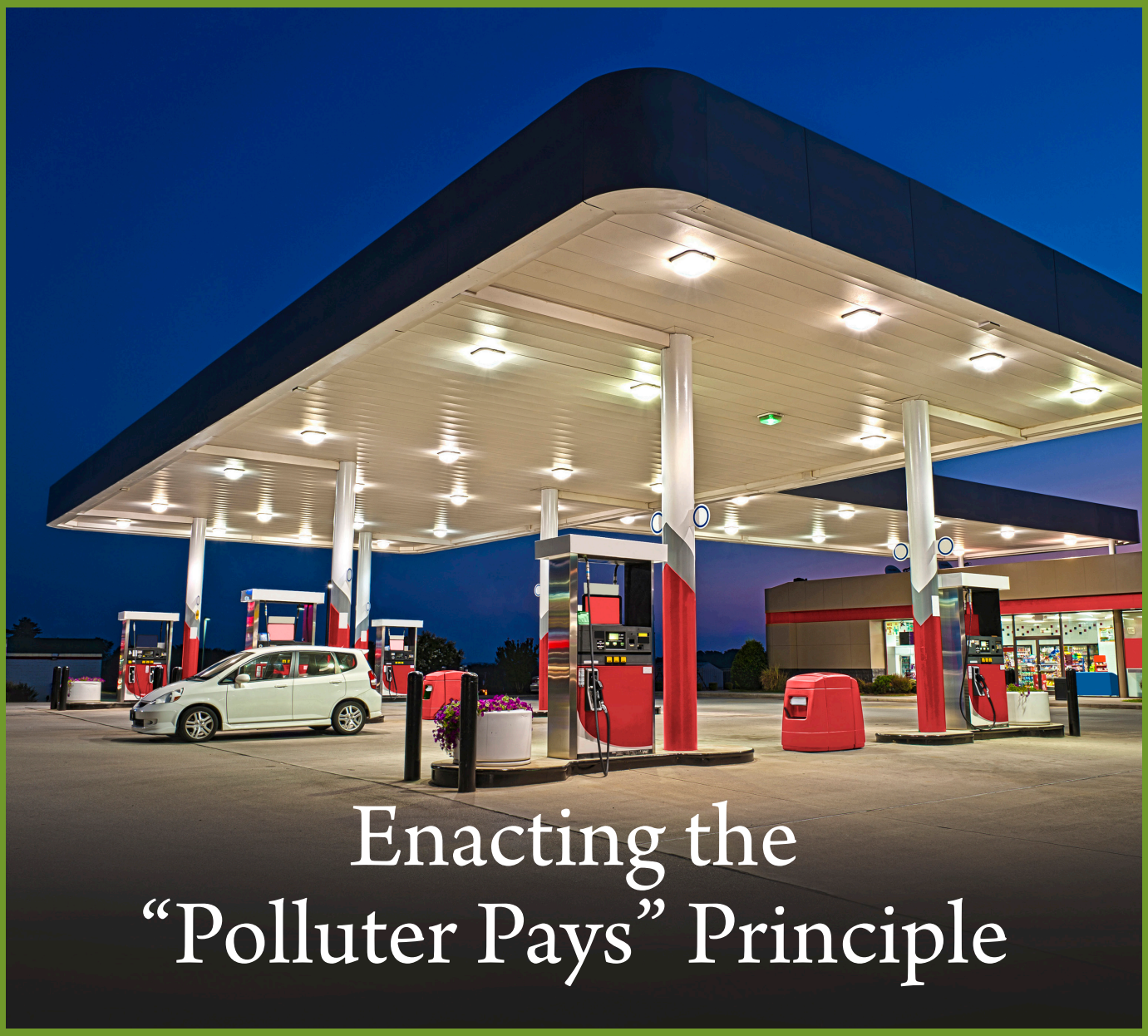
the expected harms from climate change. The greater the upstream effects on commerce and cost increases to market participants in other states, the larger the local benefits need to be.[86]

IV. Conclusion

A State Climate Superfund Program can be designed in accordance with federal law and the U.S. Constitution. The CAA would not preempt states from imposing financial liability on fossil fuel companies for climate change harms, as the law gives states the authority to control pollution more stringently than the federal government and the Program would not interfere with a federal permitting scheme for greenhouse gases. The Program also would not violate the Dormant Commerce Clause, as its effects are not overly burdensome on interstate economic activity as compared to the local benefits. Nor would the Program's retroactive liability pose a problem under the Due Process Clause, particularly given that fossil fuel companies are operating in a highly regulated industry and had knowledge of how greenhouse gas pollution could harm the environment and public health. Finally, judicial precedents on the Due Process Clause suggest that a state could constitutionally exercise jurisdiction over responsible parties who have cultivated a market for fossil fuels in the state. It will be more challenging to extend jurisdiction over responsible parties whose only connection to the state is through their emission of greenhouse gases, but it may be possible to defend the inclusion of these companies by analogizing to prior caselaw on hazardous pollution.

[86] *See id.* at 142 ("If a legitimate local purpose is found, then the question becomes one of degree. And the extent of the burden that will be tolerated will of course depend on the nature of the local interest involved, and on whether it could be promoted as well with a lesser impact on interstate activities.").

POLICY BRIEF



Enacting the "Polluter Pays" Principle

New York's Climate Change Superfund Act and Its Impact on Gasoline Prices

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November 2022

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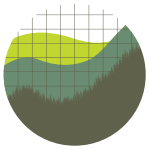

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Enacting the "Polluter Pays" Principle: New York's Climate Change Superfund Act and Its Impact on Gasoline Prices

Executive Summary

This policy brief analyzes how New York State's recently proposed Climate Change Superfund Act (the Act) is most likely to affect consumer gasoline prices. The Act establishes compensatory payments that would apply to fossil-fuel companies, including natural gas and coal companies, based on their historical contributions to the existing stock of greenhouse gases in the atmosphere (New York State Senate, 2022). The Act requires the state to place these payments in an adaptation fund to pay for green infrastructure that will help the state prepare for climate change.

The Act is unlikely to alter the price of gasoline at the pump in New York or the price of crude oil more generally. The Act's compensatory payments would be based on companies' historical contributions to the existing stock of greenhouse gas emissions such that these payments would reflect past sales of petroleum, and not current or future sales. Oil companies would therefore treat these payments as one-time fixed costs. Regardless of market structures, oil companies are unable to pass on increases in fixed costs to consumers due to economic incentives and competition (Nicholson, 2004, p. 205; Ritz, 2015).[1] Due to profit motivations, oil companies have significant incentives to leave their production levels and retail gasoline prices unchanged, even if firms may make operational changes in response to the Act.

The structure of the oil market in New York and globally is also unlikely to change in response to the Act. The Act applies only to large companies with significant operating revenue and large market capitalizations. Oil company profits will likely remain positive, particularly given their recent record profits, and thus widespread bankruptcies and consolidation are unlikely. Beyond the design of the Act, oil companies would also be unable to retaliate against New York by raising retail gasoline prices in the state due to the interconnectedness of the national and global energy markets and existing U.S. antitrust laws.

The Act could have a minor effect on retail gasoline prices by changing expectations about future liability, but even the direction of this effect is unclear. On the one hand, if the passage of the Act causes firms to increasingly anticipate future compensatory payments in New York based on current production decisions, the resulting expectations of increased marginal production

[1] Nicholson (2009. P. 205) states that "fixed costs play an important role in determining the firm's profitability in the short run, but…they play no role in determining how firms will react to changing prices because they must pay the same amount in capital costs no matter what they do." Ritz (2015) states that "From a theory viewpoint, this does not matter since changes in fixed costs do not affect prices, so any evidence for asymmetric pass-through must be due to changes in marginal costs."

costs could affect consumer prices in the state. On the other hand, firms may already anticipate that they will face liability for their contributions to climate change, such that failure to impose such charges may increase expectations of future policies that impose compensatory payments. Thus, it is unclear how actions taken now by New York State will impact perceptions of the likelihood of future policies. The recent rise in climate lawsuits nationally and globally combined with oil companies' internal carbon prices strongly suggest that oil companies already anticipate financial liability for their contribution to climate change and that New York's Act represents only a tiny portion of their overall liability risk.

Finally, as climate change is likely to disrupt energy markets (Clarke et al., 2018; Howard and Livermore, 2021; Rode et al., 2021), revenue generated by the Act will likely temper future energy cost impacts in the state. The Act's compensatory payments will be placed into a climate change adaptation fund for green infrastructure. Infrastructure projects launched as a result of this fund will likely lower energy companies' future expected costs in New York, including for the distribution of petroleum and the production and distribution of future oil substitutes. Thus, future energy prices related to transportation will likely be lower in the state as a result of the Act's ability to stimulate adaptation to future impacts of climate change.

Overall, the Act is likely to have a negligible impact on current and near-term oil prices, while potentially lowering future energy prices in New York, including for transportation.

1. Introduction

There is a longstanding scientific consensus that carbon dioxide and other greenhouse gas emissions contribute to climate change, which imposes considerable risk on societies around the world (New York State Department of Environmental Conservation, 2022; United States Global Change Research Program, 2018; Pörtner et al., 2022; Howard and Sterner, 2017). According to the U.S. government's National Climate Assessment (United States Global Change Research Program, 2018), climate change has already caused a wide range of damages for the Northeastern United States, including New York, and additional damages will continue for generations. Since 1900, the average surface temperature in New York has increased by 2.4°F, sea levels around the New York coastline and water levels in the Hudson River have risen by one foot, and precipitation has increased in the state, while snow cover in the wintertime is declining. Scientists expect these trends to persist, along with more frequent extreme weather events and a continued shift in native and invasive animal and plant species (New York State Department of Environmental Conservation, 2022).

Climate change will impact human and ecosystem health as well as many economic sectors, including the energy sector (Howard, 2014; Howard and Livermore, 2021; Pörtner et al., 2022). Substantial adaptation expenditures will be required to reduce exposure to these harms.

The Act aims to collect adaptation funds for New York from large fossil-fuel companies that are historically responsible for greenhouse gas emissions and sufficiently connected to the state of New York. This is consistent with the "polluter pays" principle that the polluter should bear the cost of their pollution. Often this comes in the form of the polluter compensating those impacted by the pollution or paying to prevent damages from the pollution. The principle is both an economic concept, which improves market efficiency, and a legal principle. A U.S. legal example is federal "Superfund" Law upon which the Act is based, which holds companies financially liable for the cleanup of their hazardous waste (Schwartz, 2010; Ambec and Ehlers, 2016).

New York's Climate Change Superfund Act

In May of 2022, New York State Assemblyman Jeffrey Dinowitz and New York State Senator Liz Krueger introduced the Climate Change Superfund Act to the state legislature. At the time of this policy brief's publication, the Act, also known as Senate Bill S9417, was in the Environmental Conservation Committee of the New York State Senate.

New York's recently proposed Act would require compensatory payments, assessed on firms that engaged in the extraction, production, refinement, and/or sale of petroleum from 2000 to

2018. Firms would be charged a share of $30 billion based on their proportional responsibility for global emissions of greenhouse gases emitted during this period. The Act measures greenhouse gas emissions in carbon dioxide equivalence, using emission factors based on fossil fuel type (i.e., coal, natural gas, or oil). Firms that emitted less than one billion metric tons during the covered period would be exempt from the payments. The Act imposes this liability on domestic and foreign responsible parties that are sufficiently connected to the state of New York. Firms subject to the fees could elect to pay over a nine-year period.

Currently, it is not entirely clear which oil companies will be covered by the Act. Firms will be assessed compensatory payments if they have "sufficient connection with the state to satisfy the nexus requirements of the United States Constitution" (New York State Senate, 2022).[2] Companies that sell oil in New York are sufficiently connected to the state, while the designation is less clear for companies operating in parts of New York's oil supply chain outside the state both domestically and internationally (Rothschild, 2022).

The Oil Industry

Based on the Act's coverage, the analysis in this brief focuses on the current structure of two related oil markets: the global crude oil market and the New York State retail gasoline market.[3] This subsection provides a brief overview of these two markets.

Global average annual petroleum production was 26.6 billion barrels from 2017 to 2021 (see Figure 1). The dominant players in the global crude oil market have traditionally been two overlapping organizations: the Organization of Petroleum Exporting Countries (OPEC), an intergovernmental organization of the 13 largest oil-producing and exporting countries; and OPEC+, a more loosely affiliated set of 24 countries. The former is responsible for 40% of global oil production and controls 80% of proven petroleum reserves, while the latter represents 61% of global oil production and 90% of global proven reserves (OPEC, 2022a; OPEC, 2022b); see Figure 2. Historically, OPEC countries have acted as a cartel to restrict supply and keep prices high (Tietenberg and Lewis, 2018, pp. 148-152). The combination of OPEC's supply restrictions and

[2] Under Supreme Court precedent, parties must have "certain minimum contacts" with a forum state that wishes to exert jurisdiction over them. International Shoe Co. v. State of Washington, 326 U.S. 310, 316–17 (1945). To satisfy this standard, the party must have engaged in some act by which it "purposefully avails itself of the privilege of conducting activities within the forum State." J. McIntyre Mach., Ltd. v. Nicastro, 564 U.S. 873, 877 (2011). For specific jurisdiction, the harm at issue must be connected to these activities and contacts within the state. Goodyear Dunlop Tires Operations, S.A. v. Brown, 564 U.S. 915, 919 (2011).

[3] This brief does not address the impact of this Act on natural gas or coal prices. The electricity sector predominantly uses coal and natural gas for generation, while the transportation sector uses gasoline. Hence, the impacts of the Act on these other energy sources are unlikely to interact with its impacts on the oil industry, as these markets have little overlap in New York. At the national and global scales, there is some overlap between crude oil and natural gas on the production side, as wells frequently jointly produce them (US EIA, 2013).

the fracking boom led the United States to become the world's largest oil producer starting in 2018, as it retook that mantel from Russia and Saudi Arabia (see Figure 3). The United States has approximately 2.3% to 2.5% of global oil reserves (US EIA, 2022b; OPEC, 2022a).

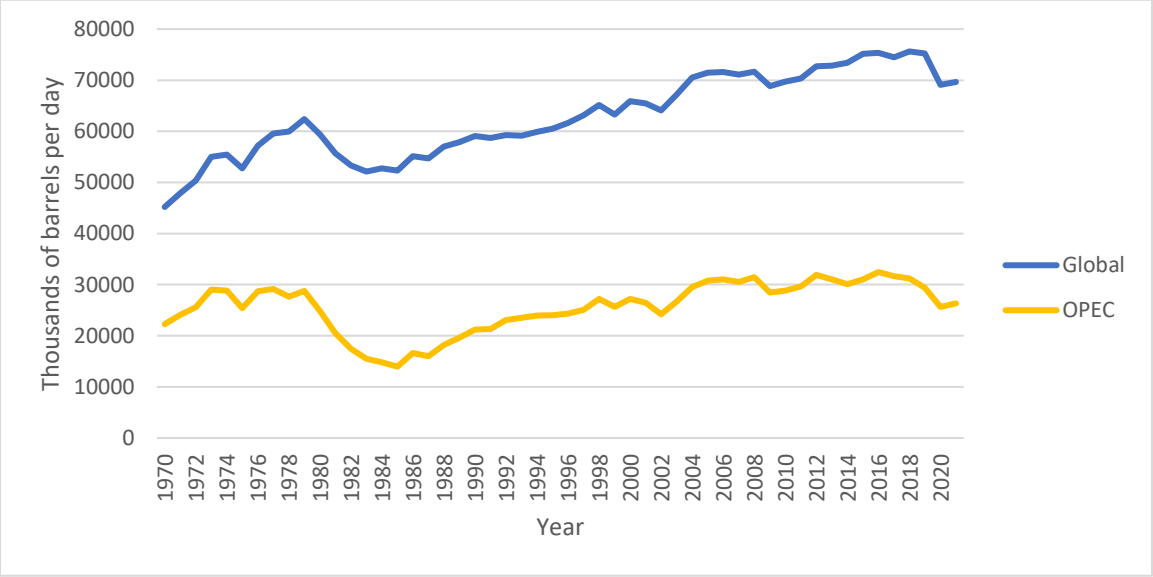

Figure 1. Global and OPEC Oil Production. *Source: OPEC (2022b).*

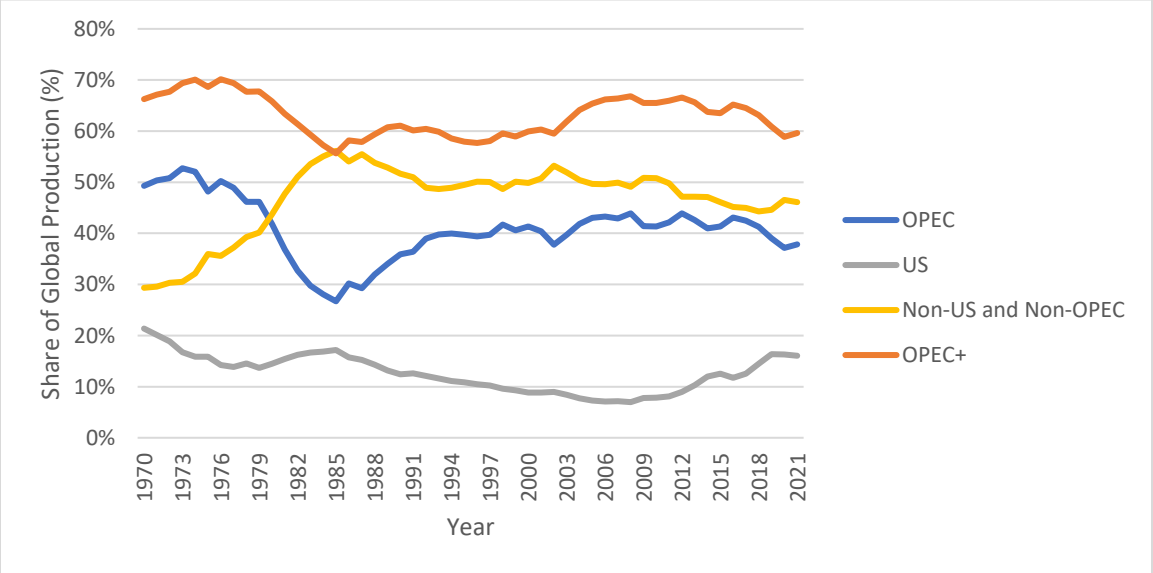

Figure 2. Share of Global Oil Production. *Source: OPEC. (2022b)*

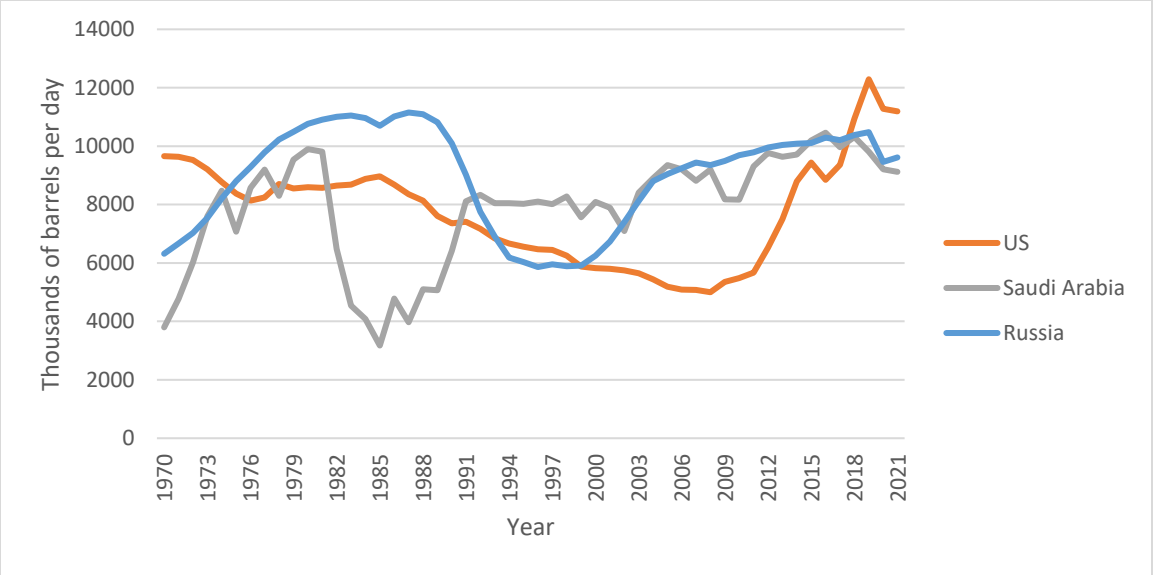

Figure 3. Oil Production of the Three Largest Oil Producing Countries. *Source: OPEC. (2022b)*

In 2020, the United States accounted for 20% of total global oil consumption. The next two largest consumers – China (14%) and India (5%) (US EIA, 2022c).

New York consumes a significant share of retail gasoline in the United States, while producing virtually none. Of the 50 states, New York is ranked fifth in petroleum consumption, equivalent to 3.2% of national consumption and less than 1% of global consumption. New York ranked fourth in motor gasoline and jet fuel consumption. Most of the state's petroleum consumption comes in the form of retail gasoline (77%), though residential and commercial heating (16%) and industrial uses (7%) also represent significant shares (US EIA, 2022a).

In contrast, New York only produces 0.01% of U.S. crude oil and has no oil refineries, importing all of its petroleum from refineries in the Eastern United States (e.g., New Jersey and Pennsylvania), the Gulf Coast, the Midwest, and Canada. Thus, oil companies operating in New York State focus primarily on importing and selling fuel. In 2020, there were 4,959 gas stations in the state (US EIA, 2022a). Suppliers comprise many large U.S. and European oil companies, including ExxonMobil, British Petroleum (BP), Citgo, Shell, ConocoPhillips, and Phillips 66.[4]

2. Economic Theory of Prices in the Short Run to Medium Run

According to economic theory, firms set production quantities (and prices) to maximize their profits, subject to market demand. Regardless of the market structure, the profit-maximizing quantity and price of any good are a function of demand and the variable cost of production. As

[4] In 2012, ConocoPhillips spun off its midstream and downstream operations into Phillips 66. However, as the Act applies to fossil fuels sold between 2000 to 2018, both companies are likely responsible for emissions during the covered period (ConocoPhillips, 2012). Of the remaining major United States' oil producers, Chevron does not appear to have retail operations in New York (ScrapHero, 2022).

compensatory payments would not vary with firms' current production decisions, these payments would be considered fixed costs for oil firms. The proposed payments thus will not affect the equilibrium price or quantity of retail gasoline in the short run to medium run when firms are unable to exit or enter the industry, such that market structure is held constant (Nicholson, 2004, p. 205; Ritz, 2015).

General Theory

Economic theory indicates that an oil firm selects a production level to maximize its profits (total revenues minus total costs). Total costs are the sum of variable costs and fixed costs (Perloff, 2008, p. 205). Regardless of market structures, profit maximization for a firm occurs at a production level that equates the marginal revenue with the marginal cost, which are the revenue and cost of producing one additional barrel of oil, respectively (Nicholson, 2004, p. 251; Perloff, 2008, p. 458; Pindyck and Rubinfeld, 2013, p. 285, 288; Nicholson and Snyder, 2008, p. 543).[5] As the marginal revenue of a firm depends on the production decisions of other firms, the exact solution varies with the market structure, which is characterized by the number of firms and their total cost functions. However, in any market structure, fixed costs do not affect the equilibrium quantity, as they are not part of marginal revenues or marginal costs. Similarly, fixed costs do not determine the equilibrium price, as they are not part of the equilibrium quantity when market structure is constant in the short-run to medium-run or the demand curve upon which the market clearing price is determined. As the existing stock of greenhouse gases in the atmosphere form the basis of the proposed compensatory payments, these payments are part of the fixed costs of production and thus will not affect current or future variable production costs. See Appendix A for mathematical derivations discussed in this subsection.

Applying Theory to the Oil Industry

Empirical research can help characterize the structures of the two oil markets of interest – the global crude oil market and the New York retail gasoline market. In the global crude market, researchers traditionally classified OPEC as a monopolist (Li, 2010). However, recent empirical evidence points to a Stackelberg oligopoly model holding historically, where OPEC is the dominant firm that leads with its production decisions and non-OPEC producers are a competitive fringe that follow its lead (Li, 2010; Huppmann and Holz, 2010; Golombek et al., 2018). More recent evidence proposes a more competitive global market since the mid-2000s, in which the fracking boom led the United States to be the largest global energy producer and the 2008 financial crisis reduced global oil demand (Huppmann and Holz, 2010; Frondel and Horvath. 2019; Berk and Cam, 2020; Balke et al. 2020). Even then, OPEC still influences prices while non-OPEC producers act as an increasingly important competitive fringe (Frondel and Horvath. 2019).

[5] Specifically, each oil firm increases its quantity produced until the marginal decrease in profits from the resulting price decline is offset by the increase in profits due to a growth in the quantity of the goods demanded.

Meanwhile, mixed evidence exists about regional market power at the retail level for gasoline in the United States with only some studies supporting competitive markets (Deltas, 2008; Houde, 2010; Bumpass et al., 2015; Eleftheriou et al., 2019).

Given the wide range of possibilities, this analysis considers several market structures starting from two market structure extremes – a perfectly competitive market and a monopoly. Firms treat the price as given in a perfectly competitive market, such that individual firm's production decisions do not affect it (Nicholson, 2004, p. 312). In equilibrium, prices equal marginal production costs (see Figure 4). In the case of a monopoly, there is only one firm, which recognizes that it alone influences prices, such that it determines the equilibrium quantity by equating marginal revenue with marginal cost (see Figure 5). As fixed costs, compensatory payments do not influence the equilibrium quantity decision or the corresponding equilibrium price in either of these extreme cases.[6]

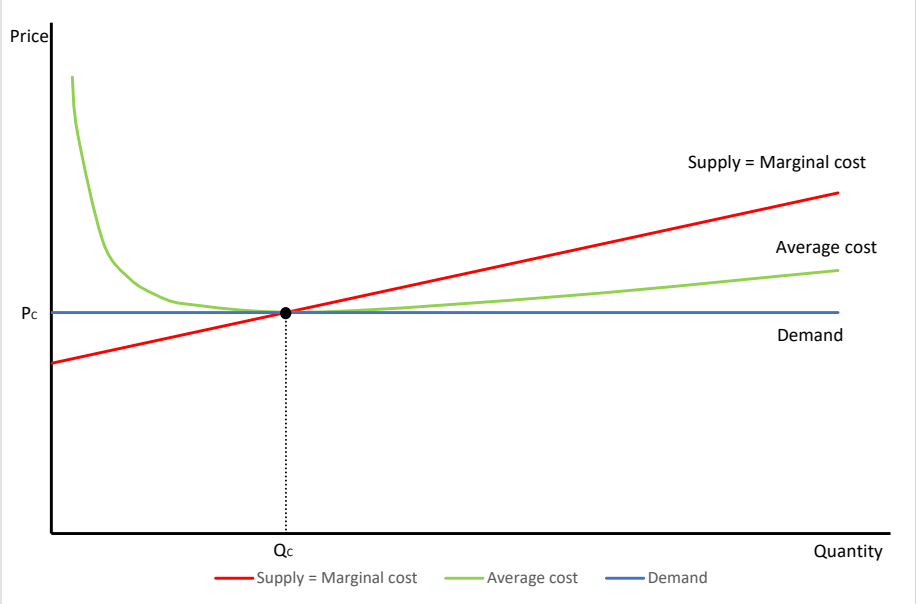

Figure 4. Equilibrium Price and Quantity in a Perfectly Competitive Industry. *The demand curve in a perfectly competitive industry is horizontal at the market price, Pc, indicating perfectly elastic demand. All firms can sell any quantity at the market price but not at a higher price because of an infinite number of firms in the market. In this figure, total cost is quadratic, such that marginal cost is linear. Total quantity produced in the industry, Q_C, occurs where price equals marginal cost. In a perfectly competitive industry, price also equals average cost in equilibrium, such that there are zero economic profits and firms have no incentive to enter or exit the industry.*

[6] The demand curve is not a function of fixed costs, which are paid by producers.

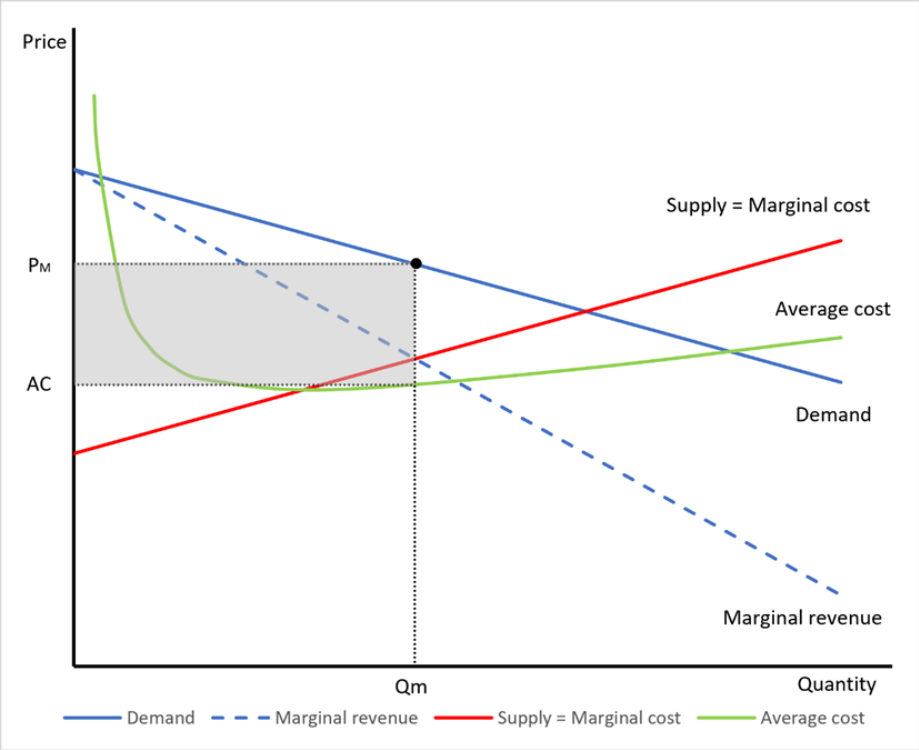

Figure 5. Equilibrium Price and Quantity for a Monopoly. *A monopoly firm produces at a quantity Q_m that equates marginal revenue and marginal cost to maximize profits. The downward sloping linear demand curve (with half the slope of the linear marginal revenue curve) determines the equilibrium market clearing price P_m. In this figure, total cost is quadratic, such that marginal cost is linear. The firm's profit is represented by the light grey area in the figure.*

Unlike these extremes, the New York retail gasoline and global crude oil markets may be more characteristic of oligopoly models, where a limited number of firms with some market power produce an outcome somewhere between the monopoly and perfect-competition equilibriums (Nicholson and Snyder, 2008, p. 523). In the New York retail gasoline market, there are several large retail gasoline companies with market power and no clear market leader, such that all gasoline distributors and retailers in the state make production decisions simultaneously.[7] Assuming a Nash equilibrium (Perloff, 2008, p, 454),[8] no firm has an incentive to change its quantities, holding all other firms' decisions constant. Again, compensatory payments do not impact the equilibrium quantities and price as part of fixed costs.

[7] Companies may exhibit power at a sub-state level in New York, as ExxonMobil does appear to have more gas stations in cities and towns across the state, though any definitive statement is difficult given the incomplete nature of the data available (ScrapHero, 2022). Furthermore, gas stations may have spatial market power due to their strategic geographic location

[8] In a Nash equilibrium, no firm has the incentive to adjust its quantity produced, as each firm cannot increase its profits if other firms hold their quantities fixed.

In the global crude oil market, empirical evidence supports an oligopoly model where firms make production decisions sequentially instead of simultaneously. Specifically, OPEC is the dominant firm making production decisions prior to other producers and to which non-OPEC firms simultaneously respond by choosing their production quantities following the leader's announcement of a decision (Nicholson and Snyder, 2008, p. 543).[9] In this sequential decisionmaking framework, compensatory payments still do not impact the equilibrium quantities and prices, given that they are fixed costs. Although it is unclear whether compensatory payments would apply to all or some oil companies in OPEC nations, as discussed in Section 1, the above result applies to the full range of scenarios.

See Appendix B for mathematical derivations discussed in this subsection.[10]

3. Oil Industry Consolidation in the Long Run

In the long run, oil firms may enter and exit the industry. Thus, contemplated compensatory payments can potentially affect consumer prices through anticompetitive behavior, as additional consolidation in the market may allow firms to charge excess prices or further increase existing price premiums (Nicholson, 2004, pp. 269-269). However, this kind of consolidation is unlikely empirically given the relatively small size of the payments relative to oil firms' revenue, market capitalization, and profits.

Economic Theory on Exiting the Industry

In the above section, we held constant market structures. In theory, the introduction of compensatory payments and the corresponding increase in fixed costs can decrease firm profits and result in smaller positive profits (see Figure 6) or negative profits (see Figure 7) for assessed firms over the nine-year assessment period. In this latter case, firms may leave the industry in the long run (Nicholson, 2004, p. 205; Perloff, 2008, p. 268-2070; Pindyck and Rubinfeld, 2013, p. 233, 288-290, pp. 293). If an oligopoly holds, the exiting of firms can lead to less oil production and higher oil prices, as the number of firms declines and the remaining firms obtain a higher degree of market power (Nicholson and Snyder, 2008, p. 523). In the extreme case where the oil industry initially consists of only two firms and one goes bankrupt or the other firm purchases it, the consolidation shifts the market equilibrium from a duopoly to a monopoly (see Figure 8). As discussed below, however, this theoretical possibility is highly unlikely in reality.

[9] It is easy to observe this dominance in the real world where OPEC and OPEC+ meet and announce their production decisions and set production targets (Northam, 2022).

[10] There is an alternative type of oligopoly model in which firms compete by setting prices instead of quantities. We do not discuss this option here, as there is no evidence that it applies to oil companies. Furthermore, the results are comparable to the perfectly competitive case as the firms compete and drive the price down until price equals marginal cost, regardless of the number of firms (Nicholson, 2004, p. 398). Again, compensatory payments as part of fixed costs do not impact equilibrium price or quantity.

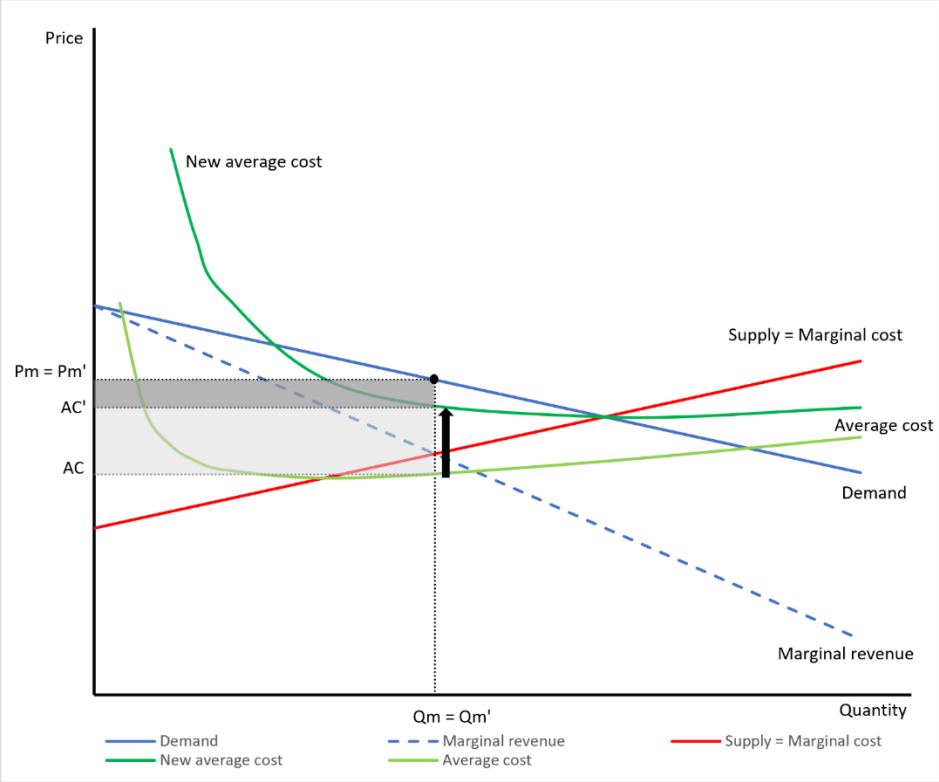

Figure 6. Impact of Compensatory Payments on Monopoly Equilibrium with Positive Profits After Shift. *Given the same monopoly firm in Figure 5, the average cost curve shifts up to AC' with the introduction of compensatory payments, as fixed costs increase. Given the unchanged marginal cost despite an increased fixed cost, the equilibrium quantity (Q'_m) and price (P'_m) remains the same as Figure 5 under the equilibrium condition that marginal revenue equals marginal cost. The dark grey area represents the firm's profit in the figure, which remain positive, but smaller than the profits prior to the compensatory payments (the light grey area).*

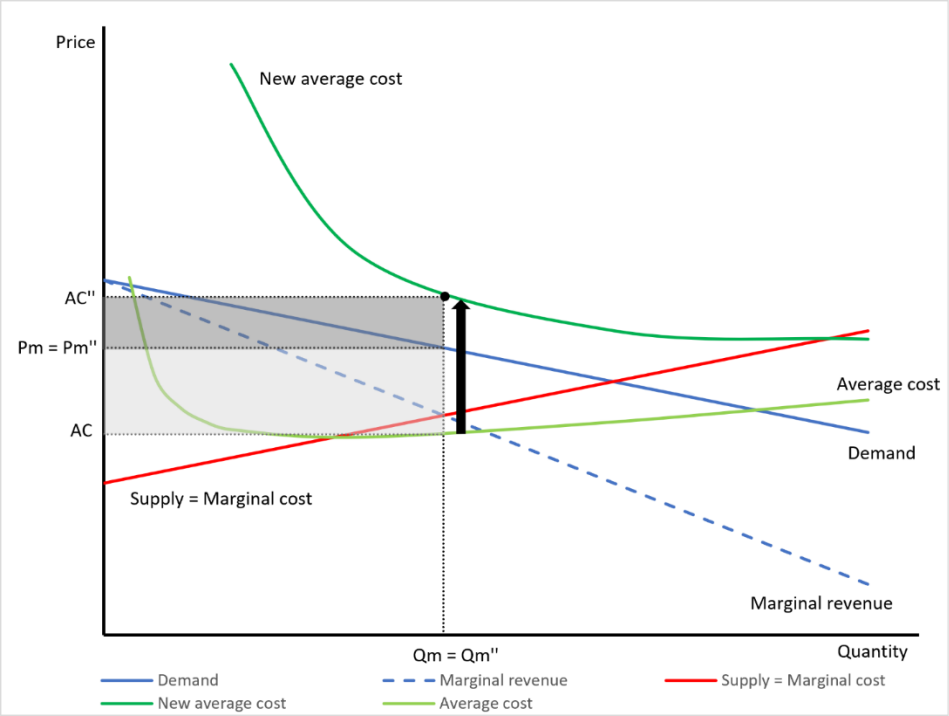

Figure 7. Impact of Compensatory Payments on Monopoly Equilibrium with Negative Profits After Shift. *Given the same monopoly firm in Figure 5, the average cost curve shifts up to AC'' with the introduction of compensatory payments, as fixed costs increase. Given the unchanged marginal cost despite an increased fixed cost, the equilibrium quantity (Q_m'') and price (P_m'') remains the same as Figure 5 under the equilibrium condition that marginal revenue equals marginal cost. The dark grey area represents the firm's profit in the figure, which become negative, in contrast to the positive profits prior to the introduction of the compensatory payments (the light grey area).*

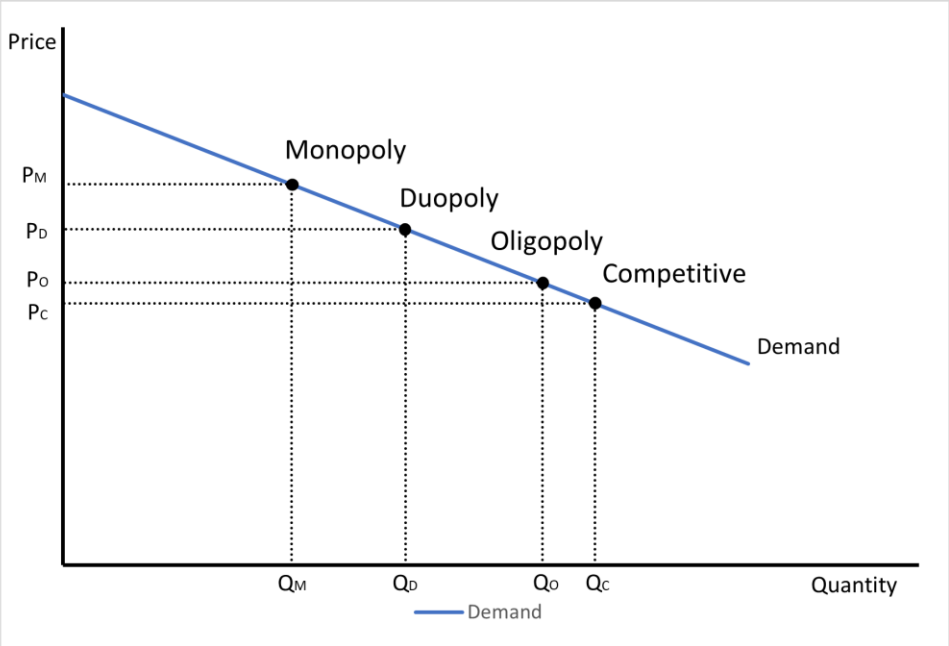

Figure 8. Equilibria by Number of Firms in the Industry· *This figure displays multiple equilibria under different market structures, where the number of firms in the industry is 1 (monopoly), 2 (duopoly),* $n > 2$ *(oligopoly), and infinite (perfectly competitive), respectively.* As the number of firms increases, the remaining firms obtain a lower degree of market power, leading to more oil production and lower oil prices.

Empirical Evaluation of Consolidation Incentives in the Oil Industry

In reality, the proposed compensatory payments are unlikely to lead to any consolidation in the oil industry, regardless of which firms the state assesses.

It is unclear which firms New York will assess the compensatory payments, though the impact on business operations and sector profitability will be minimal given the sector's relative size. Assessed firms' annual operating revenue and profits are likely to be vastly larger than the annual compensatory payments of $3.3 billion for nine years, regardless of whether the state assesses only U.S. firms or all large oil firms worldwide; see Table 1. For companies operating in New York, which will clearly be assessed, annual compensatory payments represent an upper bound of 5.6% of their average annual profits of $59 billion from 2010 to 2021 (Sönnichsen, 2022e – 2002i).[11] Furthermore, none of these companies' profits would shift from positive to negative, assuming a division of the $3.3 billion between these companies based on their relative greenhouse gas emissions in 2017 (see Figure 9).[12]

[11] Due to lack of data, these calculations excludes Citgo and 7-Eleven.

[12] If we divide annual compensatory payments using relative shares of total greenhouse emissions in 2017, each firm's annual compensatory payments equal between 3.6% and 10.3% of annual average profits between 2010 and 2021. Ideally, this analysis would use greenhouse gas emissions data for each company in every relevant year, but

Like revenue, the total compensatory payments of $30 billion also make up a relatively small share of domestic and international oil firms' market capitalization; see Table 1. The largest American and European oil companies operating in New York have a market capitalization of approximately $1 trillion; total compensatory payments represent 3.1% of this value. These small shares indicate that the compensation payments will have a negligible effect on firms' major decisions, such as exit or entry, or even smaller decisions, such as operational changes.

Table 1. Relative Size of Compensatory Payments to Oil Firms' Revenues, Profits and Market Capitalization

Economic Indicator		U.S. Oil Firms	Largest U.S. and European Oil firms Operating in NY[a]	All Large Oil Firms Globally
Average Annual Revenue	2022 USD	$158 billion	*Not Available*	$2.6 trillion
	% of annual payments	2.1%		0.1%
	Relevant time-period	2016-2020		2020-2021
Average Annual Profits	2022 USD	$55 billion	$59 billion	$300 billion
	% of annual payments	6.1%	5.6%	1%
	Relevant time-period	2010 to 2021	2010 to 2021	2021 – 2022[b]
Total Market Capitalization	2022 USD	$1.3 trillion	$1 trillion	$3.8 trillion
	% of total payments	2.4%	3.1%	0.8%
	Relevant time-period	October of 2022	October of 2022	October of 2022

[a] *Excludes Citgo and 7-Eleven due to lack of data*

[b] *Only first two quarters of fiscal year 2022*

Source: Sönnichsen (2021; 2022a – 2002l); Puri-Mirza (2022); Statista Research Department (2022)

this data is not easily available. To check our results, we redo the calculation using net profits in 2017, which matches the year of our greenhouse gas emissions data. In this case, we find that oil company's annual compensatory payments equal between 5.5% and 15.5% of profits in 2017, except for ConocoPhillips, which earned negative profits in 2017 prior to the implementation of the compensatory payments.

A similar type of analysis can be done using total revenue as a proxy for greenhouse emissions, as long as oil prices and the emission concentrations per barrel of oil are similar across companies. If we divide annual compensatory payments using relative shares of total revenue in 2022, each firm's annual compensatory payments equal between 3.3% and 14.6% of annual average profits between 2010 and 2021. We redo the calculation using net profits in 2021, which matches the year of our total revenue data. In this case, we find that oil company's annual compensatory payments equal between 3.1% and 18.5% of profits in 2021.

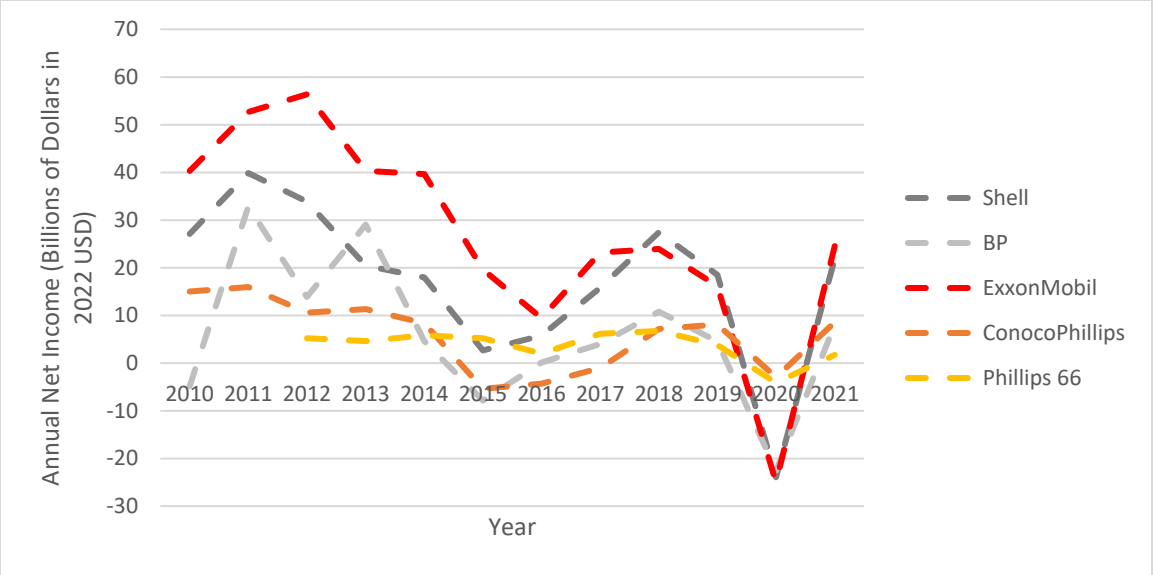

Figure 9. Net Income of Largest Oil Companies Operating in New York. *Grey lines represent the profits of the largest foreign oil companies operating in New York, while the red, orange, and yellow lines represent the largest American companies operating in New York. Source: Sönnichsen (2022e – 2002i)*

The analysis above almost certainly overestimates oil companies' liability. Critically, the Act's assessments applies to natural gas and coal companies in addition to oil companies, contrary to the assumptions in the calculations above, implying a far smaller assessment on the oil industry. Furthermore, the oil industry recently received record revenues and profits in 2022, exceeding the averages used in the calculations above (Carrington, 2022). Moreover, ongoing rapid inflation will likely lead to further price increases for oil, further eroding the relative share of compensatory payments to the above key indicators.[13] Finally, the Act further mitigates the likelihood of firms leaving the industry due to negative profits by exempting from compensatory payments those that emitted less than one billion metric tons. Thus, the Act excludes the oil companies operating in New York with the smallest profits margins from payments.[14]

[13] General inflation is at 8.2% in the first quarter of 2022, which is its highest rate since the 1970s (US Bureau of Labor Statistics, 2022a). However, energy inflation is much higher at around 20% to 30% depending on the source (United States Bureau of Labor Statistics, 2022a-c).

[14] Using a subset of oil companies operating in New York (Shell, BP, ExxonMobil, Phillips 66, and ConocoPhillips) and the United States (plus, Chevron and Marathon), we find a strong correlation between profits and greenhouse gas emissions (Fletcher et al., 2018) and profits (Sönnichsen, 2022g – 2022l) in 2017. Similarly, we find a positive correlation between profits and revenues for the subset of companies in New York (Shell, BP, ExxonMobil, Phillips 66, and ConocoPhillips) in 2021. As companies face relatively the same oil prices and emission factors, revenue should be a good approximation of emissions. Thus, profits and emissions appear positively correlated for oil companies operating in the United States.

Even if a qualifying firm did face net financial losses (i.e., negative profits), that firm would not necessarily be forced out of the market. As seen in Figure 9, individual firms have experienced negative profits in some years, such as 2015 and 2020, though these firms did not leave the market and often earned positive profits in the following years.[15] If firms expect losses to be short lived, as is the case with the proposed compensatory payments that would stretch out to a maximum of nine years, they do not necessarily exit the industry.[16]

Even if firms did seek to consolidate or exit the industry because of the compensatory payments, their ability may be limited. With respect to consolidation, any attempt to increase market power and force up prices would be regulated by antitrust laws,[17] though the overall incentives for companies to consolidate as a result of the Act are small to non-existent, as discussed above. Furthermore, while firms can avoid certain types of fixed costs in the long run by exiting the market (i.e., unsunk costs), exiting is not a means to avoid compensatory payments according to the current text of the proposed law. Specifically, the law has no bankruptcy or insolvency clause, such that New York will likely collect as a creditor the assessed amount to the greatest extent possible under the law following the example of the EPA (United States Environmental Protection Agency, 2022).[18]

Though firms are unlikely to consolidate or exit the industry due to the compensatory payments, some firms may sell assets or take other steps as a reaction to the proposed fees. Firms can accomplish these types of ownership-related transactions without disrupting operations. Indeed, even when they make operational changes, owners of these revenue-generating assets have strong incentives to continue their operations at their profit-maximizing levels.

4. Retaliation

Oil companies assessed compensatory payments may wish to retaliate by raising oil prices in New York State. However, they would be limited in their ability to do so by the

[15] A compensatory payment can only be responsible for negative profits, and thus a firm exiting the industry, if the firm's profits are positive without the payments and negative with them.

[16] "A firm need not always earn a profit in the short-run…Note that the firm is losing money when its price is less than average total cost at the profit-maximizing output…In that case, if there is little chance that conditions will improve, it should shut down and leave the industry…Will shutting down always be the sensible strategy? Not necessarily. The firm might operate at a loss in the short-run because it expect to become profitable again in the future, when the price of its product increases or the cost of production falls." (Pindyck and Rubinfeld, 2013, p. 288-290).

[17] Federal law "prohibits any agreement among competitors to fix prices, rig bids, or engage in other anticompetitive activity." (United States Department of Justice, 2005). New York State law contains a similar prohibition (New York State Attorney General).

[18] The sufficient connection requirement applies to the covered period of greenhouse gas emissions, i.e., to the 2000 to 2018 period. Therefore, if a large oil company declares bankruptcy in 2023, it would still be sufficiently connected to the state after bankruptcy if it sold gasoline in New York during the covered period.

interconnectedness of national and global energy markets. First, if oil companies ever retaliated, global oil prices would rise along with New York oil prices as the global marketplace determines wholesale crude oil price. The ability to retaliate would also be limited by competition, as New York is less likely to assess some or all foreign oil firms in the global petroleum market. Moreover, the relatively free movement of oil and other forms of energy implies arbitrage opportunities if oil companies attempt to manipulate regional retail oil prices. Again, if such retaliation occurred, nonlocal oil retailers would likely enter the New York retail market lured by above-average returns created by higher prices pushing New York retail oil prices back towards the existing equilibrium (Perloff, 2008, p. 268-2070; Pindyck and Rubinfeld, 2013, 302-304). Finally, coordinated anti-competitive behavior where multiple firms collude to punish a regulator and its constituents is illegal under New York and federal antitrust laws.[19]

5. Expectations

A fourth pathway for compensatory payments to affect prices involves expectations. The imposition of compensatory payments may lead firms to adjust their expectations about future liabilities based on their production in the future.

As the future is uncertain, oil companies make production decisions to maximize expected profits accounting for future company liability (Nicholson, 2004; Perloff, 2008; Pindyck and Rubinfeld, 2013). In this case, an increase in the probability of future liability will decrease the equilibrium quantity produced and vice versa (see Appendix C for mathematical derivations). However, it is unclear how the passage of the proposed Act would affect expectations, and thus, crude oil and retail gasoline prices. If the imposition of these compensatory payments leads firms to anticipate other, future compensatory payments based on their current and future production, the equilibrium quantity will decline as firms expect higher marginal production costs. However, it is unclear how the current action will affect future actions by New York State (or other entities). Given the ambiguous direction of the signal, there is no strong reason to believe that any anticipation effect would lead to an equilibrium increase in prices.

Reasons for Firms to Expect Liability for Greenhouse Gas Emissions

In fact, oil firms may already have strong reasons to expect liability or regulation beyond New York's regulatory decisions. In particular, the Paris Agreement, existing domestic climate policies, state and local greenhouse gas emission targets, and energy and environmental regulations, provide strong signals that the United States and other nations are taking action on climate change. Economists predict that more aggressive, additional action will be taken relative to current policy (Rennert et al., 2022).

[19] See footnote 17.

Beyond regulation, many entities have been seeking to hold fossil fuel companies liable for climate impacts (Zhongming et al., 2021), as the public increasingly believes that energy companies are responsible for climate change (Gorbach et al., 2022). The United Nations identified 864 cases of climate litigation across 24 countries in 2017, which increased to 1,550 across 38 countries plus the European Union in 2020. Historically, most cases are in the United States with only a small portion of these cases against corporations, focusing on such topics as corporate liability, disclosure, and greenwashing. As of 2020, more than a dozen corporate liability cases were still active in the United States with no such case yet decided on its merits at that time (Zhongming et al., 2021).

In addition, the United Nations and Organisation for Economic Co-operation and Development (OECD) recognize that climate impacts may represent human rights violations. Likewise, the Philippines Human Rights Commission finds that companies are morally responsible for climate change and legally liable; even if international legal liability does not apply, countries can pass laws and hold entities liable in their domestic legal systems (Benjamin, 2021; Zhongming et al., 2021). These liability lawsuits and other climate litigation may result in additional regulations, delays, bans, and financial costs, including compensation or adaptation requirements (Zhongming et al., 2021). Thus, regardless of whether New York passes the Act, oil companies will rationally assume the possibility of future legal liability for past, current, and future emissions.

Evidence Oil Firms Already Internalizing Liability Risks

Many oil companies, along with an increasing number of firms in the energy sector and beyond, have used "internal carbon prices," assigning either a real or theoretical monetary penalty for emissions in internal processes such as cost-benefit analyses of investment decisions (Harpankar, 2019; Bartlett et al., 2021). The largest oil companies operating in New York all have internal carbon prices: BP uses $50/metric ton, increasing to $100, $200, and $250 in 2030, 2040, and 2050, respectively (CDP, 2021a); Shell uses $125/metric ton with the value increasing as high as $200 by 2050 depending on the origin country of the project (CDP, 2022); ConocoPhillips uses $40/metric ton with no variation by geography unless the origin country has a higher price (CDP, 2021b); ExxonMobil reportedly used $60/metric in the past and planned to increase this amount to $80/ton, though the company stopped reporting its internal carbon price after being sued for using lower internal carbon prices than reported to shareholders (Schapiro, 2014; Brown,

2018).[20] Beyond these New York-based oil companies, many other major oil companies have an internal carbon price, including Chevron, Devon, Total, Ameren, and Excel (Davis, 2013).

While companies often have legal, normative, and competitive reasons to adopt internal carbon prices, empirical evidence and company statements indicate that regulatory risk and liability concerns frequently motivate these decisions (Chang, 2017; Harpankar, 2019; Bento and Gianfrate, 2020; Bartlett, 2021; Gorbach et al., 2022; Schapiro, 2014; CDP, 2021a; CDP, 2021b; CDP, 2022).[21] Often, companies' internal carbon prices are higher than the carbon tax or price used by jurisdictions or countries, as these companies factor in expectations about future regulatory risk (Trinks et al., 2022; Schapiro, 2014). Consequently, internal carbon prices tend to be higher in high-emitting industries with long-run investment cycles, such as the oil, gas, and utilities sectors (Ahluwalia, 2017; Chang, 2017; Bento and Gianfrate, 2020; Bartlett, 2021; Fan et al., 2021; Trinks and Scholtens, 2022).[22] In the last five years, the internal carbon prices of oil companies, e.g., BP and Shell, have rapidly increased along with regulatory risks (Schapiro, 2014; Parnell, 2020; Bartlett et al., 2021; Bento and Gianfrate, 2022; Li et al., 2022), which is unsurprising as fossil-fuel companies and utilities are the most regulated sectors of the economy and have strong expectations of future regulation (Bartlett et al., 2021).

Regardless of New York's decision, other entities are likely to ramp up climate regulations and lawsuits. As these pressures continue, oil companies will face higher costs and expected costs, which will potentially reduce the quantity of oil supplied and increase corresponding prices. Given the global nature of this marketplace, the potential for New York to impose a second round of compensatory payments in the future will have little overall impact on the current and future production decisions of oil companies. In fact, many multi-national energy and utility companies likely have already adopted internal carbon pricing assumptions for their New York operations due to regulations in other jurisdictions (Harpankar, 2019; Trinks and Scholtens, 2022), which far exceed the current market price in the New York power sector.[23] Therefore, it appears that the Act will have at most a very limited effect on industry expectations and prices.

6. Impacts of Spending the Revenue

[20] This lawsuit points to the fact that companies may report these internal prices and not use them. Even then, oil companies never set older carbon prices at levels that would be transformational (Chang, 2017), which may explain why some feel that the values are insufficient (Li et al, 2022).

[21] In addition to the risk of changing regulations and policy, there are also risks of changing social norms and technology (Fan et al., 2021).

[22] According to this same research, oil companies and others in high-emitting industries are more likely to adopt internal carbon prices relative to companies in low-emitting industries.

[23] In the power sectors of New York and eleven other Northeastern and Mid-Atlantic states, the Regional Greenhouse Gas Initiative (RGGI) operates and manages a market that sets the market price for carbon dioxide. Specifically, RGGI is a multi-state cap-and-trade program for carbon dioxide emissions from the power sector. The current market price is $13.45 (RGGI, 2022a; 2022b).

The foregoing analysis focuses on the incidence of compensatory payments and does not account for how the state spends any resulting revenue. The New York State government could spend this revenue in ways that indirectly affect demand or production costs of retail gasoline in New York, which would in turn affect prices. Moreover, if New York legislature does not pass the Act to establish the adaptation fund, taxpayers may need to pay for necessary updates of New York's climate-vulnerable infrastructure (despite their lack of direct responsibility). This in turn has general equilibrium effects by impacting consumer spending, including gasoline demand, as well as consumer welfare implications. We set aside these general equilibrium effects, as the direction of the impact is unclear, except to note that these are secondary in nature.

In addition to general equilibrium effects, the Act places the funds from these proposed compensatory payments into a climate change adaptation fund for green infrastructure (New York State Senate, 2022; Lisa, 2022), which would aid New York in adapting to climate change. To the extent that these funds address the impacts of climate change on the energy sector of New York, energy producers and distributors will have lower marginal costs in the future due to a more resilient production and distribution system (Howard and Livermore, 2021).[24] This translates into lower future energy prices for consumers, including in the transportation sector.

7. Conclusion

In summary, this analysis finds that the Climate Change Superfund Act will have little to no impact on retail gasoline prices in New York. Economic theory shows that holding oil companies liable for past emissions will not lead to production or price changes in the local, national, or international energy markets, holding the structure of these markets constant. Empirical evidence shows that total compensatory payments for emissions from 2000 to 2018 are relatively small compared to oil company revenue, market capitalization, and profits. Therefore, the Act is unlikely to result in consolidation or bankruptcy within the industry. Expanding beyond market incentives in a static environment to consider dynamic issues, such as leadership and retaliation, the analysis finds that competitive pressures greatly restrict the ability of firms to manipulate prices. Furthermore, while expectations about future liability could impact current oil production

[24] Economists expect climate change to significantly impact both demand and supply of energy (Howard, 2014). On the demand side, economists expect climate change to decrease energy demand in the winter for heating, while increasing electricity demand in the summer for air conditioning, though studies differ on the estimated net impact for the United States (Clarke et al., 2018; Rennert et al., 2020). In New York, the net impact on oil demand is likely negative from decreased heating (Rode et al., 2021), as New York uses a significant portion of its oil for heating, though the net impact of climate change on oil demand is uncertain due to unobserved feedbacks, behavior changes, and future regulations (Howard and Livermore, 2021). On the supply side, climate change will impact the costs of renewables and fossil fuels, including energy infrastructure used for production, distribution, and generation (Howard and Livermore, 2021). It is difficult to determine the net effects of climate change on the cost of supplying energy, including oil extraction, processing, and distribution, such that the magnitude of the impact is unclear (Howard, 2014). Regardless, adapting to this future will lead to lower marginal costs and prices in the future energy market.

and its corresponding price regionally and globally, there is no clear reason to suspect that passing the Act will lead to higher oil prices in the near term.

Finally, it is important to note that levying compensatory payments on companies is not a substitute for policies to reduce future emissions (like carbon pricing or regulations). State and national policies to reduce emissions remain an essential response to the many grave risks associated with climate change. Such policies will lead to higher fossil-fuel prices, though this is necessary to lower demand for pollution-intensive fuels and incentivize the transition away from these fuels.[25]

[25] If policymakers have concerns about the impact of such policies on citizen welfare, particularly for low-income groups, they can adopt a revenue-neutral, carbon tax. The use of climate dividends can greatly benefit the most disadvantaged groups in society, as they consume the least amount of energy per capita and are the most vulnerable to climate impacts (Carattini et al., 2017).

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Appendices

Appendix A

Economic theory indicates that each oil firm selects their oil production level (q_i) to maximize their profits (Π_i). Profits equal total revenue (TR_i) minus total costs (TC_i), such that firm *i*'s profit is

$$\Pi_i = TR_i - TC_i = q_i P(Q) - C_i(q_i)$$

where the market price $P(Q)$ is a function of the aggregate quantity of oil produced by all firms *Q*, total revenue for firm *i* equals the product of this market price and its quantity produced, i.e., $TR_i = q_i P(Q)$, and total production costs for firm *i* is a function of firm *i*'s quantity produced $C_i(q_i)$. The total quantify of oil produced equals the sum of oil produced by all *N* firms in the oil industry, such that $Q = \sum_{j=1}^{N} q_j$. Total costs of firm *i* equal the sum of variable productions costs $V_i(q_i)$ and fixed production costs F_i, which are costs that vary and do not vary with firm *i*'s quantity produced, respectively (Perloff, 2008, p. 205). Therefore, firm *i*'s profit is:

$$\Pi_i = q_i P\left(\sum_{j=1}^{N} q_j\right) - V_i(q_i) - F_i.$$

In this static model of firm profits, the Act's proposed compensatory payments would be part of the fixed costs of production, F_i. Because existing stock of greenhouse gases in the atmosphere form the basis of these payments, these payments would not affect current or future variable production costs.

Profit maximization for each firm occurs when the derivative of its profit function with respect to its quantity produced equals zero (Nicholson, 2004, p. 249). Therefore,

$$\frac{\partial \Pi_i}{\partial q_i} = P(Q) + q_i \frac{\partial P}{\partial Q} \sum_{j=1}^{N} \frac{\partial Q}{\partial q_j} \frac{\partial q_j}{\partial q_i} - \frac{\partial V_i(q_i)}{\partial q_i} = 0$$

where $\frac{\partial V_i(q_i)}{\partial q_i} = MC_i(q_i)$ is the marginal production cost of *firm i*, i.e., the cost of firm *i* producing one additional barrel of oil, and $\frac{\partial q_j}{\partial q_i}$ is how firm i perceives the response of firm *j* to firm *i*'s quantity decision. With some simplifying assumptions, we can rearrange this expression to the following form:

$$\textbf{(1)}\ P(Q) + q_i \frac{\partial P}{\partial Q}\left[1 + \sum_{i \neq j} \frac{\partial q_j}{\partial q_i}\right] = MC_i(q_i)$$

where this expression equates the marginal revenue (the left side of the equation and depicted as $MR_i(q_i, Q)$) with the marginal cost of the firm producing one additional unit of quantity (Nicholson, 2004, p. 251; Perloff, 2008, p. 458; Pindyck and Rubinfeld, 2013, p. 285, 288; Nicholson and Snyder, 2008, p. 543). The exact solution depends on the structure of the market, which is characterized by the number of firms and their total cost functions. Even so, fixed costs clearly do not impact the equilibrium quantity, as F_i is missing from the above expression that determines the equilibrium quantity and its corresponding equilibrium price determined on the demand curve.

Appendix B

Firms treat the price as given in a fully competitive market, such that individual firms' production decisions do not affect it (Nicholson, 2004, p. 312). When $\frac{\partial P}{\partial Q} = 0$ in equation (1), $MC_i(q_i) = P(Q)$ determines the equilibrium quantity, where marginal production costs equals the price (Pindyck and Rubinfeld, 2013, pp. 285-287). See Figure 4.

In the case of a monopoly, there is only one firm that recognizes that it can alone influences prices. In this case, the following equation determines the equilibrium quantity:

$$P(Q) + Q \frac{\partial P(Q)}{\partial Q} = MC(Q)$$

where the left-hand side is the marginal revenue change from producing one additional barrel of oil accounting for the additional revenue from one more barrel of oil sold and the resulting decline in price for all other barrels of oil sold. See Figure 5.

Thus, as part of fixed costs, compensatory payments do not influence the equilibrium quantity decision or the corresponding equilibrium price in both extreme cases.

In a Cournot oligopoly model that best represents the New York retail gasoline market, we assume simultaneous decision making and a Nash equilibrium (Perloff, 2008, p, 454). Thus, no firm has an incentive to adjust their quantity produce, as each firm cannot increase its profits if other firms hold their quantities fixed. Equivalently, $\frac{\partial q_j}{\partial q_i} = 0$, such that

$$P(Q) + q_i \frac{\partial P}{\partial Q} = MC_i(q_i),$$

Solving for q_i, we derive each firm's optimal response function to other firms' quantity decisions, and then solve for a steady state in which all firms have no incentive to change their quantities holding all other firms' decisions constant. Again, it is clear from the lack of fixed costs that charging oil firms the compensatory payments does not impact the equilibrium quantities and prices assuming that the number of firms is fixed and unaffected by the payments.

In the global crude oil market, empirical evidence supports a Stackelberg oligopoly model, in which OPEC is the dominant firm that moves before the other firms know how to respond. The equilibrium condition for the Stackelberg leader, which we label firm *k*, is

$$P(Q) + q_i \frac{\partial P}{\partial Q}\left[1 + \sum_{i \neq k} \frac{\partial q_j}{\partial q_k}\right] = MC_i(q_i)$$

where $\frac{\partial q_j}{\partial q_k}$ is firm *j*'s best response function to firm *k*'s quantity decision. The equilibrium condition for the non-dominant firms matches the Cournot equilibrium in the previous paragraph (Nicholson and Snyder, 2008, p. 543). Again, fixed costs do not enter the optimization decision. Given the dynamic nature of Stackelberg equilibriums, this also points to the generality of these results moving from static to dynamic equilibria holding the market structure constant over time (Perloff, 2008, pp. 506-507).

Above all, compensatory payments and fixed costs do not determine equilibrium quantities of firms or the equilibrium price in the short-run to medium run when market structure is constant, regardless of this structure. As these oil companies engaged in a past course of conduct that contributed to current harm, the compensatory payments act as a levy based on that ongoing harm, whereas the historical nature of the conduct eliminates any forward-looking incentive for companies to change their behavior. Thus, the profit-maximizing quantities and prices of retail gasoline would remain unchanged by the Act.

Appendix C

As the imposition of compensatory payments may lead firms to adjust their expectations about future payments, firm *i* maximizes their expected profits as follows:

$$\max_{q_i} \mathbf{E}(\Pi_i) = \max_{q_i} \sum_{m=1}^{2} \rho_m \left[q_i P\left(\sum_{j=1}^{N} q_j\right) - V_i(q_i) - F_{i,m} \right]$$

where $F_{i,m}$ is the fixed cost conditional on future company liability and ρ_m is the probability of event *m* occurring where there are only two possible states: no future liability (*m=1*) and future liability (*m=2)*. Specifically, fixed costs are a function of two terms

$$F_{i,m} = F_i + \vartheta_m \frac{q_i}{Q}$$

where ϑ_m is oil company's future climate liability that equals zero in the first state and some positive amount in the second state. Note that this latter term is not really fixed any longer, and instead varies with quantity.

The following equation shows that a change in expectations, as reflected in a change in the probability of future liability, can impact the current optimal production decision under uncertainty. The first order condition for profit maximization equals

$$\frac{\partial \mathbf{E}(\Pi_i)}{\partial q_i} = \sum_{m=1}^{2} \rho_m \left[P(Q) + q_i \frac{\partial P}{\partial Q} \sum_{j=1}^{N} \frac{\partial Q}{\partial q_j} \frac{\partial q_j}{\partial q_i} - \frac{\partial V_i(q_i)}{\partial q_i} - F_i - \vartheta_m \left[\frac{Q - q_i}{Q^2} \right] \right] = 0$$

where $\vartheta_1 = 0$ and $\vartheta_2 > 0$. If the Act affects oil company's expectations about the probability of the future likelihood of climate liability, then

$$\frac{\partial \mathbf{E}(\Pi_i)}{\partial q_i \partial \rho_2} = -\vartheta_2 \left[\frac{Q - q_i}{Q^2} \right] < 0$$

Thus, actions that increase in the probability of future liability will decrease the equilibrium quantity produced. Vice versa, actions that decrease the probability of future liability will increase the equilibrium quantity produced. The latter appears more likely, though a more conservative assumption would be that the probability is constant and unaffected by New York's decision to pass the Act.