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American Resistance to Climate Change Policy: An Analysis of Financial Market Impacts on American Renewable Energy Policy Development

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--- Abstract ---

The ability of international powers to take an active role in mitigating the effects of climate change has been consistently determined by domestic economic and political equations. However, these considerations have often acted as barriers to nations to respect their commitments to the international community to decrease their contribution to climate change. Over the past decades, the United States has seen these equations skewed by the relationship between financial markets and the political influence of large carbon emitters in the fossil fuel industry. While the economics of this relationship have consistently set the United States on a path towards failure, other developed economies, such as Germany, have successfully been able to reset their priorities in order to ensure compatibility with climate change mitigation.

With a comparative lens into the economic impacts of Germany's Energiewende, this study seeks to examine how United States financial market trends and structures have been able to influence domestic climate policy development and implementation. Through the dissection of financial and economic drivers of the fossil fuel industry's influence over the political process, this analysis investigates the loopholes that could enable US policy makers to prioritize reducing emissions. These loopholes identified, this study critically examines the tangible policies of the Energiewende to determine the transferability and replicability of the program's use of economic tools in the United States.

Analyses conclude that there is already an organic trend of institutional finance actors pushing the United States economy towards a rejection of pure fossil fuels. However, the resounding impression of professionals in the financial markets sector is that policy will still need to be the primary driver of macro-economic change, whether through regulatory pressures or active emissions-limiting tools. This conclusion drawn, it is important to consider the

timescale upon which these changes can tangibly decrease American emissions. To this end, Germany's Energiewende demonstrates that there may be hope in the local green transitions encouraged by grid decentralization as well as overall citizen education on the topic of human influence over climate change.

--- Introduction ---

The National Environmental Policy Act was one of the first iterations of American environmental policy. Enacted on January 1st, 1970, the NEPA set the groundwork for introspection and accountability of the American people with respect to the sustainability of their domestic projects. It required new development projects to have an "Environmental Impact Statement", which forced those in charge of infrastructure projects to consider sustainable alternatives to their plans (NEPA, 1970). It seemed that this law had placed the United States on a path towards a sustainable future. In fact, the nation began paving the way for countries around the world to consider their economic development in the context of environmental impact, as over 80 countries have since ratified documents following NEPA's example (Eccleston, 2008). However, the 1970s represent an environmental heyday for the United States, and, while progress in once facet of environmental considerations was indeed a step in the correct direction, economic productivity has eclipsed this progress in other areas of environmental impact. While NEPA is still in effect today, and new environmental legislation has since been enacted, the U.S, is still the largest cumulative and most consistent carbon polluter in history, according to the New York Times (Gillis and Popovich, 2017). In consequence, instead of United States continuing its leadership in global environmental policy, the nation has been met with a delay in reducing carbon emissions by comparison to the rest of the world. While the United States has consistently been expected to match the precedent of paving the way, as it has in terms of economic development, its reluctance to make the same sacrifices as it once had has placed it at the center of debate related carbon emissions reduction on the international stage.

The concept of international United States leadership has permeated through the way Americans view the responsibility of their nation to help shape global macroeconomic and

political change. An average observer with no acquaintance to American politics or its significant contribution to carbon emissions would be able to determine, firstly, that the United States has an important role to play in leading the world to a sustainable future given the precedent it has set with NEPA and in other areas of international leadership, and, secondly, that it should in theory be best equipped to mobilize its human capital and economy to support leading the international community. However, as demonstrated by shortcomings in relative emissions reduction, there are multiple case examples that have proven these two assumptions incorrect over the past few decades. The most important examples of this behavior have been witnessed at the annual Conference of the Parties, or COP, that has welcomed 197 countries to discuss climate change goals annually since 1995 (WMO, n.d). The United States has notoriously refused to ratify international agreements and has failed to respect its signed commitments in the past. However, the commitments made by the USA with respect to the Paris Agreement at the 2015 COP 21 under the Obama Administration represented a moment of hope and progress.

According to the United States' first Nationally Determined Contribution (NDC) submission, a metric of contributions to emissions reduction determined according to national capacity, the US agreed "to achieve an economy-wide target of reducing its greenhouse gas emissions by 26%-28% below its 2005 level in 2025 and to make best efforts to reduce its emissions by 28%" (NDC Registry). The administration cited numerous legislative tools that would facilitate the nation in achieving its targets, including the Clean Air Act, the Energy Policy Act, and the Energy Independence and Security Act. Unfortunately, despite these commitments and the plans put in motion as a result of successful negotiation and organization

on an international scale, this has not been enough to convince a sufficient portion of the American political elite to respect their promises to the international community.

Indeed, it is the question of how such a substantial portion of this political elite has supported leaving behind precedent and responsibility to the international community that becomes the center of the response problem. Unfortunately, where politicians have been pushed to focus on a record number of considerations, due to the multifaceted nature of environmental action, policy decisions have fallen to benefit primarily those with the financial and economic power to continue influencing political action since the end of the environmental decade. Therefore, high-emitting companies have been able to manipulate the interests of the political elite to protect the regulatory health of their industries. This is logical. As would the head of any organization, cause, or company, fossil fuel industry leaders do not want to risk losing the assets that support their operation, want to protect the jobs of their employees, and want to support the economies within which they operate. For them, the importance of these factors is greater than that of climate change. In effect, money from these fossil fuel companies dictates what interests a political leader or party might decide to support.

Further, the robustness of all fossil-fuel emitting industries is tightly linked to the markets and capital movement they support. Using oil as an example, this means nearly 1.2 million West Texas Intermediate (WTI) futures contracts traded every day (CME Group, n.d). Each contract involves around 1000 barrels and is valued at an average of USD 45,000. This amounts to a total daily trading volume of around USD 54 billion. Experts explain: “today, crude oil and its derivatives are the most actively traded commodities in the world,” (Pines, 2019). In consequence, when a policymaker or group of policymakers decide to support a motion which limit fossil fuel-related emissions in the United States, they are putting at risk the substantial

American portion of a daily USD 54 Billion. This, in addition to the influence of campaign contributions, makes prioritizing climate change a hard sell. However, it also exhibits an Achilles heel of the industry. As regulatory uncertainty increases, investors are becoming more and more worried that policymakers prioritizing climate change policy will in fact tip the scales and sacrifice the fossil fuel-related capital movements that public markets are used to, which would devastate their investments. This has caused markets to doubt the future stability and profitability of fossil fuel-based assets. Further, due to the nature of energy as an economic good, multiple industries from transportation to industrials rely on the continued use of and, more importantly, the stable pricing of fossil fuel products to continue normal operations themselves.

Essentially, in modern American politics, the development of climate policy has become a complicated set of "games" played by specific multi-actor systems. These depend, on the one hand, on the direction in which cash flows in fossil fuel markets and to cause and campaign financing efforts, and on the other, a prerogative to support ethical policies in the favor of public health and safety. In order to best the explain and simplify the interaction between economic and social considerations and their associated weight in the development of environmental policy, I have broken down these "games" into the following *policy development inequality*, situated at the level of a single decision by a single policy-maker:

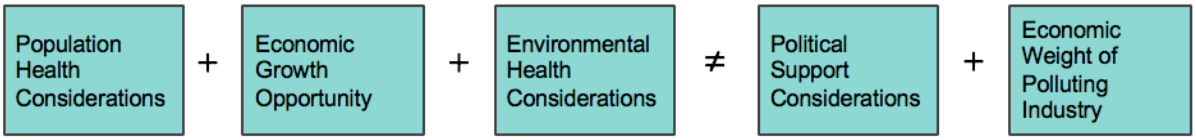


Figure 1a: The Policy Development Inequality

In this model, the decision-maker, or, here, policy-maker must make his or her decision depending on whether the right side of the inequality has a larger weight than that of the left. In this case, the left-hand side represents the economic and financial consequences of supporting a

new environmental policy: decreased support in political causes and campaigns in conjunction with substantial changes in capital movement and market configuration in affected industries. By comparison, the right-hand side represents the economic growth opportunities presented by new technology and infrastructure development in conjunction with public health and environmental conservation.

The question becomes then: how can the American political and economic elite guarantee domestic environmental policy progress? Overall, this thesis seeks to use the structure of the above inequality to investigate whether the United States has the potential to tip the scales in favor of environmental policy action and away from financial priorities in federal-level policy decision-making. Effectively, this prompts the assessment of the argument that the United States' domestic economy has the organic potential to incentivize emissions reduction simply through macroeconomic effects of market events that are already in motion. This argument is evaluated through mixed qualitative and quantitative methods to assess attitudinal change as well as to identify and visualize market data trends. These mixed methods enable one to ask: considering the fossil fuel-based energy sector as a proxy for US carbon majors, how reliable is the assumption that market forces alone could push its leaders out of the policy development inequality?

However, this thesis would also be incomplete without considering the event in which organic market effects are insufficient. Utilizing as comparative case studies the political structure of Germany and the nation's Energiewende (or Energy Transformation) and assessing the relationship between market trends and policy success, this paper will evaluate the relative use of economic and policy tools to manage emissions. I analyze the successes and failures of the German Energiewende, as well as the location of cost absorption within the German economy, in

order to understand what has allowed for the relative success of this plan among German citizens as well as among manufacturing and transportation leaders. The United States has an opportunity to reevaluate the way it frames both its domestic and foreign policy regarding the Paris Climate Agreement and could, as a result, find a bridge to a sustainable economy more representative of international cooperation and progressive ideals.

--- Background ---

Over the past few decades, there has been a substantial change in the way that individuals and political leaders weigh different parts of the policy development inequality when creating climate change legislation. Most importantly, climate change has become a partisan issue. Journalist Nathaniel Rich explains that, beginning in the late 1980s, the American petroleum industry began paying scientists to write opinions placing doubt on the validity of climate change science. He writes that this portion of the fossil fuel industry began to "sow propaganda [and] disinformation, to buy off politicians and scientists, and, ultimately, to convert an entire political party to denialism," (Rich, 2020). Years later, the result of the spread of this misinformation has been an increase in campaign contributions to the Republican Party or conservative causes from large CO2-emitting companies, seeking the consequent protection they receive from those that have been swayed by doubt in climate science. For instance, a 2016 article from the Guardian explains that "fossil fuel millionaires collectively pumped more than $100m into Republican presidential contenders' efforts last year – in an unprecedented investment by the oil and gas industry in the party's future," (Goldberg and Bengtsson, 2016). As a result, in order to please their constituents and perpetuate the trend of climate denial, Republican members of Congress

tend to vote against legislation that would harm the companies in question. Notably, according to the League of Conservation Voters, 2019 Republican members of the House had an average lifetime support score of just over 7%[1] for climate change policy, where "scores are based on a scale of 0 to 100 and calculated by dividing the number of pro-environment votes cast by the total number of votes scored" (League of Conservation Voters, 2013). The effect of this voting pattern is exacerbated due to the Republican majority in the Senate as well as a conservative executive with the Trump administration. As a result, it has become increasingly difficult for policy leaders to create climate change policies that pass the legislative branch and will not be vetoed by the Executive.

Theoretically, with a precedent of economic flexibility and rapid economic evolution, the U.S. should have been able to tackle climate agreement goals with substantial success. Having retained the position of the world's largest economy according to nominal GDP since 1871 – losing to China only in purchasing power parity – the United States has historically maintained a status of economic leadership as a place where innovation not only begins but is grown and developed (Silver, n.d.). This economic power places the U.S. in a position where it should have been able to, once again, lead the way in the face of necessary climate-related innovations. However, on June 1st, 2017, President Donald Trump announced his intention to leave the Paris Climate Agreement. This decision came after a change in administration from President Barack Obama, whose executive action in September 2016 enabled the United States to formally enter the Agreement. Overall, Paris represented a movement by nearly 200 nations of international

[1] This number is a personally calculated average based on scraped LCV provided lifetime scores. I compiled lifetime scores of Republican members of the House on the issue of "Climate Change; Other", then computed an average of the scores across all Republican members of the house. Data is available at the following source: "All Member of Congress Scores." League of Conservation Voters Scorecard, April 27, 2018. https://scorecard.lcv.org/members-of-congress.

community to set individual nationally determined contributions towards mitigating and adapting to climate change (Denchak, 2018). However, President Donald Trump followed the trend of Republican Party rejection of environmental policy commitments, particularly in relation to the economic consequences of the United States' decided Nationally Determined Contributions. His rationale included the following logic: "The Paris accord will undermine our economy, [...] [it] puts us at a permanent disadvantage" (Chakraborty, 2017). This assertion puts into question the assumed flexibility of the American economy, especially relative to the performance of other international economies. If the United States is unable to adapt, coming from a position of over 200 years of economic leadership and unmatched wealth on a global scale, what does the decision of other international economic powers to persist in the fight against climate change demonstrate about the reality of American economic stability? While historical efforts such as NEPA had been made to position the US economy to enable emissions reductions, the rejection of the Paris Agreement raised doubts about how changes might actually be made within the American political system to allow for substantial environmental changes.

However, the nearly immediate refusal of the Trump Administration to support the Paris Climate agreement highlights another important trend in American politics: the ability for policy expectations to radically change from one administration to the next. Notably, the Trump Administration successfully reversed another environmental policy effort of interest that had been established under the Obama Administration: the Clean Power Plan. As previously explained, the Paris Climate Agreement was an international agreement signed by the United States which was expected to be ratified and made legally binding domestically. The Clean Power Plan, or CPP, by comparison, was a regulation issued by the Environmental Protection Agency under Obama in August 2015. The CPP set the first limits on carbon pollution from

power plants in the US in history, aiming to cut the industry's emissions by 32% by 2030 (NRDC, 2017). With the rejection of the CPP by multiple state leaders after the Plan was announced, the Trump administration was able to use new EPA leadership to send the CPP for review and, ultimately, replacement. However, it should also be noted that President Trump unsuccessfully attempted to repeal other pieces of legislation including the Affordable Care Act or ACA (Royner, 2018). This in mind, one would logically ask how the Trump administration was able to successfully remove climate change policy initiatives where the ACA remained in place.

Unfortunately, both the Paris Agreement and the Clean Power Plan have in common the fact that they are fundamentally impermanent. The ACA was signed into law, making it a legislative document requiring the passing of a repeal law with a Senate majority for it to be removed. Comparatively, the CPP was a regulation, a document issued by a government agency as opposed to signed into law, and the Paris Climate Agreement is a treaty. While, theoretically, treaties can only be ratified and removed with Senate approval, the legal precedent established by President George W. Bush in his unilateral withdrawal from the Anti-Ballistic Missile Treaty in 2002 effectively destroyed the Legislative Branch's ability to contest unilateral action by the Executive Branch with regards to treaties (Feingold, 2018). These case studies emphasize a trend of disrespect of international agreements in American political history, with exits from or refusals to ratify the International Labor Convention, the Geneva Agreement, Trans-Pacific Partnership, the Iran Nuclear Deal, the Rome Statute of the International Criminal Court, the Transatlantic Trade and Investment Partnership, and more (Merelli, 2018; Pan, 2018). Yet, they also shed further light on the inherently partisan nature of this trend: at the heart of the trend of reversals is the US's bipartisan political structure.

Bipartisanship has allowed for the American government to change policy that is unfavorable to a subset of the US political environment within a few years of its acceptance. By comparison to, for instance, the British parliamentary system, which allows for parties to create coalitions and solidify the permanence of legislative or agency action, the American political system lacks this flexibility. Instead, the moment a party takes control of either the Legislative Branch or the Executive, policies enacted the term prior become vulnerable if they were previously passed with a partisan majority. If these policies have not been formally signed into law, or are the product of malleable policy instruments, they become particularly at risk of reversal.

There is, of course, an alternative avenue of change to explore, especially considering the unlikely event that the United States political structure will change. President Trump noted, in his decision to withdraw from the Paris Agreement, that it would "undermine [the] economy" (Chakraborty, 2017). This has been a repeated rationale used by the current administration to refuse to enact climate policies, particularly in the context of a presumed relative disadvantage compared to foreign economies that would continue producing and trading fossil fuels internationally. In consequence, the question arises of whether the American economy holds the potential to change the environmental outlook of the United States. Assuming an optimistic outlook, one could choose to accept the rationale that the American economy can in fact transform itself to support the reduction of emissions without governmental manipulation of economic factors, such as subsidies. For the sake of simplicity, one can also assume that US energy markets are a passable proxy for traditional emissions metrics, as the American penchant for the use of fossil fuels remains a strong driver of historical emissions. Under this assumption, renewable energy prices would have to decrease sufficiently to provide market-based incentives

for a natural transition away from fossil fuels, and the costs related to energy grids would have to support the development of compatible infrastructure and increased performance of storage.

The domestic prices of renewable energies have been steadily declining for the past couple decades, while oil and gas prices have comparatively increased. However, it is difficult to determine if this trend alone is sufficient to drive the switch from carbon-emitting energy sources. This is particularly interesting considering the historically large American subsidies of fossil fuels, which have supported margins sustained by fossil fuel industry leaders. While foreign nations, like Germany, have been able to entirely redesign the manner in which they use manage energy in the context of their economies and arguably capitalize on the transition, the United States still relies on outdated infrastructure and subsidies supporting lower cost fossil fuels. As a result, this raises the question of whether it would be possible to grow domestic investments into the energy sector sufficiently to complement changes on public asset markets. It must be noted, however, that the United States mentioned in its initial NDC submission that "At this time, [the nation] does not intend to utilize international market mechanisms to implement its 2025 target" (USA NDC). Essentially, the United States suggests that it will not use market or price manipulation tools to influence domestic ability to reach NDC targets.

In conclusion, as fossil fuel giants have found a home among the conservative political elite, their interests have been able to sway the dynamic in the policy development arena. For instance, of the oil and gas companies that generated the highest campaign contributions in 2019 and 2020, only three companies made any contributions outside of conservative or Republican groups (OpenSecrets.org, 2020). This leads to the question: how might policy discussion change if the upper echelons of the conservative political elite no longer receive these contributions? How might the inequality change if investors across the United States started shorting coal and

oil as commodities? Even an inexperienced investor can conclude, the consequences of such capital movement would be catastrophic to the fossil fuel industry and to the portfolios of innumerable investors globally.

--- Literature Review ---

United States environmental policy has been a testing ground of the American political process and legislative process since the mid 1960s. With American political and economic conditions driving shifts in prioritization, environmental policy has changed dramatically in significance over time. However, now more than ever, energy policy has become an element of comparison between nations due to the global nature of its impact and the influence of environmental policy on international markets and trade. In consequence, the analysis of American policy actions overall often requires comparison of domestic policy decisions to those of other nations, especially due to the economic impact on international trade and competition.

Considering the complex nature of domestic environmental policy development, my investigation of the intersection between environmental policy and markets in the United States is dual and sequential, which, as previously mentioned, implicates both political and economic opportunities. Thus far, a large portion of literature has been written about either the political effects of environmental policy or about the associated economic implications. In other spaces focus has been on understanding *why* the United States shies away from implementing the policies it agrees to in the context of international environmental agreements. Therefore, literature has been dedicated to the inability of the United States to implement any renewable energy policies and climate policies domestically or alternatively to the development of

economic frameworks within which one can analyze the specific points of impact of environmental policy and climate change effects.

In my literature review, I break down and analyze the work that has been developed regarding, firstly, the impact of the American policy process on environmental policy development as a whole, secondly, the status of modern economic theory related to environmental policy and market reactions, and finally the comparison of American progress against that of Germany in the environmental sphere and in analysis of the policy process.

I. The American Policy Process

The majority of American environmental policy literature covers the process of policy development or the history of environmental law in the United States. Overall, according to Zygmunt J.B. Plater, the United States has witnessed a significant structural paradigm shift from the 1960s to today, whereby American governance has shifted from a "bipolar, Market/Regulatory Government Paradigm to a multipolar, actively pluralist model," (Plater, 1994, 3). This has broadly caused environmental legislation to develop increasingly frequently "outside official private and public governing institutions," (Plater, 1994, 3). While early legislation such as the National Environmental Policy Act (1970) and the Clean Air Act (1963) made strides towards increasing sustainable American behavior and legislation, once environmental issues became politically partisan, it became increasingly difficult to enact lasting legislation.

As a result, modern American environmental policy revolves around common law and the development of regulations instead of laws. *In Common Law and the Modern Environmental Conceit*, Roger Meiners and Bruce Yandle explain that the misallocation of federal funds has led to the majority of progress residing in precedent built into common law cases (Meiners and

Yandle, 1999, 924). In these cases, individual citizens are able to defend their personal rights to health, happiness, and property. This use of personal rights has laid the groundwork for local-level protections of the environment without requiring formal legislation. In this way, environmental policy, while able to persist, is unfortunately slowed by the legal process and the unreliable nature of the establishment precedent in affecting long-term policy change.

However, the effect of environmental regulations, as opposed to formal legislation, has not been as reliably explored. By comparison to legislation that leaves Congress, regulations are the product of governmental agencies, and are easily overturned as in the case of the Clean Power Plan. Therefore, the paradigm shift that has occurred in environmental policy has led progress to occur largely in the spaces of ineffective and short-term policy options. Therefore, a gap exists in determining how the policy process could be redeveloped to include greater permanence.

II. Government Structure and Local Implementation of Federal Policy

Much of the implementation of environmental policies revolves around the US structure of government that has allowed for slower policy growth. Most importantly, literature has been dedicated to the impact of a federalist structure of government on environmental policy. For instance, the assessment of particular policies, from projects involving local protection of resources to larger cross-border initiatives, has yielded notable research into the effects of federal versus local policy implementation. In the case of the implementation of drinking water regulations, Denise Scheberle illustrates the difficulty of a one size fits all policy structure when it comes to environmental policies (Scheberle, 2004). Scheberle explains that, due to the size of water systems as well as the internal ability of states to govern implementation of federal policies

within their borders, implementing and managing large scale environmental policies has to potential to jeopardize the independent decision-making of local actors within water systems. More directly, federal level policies threaten the sovereignty of individual states and allow for states to refuse the implementation of policies they don't agree with. Notably, in the example of the Clean Power Plan, numerous state leaders expressed their distaste for the Plan as well as their decision to blatantly refuse to implement it. Famously, Senate Majority Leader Mitch McConnell at the time of the Plan's role out told states to "just say no" (Roberts, 2015).

As expected, the trend of refusals to support or implement federal policies at the local and state level very much affects the ability for environmental policies to succeed in the United States and remains related to the theory of policy reversals as a result of action in the Legislative and Executive branches in past decades. Overall, reversals have increased in recent decades due to the growth of majority versus minority decisions. To this end, scholars such as Espen Moen have theorized that reversals are the direct result of calculated decisions and strategy by participants, here state representatives at the Congressional level (Moen and Riis, 2010). In essence, the federal nature of environmental policies extends to international agreements that are signed by the Executive branch, removing a substantial amount of power from minority parties.

III. Overview of International Agreement Withdrawals

When it comes to international climate agreements, substantial progress has been made in assessing why the United States has universally decided to withdraw from the commitments it makes to other nations to reduce its impact on climate change and sustainability. Overall, the United States has repeatedly relied on the state of its economy to explain why it cannot allow for disruptive environmental policies that will affect important American industries.

Notably, Frank E. Loy writes in his paper *The United States Policy on the Kyoto Protocol and Climate Change* that European and American responses to international Climate Agreements can be divided according to their perspectives regarding the impact of environmental policy and its effect on their economies. He states importantly that, while "many in the EU believe that producing significant short-term pain and suffering is actually desirable, rather than something to be avoided [...] the United States and its Umbrella Group partners believe that the most cost-effective and affordable solutions will build the broadest public sup- port for action and stretch our dollars to achieve the maximum environmental protection," (Loy, 1994, 153). For reference, here Loy defines the Umbrella Group partners as "partnership of like-minded countries that includes Japan, Russia, Canada, Norway, Australia, and the United States," (Loy, 1994, 153). This is a fundamental difference in how both regions prioritize policy changes.

Loy expands, stating that "[the United States] are concerned that, under any assumption, implementing the Kyoto Protocol will be a difficult exercise having a discernible effect on national economies, and that if elaborated in the wrong way, it will cost more than is necessary," (Loy, 1994, 153). This shines light on the aforementioned trend of focusing on the effect on economies and the cost of implementing policies in the United States.

IV. Overview of Economic Literature

As explained by Francis S. Blake, "there is no more schizophrenic area of the environmental debate than the issue of costs associated with environmental regulation" (Blake, 1990, 1). Overall, the American approach to environmental policy has been one of acceptance as it relates to health impact, but significant resistance as it relates to costs. To this end, much research has been dedicated to the investigation of how environmental agencies and the developers of

environmental projects use cost-benefit analysis (CBA) to assess whether to implement projects. I use this approach to develop the policy development inequality in *Figure 1a*, specifically relevant when applied to the scale of federal policy creation. As explained in the context of the policy development inequality, CBA provides a method with which to consider multi-dimensional problems in fewer dimensions. As one might expect, CBA has proved to be a useful tool with which to analyze policy developments and implementation in the United States.

Notably, in the intersection of political economy and macroeconomics, the work of Michael Jakob and his co-writers in *The political economy of climate and energy policy: A Theoretical Framework* subtly features applications of cost-benefit analysis in their examination of country-specific approaches to low-carbon energy system development (Jakob et. al, n.d.). Similar to the "game" approach of the policy development inequality, their framework relies on an actor-centered structure, which drives the identification of potential "entry points that could bring about policy change," (Jakob et. al, n.d.). Further, the authors ground their own literature in a review of political economy interactions with developments in the renewable energy policy. They reference the work of Oye and Maxwell (1994), who find the convergence of political process and environmental economics implications in "distinguishing between 'Stiglerian' settings, in which the beneficiaries of an environmental policy are well-organized and costs widely dispersed (thus making policy adoption more likely), and 'Olsonian' settings, in which costs of regulation are concentrated but benefits are dispersed (making policy adoption more difficult due to free-riding problems in interest group formation)" (Jakob et. al, n.d.). In continuing their review, they reference work on the lock-in of fossil fuel systems by a series of authors in the space of limits to infrastructural change and unshakable regulatory regimes.

Outside of literature specific to political economy, research in the space of depletable resource economics and willingness-to-pay evaluations of consumers for environmental conservation has substantially impacted developments in market and price evaluations of environmental action on the fossil fuel industry. In the space of depletable energy economics, many papers, such as the analysis of Jeffrey Krautkraemer and Michael Toman in *Fundamental Economics of Depletable Energy Supply* (Krautkraemer and Toman, 2003), researchers utilize the economic theory behind Hotelling's Rule to explain how, broadly, "the act of producing or developing more or less resource today has unavoidable consequences for future potential returns because of the interplay of economics, geology, and technology" (Krautkraemer and Toman, 2003). The Hotelling Rule posits that "in a competitive market, the equilibrium net price per unit of an exhaustible natural resource reserve (selling price per unit less the cost of extracting the unit) should increase at the fair rate of return" (Galanos, 2012). This rule has become particularly important in forecasting the potential price evolution of fossil fuel assets, which in turn is applied in the scope of public markets. Notably, a public market application suggests that "owners of non-renewable resources will only produce a supply of their basic commodity if it can yield more than available financial instruments, specifically U.S. Treasury or other similar interest-bearing securities," (Kenton, n.d.). The availability of such a price modelling tool is particularly important to understand the potential interaction between natural price increases due to fossil fuel exhaustibility by comparison to price patterns of naturally intermittent but inexhaustible renewable energy options. However, direct applications in the space of fossil fuels are unreliable due to consistent violations of assumptions of Hotelling's Rule in certain economic climates, namely the influence of monopolistic forces and government interaction as well as the stochastic nature of pricing responses to increased product quantity. In consequence, the testing of the

applicability of Hotelling's principles is further developed in the literature through the challenging of the Hotelling Valuation Principle (HVP), a conclusion of the Rule stating that "value per unit of an exhaustible natural resource reserve is simply the current net price" (Shumlich and Wilson, n.d.). Where testing of the HVP has most notably taken the form of assessing validity within the scope of existing oil and gas industry structures (Shumlich and Wilson, n.d.; Galanos, 2012), research has also consequently focused on developing strategies to optimize and refine the future pricing models derived from the Hotelling Rule in order to allow them to be more directly applied to modern commodities markets (Chari and Christiano, 2014).

Further related to future pricing models associated with the relationship between commodities pricing and environmental policy has been the development of research on consumer willingness to pay for environmental changes. Notably, Gianluca Grilli's 2017 meta-regression of cumulative willingness to pay for renewable energy policy assessments within the European Union determined, firstly, that "the present level of CO2 emissions, the share of renewables and the specification of the energy source in the scenario are positively related to the stated," that "the actual level of energy consumption, conversely, has a negative effect on WTP," and finally, that "producing nuclear energy contributes to lower the stated WTP for renewables," (Grilli, 2018). This meta-regression and similar analysis of WTP patterns demonstrates an important consideration in evaluating renewable energy plans and climate policy overall: asymmetry of typical energy conditions and attitudes will substantially shape public willingness to pay for new renewable energy sources in favor of climate action.

However, in more direct applications of theory on actionable policy plans, there has been a substantial development in theories behind the merits of carbon taxes and cap-and-trade policies, as well as in analyses of carbon leakage interference in current production and consumption data.

Carbon leakage is the process in which, “as a result of stringent climate policies, companies move their production abroad to countries with less ambitious climate measures, which can lead to a rise in global greenhouse gas emissions” (Carbon Market Watch, 2014). The carbon taxes and cap-and-trade programs can be described as follows. Carbon taxes are a tax placed on emissions volume in order to incentivize companies to produce less CO2. According to the World Trade Organization, “countries have followed a more pragmatic ’Baumol-Oates’ approach, in which the tax is set at a rate which should influence taxpayers’ behavior in order to achieve a given environmental objective,” (Tamiotti, 2009). More directly, in The Theory of Environmental Policy, Baumol and Oates look past standard Pigouvian optimality to determine that “the expected gain in welfare may be higher or lower under such a permit system than under a tax regime, depending on the shapes of the control cost and damage functions,” (Baumol and Oates, 1988). Notably, “the choice of one system over the other thus depends on the way damages and control costs change with the level of pollution,” (Baumol and Oates, 1988). This approach to emissions reduction has been extensively advocated for in multiple policy development spheres. However, practice suggests that, where economist seem to support carbon taxes in the literature, the proposed approach is routinely scrutinized by the public, who’s willingness to pay for change is exceeded by the prospect of increased utilities pricing (Gleckman, 2018).

By comparison, a cap-and-trade policy sets a regional or national emissions ceiling, allowing for registered institution to have and utilize an allocated amount of emissions credits, which can then be traded with other institutions (U.S. EPA, 2003). A large portion of the literature regarding this program stems from international oversight organizations or governmental structures, such as the European Union that has implemented the European Union Emissions

Trading System, which have dedicated numerous compiled resources to the adequacy of their recommendations. However, alternative economic investigations, such as Daniel Farber's analysis of fairness and social equity implications in cap and trade policies (Farber, 2012), have raised concerns about the complications that arise from specific modes of implementation of this emissions management tool. Overall, these are the primary avenues that have been recommended as market-based approaches.

V. Comparative Literature

Substantial work has been dedicated to German policy development in the context of effectiveness of the Energiewende and to the comparison of German policy development approaches to those of the United States. Notably, climate change has been labeled as "an important foreign policy problem," (Ott, 2001) highlighting the relevance of comparing the actions of the United States to those of neighboring nations.

In particular, Germany's Energiewende has been placed under a microscope by multiple scholars, including David Jacobs, who identify the historical rise of energy transition sentiments across Germany particularly as a result of nuclear phase-outs (Jacobs, 2012). Jacobs contextualizes the Energiewende within the historical German political environment and provides a dissection of the program's general targets. Within this thread, authors such as Knut Kübler, label Germany's approach as driven by data. Uniquely, it is target-oriented and the result of quantitative evaluations of current knowledge on different facets of environmental policy proposals (Kübler, 2008). The target-based approach is important to understand how the German government and German policymakers consequently prioritize.

In placing an emphasis on data and relevant economic and political calculations, Germany, on the one hand, increases its flexibility to make sweeping economic changes, and on the other, is bound to the responsibility to consistently stay on track to meet the targets developed and decided upon. Importantly, scholarship, including the work of Daan Rutten for the Clingendael International Energy Programme (CIEP), has also examined the relationship between German environmental policy and broader economic ramifications of change on German industry. As Germany's economy is supported by "manufacturing industries including automotive, chemicals, metals such as iron and steel," (Sawe, 2016) Rutten's analysis implicates environmental and energy policy effects on German industrial policy. Notably, Rutten explains that German "government policies give preferential treatment to certain segments of the country's industrial sector, while shielding other segments either fully or partially from the transition's unfavourable consequences," (Rutten, 2014). This assessment furthers his claim that policymakers have been "approaching industrial and energy policy as a unit," (Rutten, 2014). This provides particularly meaningful context to the economic assessments made by the German government in the context of their own related industries. Due to the priority that the United States has historically placed on the health of fossil fuels and their related industry, analyses such as this one provides insight into Germany' own environmental policy inequality.

In the space of comparative literature, scholars have examined differences in climate policy between the United States and Germany at great length. For instance, from the political science perspective, authors such as Edda Müller, have analyzed how Germany and the United States differ in their assessment of "determinants and restrictions of the policy-making process," (Müller, 1998). This and similar analyses provide insight into the direct differences in policy development between the United States and Germany. Further, many parts of the literature, such

as the work of Roger Karapin, utilizes German case studies to compare the effects of successes and failures of climate policy.

VI. Conclusion

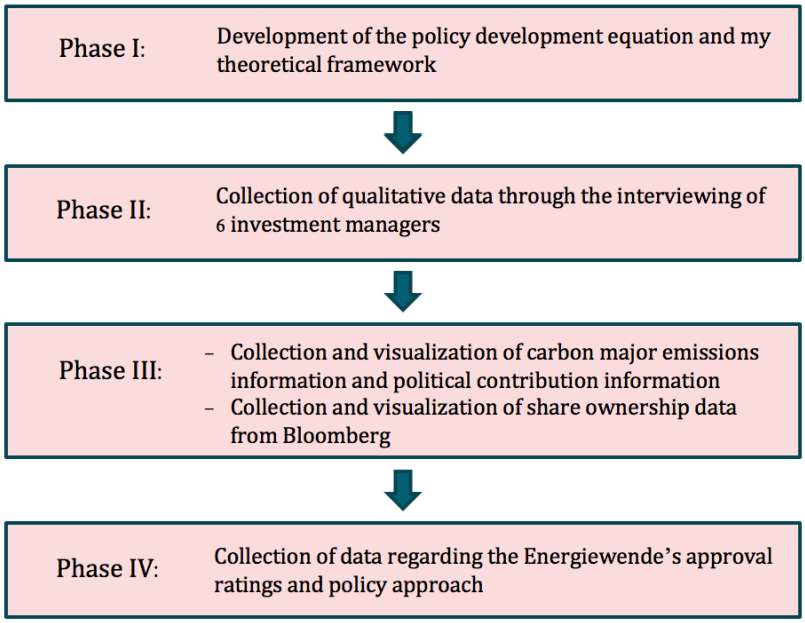
In summary, the literature thus far focuses on one of three areas: compatibility of the American policy process with climate action, analysis of economic and market approaches to the emissions reduction recommendations, and comparative attitudes to climate change. However, these approaches take the form of a broad scope that responds exclusively to theory. While these approaches are indeed fundamental to understanding the overarching context of environmental policy implementation, they do little to directly address the effects of key market trends that are already in action. Further, they do not sufficiently consider the impressions of professionals in related fields, whose attitudinal perspectives in addition to market transformation data, can be linked to policy process information to provide better insight into the status quo of climate change as a priority within the American economy. This paper seeks to contribute to the literature the attitudes of professionals witnessing and creating market changes first hand and link them to existing understanding of the political process and political economy through the policy development inequality.

However, the literature also frequently only addresses *why* the aforementioned parts of environmental policy change are having specific effects as opposed to, with certain exception, *how* they can be directly used to understand and shift the American political perspective. This paper posits that the economic tools utilized by peer nations, such as Germany, provide an interesting example of how the theories developed in economic and political literature can be more directly applied in practice to the United States and its specific preconditions. Therefore,

this thesis will add to current comparisons of Germany to the United States by focusing on the results of the aforementioned professional accounts and by seeking to highlight specific policy recommendations that may in fact be compatible with the American policy process.

--- Methodology ---

The research in this paper is developed through both quantitative and qualitative data collection and manipulation methods. Overall, the process was divided into four primary phases, accompanied by a pre-analysis phase, that reflect the sequential nature of the thesis questions. These phases are illustrated below:



Throughout my research process, I broke down my approach into a development of general process knowledge of American and German legislative systems and economies in order to assess compatibility of the nations and gain an impression of the direction of my research. I began the process by developing my knowledge of the current policy implementation and policy

reversal structures in the United States in order to shape and refine my questions according to the work that has already been done in the space of policy development analysis and environmental economics. To this end, I analyzed available literature in order to place my investigative inquiry within the the framework of American policy creation accompanying macroeconomic theory, the processes that dictated political influence of outsiders on the political elite, as well as the key priorities that have historically influenced environmental policy and economic policy development.

In this pre-investigative phase, I decided to focus on the policy powers of each branch of American government, with a focus on the power of the executive to unilaterally influence, remove, and encourage policy. The majority of this research was driven by public information on United States government websites. To encourage an understanding of the framing of my question within reasonable bounds of the existing technical political analysis, I also informed my inquiry with the inclusion of academic texts explaining the process of policy implementation and law in the United States from a number of academic institutions. Finally, I also reached out to numerous experts in the field of public policy in order to identify alternative directions of my research process. From these insights, academic information, and later additions from the investment professionals I interviewed, I began to develop the *policy development inequality* in order to facilitate understanding the climate policy development process in the United States, elaborate on a possible alternative way forward that supports a low-carbon future, and identify the areas where I saw the most potential for impact and the least development in available literature. This policy development inequality (*Figure 1a*) is utilized throughout my analysis as a framing tool to allow for simpler visualization of the implications and goals of my investigation throughout this paper. This frame later guided my placement of a pivotal point of change among

an expanded set of actors, which defined the remainder of my analysis in response to the questions that this paper seeks to address.

In order to address the second part of my thesis, specifically what policy options a peer nation may demonstrate as successful to United States policymakers, I had to include in my pre-analysis phase the selection of a nation with compatible structures, processes, power, and economic history to that of the United States in order to adequately provide a point of comparison. After considering a number of nations with greater success in environmental policy development and implementation, I identified Germany as potential match. It was imperative to analyze the structure of German government as well as the nation's legislative process, and I therefore decided to investigate both German federal documents and websites as well as reputable opinion pieces. This enabled me to analyze both the structures of policy creation and implementation from the perspective of the German government as well as the perspective of the German population and political experts. In addition, initial readings of expert opinions on German policy implementation thoroughly guided my research and allowed me to confirm compatibility benchmarks for logical policy comparison.

Fortunately, the German government has made public the majority of its constitutional and legislative documents, especially with respect to the German Energiewende. This is primarily in an effort to inform the German public of the benefits of the program, as well as to outline the economic and political expectations of the Energiewende. However, acknowledging the potential bias that could arise from analyzing the German government exclusively from its internal documentation and justifications, I also sought to include information on legislative processes and the Energiewende from German political experts in order to properly assess the effectiveness of these implementations from an outside perspective.

Phase I: Developing a Theoretical Framework and Identifying the Pivotal Point of Change

Based on the environmental policy inequality, I was able to identify, at the level of the individual decision-maker, what priorities were of interest to those deciding whether or not to enable a sustainable future. However, analysis of literature regarding the various facets of the environmental policy process revealed the importance of the placing the environmental policy inequality relative to the remainder of actors in the policy development sphere. Most importantly, in order to simplify and visualize the relationship between my proposed inquiry into the influence of market trends on policy development, I decided to expand the inequality to a broader scope in order to identify where exactly the points of my analysis converged. In this manner, I was able to develop this expanded view the as the *Theoretical Framework*, pictured in *Figure 1b*, in of the remainder of my inquiry. Within this framework, I was able to place the exact location that posited change to be occurring and tipping the scales of the policy development inequality. I labeled this location the *Pivotal Point of Change*. The identification of the *Pivotal Point of Change* enabled me to then relate my later findings back to the policy process as a whole as well as the various actors that were implicated in new findings.

Phase II: Collection of Qualitative Markets Impact Data

The goal of the market impacts analysis and economic predictions was to determine what drivers within American energy markets organically affected climate policy and to assess the magnitude of that impact. Understanding the subjectivity of the perceived relationship between regulatory market policies due to the fact that each investor will have their own interpretation of how policy development may unfold, I wanted to develop a deeper understanding of how

changes in federal and state policy actually affected the way people decided to financially support renewables-based versus fossil fuel-based asset developments. I intended to be able to determine the potential for natural price effects to fully reverse the pricing trends between fossil fuels and renewable energies — essentially for renewables to become entirely interchangeable or even preferable to fossil fuels based on price. From this, I then planned to use my framework to determine effects on policy development. I interviewed six investment managers from institutional financial management firms. Each of the interviewees had experience in energy or utilities investments either in the United States or in Europe, and in some cases, in both. Their profiles are iterated in further depth below:

Individual	**Demographic Information**	**Relevant Experience**
Investment Professional 1	Male, Aged 50-60	Portfolio Manager at Global Investment Management Firm
Investment Professional 2	Male, Aged 30-40	Senior Research Analyst at Global Investment Management Firm
Investment Professional 3	Male, Aged 50-60	Portfolio Manager at Global Investment Management Firm specialized in Utilities
Investment Professional 4	Male, Aged 50-60	Portfolio Manager at Global Investment Management Firm specialized in Energy and Industrials
Investment Professional 5	Male, Aged 50-60	Portfolio Manager at Global Investment Management Firm
Investment Professional 6	Male, Aged 50-60	Former Global Equity Sales Executive at a Bulge Bracket Bank

I approached each interview with a set of predetermined questions, available in the Appendix, to guide the conversation but allowed dialogue to flow naturally as unexpected pieces

of information arose. Overall, these interviews provided me with an insight into the private sector's perception of investment volume into renewables and the opportunity they represent within American markets.

It is important to note, however, that due to the number and profile of the interviewees, my analysis of trends is limited to the perspective and bias of financial executives and their personal outlooks as professionals in the industry. In consequence, my analysis may not reflect alternative theoretical trends and perspectives that may arise as a result of including a larger pool of subjects and the expertise of individuals that may be approaching market impacts on renewable energy trends from a different lens.

Phase III: Collection of Quantitative Data

I. Collection of Ownership Structure and Emissions Data

From these conversations, I was able to develop a picture of the relationship between energy and utilities investments and climate policies in the United States and globally. Notably, with confirmation of the potential impacts of changes in the attitudes of institutional investors in Phase I of my investigation, I was able to dive deeper into understanding the vulnerability of the financial health fossil fuel majors as a result of high levels of capital control by large institutional investors. I decided to reinforce these assertions using quantitative information available from public market data on the ownership structure of public assets of the largest carbon emitters in the United States, particularly fossil fuel companies. To this end, I began by obtaining data on United States companies with the highest emissions volume and filtering for those within the energy industry to keep the impact of the energy industry consistent, as I used fossil fuel companies and the growth of renewable as a proxy for broad environmental change throughout

my analysis and earlier interviews. After identifying a set of 8 high emitting companies within the energy production industry, including Exxon, ConocoPhillips, and Marathon Petroleum, I was able to analyze the potential for their economic health to be threatened by large capital movements as a result of institutional investor decisions. While many more companies fit the description of high-emitter in the energy production industry, I decided to restrict my analysis to companies with public financial data in order to facilitate subsequent investigation into their financial vulnerability on public markets.

In order to assess the financial vulnerability of these companies, I used a Bloomberg terminal to access data on their ownership structure, searching specifically for the breakdown of institutional ownership, retail ownership, and insider ownership. To deepen my analysis, I also recorded the largest institutional owners of each of the companies in question. This data allowed me to build an analysis of the impact that the decisions of these individuals and their peers decisions could have on the amount of capital currently held in the public assets of carbon majors and the effect that they are already having on the prospective financial health of carbon majors. I created several visualizations of the data in order to better explain the results of this data collection and exploration.

II. Collection of Political Contributions Data

As a result of my pre-analysis, the environmental policy inequality allowed me to more directly elaborate upon a link between the legislative priorities and alignments of policy makers and their dependence on the financial health of certain industries. Importantly, the media had often suggested the dependence of conservative and Republican political leadership on the support of those same fossil fuel majors. I confirmed the relevance of this trend by checking and analyzing the voting patterns of conservative legislators in the United States House of

Representatives to ensure a consistent trend of environmental policy opposition (with certain exceptions).

Next, reusing the list of United States companies with the highest emissions volume, I collected information on the recipient causes and parties of political contributions made by these companies in the past year and visualized these contributions for more visual simplicity. Next, I combined the information I had collected on donations information to specifically Republican campaigns or conservative causes to the emissions data I had used earlier to select carbon majors to analyze in my financial health investigation. Essentially, I sought to confirm that increased donations to these Republican campaigns or conservative causes was associated with high emission in the energy industry. In order to best visualize this relationship, I ran a simple linear regression of Scope 1 emissions, defined as emissions resulting directly from operating activities, volume from selected carbon majors against political contribution volume for conservative or Republican candidates in R. However, in order to best demonstrate the positive relationship, I also included data on companies with low emissions volume and low Republican or conservative contribution amounts. However, it is important to note that due to the limitations of my data collection and sample size, it is difficult to demonstrate statistical causation or correlation in any capacity. In essence, I sought specifically to confirm and visualize a loose positive relationship between Scope 1 emissions and donations to Republican campaigns or conservative causes within the energy industry in order to link my analysis back to the policy development inequality.

Overall the analysis of combining emissions information with political contribution records, provided a better look into contribution trends across the American economic and political landscape as opposed to just focusing on the particular culprits of the emissions

problem. Further, to simplify the assessment of comparative contributions to liberal/Democratic causes against conservative/Republican causes at the individual company level, I once again used R to create simple histograms of percentage of contributions going to each side of the political spectrum. This allowed for a more direct visualization of the degree to which particular carbon majors are allocating their contributions.

III. Linking the Financial Health of Carbon Majors to the Policy Development Process

Having analyzed ownership data of selected carbon majors in addition to combining emissions data with political contribution information, I sought finally to demonstrate that the relationship between the drivers of market trends explained during Investment Professional interviews could be linked to the influence of large fossil fuel companies on climate policy. Therefore, I combined Phases II and III of my inquiry to identify a flow of effects as explained by the Theoretical Framework I developed in Phase I. Essentially, the drivers identified in Investment Professional interviews revealed a notable vulnerability of the financial health of carbon majors when considering ownership data. I was then able to link emissions information and political contribution trends to identify how market trends and attitudes towards fossil fuels among institutional investors might impact the weight of the right side of the policy development inequality.

Phase IV: The German Economic Policy Comparative

In order to explore the economic alternatives to pure free market transformation of the American energy sector, I sought to investigate the economic transformation that Germany has undergone through the Energiewende as well as the circumstances within which the policy was developed. I reviewed both German government documents and online resources to understand

the cost expectations of the plan and the subsidy system that the Energiewende called for. As previously mentioned, the majority of the Energiewende's economic and financial effects are outlined on federal German websites to inform the public. To bolster this perspective, I also elected to review opinions from finance and economics experts in order to identify the sentiment and effect of the implementation of these economic transformations.

Further, I sought to investigate the economic contexts within which the Energiewende operates within European energy markets to attempt to assess skew that could confound the results of my analysis. Having discovered the exacerbated potential for carbon leakage across European borders, I sought to factor energy imports and exports into my analysis of the German energy transformation. In order to visualize these factors, I simply plotted the volumes of domestically consumed versus domestically produced fossil fuel energy. In this way, I was able to shape my understanding of the Germany Energiewende in the context of production versus consumption metrics: while producing relatively small amounts of fossil fuels, Germany consumes very large comparative quantities due to its ability to easily trade energy with Eastern European nations. Once I had reviewed secondary sources and Investment Manager commentary on the drivers of the Energiwende's success, I also sought to understand the status of public support for the program. Therefore, to complete these analyses, I explored and visualized polling data related to public approval of German projects despite the cost allocation structures.

Data Sources

I sourced the data for my analyses as follows. All financial market and ownership data was sourced from a Bloomberg terminal. Data related to emissions volume of carbon majors was sourced from the Carbon Disclosure Project's open database of corporate and municipal

emissions. Political contribution data was sourced from the Open Secrets database. German energy consumption and production data was sourced from the Energy Information Agency's database on German energy. Finally, Energiewende approval polling data was found through the Clean Energy Wire. Interview data was developed as a result of written or recorded interviews with investment professionals, whose names have been kept anonymous, at their request, to protect business interests. Overall, I personally created all of figures in this paper (body and Appendix) from collected data, with the exception of Figures 5 and 11 which were sourced from the Energy Information Agency.

--- Analysis ---

The Right-Hand Side of the Policy Development Inequality

When President Trump indicated that the American economy and U.S. competitiveness in international trade were jeopardized by their commitments to the Paris Climate Agreement, his statement considered a large set of economic and financial players that influenced, and were in turn influenced, by the withdrawal decision. Most traceable were his concern for the interests of fossil fuel giants that supported his campaign as well as secured the financial backing of reelection efforts of a large portion of the president's political party. However, there are multiple pieces to the policy development inequality that legislators, regardless of their position on the issue of climate change, need to consider. All of those that have thus far prevented legislative progress rest specifically within the economic weight of the fossil fuel giants that Trump is bearing in mind, essentially on the right-hand side of the policy development inequality.

The notion that these obstacles are housed within the asymmetric weighting of financial and economic consequences of removing influence from the fossil fuel industry informs the

assumption that, in order to enact change, the potential for a decrease in weight of that side of the inequality needs to be assessed. In short, how does one reduce the degree to which a policymaker must prioritize the effect of, firstly, personal reelection campaign and cause financing, and secondly, massive capital movement away from a large part of American markets? The ability to answer this question requires the expansion of the policy development inequality of *Figure 1a* to include actors outside of the scope of the single decision-maker in order to understand the location of what I have identified at the *pivotal point of change*. Essentially, while the policy development inequality allows for the conclusion that priority in a policymaker's decision needs to be moved away from considerations on the right side of the inequality, thus, away from considerations prioritizing financial and economic consequences of sacrificing the fossil fuel industry, it is difficult to visualize *how* this shift can occur *and relative to which actors* it needs to occur.

To this end, I posit that the ability to decrease the relative weight of these consequences from the considerations of the policy development inequality lies in the convergence of financial and economic consequences into financial health of fossil fuel companies and carbon majors (companies with the highest level of emissions), particularly as a result of their interaction with and dependence on public markets. Therefore, considering the literature available on climate change policy and economics, the following framework defines the location of the *pivotal point of change* and locates it among other relevant actors by demonstrating the trickle-down effect of environmental policy development and implementation:

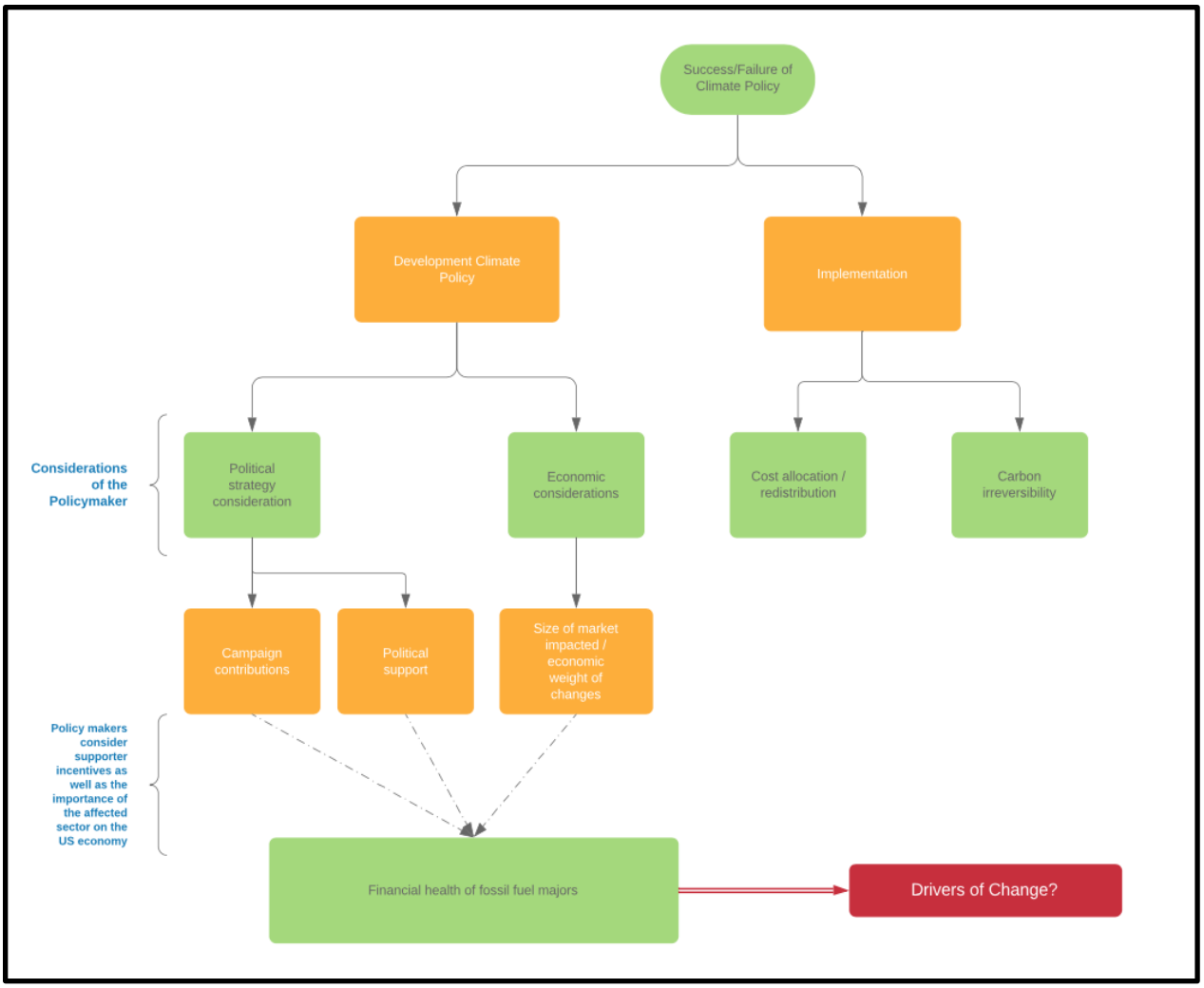


Figure 1b: Trickle-down climate policy considerations

Within the framework above, the identification of the effect of pivotal change can occur in reverse. Essentially, as the financial health of fossil fuel majors enables their contribution to both the economic health of the United States economy and to political causes, it can be assumed that diminishing this financial health would organically reduce the degree of importance policymakers would have to place on the industry in the event that both industry size and influence are shrunk. In the event that the pivotal change can occur, decreasing industry size and influence, policymakers would be better able to develop policy that focuses on the ethical support of American public, environmental, and long-term economic health. Notably, the

vulnerability of the fossil fuel industry and its role the frame of *Figure 1a* can be confirmed by analyzing the rhetoric behind Trump's decision to leave the Paris Agreement. Where the President relied on an economic argument, favoring the continued strength of the American fossil fuel business on a national and international scale, this reaction sheds light on the fact that, currently, American markets have both historically supported and depend too heavily upon the success of this industry's business interests.

As it currently stands, fossil fuels drive growth of the American economy. Policymakers that recognize and prioritize this correlation thus find it difficult to take regulatory action to jeopardize the financial health of these companies that facilitate American economic dominance on a global scale. That said, the argument that Trump utilized in prioritizing growth of the American economy also leaves room for organic market transition to a green economy, and a substantial stream of conservative thought is rooted in the expectation that markets will naturally price out fossil fuels over time. Organic pricing-out of fossil fuels in public markets, however, is unlikely in the near future and generally infeasible in the near term without increased government subsidization of renewable energy and decreased subsidies for fossil fuels, both of which would again require legislative action. As explained by May Boeve, Executive Director at 350.org, to the New York Times, "[...] the coal, gas, and oil industries cannot make this happen on their own; markets are not going to get us out of the hole they got us in. We need the political will to fundamentally rethink some of the underlying assumptions about how we organize our societies. This is why we call for a global Green New Deal," (O'Brien, 2019). Essentially, the consensus among climate economists, who describe climate change as a market failure, seems to be that policy will need to pass first before emissions and market transformations can occur (Clark, 2012). However, time is limited if assuming a 2-degree maximum temperature target as

outlined by the Paris Agreement (Denchak, 2018), and analysis of alternative drivers of change reveal that there have instead been natural developments in the risk profiles of fossil fuels themselves. Therefore, evaluation need not happen at the level of market impacts on emissions reduction directly, but rather on the effect large market trends on the health of fossil fuels majors, which in turn can allow for disregard of the right-hand side of the policy inequality, enabling successful environmental policy creation.

My qualitative interviews consequently sought to investigate and evaluate the financial market drivers that dictate the economic power wielded by fossil fuel giants as well as the trends that can predict their financial health going forward. Throughout my investigation, interviews with Investment Professionals 1 through 6 allowed me to develop an understanding of the financial trends that have historically supported the growth of the fossil fuel industry as a whole and further enable the anti-climate change policy voices in the climate inequality as well as those that threaten it. Further, analysis of emissions, market data, and campaign contribution data demonstrates a direct link between financial market movements, political support for particular candidates, and the bottlenecking of climate policies in on the Congress floor.

Drivers of Change in the Weight of Fossil Fuel Majors

Assuming that the largest drivers of change in financial health of fossil fuel majors rest in the people that have the power to most substantially impact the movement of capital away from the pockets of fossil fuel leaders, institutional investors have the capacity to jeopardize the prospective business success of many companies on public markets. For the sake of simplicity, the investor breakdown of the fossil fuel industry can be analyzed through the proxy ownership in public equities. In this framework, stocks can be held by institutional investors, such as large

insurance companies, banks, and asset managers; by insiders, such as high-ranking company officials; or by retail investors, the independent investor participating through ownership of energy-related stocks, options, mutual funds, or ETFs. In order to frame the drivers identified by Investment Professionals 1 through 6, it is important to understand how ownership of large fossil fuel majors currently looks. *Figure 2* provides a recently updated ownership overview of nine important fossil fuel majors that either produce or emit some of the largest portions of CO2 in the United States. These majors were selected either due to placement in the top twenty CO2 emitters in the United States in 2013, or due to their placement in the top twenty contributors to right-wing causes and candidates in 2019.

Company	% of Shares Held by Institutional Holders	% of Shares Held by Insiders	% of Shares Held by Retail Owners
Exxon Mobil Corporation	57.80%	0.02%	42.18%
Duke Energy Corporation	62.46%	0.10%	37.44%
American Electric Power Company, Inc.	76.67%	0.06%	23.27%
Chevron Corporation	69.64%	0.02%	30.34%
Dow Chemical Company	68.91%	0.10%	30.99%
Exelon Corporation	86.56%	0.19%	13.25%
ConocoPhillips	83.16%	0.09%	16.75%
Marathon Petrolem Corp	82.77%	0.43%	16.80%
Occidental Petroleum Corporation	81.57%	0.18%	18.25%

Figure 2: Percentage of Public Equity Shares Outstanding by Investor Type
Source: Bloomberg Terminal Data

Upon investigation of this data, it is clear that, while the percentage ownership of retail investors in public fossil fuel equities in a given fossil fuel major is substantial, the portions of shares held by institutional investors is a key component of company success on public markets and subsequent financial health. A significant portion of companies' capital sourcing has historically come from institutional trading, making fossil fuel majors' share prices dependent on continued ownership by institutional investors. In general, this set of institutional investors

includes merely a short list of a couple dozen to a few hundred managers that own extremely large portions of the majors' public issuances. *Figure 3* provides an example of the breakdown of institutional investors for three selected majors: Exxon Mobil, ConocoPhillips, and Marathon Petroleum.

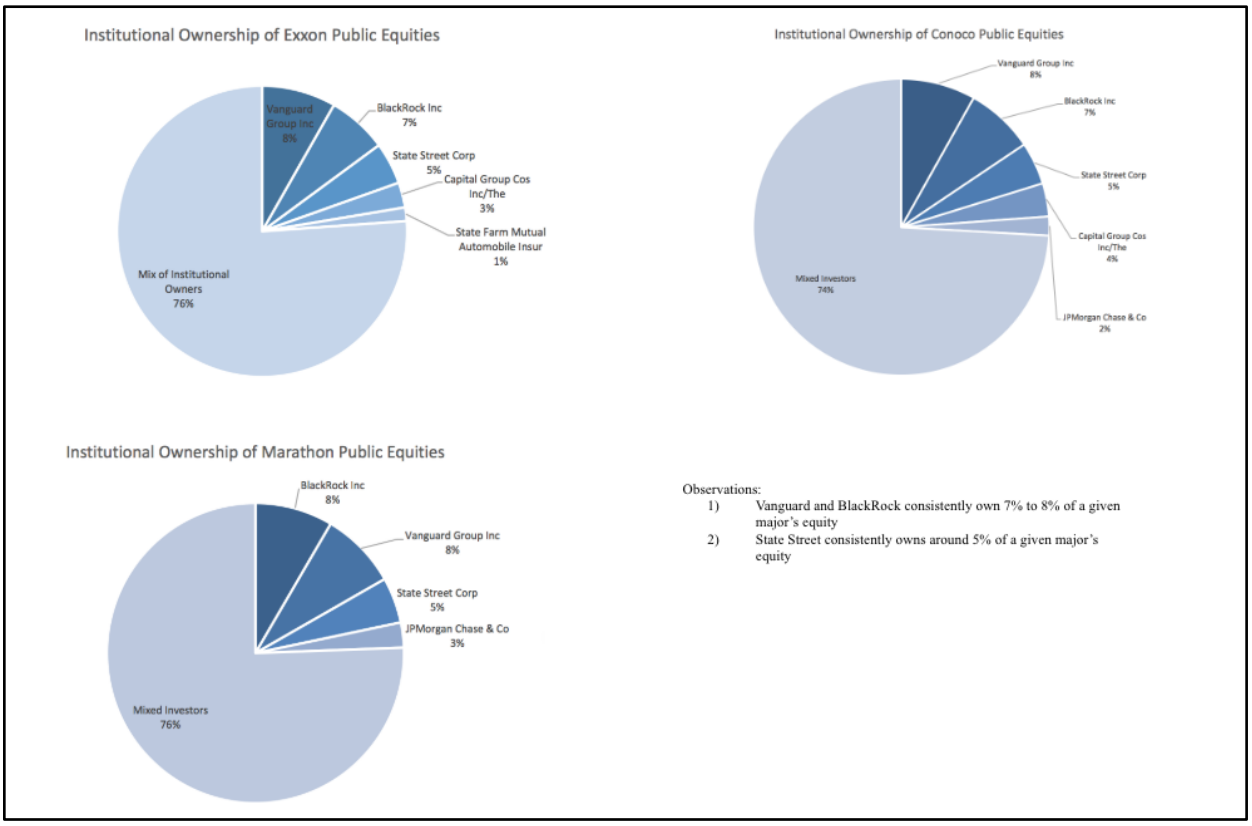


Figure 3: Institutional Ownership of Exxon, Marathon, and ConocoPhillips
Source: Bloomberg Terminal Data

This breakdown shows that large portions of these companies' public stock is held by a select group of sophisticated investors. Notably, three institutional investors, Vanguard, Blackrock, and State Street, regularly hold a cumulative 20% of the issued public equity of a given fossil fuel major. This trend is reinforced when the breakdown overview is expanded to the rest of the selected fossil fuel majors and is observable in *Figure 4*.

Company	Vanguard Ownership	BlackRock Ownership	State Street Ownership
Exxon Mobil Corporation	8.27%	6.65%	4.66%
Duke Energy Corporation	8.40%	7.04%	5.18%
American Electric Power Company, Inc.	8.23%	7.55%	5.15%
Chevron Corporation	8.39%	6.92%	5.95%
Dow Chemical Company	8.04%	6.30%	4.86%
Exelon Corporation	8.60%	7.51%	6.29%
ConocoPhillips	8.15%	7.44%	4.63%
Marathon Petrolem Corp	8.32%	8.47%	4.93%
Occidental Petroleum Corporation	8.20%	6.61%	4.87%

Figure 4: Ownership overview of Vanguard, BlackRock, and State Street
Source: Bloomberg Terminal Data

Every fossil fuel major has ownership by these three institutional investors floating around the 20% mark. This suggests that there is a notable weight to the investment decisions taken by these three institutional investors in particular, as changes in the positions of these managers could substantially affect the financial health and performance of the majors that they own. Further, a portion of these institutional investors also commit credit investments into these fossil fuel majors in the form of term loans that determine the fossil fuel major's liquidity for a given period. This only amplifies the dependence of these fossil fuels majors on institutional investors, both from the perspective of internal financial health in terms of access to liquidity and in terms of public market asset (either equity-based shares or debt products) pricing, which can jeopardize the company's overall valuation.

Considering the financial sector's link to the fossil fuel industry and overall high-emitters, the dependence of fossil fuel majors on institution investors demonstrated by the above ownership data provides context in which to evaluate the drivers identified the by six interviewed investment professionals. Investment Professionals 1 through 6, overall, discuss three overarching themes to their impressions of the changing financial environment in which climate

policy operates: 1) increasing investor aversion towards fossil fuel assets, 2) the case for divesting, and 3) decreasing visibility into direct investment fossil fuel projects.

I . Increasing Investor Aversion Towards Fossil Fuel Assets

In the financial sector, investors refer to clean (renewable or non-fossil fuel) investment assets, indices, and opportunities as Environmental, Social, and Governance (ESG) products. ESG products have bound together non-financial "conscience" incentives to invest in companies that support causes from the removal of air and water pollution to the even gender distribution of company board executives (CFA Institute, n.d.). In consequence, ESG-oriented investment behavior includes investments in fossil fuel-free products as well as renewables-heavy products. Therefore, ESG is featured as a criterion in investor decisions as opposed to pure renewables promotion.

According to Investment Professional 3, there have been historically four categories of investors in ESG assets depending on their motivation behind deciding to invest. The first group, as identified and labeled by Investment Professional 3, are the *Ideal Evangelicals*. This group of individuals invests in ESG assets because of the interests of its members to altruistically save the world, help those in need, and, quite simply, do the right thing. The next group is the *Financial Pragmatists*. As the name would indicate, this group is primarily interested in ESG products due to the benefits they offer in the scope of financial performance metrics. Essentially, some of the time, ESG investments simply present opportunities for high quality transactions and high return. The third group are the *Risk Averse*. This group is interested in ESG products due to their availability as strong regulatory hedging products. These investors expect social changes to drive policy decisions that will threaten investment decisions outside the bounds of ESG qualifying

products. Therefore, they seek to stay ahead of the curve by investing in ESG products that are likely to be positively impacted by policy changes. Finally, the fourth group is the *In-Name-Only* investors. This group of investors is interested in ESG products purely for the sake of advertising an ESG platform publicly in order to appease consumer activists and have little regard for the potential of ESG products as a part of genuine investment strategies.

Within this framework, Investment Professional 3 maintained that the institutional investors of today primarily fall into the categories of *Financial Pragmatists* and the *Risk Averse*. This assessment was reinforced by Investment Professional 2's assertion that parameters dictating future company profitability is still the primary incentive behind investment decisions. These two subgroups highlight important financial market trends when it comes to the market support of renewable assets and fossil fuel majors.

The most visible trend follows the *Risk Averse* group: due to the growth of the climate change cause, there exists a looming threat to fossil fuel positions. Essentially, as public support for fossil fuel decreases, so does the chance that policy makers will be able to respond with policy changes that affect the profitability of fossil fuel investments. This regulatory risk could be characterized by the domestic curbing of federal subsidies for fossil fuel production, by the capping of emissions domestically, affecting the expenses incurred by fossil fuel majors, or even by the placing of new funds towards the subsidization of renewables in particular, increasing the price competitiveness of renewable products.

According to Investment Professional 3, this regulatory risk has been a common part of investment decisions in Europe for a while. However, this trend is increasing at the turn of the decade with a set of landmark changes. For instance, BlackRock announced its decision to divest a large portion of its fossil fuel-oriented investment business. In theme with the risk aversion

considerations, CEO Larry Fink stated in his letter to investors: “Our investment conviction is that sustainability- and climate-integrated portfolios can provide better risk-adjusted returns to investors,” (Fink, n.d.). According to Bloomberg, this is part of a larger trend taking shape in 2020. A recent Bloomberg article directly states: “With rising concern about investment risk posed by climate change, we expect sustainability as a theme within oil & gas to feature prominently in 2020. Once fringe among financial institutions, we're now seeing large, mainstream asset managers, pension funds, banks and insurers pressuring companies to align with the Paris agreement goals and amending policies to exclude those that have emissions or climate strategies deemed incompatible. The fossil-fuel divestment movement will almost certainly extend further beyond coal into emissions-intense methods of oil extraction” (Bloomberg, n.d.). Further, there has been notable economic substantiation of divestment decreasing of funding inflows to fossil fuel majors (Cojoianu, 2019).

II. The Case for Divestment

When combined with the ownership data of large institutional investors, the reassessment of fossil fuel product risk profiles sheds light on a grim future for fossil fuel majors. Taking BlackRock as an example, we can directly relate the asset manager’s ownership of fossil fuel major equities to its divestment decision. BlackRock owns at least 7% of every single selected fossil fuel major[2]. The decision to divest the portion of their business is significant and makes a resonating statement to the other two asset managers that own the largest share percentages in the selected fossil fuel majors: Vanguard and State Street. While divesting this portion of their business will not cause BlackRock to directly harm the profitability of fossil fuel majors, as the

[2] See Figure 4.

shares will likely simply change hands, the spotlight the decision has placed on the regulatory risk of these businesses is inexorable. It is extremely likely that peer institutions will respond to BlackRock's decision in the coming months, taking this risk into greater consideration. Once the number of divestment movements have reached a critical mass, it is likely that the financial health of the fossil fuel majors will in fact begin to be affected.

There has, however, also been pushback to the idea that divestment of fossil fuel investment business will in fact have an impact on the financial health of majors. In particular, this resistance has been explained in response to University student movements supporting the divesting of fossil fuel investments currently part of University endowments (Irfan, 2019). While University endowments do influence the effect of financial market changes on fossil fuel majors' financial health, the impact of individual University endowments is unlikely to affect majors in the same way as decisions enacted by BlackRock, Vanguard, or State Street, due to differences in the way institutional investors interact from that in which private University investments are decided. Even in this case, critics argue that, "instead of reducing global fossil fuel production, the divestment movement will simply force [International Oil Companies] to cede market share to [National Oil Companies]. If anything, this would cause CO2 emissions to rise. The carbon footprints of [National Oil Companies] per unit of fuel produced are on average bigger than those of [International Oil Companies]," (Andreasson, 2020). In essence, this analysis would suggest that smaller oil producers and distributors would take over active oil markets in the United States in the place of international oil companies, whose shares are more frequently available for purchase and trade on public markets. Further, experts suggest that debt instruments and the liquidity requirements of fossil fuel companies will also be insufficient to change the structure of the energy sector and limit financial health of fossil majors. Notably, experts suggest

that, given the nature of the financial sector, there will always be alternative lenders for fossil fuel majors to fall back on. While they may be lower quality, the availability of term loans to support liquidity will not disappear (Ip, 2020). At an even more basic level, basic economics seems to punch a hole in the promise of divestment as a cure-all. In his article “Fossil-Fuel Divestment Is Futile”, NYU Professor Paul Tice asserts that basic economics demonstrates that, despite divestment trends, the demand for fossil fuels will regardless drive the supply of fossil fuels (Tice, 2018). He states: "it would likely push oil prices well above the $100-a-barrel mark, generating windfall returns for energy companies—and for those investors who resist peer pressure and maintain exposure to the sector,” (Tice, 2018).

The above rejection of divestment by asset management organizations considered, there is still a set of angles to divestment, that Investment Professionals 1 through 6 have shown, that might present an argument in support of the impact of divestment. This potential rests in the changing business priorities of fossil fuel majors as well as geographic policy considerations. Investment Professionals 1 and 2 made note of an interesting trend: oil majors are emerging as some of the largest investors in renewables products all over the world. In particular, European law dictates that investing in renewables is part of the social license to operate. This diversification of assets is occurring internationally and includes American fossil fuel majors. For example, in 2018, Exxon announced the purchase of a solar field that would be used in the production of oil (Martin and Crowley, 2018). While imperfect, there is an existing trend of attempts by majors to change their business models to include renewable energy or transition energy assets.

With regards to the liquidity problem, the availability of alternative sources of term loans is inarguable, as there will always be individuals willing to provide loans at unlimited interest

rates according to circumstance. However, it is important to bear in mind the decision process utilized by majors when deciding to accept a term loan and the issuance decisions of the financial institutions committing capital (Macabacus, n.d.). Basically, it is not as simple as the law of supply and demand. Not only do term loans and other liquidity instruments have certain reasonable size and duration characteristics for effectiveness, there are also multiple sets of internal considerations. First, term loan issuers and the loan client must agree to loan rates, which can be raised substantially if the company's liquidity profile is considered threatened by the financial and social environment of the deal. Next, subsequent debt syndication processes would require the same institutional lenders that actively divest their fossil fuel businesses to re-invest in the same debt products. This process is, similarly, threatened by the financial and social environment of the deal. It is likely that, over time, the cash flows of fossil fuel majors could be insufficient to result in any logical term loan deal.

Finally, there is also the consideration of distance, quality, and competitiveness. While unregulated foreign fossil fuel producers could likely continue to sell their products in the United States, this process would also put a hole in the "competitive trade environment" that Donald Trump is also trying to foster. If the prices of oil were to cause dependence on oil imports due to more competitive pricing of oil from abroad, it is likely that even a conservative government would actually turn its back on oil and coal all together in favor of natural gas. While imperfect, the United States has dedicated numerous resources to the successful development of natural gas usage domestically and competitiveness abroad. Notably, in 2019, the United States doubled its natural gas exports (Paraskova, 2019). *Figure 5* shows a U.S. Energy Information Administration chart of the growth of natural gas production, consumption, and trade for the United States.

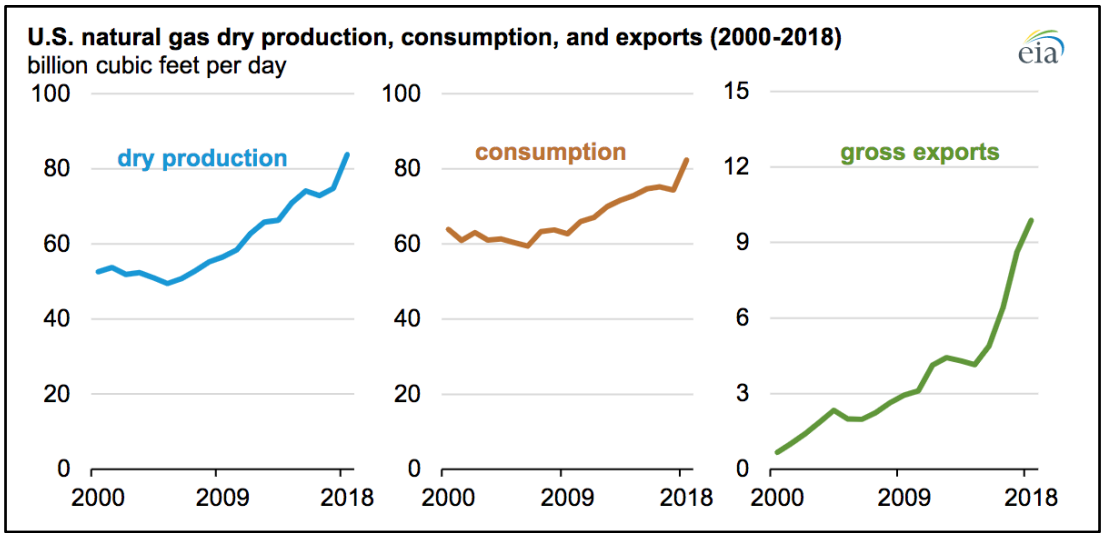


Figure 5: Domestic Natural Gas Growth
Source: U.S. Energy Information Administration
Note: Graphic Proprietary to the EIA

In this case, it is likely that the United States might actually receive the support necessary to ditch oil and coal products. This would open a pathway towards formalized climate change policy with natural gas as a tool for energy transition. Of course, while natural gas is in imperfect substitute for oil and coal products, it is an energy source that already represents 31% of United States primary energy consumption (EIA, n.d.). The replacement of fossil fuels by natural gas would potential help pave the way for other energy sources to represent a larger portion of American energy consumption.

III. Decreasing Visibility In Direct Investment Projects

Regulatory risk, however, does not end within public markets. Investment Professionals 2, 3, and 4 explained that it is also becoming increasingly difficult to set up fossil fuel production projects. In fact, it is becoming safer to be an early private investor in a renewable energy power plant, despite newer untested technology and less investment precedent, due to the increased risk of investing in a fossil fuel plant. This lack of visibility has multiple sources outlined by

Investment Professionals 1 through 6. Firstly, the long-term return on investment no longer has the same potential as regulatory risks endanger the opportunity for investors to ever see a profit. Secondly, due to the way electricity grids and transportation routes are set up all over the globe, new fossil fuel projects are hyper-susceptible to carbon leakage. Finally, fossil fuels pricing has particularities that exacerbate volatility in times of regulatory uncertainty to substantially harm economic sustainability of a new fossil fuel plant.

In the context of developing energy plants, Investment Professional 3 explained that fossil fuel-based energy plants are slowly becoming riskier for early investors due to the uncertainty of returns on capital. Essentially, when investing in a new energy project or asset development, return on investment doesn't generally reach the original seed investors until the second half of the asset's lifetime. Fossil fuel, for instance, has an inventory backlog of five to ten years, according to Investment Manager 2. This means that capital is being locked into a project for at least five years until seed investors have an opportunity to receive any return on their original investment. However, when there's regulatory uncertainty that could jeopardize the success of the new fossil fuel plant, the potential return on those investments is jeopardized in turn, as the new plants could fail before the plant comes out of the red. Essentially, in the event that the federal government or state government in question would remove fossil fuel subsidies, the economics of the project would rapidly stop working out.

The result of this uncertainty has been, on the first hand, the domestic expectation for governments to de-risk investments to promote economic activity, or, on the second hand, for investors in the renewable energy space to place venture and seed investments in renewable energy projects. This sheds light on a promising trend in investments in the fossil fuel space. While there remains a certain amount of stability for fossil fuel in mature public markets, the

instability of new projects means that there is limited asset growth among fossil fuels. Further, increased interest in renewable energy projects instead of fossil fuel projects has provoked the beginning of renewables subsidies as well. In many European countries, such as Germany, this has translated into successful promotions of renewable energy plants.

Further within the considerations of new fossil fuel projects, there also comes a risk associated with the competitiveness of a particular fossil fuel plant to feed consumer grids and services. Essentially, if fossil fuel plants are located at state or country borders or if they source mega grids with expansive geographical reach, fuel customers have the opportunity to compare their prices against those of competitors across borders. If the industrial customer finds that a nearby country, with more relaxed carbon emission laws has a fossil fuel plant with lower pricing as a result of those policies, they could choose to move their business across the border to take advantage of those lower prices. As aforementioned, this process is called carbon leakage (European Commission, 2017). Investors in new fossil fuel plants, especially in countries with high-technology grid systems, have begun to consider how this race-to-the-bottom effect could impact their projects' profitability down the line. Once again, potential regulatory changes pose a substantial risk to new fossil fuel project profitability and general visibility.

Finally, there is a certain amount of natural market volatility that is tracked by financial analysts and considered in asset investment decisions. However, it is important to note that fossil fuel commodity volatility is unique. Notably, there have been numerous United States recessions driven by oil price spikes, according to Kellogg school of management professor Sergio Rebelo (Rebelo, 2017). This observation is confirmed by Investment Manager 3, who suggested that spikes in oil prices, or increased price competitiveness of alternatives, could also destroy the profitability of a new fossil fuel venture, as alternative products may either eclipse the potential

returns of projects or products may become less attractive to consumers. In addition, oil in particular is heavily influenced by international politics and conflict. This adds increased risk to fossil fuel investments that is not experienced by renewables projects. Further, fossil fuel pricing itself does not need to change directly. Investment Professional 2 maintained that, despite early public market failures faced by renewable energy companies, such as SunEdison, that originally drove investment caution in the space, public investors are being brought back to the market due to lower costs and certainty of upcoming asset class growth due to regulatory benefits.

Within the considerations of price risk, it is also important to note the source of price risk on the renewable side as well. Investment Professional 4 explained that, while there may be more precedent in fossil fuel projects, renewables projects simply work differently. Overall, according to Investment Professional 3, renewables rate of return and price risk comes from the natural intermittency, such as inconsistent wind or sunlight during certain times of day or weather patterns, of renewables products. This brings the assessment of risk back to the question of technology: is there sufficient storage capacity to enable a new project to support a grid perpetually? Further, will there be need for the plant's supply to be complemented by a different energy type? The consideration of these questions has led to increased investments in the storage technology space, as explained by Investment Professionals 1 and 4. There has, in consequence, been an interest in funding the bridging of the technology gap and supporting government or policy-level financing of related technology developments to enable increased renewables investment.

Connecting Financial Health and Policy Development

When prompted, Investment Manager 3 asserted that transition to a green economy will be led by a policy change first, as opposed to a market change. That is: policy developers will take a stand and develop policy that promotes renewable energy and a green economy regardless of the political obstacles before organic market forces can push for natural pricing out of carbon. However, the debate is complex, and the question of whether policy change will occur first is ill-posed. The consequent inquiry is then, what would enable policy developers to bypass the policy development deadlock that rules Congressional decision-making under the current administration? Considering the trends identified by Investment Managers 1 through 6, there may be an answer in the financial health of large emitters and Carbon Majors.

To reiterate, the financial health of fossil fuel majors is a crucial piece of climate policy development. As explained in *Figure 1*, when political leadership decides on a policy, they factor in two concepts: first, their strategic constituent support, and, second, the economic and financial magnitude of the decision's impact. Put simply, they evaluate which business leaders they need to keep happy for the sake of reelection support and whether the industry affected by the policy in question is a large and important part of the American economy with multiple dependent individuals and entities that could be affected by changes. It is important to note that the latter portion of this sequence of considerations is particularly important in the climate policy discussion as a result of capital irreversibility (Baldwin, Cai, Kuralbayeva, 2017). Essentially, the theory states that many countries have already poured so much capital into their current energy infrastructure that rebuilding would take a substantial toll on the economies of countries that need to make large changes. This is particularly relevant in the considerations of policy developers. In practice, the financial health of fossil fuel companies factors into both the implications of capital irreversibility and the personal financial success of business leaders in the

industry. Now, when considering the ownership of fossil fuel companies by either large institutional investors or retail investors, we can begin to consider scenarios where regulatory risk could harm the valuation of majors. Changes in this valuation could thus affect the cash flows they are able to provide to remain relevant to political leadership and their cumulative relevance within the American economy. If, for whatever reason, these companies were to lose their ability to meet these cash flow criteria, they would likely enter a toxic feedback loop, where political leadership subsequently stops enacting policies that support and protect the industry in question further.

In a political environment where conservative, Republican voices are in the congressional majority, it becomes important to understand why those conservative voices speak and vote against green policies. Essentially, the relationships and cash flows from fossil fuel majors to conservative, Republican politicians dictate voting patterns. Since the polarization of climate policy after the 1970s environmental heyday, climate policy has become an entirely partisan issue. Within political debates and on candidate platforms, policies in favor of green economies, including supporting green energy, have become flagship platform considerations of the Democratic party and are actively considered to be part of a "liberal" political position (Milman, 2019). Republicans and conservative political positions, as a result, oppose climate reform. Within this framework, when companies want to protect their emissions heavy operations, they give more to the conservative and Republican political leadership that will subsequently protect them. *Figure 8* shows the positive relationship between Scope 1 (direct) emissions volume and political donations to Republican and conservative causes for both large and small emitters. The plot clearly shows a loose positive relationship. This demonstrates that companies with higher emissions volume will in fact donate more to Republican and conservative campaigns

polarization of the issue and the relationship held between high emitters and conservative political leadership.

The above data considered, it is interesting to entertain the notion that sufficient increases in fossil fuel majors' risk profiles may actually push markets to support financial disenfranchisement of those high emitting companies. Perhaps there is a way for trends in regulatory risk recognition, such as the public divestment decision of Blackrock, to inspire sufficient public doubt to shock the financial health of fossil fuel companies. To a certain degree, this is already occurring, as large fossil fuel companies have begun to invest in newer and cleaner energy types in order to remain relevant to investors interested in clean options. As explained by Investment Manager 2, multiple oil companies have already made the move and more are certain to follow. However, the questions of time scale and implementation feasibility still remain.

Case Study: The German Energiewende

I. Overview

Given the uncertainty associated with the potential of regulatory uncertainty to command economic change, it is interesting to evaluate the ways in which countries in the rest of the world have developed successful policies for transition to green economies despite similar political divides related to the issue of climate change. Germany's Energiewende, for example, provides an illustrative case study of a successful program in a country where non-negligible conservative groups oppose the program and where economic considerations and cost allocations have been organized to optimize public support and ease the economy into clean energy generation. While the AfD does not necessarily wield the same power as the American right in the context of policy

development, they remain an interest group with increased membership due to the rise of nationalism in Germany over recent years (Asthana et. al. 2020). This has slowly increased the degree to which their perspective on renewable policy is threatening to environmental policy.

Overall, the Energiewende, or Energy Transformation, is a set of German policies that have been promoting the country's transition towards a "a low-carbon, nuclear-free economy" since the 1970s (Clean Energy Wire, 2019). These policies have primarily included economic support for electricity-oriented energy sources. The German government has been focused on guiding particular financial forces to support a substantial decrease in fossil fuel power sources throughout the nation as well as to match economic fallout from the decrease with new business opportunity. In the words of the Federal Foreign Office, "This unique opportunity for Germany as a location for business and investment will open up new business opportunities, foster innovation, create jobs, boost growth and make us less dependent on oil and gas imports," (Federal Foreign Office, n.d.).

However, it is important to note that the success of the Energiewende is far from flawless. Most importantly, key metrics regarding the program are regularly misreported. For instance, German public media often refers to sources such as renewables having "a share of 27.4% in the electricity mix" (Federal Foreign Office, n.d.). However, this statistic is extremely misleading. *Figure 9* shows the comparative volume of German fossil fuel-based energy production and consumption over time.

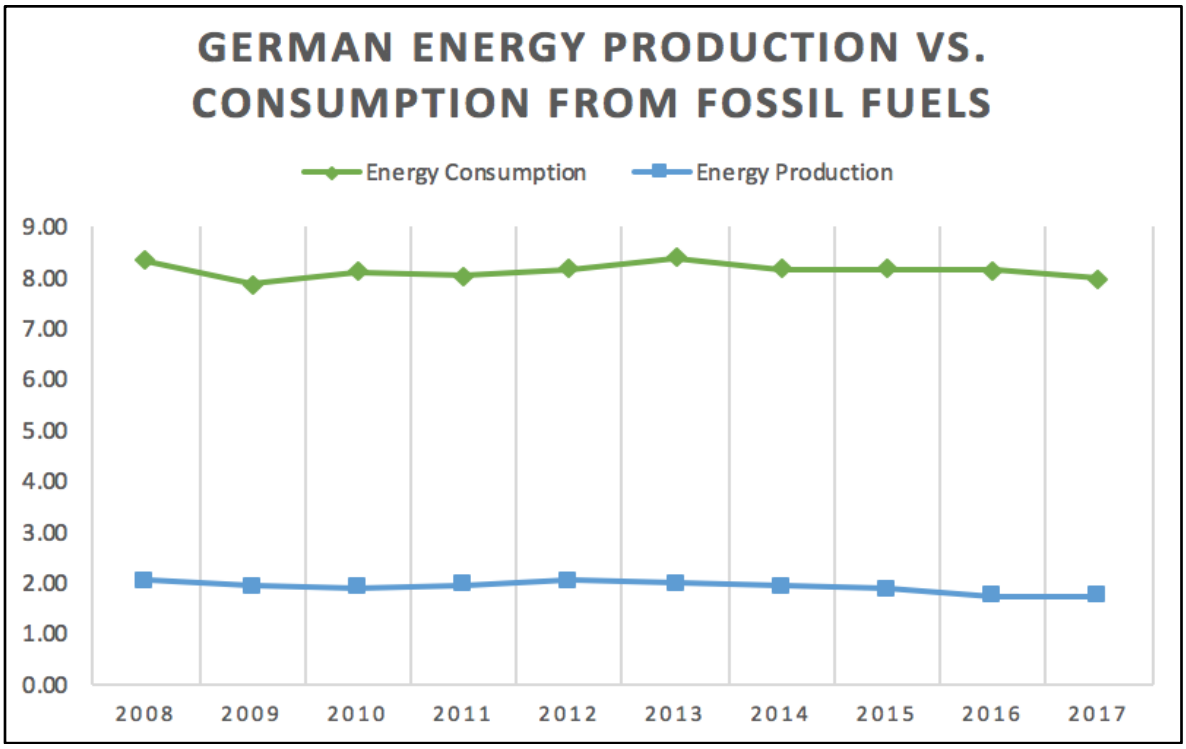


Figure 9: Difference in German Energy Production and Consumption from Fossil Fuel Sources from 2008 to 2017
Source: Energy Information Agency Data

Combining both coal and oil source volume, the difference between production and consumption is consistent and substantial. This raises the question: if Germany is not producing this energy that it consumes, where is the fossil fuel-sourced energy coming from? In reality, the accessibility of cross-border European energy markets is responsible. Essentially, because of insufficient energy grid supply, when Germany electricity grids are unable to send a sufficient volume of energy across the nation, it simply buys the energy from nearby nations. This is carbon leakage in action. In the words of Investment Manager 3, "the German government operates very much on a 'do-no-evil' and 'speak-no-evil' basis. The public is simply not made aware of where their energy comes from". While this phenomenon does not discredit the Energiewende in its entirety, it is important to take into consideration when explaining why

countries like the United States, that can less readily engage in cross-border energy trades due to the country's size, have not managed to reach the same levels of success.

However, there are two key policies, or economic tools, that stand out as part of the German Energiewende that offer novel solutions to many climate policy obstacles. These are, first, the use of feed-in tariffs to enable growth of renewable energy projects; and second, the logical cost reallocation of changing electricity pricing to optimize public support.

Feed-in tariffs (FITs) are economic policy tools used to promote the growth and development of renewable electricity technologies. According to the Energy Information Agency, FITs guarantee "that customers who own a FIT-eligible renewable electricity generation facility, such as a roof-top solar photovoltaic system, will receive a set price from their utility for all of the electricity they generate and provide to the grid". The first FIT came into effect in Germany in 2000. Despite numerous amendments to the original policy, the German FIT boosted the development of smaller, localized renewable energy production projects. This allowed individuals to approach the climate policy issue from the ground up. Numerous townships and cities have thus developed renewable power generation operations to take advantage of this trend. For example, the UrStrom project of the city of Mainz and the surrounding area has become a success, generating sufficient power for the citizens of the city, as well as providing substantial returns to the cooperating citizens. The UrStrom site states: "Our cooperative is now supported by more than 300 members. At our monthly meetings in the UrStromClub, we exchange ideas about new projects and current developments in the field of renewable energies" (UrStrom, 2020). In this model, the average citizen, who would have invested in public market energy assets, can instead dedicate themselves to the development of a profitable operation that supports renewable energy growth.

Further, the manner in which the German government has reallocated costs is also significant, especially to the average German citizen. The way the program is currently structured means that there are substantial costs in energy generation projects that should be passed to the consumer of electricity. However, as part of Energiewende plans, the German government has reallocated all taxes and costs to one section of the German economy, the Mittelstand, instead of large consumers of electricity and households. The Mittelstand is the set of "small and medium sized enterprises (SMEs) in Germany, which form the backbone of the country's economy," (IGI Global, n.d.). Essentially, German policy has placed end-user taxes on electricity that affect only the Mittelstand. Logically, the companies that are part of the Mittelstand should be upset about this, as explained by Bloomberg's assessment that the Energiewende has damaged the competitiveness of Mittelstand companies (Wilkes and Parkin, 2018). However, it seems as though, aside from the AfD (Alternative für Deutschland), the extreme right, Germans are generally on board with this cost allocation.

This reality may be confusing to American citizens. How can the German people accept this cost structure? The reasoning, surprisingly, rests in the understanding and acceptance by the German public that climate change is worth the cost. Notably, recent approval polls of the German public have demonstrated that people understand the fact that the Energiewende is important to secure long term climate policy success and a healthier Germany. For instance, a 2017 poll by GfK asked the public to agree or disagree with the following statement: "The Energiewende is an important project that I personally deem to be right" (Wehrmann and Wettengel, 2019). *Figure 10* displays the results of the poll. It is clear that a large portion of the German population understands the importance of the program.

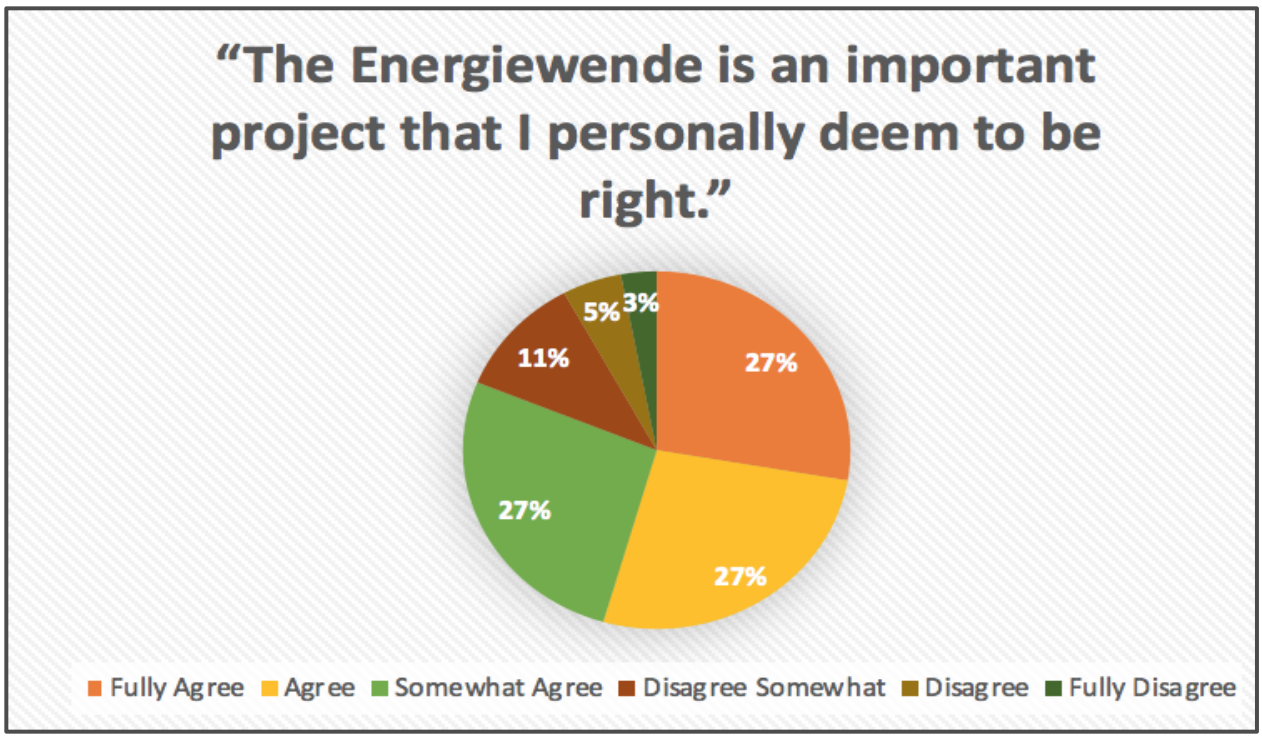


Figure 10: Energiewende Approval Poll Results
Source: Clean Energy Wire

Assuming survey data can be considered a proxy for US sentiment, the German survey data can be compared against statistics from the United States, where only around 53% of the population believes that climate change is happening and is primarily man-made in 2019 (Marlon et. al, n.d.). This difference is likely the most pivotal pillar of the Energiewende. While seemingly simple, Germany has managed to educate its population to recognize their role in climate change as well as their role in what must be done to reverse it.

II. Comparative Impressions

The United States has faced innumerable difficulties in identifying how its domestic policy process can become compatible with the economic implications of renewable energy and climate change policy. Comparatively, the Energiewende has enabled the German government to condition both the national economy and the German people to accept climate change policy and

renewable energy in particular. While the Energiewende has been marketed as a policy of substantial success throughout Germany and internationally, the process in which it became law and has become accepted by the public remains unique. Notably, it sheds light on the key differences between the American and German policy process as well as the barriers that have prevented the United States from making progress thus far.

The limited success of American climate change policy rests in two notable areas: public opinion on climate change and on cost. The United States climate change policy history has been derailed by bipartisan pull either against or in favor of climate change policy. For conservatives, derailing success has been rooted in convincing the American public that climate change is not related to emissions caused by the agricultural or power industries, and that climate change policies is an expensive way to harm large industries and increase American taxes according to a liberal agenda. This is exemplified in EPA director Scott Pruitt's statement on repealing the Clean Power Plan: "That rule really was about picking winners and losers[...] The past administration was unapologetic, they were using every bit of power, authority to use the EPA to pick winners and losers on how we pick electricity in this country. That is wrong," (Fox, 2017). This has contributed to only around 6 in 10 Americans believing that climate change is mostly man-made (Marlon et. al, 2019), while the remaining 4 are skeptical of the involvement of humanity in global climate trends. These concepts paired together have led to a deadlock in American climate policy, with half of the public and half of the political elite bent on preventing the so-called destruction of American industry and unnecessary expenses.

In reality, Germany is experiencing a nearly identical refusal of climate change policies such as the Energiewende among conservatives in parties such as the AfD. According to the Connected Plant Conference, "For the AfD, economic, energy and environmental policies are

intertwined in a way that funnels money and security away from the middle and working classes in Germany. They rail against the higher retail costs of energy following the Energiewende, stating that 'energy must remain affordable and should not be a luxury commodity,'" (Buchsbaum, 2016). With the AfD winning nearly 25% of the vote that year, the impact of this party platform is not insignificant. While Germany has a very similar governmental and legislative structure, there are certain pivotal characteristics of the German policy environment that has allowed for greater success.

On the one hand, Germany is not exposed to the same divisive politics surrounding climate change. Instead, the nation's multiple political parties have allowed for increased flexibility with regards to climate change, and the proximity to international power disasters has led to a shift from one emissions option to another. In the case of the energy industry, Germany has experienced a staggered shift, first from fossil fuels to nuclear, and then from nuclear to renewables. In fact, in 2016, "opinion among once-divided political movements, represented by Merkel's center-right Christian Democratic Union (CDU), the center-left Social Democratic Party of Germany (SPD), and the left-wing Green Party, have in the last five years since the Fukushima nuclear meltdown, merged on decisive issues such as renewable energy. Chancellor Merkel has since largely moved closer to mainstream Green positions on energy as well," (Buchsbaum, 2016). The merging of parties on this issue, coupled with around 81% of the German public believing "climate change to be a 'very serious' problem" according to the European Commission, has enabled climate policies to receive multi-party support, avoiding the bi-partisan barrier found in the United States (European Commission, 2019).

However, the analysis of economic policies does seem to show promise, most importantly with feed-in tariffs. This economic tool has promoted the grassroots development of

renewable energy plants, naturally bypassing the market effects on renewables policy. Essentially, while waiting for regulatory risk and price competitiveness to hit American public markets sufficiently to change the climate policy development inequality, individual American citizens can gather together within their communities and engage in private, local renewable energy ventures. Further, the United States has already begun this process by offering feed-in tariffs in multiple U.S. states. *Figure 11*, provided by the Energy Information Agency, demonstrates the early stages of feed-in tariff offerings.

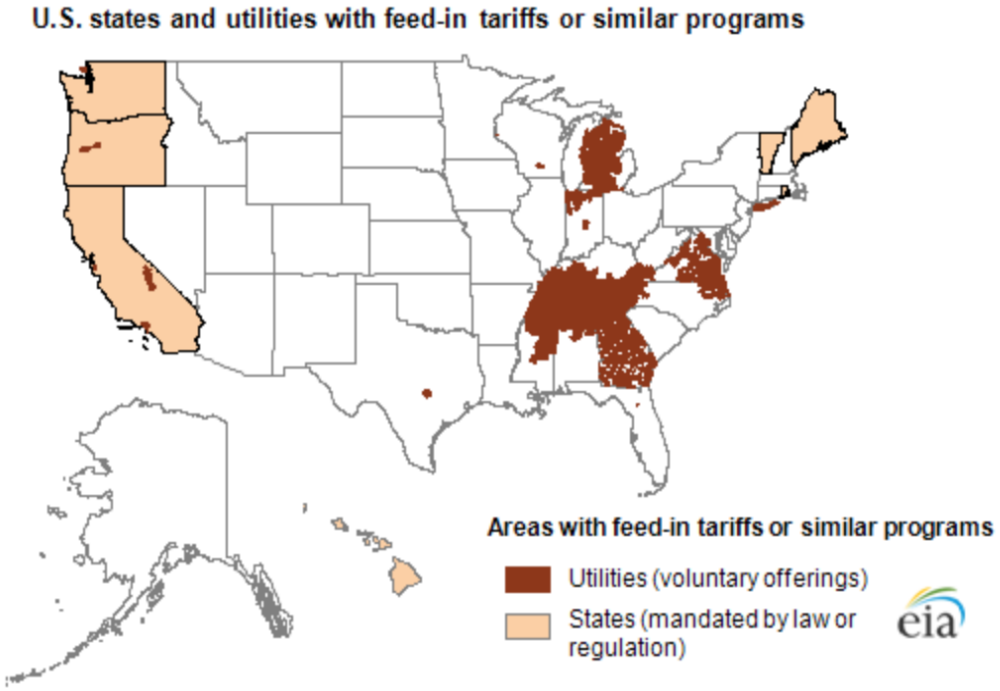


Figure 11: Feed-in tariffs in the United States
Source: Energy Information Agency
Note: Graphic Proprietary to the EIA

However, it is important to also understand that feed-in tariff programs have drawbacks challenges that have been reflected in reluctant policy action. Notably, feed-in tariffs have been shown to exacerbate social inequity on the local level due to inconsistent payment across socioeconomic groups (Grover and Daniels, 2017). These drawbacks recognized, no policy option is bullet-proof, and, with proper policy design and management, feed-in tariff programs

regardless represent a point of success for the Germany's environmental policy advancement and an opportunity for the United States.

--- Policy Recommendations ---

When considering the economics and political implications of climate change policy, the interconnected nature of the topic dictates that one "magic pill" solution is fundamentally impossible to find. If anything, climate change is one of the most complicated policy issues with which the United States federal government as well as state governments are faced in the modern age. However, when following a framework inclusive of the weight of financial markets and capital movements to assess the flow of impacts related to climate policy implementation, analyses can begin to approach the implementation problems from multiple angles, but at the same time, in a simplified dimension. The following policy recommendations can be considered sequential strategies with which to achieve emissions reduction and develop a green economy. This begins with a first step towards changing the path of the American economy and financial markets: decreasing obstacles to successful implementation of green climate policies at the federal level.

This thesis has sought to investigate the potential of changing investment perspectives to decrease the significance of fossil fuel market size as a piece of the puzzle to encourage change in policy making prioritization. However, due to uncertainty related to the timeline in which financial markets may impact policy decisions, my recommendations take the form of progress *acceleration* and seek to draw largely from the second part of my analysis, which addresses the potential for change assuming an extended financial market impact timeline. Essentially, while my research suggests that financial markets will be incrementally creating shifts in the influence

of carbon majors on the United States policymaking, notably sooner than might have been expected, it is impossible and inefficient to assume that markets alone would have an organic impact that satisfies the 2-degree temperature target. In consequence, I develop my policy recommendations as a reaction to the successes and challenges that Germany has experienced with the Energiewende in the context of consistently changing investment trends impacting the United States fossil fuel market size and long term profitability.

Comparative analysis of implementation and market reactions to the German Energiewende allows for a benchmark against which to consider policy options compatible with United States financial, political, and economic customs. Further, it provides numerous examples upon which to model plans and opportunities for change in the United States, as that have proven success both in terms of public approval as well as in terms of institutional and political approval in a comparable nation. With the help of Energiewende survey data in addition to opinion pieces and economic impact assessments, I am able to gauge the effectiveness of Energiewende goals and determine the feasibility of the implementation of similar programs in the United States. Further, assessing the potential of such opportunities also highlights the obstacles that could be associated with an implementation attempt due to incompatibility with the American context. Unfortunately, a large majority of potential policy recommendations require stratified approaches upon which policy makers can build in the event that success is achieved with the first level of change. Considering the American political landscape and the implementation trends of past U.S. climate policy, the evaluation of German success alone cannot be considered sufficient due to differences in implementation precedent with green policy.

It is important to note that I have chosen to select policy recommendations based on conservative political projections for the sake of simplicity and accuracy of analysis. I assume

that policy recommendations will be enacted in a political climate identical to the status quo: under the current state of the Trump Administration. I recognize that my policy recommendations may be enhanced or restricted in their effectiveness in the event of a change in dynamics within the Executive Branch of the U.S. Federal Government. However, considering the bipartisan nature of the problem, I consider it likely for my policy recommendations to either be accelerated and improved upon in the case of a Democratic nominee to the Executive, or to remain the same, in the case that the incumbent Trump regains office.

Response to the Policy Development and Implementation Problem

At the heart of the policy implementation problem is the political bottlenecking of climate policies due to the polarized nature of the problem in American government and in the American elite. Overall, this thesis posits that members of the Republican party in the upper income bracket respond to private political contributions due to the weight of their capital investments in fossil fuel commodity assets. Limited exposure of renewable energy assets to public markets limits the sway of climate policy supporters due to only niche-level involvement in the renewables space. There are a couple different conclusions that can be drawn when comparing the backdrop of American climate policy implementation against that of Germany. Throughout this comparison, one can identify four key support areas that allowed Germany to successfully and easily implement Energiewende policies: the presence of feed-in tariffs for renewable energy sources (World Nuclear Association, 2018), high levels of public acceptance of climate change policy as a public responsibility (European Commission, 2019), the decreased polarization and partisanship associated with climate change policies, and, finally, the reallocation of costs and optimal trading strategies in the context of the European Emissions Trading System (European Commission, 2017).

These four key drivers of the German Energiewende's success shed light on the missing pieces in the American climate policy inequality. While the Energiewende has promoted the use of renewable energies through feed-in tariffs and capped the growth of emissions using the European Emissions Trading System, the United States has instead continued to pour over USD 20 Billion into fossil fuel subsidies per annum, lowering the price of fossil fuel products and increasing producer margins. This perpetuates American dependence on fossil fuels as a form of energy generation and protects fossil fuel products and producers as financial assets held by investors on public markets. Further, due to the market size of oil and other fossil fuels in the United States, it is difficult to imagine that Americans would support the instigation of an economic shift using the support of public financing and movement of subsidies towards renewables. By comparison, 81% of Germans polled by the European Commission agree that more public financial support should be given to enable the transition to clean energies even if this means reducing subsidies for fossil fuels," (European Commission, 2019). With regards to public belief in the human complicity in modern climate change and correlated political polarization, the United States is far behind the majority of the European Union. While approximately 80% of German citizens believe in the role of mankind, only 60% of Americans recognize and accept the impact that human behaviors have had on a warming climate and its related impacts.

These differences shed light on the specific areas that need to be targeted by policy changes and movements, notably relative science denialism and public finance. The impact that policymakers can have rests in their ability to effect change on the status quo enabling American dependence on fossil fuels and on those behind the relevant emitting industries. In essence,

policy recommendations should seek to rectify a number of incompatibilities with climate policies and barriers to successive implementation efforts.

Financial Market and Regulatory Reform

In order to encourage the convergence of climate policy priorities as well as economic progress, both the average investor as well as large institutional investors need to be incentivized to place capital outside of fossil fuel assets and into markets trading and supporting renewable energy ventures and assets. The effect of such capital movements would be to decrease the financial weight of the fossil fuel industry in the policy development inequality by reducing the influence of the fossil fuel industry on policy development and implementation success. In an ideal world, fossil fuel subsidies supplied by the government should subsequently be lowered or entirely removed to encourage competitive pricing of renewable energy products and to enhance the potential return on investment of relevant investment opportunities. These would likely cause fossil fuel costs to flow to the consumer, which would raise the retail price of oil and encourage the development of infrastructure required to support renewable energy nationally. In conjunction, as has been recognized by the German public according to the European Commission, subsidies should be allocated to support the lowering of renewable energy prices (European Commission, 2019).

Once public finance policy is in place, the polarized elite would be able to respond to changing capital allocations and cost structures by supporting legislative reinforcement of regulatory trends or encouraging line-of-business transitions within the business structures and ventures of carbon majors themselves. Such regulatory changes would ideally make way for policies similar to the European Emissions Trading System, which entertain stricter emissions

guidance on a federal level, or, alternatively, finally allow for investors to take a more certain step away from fossil fuels on public markets, accelerating the transition to a low-carbon economy.

However, feasibility of recommendations and organizational sequencing of recommendations is of crucial importance when analyzing whether a real change can be made in this space. As previously concluded, while promising, financial market drivers of policy change due to regulatory risk increases would still require multiple years to take effect that the global environment simply does not have assuming the 2-degree temperature increase target. Similarly, due to context of the American policy process and environmental partisanship, it would be nearly impossible to exact immediate change in the regulatory space or public finance space to then affect financial markets. As seen in the case of the suggested Waxman-Markey Discussion Draft (the American Clean Energy and Security Act of 2009) (Reilly and Bogardus, 2016), which failed to make it to the Senate floor for debate after passing the House of Representatives, it would be extremely difficult to expect policy success without changing the polarization of climate change and fossil fuels in among the political elite. No matter the angle, we repeatedly run into the "chicken and the egg" problem: policy influences markets, which in turn influences policy.

The consequence of these conclusions is not moot, however. Notably, the analysis developed in this paper shows that regulatory pressure and investor perspective trends play a crucial gradual role and have been instrumental in encouraging movement away from fossil fuels in the form of uncertainty. They enable the acceleration of decreasing the financial influence of fossil fuel majors in policy decision-making. Even in an "unideal" world, both institutional investors and political figures in public finance have an incredibly important role to play be

leaning into uncertainty and encouraging doubt in the long-term profitability of fossil fuel ventures. Many investors took note of Larry Fink's letter in their own investment decisions, and every press conference and news headline suggesting subsidy changes informs how capital moves on public markets. These subtle indications of pressure and risk shape policymakers choose to prioritize the fossil fuel industry. In consequence, institutional investors and political figures in public finance have the potential to incrementally push public market perspectives to a threshold where the financial health of fossil fuel majors suffers sufficiently to make room for policy change. Individuals with the influence and ability to impact these opinions have a vital responsibility to encourage this change.

However, given it is difficult to predict how and when public market opinion could meet a critical threshold that enables restricted financial health, it is important to consider parallel policy recommendations that effect changes from the ground up. As shown in the German trends of local energy self-sufficiency, the average citizen has the same potential to impact financial health of fossil fuel majors as do individuals with influence over perspectives of uncertainty. Notably, consumer activism and localization of utilities infrastructure demonstrate an incredible opportunity for citizens to impact fossil fuel pricing in the context of utilities and contribute to market-oriented change.

Educating the Public

At the root of environmental policy change and emissions reduction in the United States rests education of the general public and influencing the moral decisions of institutional investors with substantial media or market sway. As aforementioned, influence over large market decisions that could change the competitive relationship between fossil fuel products and

renewable energy products rests in the hands of both the average investor and reputable institutional investors. Therefore, it is imperative to repair the denialism of the American people in the context of climate change science and redefine the priorities of the masses in the United States. This represents the first step towards enabling those with influence to choose to support a change of perspective in favor of moving capital away from fossil fuel majors and to encourage citizens to demonstrate to policymakers that their priorities are in an green economy.

Ideally, this means that, firstly, the U.S. needs to meet a rate of acceptance similar to Germany's 80% of the public believing the humans are a primary driver of climate change in the modern century. Secondly, public media and increased access to and profitability of green investment products needs to encourage institutional investors need to consciously step back from their capital-intensive fossil fuel businesses. Neither of these recommendations is entirely impossible to achieve.

In the case of denialism among American citizens, Non-Governmental Organizations (NGOs), such as National Oceanic and Atmospheric Administration (NOAA) Education and UNICEF, provide a limited-risk, non-partisan source of education and media information that can be disseminated to the members of the public at an early age. Improved access to information regarding climate change regardless of regional placement, political affiliation, and educational background can substantially impact the degree to which the average American recognizes their role in climate change. Further, if educational materials come from non-governmental and non-partisan sources, educational focus can be redirected towards the dissemination of climate change facts exclusively. Unlike in the case of media campaigns stemming from government agencies, such as the EPA, from private entities, or from political organizations, bias can be sufficiently removed to develop a notion of untampered truth that can

be received by the public. The average investor can also, in turn, help change the financial market dynamics supporting fossil fuel producers in their lobbying efforts.

In the case of large institutional investors, education needs to come in the form of role models. As explained in the example of the recent Blackrock decision, where the asset management giant announced its planned divestiture of its thermal coal investment line of business (Fink, n.d.), leaders in the institutional investment space can learn from one another. Notably, the Blackrock letter shows that such investors are choosing to place competitive advantages on hold in favor of perceived investment risk mitigation[3]. Importantly, the decision of large institutional investors to take the first step in the right direction and set an example is supported by changes in both media presentation of climate change in a financial context and in the context of corporate responsibility as well as by increased access to high quality investment opportunities in renewable energy and other sustainable projects. If corporate entities can lean into renewables ventures, encourage participation in ESG portfolios, and utilize the opportunities provide by clean investment instruments such as green bonds, smaller scale institutional investors as well as retail investors are likely to follow. Further, if large institutional investors can partner with NGOs and third-party research institutions, such as Climate Central, to substantiate such investment decisions, it is very probable that other similar institutions will follow suit. In consequence, the weight of capital placement in fossil fuels can be steadily decreased in the political space.

Redefinition of the Economic Problem

[3] Based on a number of reports, Blackrock leadership determined that the regulatory uncertainty associated with continuing to hold its thermal coal positions was too great to justify further harming the climate and taking on potentially indefensible investment risk.

There exists, however, the possibility that education of the public does not result in a market outcome sufficient to prevent fossil fuel giants from influencing decisions related to climate policy. For example, this could occur if the threshold of influence is never met. Additionally, there exists the timeline consideration, where influence of economic and market processes do not create change rapidly enough to prevent the United States from propelling the world towards a 2-degree Celsius temperature increase with catastrophic global consequences. In the likely event that this occurs, the resulting recommendation hinges on the definition of the economic problem and the localization of climate change prevention efforts.

Based on the model of the German trend towards localized grids that support one city or township specifically, this policy recommendation encourages the public to take the economic implications of energy generation out of the hands of the political elite. In essence, American citizens can seek to establish their own local power plants linked to their own local energy grids. These grids can then be used to power the township and neighboring urban and rural areas. At a large scale, this would like force utilities companies to take seriously consumer activism and accordingly seek to change utilities pricing or change energy sourcing in order to keep customers.

German citizens have already taken this concept in stride and have indisputably seen the positive effects of their energy localization further than energy autonomy and contribution to the fight against climate change. In the example of UrStrom.eG, the citizens of the city of Mainz have begun to operate their own set of twelve photovoltaic systems that power 100 4-person homes throughout the city (UrStom, 2019). This has given the citizens of the city control over the regulation of their energy grids and the resulting energy prices, affording each participating citizen substantial autonomy and transparency in their energy sourcing. Further, UrStrom eG

offers 100% pure renewable energy to “private and commercial customers” (UrStom, 2019). This means that Mainz citizens that purchased or contributed to founding shares of the photovoltaic plants can even make a profit from the energy they create, providing an investment opportunity for the average citizen in the renewables space.

While the development of these systems has been to an extent financially supported by government policies in Germany as well, the ability of local governments to build such operations is far from infeasible in the United States. By providing incentives from investment returns to grid autonomy and price regulation, these grassroots efforts by local groups have the potential to uproot large energy grids systems. With sufficient uptake, these localized systems could become the norm, especially in rural areas, and could grow to redefine how energy grids are supplied and managed at the state, and, later, at the federal level.

Notably, the German example demonstrates that pressure from the perspective of consumers can reshape the relationship between utilities and American government structures. While grids have thus far been on a trend of expansion with the rise of supergrids internationally, localizing grid infrastructure and removing power from national utilities companies could decrease the political friction between state and federal policy decision-makers. This would possibly enable a bypass of the policy bottleneck at the federal level and accelerate the transition to a green economy state by state.

--- Conclusion ---

Since the end of the American climate policy heyday in the 1960s, the United States has dealt with perpetual obstacles to prioritizing the transition to a green economy. Firstly, the polarization of the political elite on the issue of climate change has led to the division of the

legislative and to the consequent climate policy development deadlock. Secondly, the status quo of global trade has driven American politicians to prioritize the continued growth and success of industries in which it has had a competitive advantage, such as fossil fuels, as opposed to developing industries where it has a chance of leaning into new technological territory, such as with renewables. This has repeatedly placed the United States on the wrong side of history in international cooperative discussions to mitigate the effects of climate change. Essentially, where other nations commit to changing their economies and take a risk in favor of protecting those in need of assistance, the United States has agreed and then withdrawn, effectively failing in its role of international leadership.

There arises then the question of whether the United States will ever end its cycle of participating in discussion and failing the international community when it comes to climate change policy: can Americans ever set aside policy in favor of helping future generations? While the future of climate change policy remains uncertain, the United States has two opportunities to change the direction of its fate. On the one hand, it has the opportunity to learn from other developed countries, such as Germany, strategies to economically adapt to the changes in markets and trade that will inevitably arise. On the other hand, there exists the possibility for average Americans to influence the series of events that enable or disable the government to make climate policy decisions. Essentially, there are ways to bypass waiting for the political elite to stop breaking its promises to our neighbors and our allies.

The first way is to reverse the attitude of climate change science denial that was instigated in the 1980s and advocate for the spread of knowledge to those that are misinformed, do not have access to information, or simply do not care. At the heart of every policy decision, the policymaker considers its constituents. Thus far, with 4 in 10 Americans not believing the

claim that climate change is man-made according to Yale (Leiserowitz et. al, 2019), policymakers have been able to guarantee that constituents sufficiently disbelieve climate change to justify policy decisions based on public opinion instead of business and trade interests. However, independent efforts to educate the public that sits in that 40% of individuals could tip the scales of policymakers' considerations.

The second way is through the encouraging of language that demonstrates the regulatory risks of continued investment in fossil fuels. Essentially, large asset managers that have influence over the cash flows that give life to large fossil fuel producers need to be repeatedly convinced that they are falling behind the curve. The world is moving on beyond them, and change is imminent. While financial markets are inaccessible to some, the areas in which the average citizen can create change remain the same. American citizens must contribute to this trend of changing times to propel market forwards. Either through the development of localized energy grids and renewable plants to separate renewables markets from the public energy markets, or through the boycotting of investment firms that support fossil fuel businesses, the American public is the entity with the most substantial influence over America's leadership in climate change policy on the international stage.

However, every day unexpected events change the economic and financial market context in which we evaluate the potential for the sides of the policy development inequality to be weighed differently. Notably, recent demand changes related to the COVID-19 epidemic have devastated oil's position on American markets. The BBC's Global News Podcast reports in a April 21st, 2020, episode "US oil prices turn negative as demand dries up", that, on April 20th, "West Texas Intermediate plunged 300%, ending up at a barrel-scraping -$37.00 a barrel" (BBC, n.d.). In the episode, Ben Lefebvre, energy reporter for Politico, explains that due to storage

concerns resulting in changing energy demands, individuals holding WTI Crude futures contracts for May realized that they would not have the sufficient storage space and are now willing to pay individuals to take the oil off their hands. Lefebvre explains that this has encouraged numerous oil producers and fracking companies to go out of business, continuing a trend of smaller oil producers filing for bankruptcy under the media's radar. Most importantly, however, Lefebvre suggests that this event is particularly related to the Trump presidency and re-election considerations, as posited in the policy development framework of this paper. He states that "The oil industry had historically been big backers of Trump, but they've started to cool off," (BBC, n.d.). Notably, he explains that the White House has been talking about helping the oil industry generally, but "they float a lot of ideas that don't get a lot of follow-through," (BBC, n.d.). Perhaps, this represents a glimmer of hope for a change to renewable energy sources, notably with substantial influence from financial markets and likely permanent change in the relationship between fossil fuels and Republican leadership.

Despite the technical focus of this investigation on financial market impacts on renewable energy policy by comparison to German policy development, the conclusion remains relatively simple: every American is responsible for changing the way the United States chooses to respond to international commitments and, luckily, change is already happening.

--- Bibliography ---

Andreasson, Stefan. “Fossil Fuel Divestment Will Increase Carbon Emissions, Not Lower Them – Here's Why.” The Conversation, January 14, 2020. https://theconversation.com/fossil-fuel-divestment-will-increase-carbon-emissions-not-lower-them-heres-why-126392.

Asthana, Anushka, Philip Oltermann, Joshua Kelly, Courtney Yusuf, Axel Kacoutié, Phil Maynard, and Nicole Jackson. “What's behind the Rise of Germany's Far Right? – Podcast.” The Guardian. Guardian News and Media, March 1, 2020. https://www.theguardian.com/news/audio/2020/mar/02/whats-behind-the-rise-of-germanys-far-right.

Baldwin, Elizabeth, Yongyang Cai, and Karlygash Kuralbayeva. “Build Today, Regret Tomorrow? Infrastructure and Climate Policy,” April 12, 2017. https://www.gtap.agecon.purdue.edu/resources/download/8447.pdf.

Baumol, William J., and Wallace E. Oates. Theory of Environmental Policy. New York, NY: Press Syndicate of the University of Cambridge, 1988. http://econdse.org/wp-content/uploads/2014/07/Baumol_Oates_Theory_of_Environmental_Policy_1988-2.pdf.

Blake, Francis S. “The Economic Impacts of Environmental Regulation.” Natural Resources & Environment 5, no. 1 (1990).

Bloomberg. “BI BITID=<1192107_V29.0>= Once Fringe, Fossil-Fuel Divestment Movement Enters Mainstream.” January 14, 2020.

Buchsbaum, Lee. “Rise of Populist New Right Party AfD May Trump Germany's Energiewende.” POWER Magazine, March 17, 2016. https://www.powermag.com/rise-of-populist-new-right-party-afd-may-trump-germanys-energiewende/.

Carbon Market Watch. “Carbon Leakage.” August 29, 2014. https://carbonmarketwatch.org/2014/08/29/carbon-leakage/.

CDP. “2013 Industry Emissions.” CDP Open Data Portal. Accessed February 8, 2020. https://data.cdp.net/Companies/2013-Industry-emissions/jyuv-c6yg.

CFA Institute. “ESG Investing and Analysis.” Accessed February 7, 2020. https://www.cfainstitute.org/en/research/esg-investing.

Chakraborty, Barnini. “Paris Agreement on Climate Change: US Withdraws as Trump Calls It 'Unfair'.” Fox News. FOX News Network, June 1, 2017. https://www.foxnews.com/politics/paris-agreement-on-climate-change-us-withdraws-as-trump-calls-it-unfair.

Chari, V. V., and Lawrence J. Christiano. “The Optimal Extraction of Exhaustible Resources.” Federal Reserve Bank of Minneapolis, December 11, 2014. https://www.minneapolisfed.org/article/2014/the-optimal-extraction-of-exhaustible-resources.

Clark, Duncan. “Why Do Economists Describe Climate Change as a 'Market Failure'?” The Guardian. Guardian News and Media, May 21

Clean Energy Wire. “Germany's Energiewende – The Easy Guide.” February 11, 2019. https://www.cleanenergywire.org/easyguide.

CME Group. “Welcome to NYMEX WTI Light Sweet Crude Oil Futures.” Futures & Options Trading for Risk Management - CME Group. Accessed February 7, 2020. https://www.cmegroup.com/trading/why-futures/welcome-to-nymex-wti-light-sweet-crude-oil-futures.html.

Cojoianu, Theodor and Ascui, Francisco and Clark, Gordon L. and Hoepner, Andreas G. F. and Wojcik, Dariusz, The Economic Geography of Fossil Fuel Divestment, Environmental Policies and Oil and Gas Financing (April 22, 2019). Available at SSRN: https://ssrn.com/abstract=3376183 or http://dx.doi.org/10.2139/ssrn.3376183

Denchak, Melissa. “Paris Climate Agreement: Everything You Need to Know.” NRDC, December 2, 2018. https://www.nrdc.org/stories/paris-climate-agreement-everything-you-need-know.

Eccleston, Charles H. NEPA and Environmental Planning: Tools, Techniques, and Approaches for Practitioners. Boca Raton, FL: CRC Press, 2008.

European Commission. “Carbon Leakage.” Climate Action - European Commission, February 16, 2017. https://ec.europa.eu/clima/policies/ets/allowances/leakage_en.

European Commission. “EU Emissions Trading System (EU ETS).” Climate Action - European Commission, February 16, 2017. https://ec.europa.eu/clima/policies/ets_en.

European Commission. “Germany.” Special Eurobarometer 490. April 2019. https://ec.europa.eu/clima/policies/ets/allowances/leakage_en.

Farber, Daniel A. "Pollution Markets and Social Equity: Analyzing the Fairness of Cap and Trade." Ecology Law Quarterly 39, no. 1 (2012): 1-56. Accessed April 24, 2020. www.jstor.org/stable/24113488.

Feingold, Russell. “Donald Trump Can Unilaterally Withdraw from Treaties Because Congress Abdicated Responsibility.” NBCNews.com. NBCUniversal News Group, May 7, 2018. https://www.nbcnews.com/think/opinion/donald-trump-can-unilaterally-withdraw-treaties-because-congress-abdicated-responsibility-ncna870866.

Fink, Larry. “Larry Fink CEO Letter.” BlackRock. Accessed February 7, 2020. https://www.blackrock.com/corporate/investor-relations/larry-fink-ceo-letter

Fox News. “EPA Moves to Repeal Obama's Clean Power Plan Coal Regs.” Fox News. FOX News Network. October 9, 2017. https://www.foxnews.com/politics/epa-moves-to-repeal-obamas-clean-power-plan-coal-regs.

Galanos, Guillaume Dimitris. “The Hotelling Valuation Principle: Evidence from the Six Super Majors.” RMIT University, October 30, 2012. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2168621.

Gillis, Justin, and Nadja Popovich. “The U.S. Is the Biggest Carbon Polluter in History. It Just Walked Away From the Paris Climate Deal.” The New York Times. The New York Times, June 1, 2017. https://www.nytimes.com/interactive/2017/06/01/climate/us-biggest-carbon-polluter-in-history-will-it-walk-away-from-the-paris-climate-deal.html.

Gleckman, Howard. “Economists Love Carbon Taxes. Voters Don't.” Forbes. Forbes Magazine, December 27, 2018. https://www.forbes.com/sites/howardgleckman/2018/12/27/economists-love-carbon-taxes-voters-dont/#22028fab4338.

Grilli, Gianluca. “Renewable Energy and Willingness to Pay: Evidences from a Meta-Analysis.” Franco Angeli Edizioni, December 12, 2018. https://www.francoangeli.it/riviste/Scheda_Rivista.aspx?IDArticolo=61089&Tipo=ArticoloPDF.

Goldenberg, Suzanne, and Helena Bengtsson. “Oil and Gas Industry Has Pumped Millions into Republican Campaigns.” The Guardian. Guardian News and Media, March 3, 2016. https://www.theguardian.com/us-news/2016/mar/03/oil-and-gas-industry-has-pumped-millions-into-republican-campaigns.

Grover, David, and Benjamin Daniels. “Social Equity Issues in the Distribution of Feed-in Tariff Policy Benefits: A Cross Sectional Analysis from England and Wales Using Spatial Census and Policy Data.” Energy Policy 106 (July 2017): 255–65. https://www.sciencedirect.com/science/article/abs/pii/S0301421517301878.

IGI Global. “What Is German Mittelstand (German SMEs).” Accessed February 7, 2020. https://www.igi-global.com/dictionary/enterprise-system-german-manufacturing-mittelstand/12168.

Irfan, Umair. “The University of California System Is Ending Its Investment in Fossil Fuels.” Vox. Vox, September 18, 2019. https://www.vox.com/2019/9/18/20872112/university-california-divestment-fossil-fuel-climate-change.

IP, Greg. “No, Banks Don’t Hold the Key to Climate Change.” The Wall Street Journal. The Wall Street Journal, January 29, 2020. https://www.wsj.com/articles/no-banks-dont-hold-the-key-to-climate-change-11580299203.

Jacobs, David. "The German Energiewende – History, Targets, Policies and Challenges." Renewable Energy Law and Policy Review 3, no. 4 (2012): 223-33. Accessed April 24, 2020. www.jstor.org/stable/24324660.

Jakob, Michael, Christian Flachsland, Jan Christoph Steckel, and Johannes Urpelainen. Mercator Research Institute on Global Commons and Climate Change, Torgauer Str. 12-15, 10829 Berlin, Germany; Hertie School of Governance, Friedrichstraße 180, 10117 Berlin, Germany; Johns Hopkins School of Advanced International Studies, 1740 Massachusetts Avenue, 20036 Washington, DC, USA., n.d. https://www.mcc-berlin.net/fileadmin/user_upload/Jakob/20190403_Jakob_et_al_Political_Economy_Framework.pdf.

Kenton, Will. "Hotelling's Theory." Investopedia. Investopedia, February 5, 2020. https://www.investopedia.com/terms/h/hotellings-theory.asp.

Krautkraemer, Jeffrey, and Michael Toman. "Fundamental Economics of Depletable Energy Supply", Resources for the Future, November 2003. https://media.rff.org/documents/RFF-DP-03-01.pdf.

Kübler, Knut. "CLIMATE PROTECTION POLICY IN GERMANY: FACING UP TO THE DATA." Energy & Environment 19, no. 2 (2008): 317-24. Accessed April 24, 2020. www.jstor.org/stable/44397202.

League of Conservation Voters. "All Member of Congress Scores." League of Conservation Voters Scorecard, April 27, 2018. https://scorecard.lcv.org/members-of-congress.

League of Conservation Voters. "Methodology." League of Conservation Voters Scorecard, February 20, 2013. https://scorecard.lcv.org/methodology.

Leiserowitz, Anthony, Edward Maibach, Seth Rosenthal, and John Kotcher. "Climate Change in the American Mind". Yale Program on Climate Change Communication, George Mason University Center for Climate Change Communication, 2019. https://climatecommunication.yale.edu/wp-content/uploads/2019/06/Climate_Change_American_Mind_April_2019c.pdf.

Leonard, Jackie. "US oil prices turn negative as demand dries up." BBC World Service Global News Podcast (podcast). April 21, 2020. Accessed April, 24, 2020. https://www.bbc.co.uk/programmes/p08b1kjm

Loy, Frank E. "The United States Policy on the Kyoto Protocol and Climate Change." Natural Resources & Environment 15, no. 3 (1994).

Macabacus. "Capital Structure of an LBO." Accessed February 8, 2020. https://macabacus.com/valuation/lbo/capital-structure.

Marlon, Jennifer, Peter Howe, Matto Mildenberger, Anthony Leiserowitz, and Xinran Wang. "Yale Climate Opinion Maps 2019." Yale Program on Climate Change Communication, September 17, 2019. https://climatecommunication.yale.edu/visualizations-data/ycom-us/.

Martin, Chris, and Kevin Crowley. "Exxon Will Use Wind, Solar to Produce Crude Oil in Texas." Bloomberg.com. Bloomberg, November 28, 2018. https://www.bloomberg.com/news/articles/2018-11-28/oil-giant-exxon-turns-to-wind-solar-for-home-state-operations.

Meiners, Roger, and Bruce Yandle. "COMMON LAW AND THE CONCEIT OF MODERN ENVIRONMENTAL POLICY." The University of Chicago D'Angelo Law Library, 7 Geo. Mason L. Rev., 1999.

Merelli, Annalisa. "It's Not Just Trump. The US Has Always Broken Its Treaties, Pacts and Promises." Quartz. Quartz, May 12, 2018. https://qz.com/1273510/all-the-international-agreements-the-us-has-broken-before-the-iran-deal/.

Milman, Oliver. "Climate Crisis More Politically Polarizing than Abortion for US Voters, Study Finds." The Guardian. Guardian News and Media. May 22, 2019. https://www.theguardian.com/us-news/2019/may/21/climate-crisis-more-politically-polarizing-than-abortion-for-us-voters-study-finds.

Moen, Espen, and Christian Riis. "Policy Reversal." The American Economic Review 100 (June 2010).

Müller, Edda. "DIFFERENCES IN CLIMATE CHANGE POLICY IN GERMANY AND THE UNITED STATES FROM A POLITICAL SCIENCE PERSPECTIVE." Energy & Environment 9, no. 4 (1998): 463-77. Accessed April 24, 2020. www.jstor.org/stable/44396913.

National Environmental Policy Act of 1969, Washington, D.C.

NDC Registry. "USA First Nationally Determined Contribution." United Nations. Accessed December 11, 2019. https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/United States of America First/U.S.A. First NDC Submission.pdf.

NRDC. "What Is the Clean Power Plan?" September 29, 2017. May 29, 2019. https://www.nrdc.org/stories/how-clean-power-plan-works-and-why-it-matters.

O'Brien, James. "Climate and Energy Experts Debate How to Respond to a Warming World." The New York Times. The New York Times, October 7, 2019. https://www.nytimes.com/2019/10/07/business/energy-environment/climate-energy-experts-debate.html.

OpenSecrets.org. "Oil & Gas." Accessed February 8, 2020. https://www.opensecrets.org/industries/indus.php?Ind=E01.

Ott, Hermann E. "Climate Change: An Important Foreign Policy Issue." International Affairs (Royal Institute of International Affairs 1944-) 77, no. 2 (2001): 277-96. Accessed April 24, 2020. www.jstor.org/stable/3025541.

Pan, Yian. “TRUMP UPDATES 2018: Trump's Treatment of International Treaties, Immigrants and Refugees.” Wong Fleming, December 6, 2018. http://www.wongfleming.com/trump-updates-2018-trumps-treatment-of-international-treaties-immigrants-and-refugees/.

Paraskova, Tsvetana. “The U.S. Just Doubled Its Natural Gas Exports.” OilPrice.com, October 30, 2019. https://oilprice.com/Energy/Energy-General/The-US-Just-Doubled-Its-Natural-Gas-Exports.html.

Pines, Lawrence. “Crude Oil: The Commodity.com Guide.” Commodity.com, June 19, 2019. https://commodity.com/energy/oil/.

Plater, Zygmunt J.B. “From the Beginning, a Fundamental Shi of Paradigms: A Theory and Short History of Environmental Law.” Boston College Law School, January 1, 1994.

Rebelo, Sergio, Krusell, Per, Bornstein, Gideon. “What Makes Oil Prices So Volatile?” Kellogg Insight, July 7, 2017. https://insight.kellogg.northwestern.edu/article/what-makes-oil-prices-so-volatile.

Reilly, Amanda, and Kevin Bogardus. “CLIMATE: 7 Years Later, Failed Waxman-Markey Bill Still Makes Waves.” CLIMATE: 7 years later, failed Waxman-Markey bill still makes waves -- Monday, June 27, 2016. Accessed February 8, 2020. https://www.eenews.net/stories/1060039422.

Rich, Nathaniel. Losing Earth: A Recent History. New York: Picador, 2020.

Roberts, David. “Mitch McConnell's ‘Just Say No’ Strategy on the Clean Power Plan Fizzles.” Vox, November 3, 2015. https://www.vox.com/2015/11/3/9665194/states-clean-power-plan-no.

Rovner, Julie. “Timeline: Despite GOP's Failure To Repeal Obamacare, The ACA Has Changed.” Kaiser Health News, April 5, 2018. https://khn.org/news/timeline-roadblocks-to-affordable-care-act-enrollment/.

Rutten, Daan. The Energiewende and Germany’s Industrial Policy. Edited by Deborah Sherwood. The Hague: Clingendael International Energy Programme (CIEP), 2014.

Sawe, Benjamin Elisha. “The Economy Of Germany.” WorldAtlas. WorldAtlas, December 8, 2016. https://www.worldatlas.com/articles/the-economy-of-germany.html.

Scheberle, Denise. Federalism and Environmental Policy: Trust and the Politics of Implementation. 2nd ed. Washington, DC: Georgetown University Press, 2004.

Shumlich, Michael, and Craig A Wilson. “RE-EXAMINING THE HOTELLING VALUATION PRINCIPLE: Empirical Evidence from Canadian Oil and Gas Royalty Trusts.” Edwards School of Business, n.d. http://www.realoptions.org/papers2009/62.pdf.

Silver, Caleb. “The Top 20 Economies in the World.” Investopedia. Investopedia, March 18, 2020. https://www.investopedia.com/insights/worlds-top-economies/.

Tamiotti, Ludivine, Robert Teh, Vesile Kulaçoğlu, Anne Olhoff, Benjamin Simmons, and Hussein Abaza. “Trade and Climate Change.” WTO and UNEP, 2009. https://www.wto.org/english/res_e/booksp_e/trade_climate_change_e.pdf.

The Federal Foreign Office. “The German Energiewende.” Accessed February 8, 2020. http://www.energiewende-global.com/en/.

Tice, Paul H. “Fossil-Fuel Divestment Is Futile.” The Wall Street Journal. Dow Jones & Company, May 29, 2018. https://www.wsj.com/articles/fossil-fuel-divestment-is-futile-1527635953.

UrStrom. “Urstrom EG Bürgerenergiegenossenschaft.” My Website. November 8, 2019. Date Accessed Accessed February 8, 2020. https://www.urstrom.de/.

U.S. Energy Information Administration (EIA). n.d. “Feed-in tariff: A policy tool encouraging deployment of renewable electricity technologies”. Accessed February 8, 2020. https://www.eia.gov/todayinenergy/detail.php?id=11471.

U.S. Energy Information Administration (EIA). “U.S. energy facts explained - consumption and production.” Accessed April 24, 2020. https://www.eia.gov/energyexplained/us-energy-facts/.

U.S. Environmental Protection Agency. “A Guide to Designing and Operating a Cap and Trade Program for Pollution Control.” June 2003. https://www.epa.gov/sites/production/files/2016-03/documents/tools.pdf.

Wehrmann, Benjamin, Julian Wettengel, Benjamin Wehrmann, and Julian Wettengel. “Polls Reveal Citizens' Support for Energiewende.” Clean Energy Wire, October 21, 2019. https://www.cleanenergywire.org/factsheets/polls-reveal-citizens-support-energiewende.

Wilkes, William, and Brian Parkin. “Germany’s Economic Backbone Suffers From Soaring Power Prices.” Bloomberg.com. Bloomberg, September 23, 2018. https://www.bloomberg.com/news/articles/2018-09-24/electricity-power-prices-surge-for-german-mittelstand-merkel.

World Nuclear Association. “Germany's Energiewende.” December 2018. https://www.world-nuclear.org/information-library/energy-and-the-environment/energiewende.aspx.

WMO. “What Is the Conference of Parties of the United Nations Framework Convention on Climate Change?: WMO for Youth.” What is the Conference of Parties of the United Nations

Framework Convention on Climate Change? | WMO for Youth. Accessed December 12, 2019. http://youth.wmo.int/en/content/what-conference-parties-united-nations-framework-convention-climate-change.

--- Appendix ---

Interview Questions:

1. In general, how has investment in renewable energy changed in recent years and how do you see it changing going forward?
2. Can you comment on the sector's perceived maturity?
    1. Are public investments driving/beginning to drive growth in the renewables sector or are energy projects in this space still generally supported by private ventures and private offerings?
    2. How mature is the renewables sector in the American public market, especially by comparison to global public markets?
3. How does the life cycle of renewable energy companies differ from that of other energy companies or utilities companies?
    1. How do such considerations factor into investment decisions in the energy space?
    2. As such, are investments in renewables generally longer term or part of longer-term strategies for institutional investors?
4. How are investment decisions related to the energy sector affected by changes in the utilities, transportation, or industrials sectors?
5. How is the average independent investor exposed to public equities in renewable energy differently from institutional investors?
6. Are equity-based investments driving growth in the renewable energy space or is there potential in debt-based investments as well?
7. What generally drives volatility in renewable energy equities? Are hedging instruments often used in the space?
8. How have changes or suggested changes in federal laws related to emissions regulations affected industry outlook on the renewables sector?
    1. Have such (potential) laws changed perspectives on the long-term potential of fossil fuels?
    2. Have changes in public opinion, particularly in favor of GHG reduction, swayed how investors think about profitability against ESG impact?
9. Are changes in fossil fuel prices and renewables prices the largest drivers of change?

    1. How could potential changes in government subsidy structures and placements affect the impact of price on investment decisions and the health of energy companies?
    2. Is institutional investment research oriented more or less heavily towards changes in relevant commodity pricing by comparison to research in the general growth potential of corporations?
10. How are changes in public opinion and public policy changing the positioning of energy and utilities companies?
    1. How are institutional energy investors considering fuels such as clean coal as opposed to renewables directly?
    2. Are companies that have traditionally been involved in fossil fuels reevaluating their trajectories going forward to include cleaner energy options?
11. How do perspectives on renewable energy investments change depending on the country of impact?
    1. Are there certain nations with federal regulations that make investments more or less risky for institutional investors?
    2. Are there certain countries that allow for greater investment opportunity in renewables or that have a more mature presence in public markets?

Additional Figures:

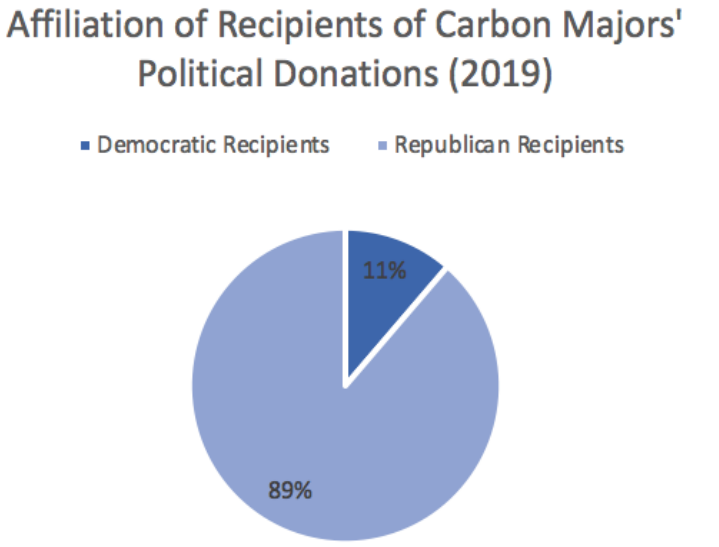


Figure 6: Percentage of Democratic and Republican Donations by Carbon Majors
Source: OpenSecrets.org

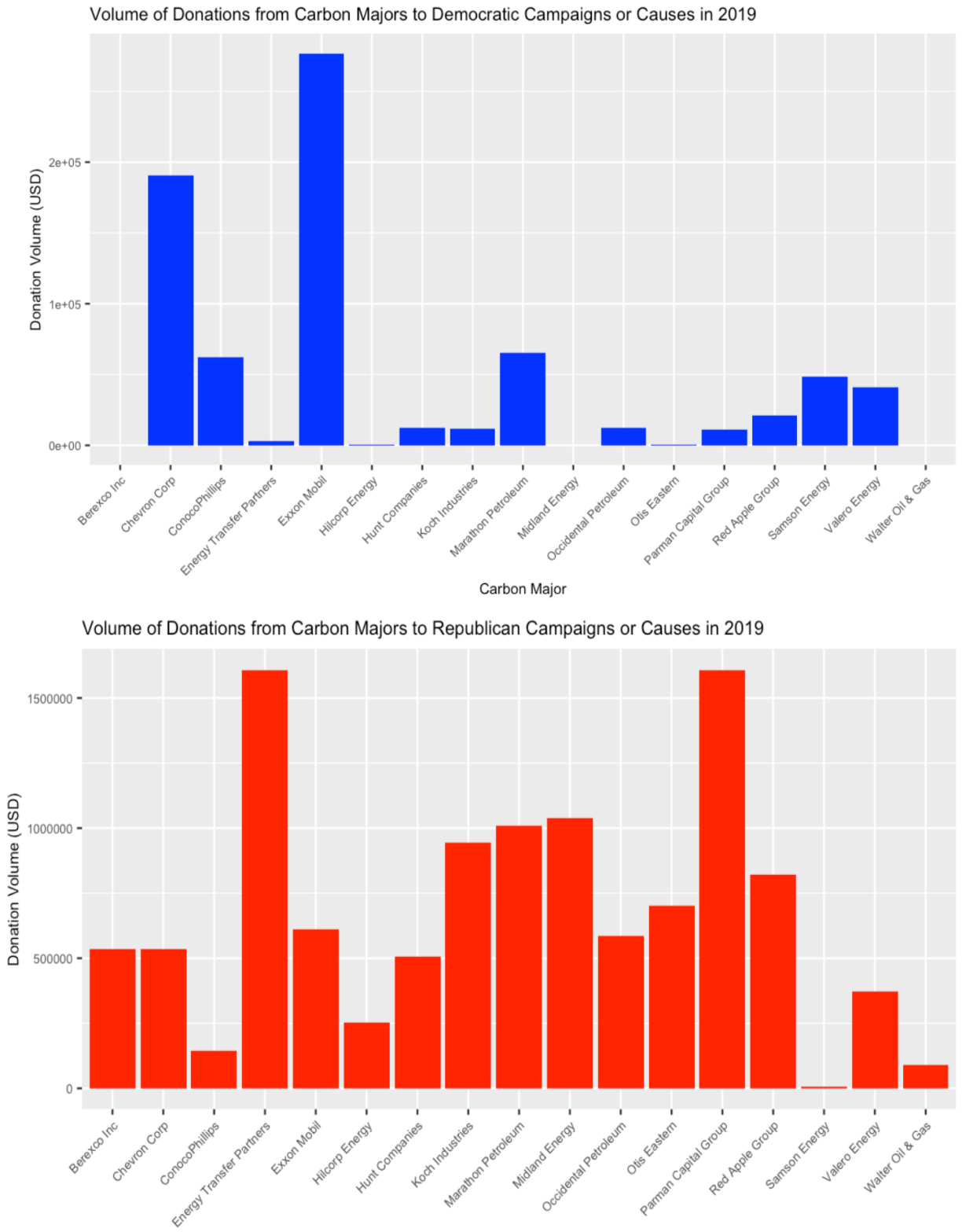


Figure 7: Donation Volumes of Democratic and Republican Donations by Carbon Majors in 2019
Source: OpenSecrets.org

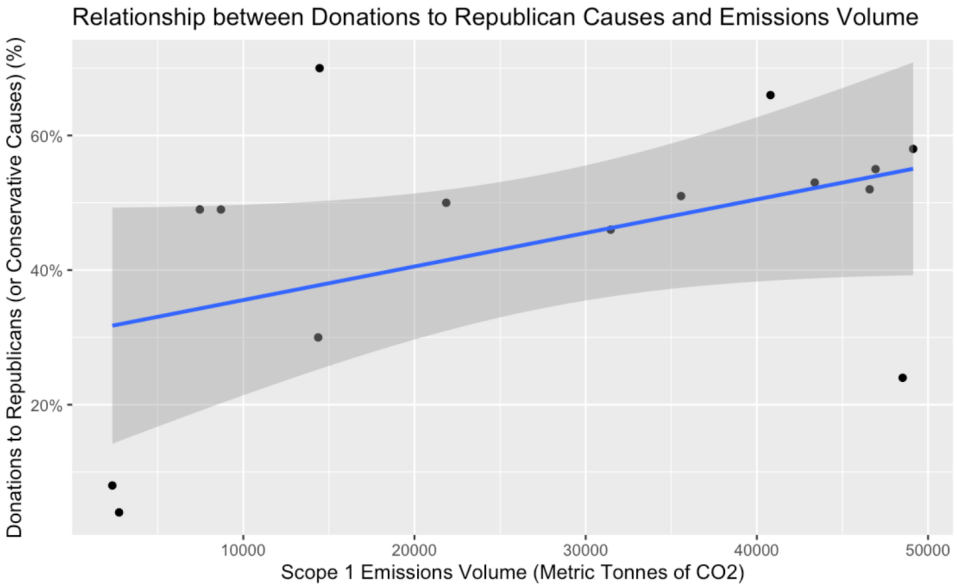


Figure 8: Relationship between Emissions Volume and Percent of Annual Donations to Republican Causes
Source: CDP Open Data Portal and Open Secrets