Predicting the Policy Future: Are Financial Markets Sensitive to the Progress of State-Level Climate Bills?

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Abstract

Environmental policymaking in the United States follows a long and uncertain process, with variability in both the eventual implementation of introduced legislation and its likely impact on firms. Firms are incentivized to predict the policy future, and financial markets are highly sensitive to relevant information. This project aims to identify whether or not national financial markets react to legislative process news, making use of a novel dataset from the National Conference of State Legislatures (NCSL). A state legislative productivity index that enables assessment of legislative progress was constructed out of the NCSL Energy bill tracking database for six key policy areas. For each of these policy areas, a set of relevant national firms were chosen. The initial analysis showed that the volatility and trading volumes of relevant firms did not react to legislative process. To account for alternative explanations, two additional regression analyses were constructed. Examining enacted bills only, and examining utilities specifically (which enabled tighter geographic connection to firms), the volatility and trading volumes did not react to greater legislative productivity. These results suggest that policymakers may have freedom to experiment with new environmental policies without fear of backlash from financial markets.

1. Introduction

The anticipation of a policy change can often be as important as that policy change itself. During the 2022 negotiations for the Inflation Reduction Act, solar stocks fell around 7% when Senator Joe Manchin, the Senate's deciding vote, indicated that he would not support a climate bill and rose around 10% two weeks later, when Senator Manchin changed his mind, and agreed to support a large climate bill (Stevens 2022). Firms need to respond to potential policy changes, because they may benefit from being prepared for them. Because firms need to respond to potential policy changes, investors may make decisions based on the probable impact of those changes.

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In a world of perfect information with no uncertainty, and instant policy implementation, markets would identify the impact of a particular policy on relevant firms, and their respective valuations would immediately shift accordingly. In the real world, however, policymaking is a slow, complex, and uncertain process. At both the federal level, and at the state level, bills must survive a multistage process in order to become law. At each stage, numerous bills die, either by explicitly failing to advance (e.g., failing a vote, being vetoed) or simply by being abandoned. Thus, the fact that a policy has been proposed is no guarantee that it will eventually become law, though for any given policy, the probability of eventual implementation increases after each stage has been cleared.

The domain of environmental policy is particularly interesting. While the range of policies that have been developed is extensive, and the industry has a broad expectation that more aggressive environmental policies may be implemented at some point in the future, like any other policy area, environmental legislation is constrained by the legislative process. Thus, relative to the potential scope of environmental legislating, the amount of actual environmental legislating has been comparatively underwhelming. At the same time, the level of innovation and policy spillover in the domain of environmental policy is quite high, as states often look for another state's policies as a template for their own. Thus, there is a good reason for firms to pay attention to the state-level environmental legislation process.

This project is motivated by a broader desire to understand how policy expectations may shape real-world decisions made by firms, focusing on the impact of governmental environmental policy. Given the level of uncertainty in the legislative process, firms need to be able to form expectations. If firms believe that a policy change would impact them, they will make long-term decisions around this expectation. If policymakers can shift firms' expectations of the policy landscape merely by introducing a bill, they can influence what the firms decide to do, even before this bill becomes reality. One might expect that the strength of this announcement effect—the phenomenon by which news, often of policy changes by governments, impacts financial markets (Waud 1970)—may also depend on how far a bill advances through the necessary stages of the legislative process. Markets should be sensitive to the process. When markets learn that a bill is likely to become a law, perhaps after clearing a pivotal stage of the legislative process, the valuation of the firms that would be impacted by that bill should shift accordingly. By contrast, if a bill is proposed but is unlikely to become a law (e.g., most bills during the early stages of the legislative process), those firms' valuations may not shift.

This research aims to assess whether changes in the expected probability of a particular policy landscape impact markets, and looks for a generalized pattern with a wide range of state-level environmental policies. To test this idea, I quantified the degree of legislative productivity across the country, measured by the number of bills clearing the different stages of the policymaking process (such as being introduced, passing a legislative chamber, or being signed by the governor), and weighted by the importance of the state (with larger states like California weighted more heavily than smaller states like Connecticut). This analysis examines whether this legislative productivity has an impact on industry expectations. These industry expectations were measured by two financial metrics: stock price volatility and trading volumes. For this purpose, I use a large collection of state-level climate policy announcements, collected from the National Conference of State Legislatures (NCSL) Energy database, and financial datasets taken from Compustat, a data source from Wharton Research Data Services (WRDS).

The main finding of this paper is that, contrary to expectations, there is essentially no statistically significant relationship between the degree of legislative productivity and the volatility and trading volumes of national publicly traded companies. This null pattern holds up across a number of sectors, stages of the legislative process, and against multiple alternative settings that address plausible concerns with the initial methodology. This lack of significant results across all policy/industry areas may be due to the fact that only a small number of bills are actually consequential enough to be noticed, legislative developments are priced in at the time of elections, and there is an inadequate level of matching between firms and bills in my study. I propose some ways in which each of these explanations can be empirically tested in future research, and discuss the potential policy implications of these findings.

2. Literature Review

The Efficient Markets Hypothesis (EMH) holds that asset prices in financial markets quickly respond to the latest information that is relevant to them (Fama 1970). Policy change is an important kind of information that broadly impacts asset prices. Empirically, the idea that policy announcements impact asset prices is well-established across a wide range of policy areas. For example, financial markets typically become less volatile than usual in advance of scheduled monetary policy announcements, and when unexpected monetary policy announcements are made the markets become considerably more volatile than usual (Bonfim 2003). In a completely different domain, the announcement of an airport expansion project lead to a significant decline in housing values in close proximity to the airport, even before construction was scheduled to begin (Donald and Winkler 2006). Clearly, announcement effects are widespread, and these findings illustrate that different components of the financial system react to relevant news in a very timely fashion, even before said policy changes are actually implemented.

Focusing on climate issues in particular, there is substantial evidence supporting the idea that financial markets are highly sensitive to environmental events as well as changes in environmental policy. Investors are highly sensitive to climate-related news, hedging portfolios according to present environmental disasters as they inform their expectations of future patterns of environmental disasters (Hong, Karolyi, and Scheinkman 2020). On climate policy more specifically, asset prices have been shown to account for the cost of transition risk (i.e., the cost of transitioning off of greenhouse gas-intensive technologies) driven by policy action (Giglio, Kelly, and Stroebel 2021). Thus, investors are broadly aware of the potential for climate-related changes to the economy, both in the form of direct climate risks (e.g., disaster-related disruption) and transition risks (e.g., policy-related disruption). This means that the behavior of asset prices can be used as a measure of industry expectations of climate-related events, including climate policy changes in particular.

There is also evidence that investors closely monitor specific and ongoing policy changes. In relation to a German emissions fee designed to discourage the use of coal, investors considered the possibility of a stranded asset (i.e., an asset that experiences unanticipated depreciation, in this case because of policy) but that they also expected to be compensated by the government if that asset indeed gets stranded (Sen and Schickfus 2020). This finding suggests that financial markets are fairly sophisticated in their reaction to ongoing policy changes, and supports the idea that asset prices can be a measure of changes in industry expectations even based on very narrow climate policy developments.

While it is clear that asset prices capture expectations of how ongoing policy changes may impact firms, it is less clear how asset prices would respond to news suggestive of uncertain future changes in policy. Given that investors closely monitor the evolving policy landscape, it would be reasonable to expect that beyond the actual policy, even uncertain policy announcements (e.g., news about the introduction of a particular bill) may have a measurable impact on financial markets, but predicting the extent to which a legislative process announcement of a state climate bill would impact the expected profitability of a particular firm presents a number of empirical and conceptual challenges.

The question about how markets react to announcements about the legislative process of environmental policies is complex for three reasons. First, going through multiple stages of the legislative process, different policies have different probabilities of actually passing. The extent of the market reaction to political news has broadly been shown to depend on the degree of uncertainty of a given policy passing in a political system. It has been proposed that, in general, whether or not the news of a particular policy change elicits a response from the market depends on whether this policy change was expected by the market (Bernhard and Leblang 2006).

Second, numerous policy developments occur in the backdrop of other kinds of larger political uncertainty at both the federal and state level, which in itself could have a large impact on financial markets. Previous research has shown that because Congress historically tends to flip more often in midterm elections than presidential elections, equity prices in financial markets are more volatile following midterm elections compared to presidential elections (Chan, Fong, and Marsh 2021). More broadly, political events that are indicative of future policy changes are frequently taking place, making it more difficult to disentangle the longer-term implications of any given event.

Third, particularly with climate policy, state legislatures tend to borrow policy ideas from other states and this influence occurs in an asymmetric way. That is, states tend to follow the lead of surrounding (and more powerful) states with more stringent climate policies, but not the other way around—states do not seem to copy other states with less stringent climate policies (Fredriksson and Millimet 2002). This suggests that the climate policies that one state decides to pass (particularly a very large state) can frequently have national implications, potentially impacting a broad range of national firms.

Given these complexities, it is unclear how findings based on specific environmental policy cases could generalize to the general set of environmental legislation more broadly. Thus, the main goal of my thesis is to examine whether there is a generalized effect of legislative process news on expectations of future policy change. Whereas most research looking at the market response to uncertain ongoing policy production has looked at specific cases, my project aims to answer a more general question. This project uses a national dataset including the impact of a wide range of policies across 14 years, which includes a diverse set of political and societal backdrops, and combines it with financial data from national corporations. Moreover, this project aims to estimate the differential impact of policies at the different stages of the legislative process, representing the varied degree of implementation uncertainty of policies at different points in their legislative process.

I address this question using the NCSL dataset, which until now has mainly been used in the fields of political science and public policy. For example, NCSL data has been used in a broad overview of the state of environmental health legislation to show that the passage rates of different pieces of legislation significantly differ by state (Farquhar and Ellis 2013). It has also been used to show that the legislative effectiveness of a particular bill's sponsor substantially predicts the likelihood that the bill will eventually pass and to explore, using a natural language processing technique, which policy components predict passage (Park and Hassairi 2021).

The large sample size of announcements (roughly 400,000) and policies (roughly 50,000) from between 2008 and 2022 contained in the NCSL database enables a test for the existence of legislative process announcement effects within any given category. I also use investor behavior and the volatility of asset prices as a measure of industry expectations because of the extensive literature (Hong, Karolyi, and Scheinkman 2020; Giglio, Kelly, and Stroebel 2021), showing their validity as indirect measures of industry expectations of the future.

This project contributes to the literature in three main ways. First, it tests whether and how climate legislative process announcement affects financial markets, and whether the markets are sensitive to the degree of uncertainty that changes as bills advance in the legislatures. Second, it makes use of the NCSL database, which has not been examined in the context of climate finance. Third, the finding that state-level climate bill announcement effects do not appear to be detectable in this setting has potentially important implications for environmental policy decisions.

3. Data and Methodology

3.1. Data

This project makes use of the NCSL Energy State Bill Tracking Database, a comprehensive repository of all state-level bills that govern the production, transmission, and use of energy. To obtain this database, Python was used to scrape the entirety of the contents of the database onto a .txt file, and then transform this text file into a spreadsheet format. Each bill in the database is categorized by NCSL into topics, which I use as an indirect proxy for the contents of each of these bills. By virtue of being included in this database, and being assigned a set of topics, a bill has been thoroughly vetted as environmentally relevant and closely connected to the assigned topics.

At the policy level, each policy has been categorized into a number of policy areas, which are not mutually exclusive (the average policy is assigned to approximately 1.54 areas). Out of the 53,067 unique bills in the tracker, 49,479 have been assigned to a policy area; the remaining 3,588 were not assigned. As can be seen below in Table 1, some policies are proper subsets of the others (e.g., Fossil is partially decomposed into Hydraulic Fracturing—denoted Fracturing, Coal, and Natural Gas—denoted Natural), whereas others are separate categories (such as Utility and Transportation).

Sector	Number of Bills
Adaptation	654
Jobs	1215
Efficiency	10918
Utility	4140
Transportation	9500
Security	4365
Grid	2389
Capture	394
Fossil	9509
Fracturing	1334
Coal	1077
Natural	5225
Renewable	20544
Wind	2327
Solar	5257
Nuclear	2112
Hydrogen	368
Associated	160
Total	53067

Table 1: Number of Bills by Sector, All Years

Of the bills in the dataset, the vast majority do not end up being enacted. As can be seen below in Table 2, most of the bills introduced (not all of the total bills in the dataset have an identifiable introduction date, and are subsequently dropped) do not ever make it past the committee stages, and a substantial number fail at each subsequent stage of the process. Bills that are not taken up for a vote die at the end of the legislative session. About one-half of all bills that are introduced end up being heard in at least one house committee and in at least one senate committee.

Stage	Number of Bills
Introduced	49929
Heard in at least one House Committee	22252
Heard in at least one Senate Committee	24962
Passed House	11510
Passed Senate	11343
Passed Both Chambers	8868
Signed by Executive	7488
Vetoed by Executive	686

Table 2: Number of Announcements by Stage, All Years

The database is geographically dispersed, as seen in Appendix 1. It is perhaps worth noting that the five states with the most bills (NY, NJ, MA, CA, HI) are all controlled by the Democratic Party, signaling that Democratic controlled states may engage in more environmental policymaking.

Across the entire database, the number of bills introduced per year is generally increasing over time, as can be seen below in Figure 1, and vary substantially according to seasonality, as can be seen below in Figure 2.

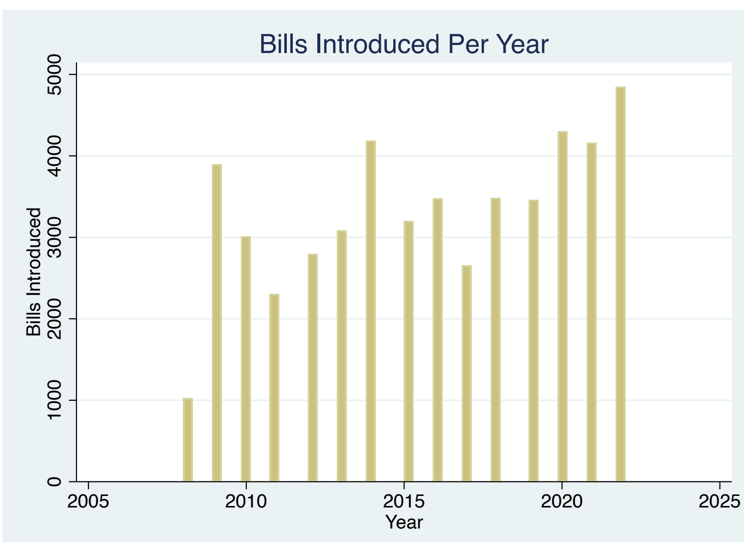

Figure 1: Yearly Bills, All Sectors

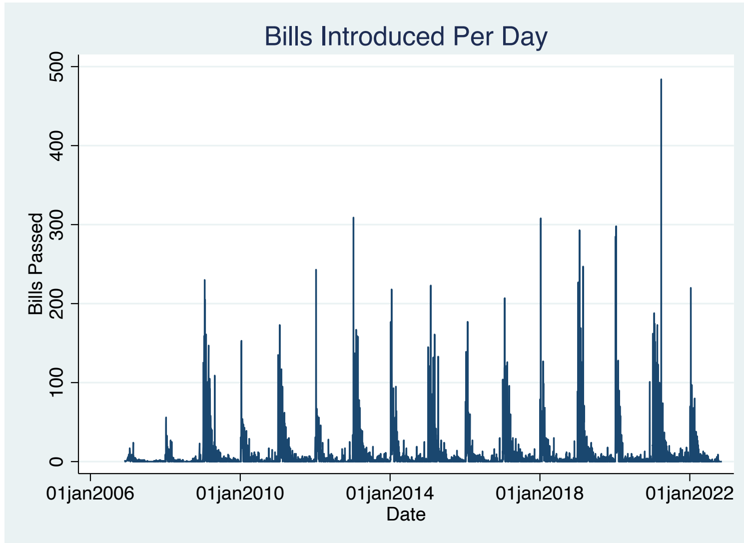

Figure 2: Yearly Bills, All Sectors

To try to answer the question of whether or not an announcement effect exists and is measurable, the main challenge is adequately matching policies to firms. In particular, given how many potentially relevant events to a particular company are occurring, one might conceptualize a distance between a particular policy and a particular firm. For example, a bill that directly impacts a particular firm or industry (e.g., a subsidy for the solar energy industry) would have a very close proximity to that particular industry. That same bill would have moderate proximity to some related/competing industries (e.g., the fossil fuel industry) and very little proximity to others (e.g., the classical music performance industry). Given this context, the process of matching bills in the NCSL database to publicly traded corporations is central to this project.

To match the bills with firms, I created a shared sector classification system in which the bills and stocks were sorted into six industry categories (Fossil Fuels, Natural Gas, Coal, Renewables, Transportation, and Utilities). The NCSL sorts all of the bills in the database into topics, which neatly corresponded to these industry categories. Figures 3–5 show the number of announcements in each sector per month, the number of announcements in each sector per year, and the number of bills in each sector per year, respectively.

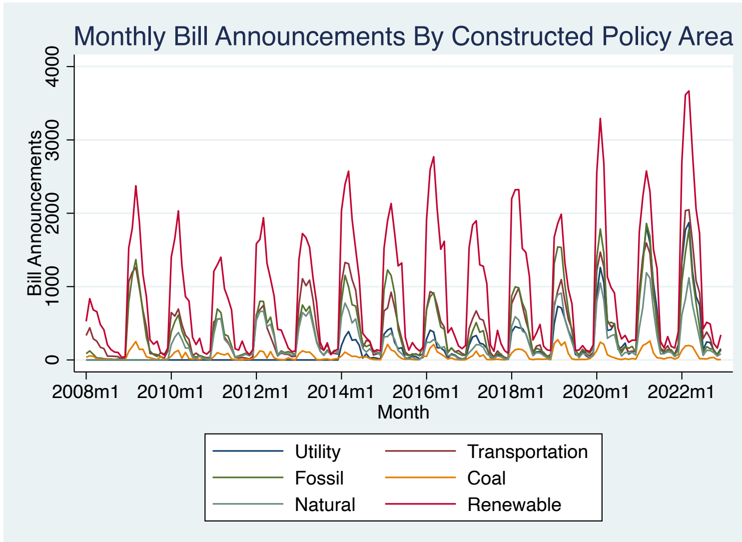

Figure 3: Monthly Bill Announcements by Sector

As can be seen above in Figure 3, the sector-specific seasonal trends mirror the broader trends. Looking across all sectors individually, seasonality is consistent across all six sectors, with a peak in the earlier part of the year around March. In numerous states, the legislature only meets part-time, often just in the first half of the year. Figures 4 (bill announcements) and 5 (bills), below, are on the annual level and show broader trends that are more difficult to spot.

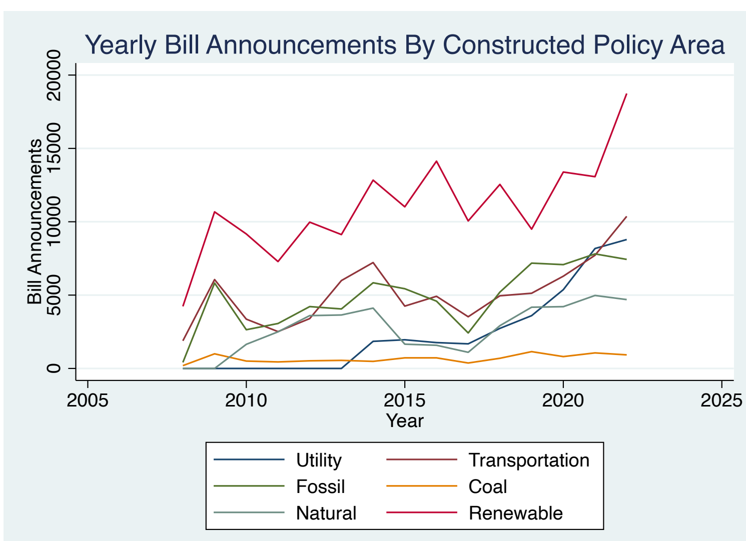

Figure 4: Yearly Bill Announcements by Sector

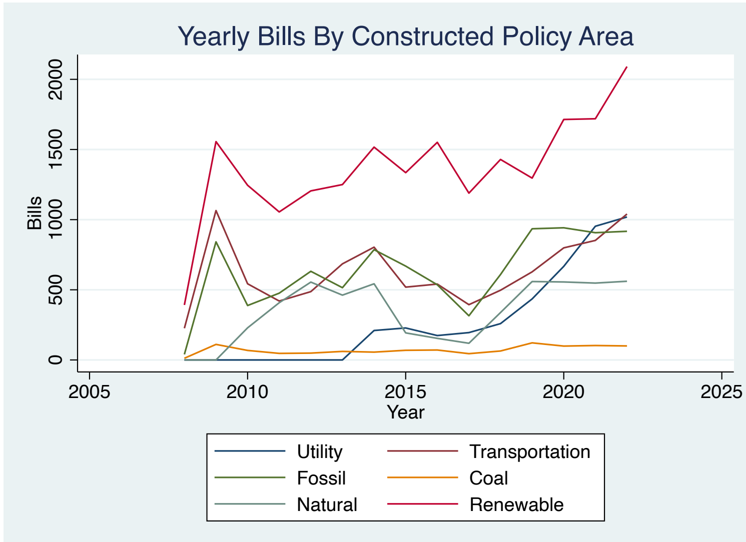

Figure 5: Yearly Bills by Sector

Five of the policy areas—all except for utility bills—appear in the database from 2008 until 2022 (the most recent year in the dataset). As with the database in general, in the policy areas that I designated there is a consistent increase in legislative productivity over time, and the number of bills is very strongly related to the number of announcements.

To match firms into these categories, I used the Global Industry Classification Standard (GICS), a well-established categorization system that breaks publicly traded companies into 158 sub-industries, and has been empirically validated as being a better classification scheme at identifying co-movements in stock prices (Bhojraj, Lee, and Oler 2003). Table 3, below, outlines the categories that I selected for each of the six policy areas above as well as the number of firms included in the sector-specific index.

Sector	**GICS Industry**	**GICS Code**	**Firms**
Fossil	Oil, Gas, & Consumable Fuels	101020	895
Coal	Coal & Consumable Fuels	10102050	68
Natural	Integrated Oil & Gas	10102010	12
Renewable	Renewable Electricity	55105020	30
Utility	Utilities	5510	246
Transportation	Transportation; Automobiles & Components	2030 and 2510	362

Table 3: Sector and Firm Correspondence

The bill announcements are also broken into categories that correspond to the different stages of the legislative process. These categories, as briefly described in the introduction, include being introduced, being heard in a house committee, being heard in a senate committee, passing the state house, passing the state senate, and being signed or vetoed by the governor. As with the larger set of bill announcements, a large percentage of the bills in all sectors die at each of the stages, and ultimately a small fraction of bills introduced ultimately end up being implemented, as can be seen below in Table 4.

Sector	**Fossil**	**Coal**	**Natural**	**Renewable**	**Utility**	**Transport**
Introduced	8808	963	4882	19359	3889	8850
Senate Committee	6065	897	3236	11175	2313	5483
House Committee	6026	734	3395	12423	2613	5740
Passed House	2183	325	1222	4349	973	2082
Passed Senate	2129	320	1180	4343	928	2058
Signed by Gov	1438	218	841	2913	691	1392
Vetoed by Gov	86	17	47	274	51	125

Table 4: Announcements by Sector/Stage, All Years

Using the categorization processes above, I constructed two sets of time series variables: the legislative productivity index, a measure of bill announcements, and the financial markets indices, which are constructed from the financial variables. The legislative productivity index is reminiscent of the Climate Change News Index, a time series index that measures the salience of climate change with the general public, with higher values of the index being associated with a higher salience of climate change (Engle 2020).

3.1.1. Creation of Time Series Variables

The main predictor variable in this project is the legislative productivity index. Here, legislative productivity refers to the number of bills clearing the different stages of the legislative process. To operationalize legislative productivity, which will later be referred to in the econometric setup by X_t^{is}, I first created a set of state-level subseries. To create each of these subseries, I added up the number of announcements in each sector-stage-state-month, thus creating a different monthly sub-series for each sector-stage-state. I then multiplied each state's subseries by this state's population divided by the population of California (as the most populous state) and added them to create a national index for each sector-stage combination. Thus, bills were aggregated across all 50 states, with states smaller than California being weighted less in proportion to their populations. Bills were weighted by population as a proxy for the magnitude of their impact on national companies. When aggregating across all states, adjusting for expected impact is necessary because the market should not be expected to respond equally to a bill from a very large, economically important state (e.g., California) as to a bill from a very small state (e.g., Wyoming).

As a simple example, assume that there are two states (e.g., California and New York), and that the population of California in 2020 was double that of New York. If there were five Fossil Fuel bills introduced in California and four Fossil Fuel bills introduced in New York in February 2020, the February 2020 value of the legislative productivity index would be seven ($7 = 1 \times 5 + 0.5 \times 4$).

As an example below, we see the legislative productivity indices for the fossil fuel sector visualized below in Figure 6. The equivalent visualizations for all other sectors are included in Appendix 2. In this figure, we see that, while all of the stages are seasonal, the peaks of each stage occur roughly sequentially corresponding to where in the process the stage occurs (e.g., introduction has the earliest peak, being signed by the governor has the latest peak).

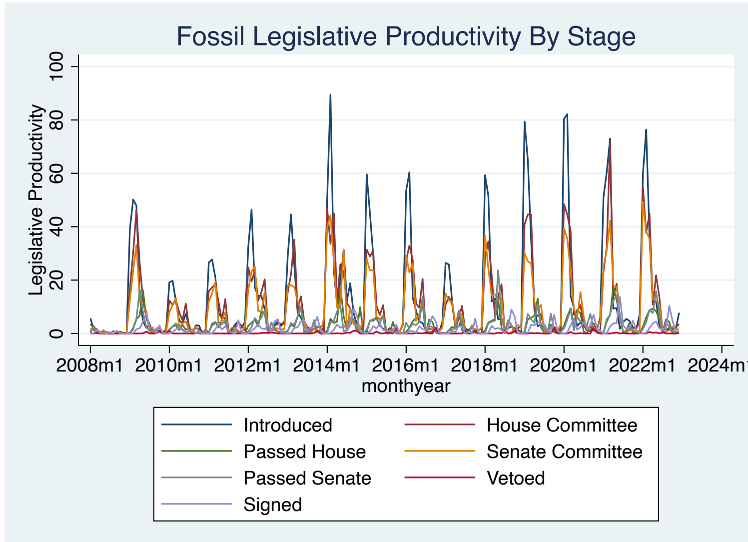

Figure 6: Fossil Fuels Legislative Productivity by Stage

Two financial metrics were constructed using the Compustat CapitalIQ North America Security Daily data: the volatility index and the trading volumes index. To construct the volatility index, I first calculated the daily returns of each individual stock within each company bucket, using the equation below.

$$R_t^i = \ln P_t^i - \ln P_{t-1}^i$$

Here, R corresponds to the return and P corresponds to the daily closing price. These values are indexed by firm i and by day t. With daily returns calculated for each firm, I then computed the standard deviation of the return across the month, generating a monthly series for each firm. I then averaged this firm volatility metric across all firms to get an industry-specific volatility index, weighting by the firm's market capitalization.

The industry-specific trading volumes index was constructed by taking the daily ratio of the number of shares transacted and the total number of shares outstanding, and averaging across the firms in the industry and the days in the month, again weighted by market capitalization of the firm.

For the financial variables metrics for the sector-specific index, I also constructed a corresponding metric using the S&P500 stock components, a set of 500 large companies drawn from all sectors of the economy. These market metrics were designed to be used as a control, and this analysis used many variants of the basic econometric setup detailed in the following section.

To summarize, for each of the five sectors (the original six minus Utilities, which were analyzed separately), I constructed a monthly measure of legislative productivity for each stage of the legislative process using sector-relevant bills, a monthly measure of stock market volatility using firms in that sector, and a measure of trading volumes using firms in that sector. Below, in Table 5, are the summary statistics of these indices, with count denoting the number of months for which the sector-index is defined.

	count	mean	sd	min	max
Fossil Introduced	181	12.86969	19.80206	0	89.48319
Fossil House Committee	181	10.67205	13.66102	0	71.31278
Fossil Passed House	181	2.952386	3.493761	0	17.4745
Fossil Senate Committee	181	8.865303	11.00828	0	49.41183
Fossil Passed Senate	181	2.889138	3.631524	0	23.68667
Fossil Vetoed	181	.1560614	.3760317	0	2
Fossil Signed	181	1.890485	2.236086	0	13.69444
Fossil Sector Volume	183	.0076867	.0019916	.0048807	.0161591
Fossil Sector Volatility	183	.0227403	.0120857	.009754	.1062484
Coal Introduced	175	1.090114	2.000385	0	12.13124
Coal House Committee	175	1.150848	1.514854	0	5.888185
Coal Passed House	175	.3465471	.5282456	0	2.627339
Coal Senate Committee	175	.9242142	1.475034	0	8.897995
Coal Passed Senate	175	.3544495	.5930245	0	3.460069
Coal Vetoed	175	.0233331	.1209804	0	1
Coal Signed	175	.242167	.3367039	0	1.323697
Coal Sector Volume	183	.0163719	.0092946	.0039141	.0523152
Coal Sector Volatility	183	.0384185	.0297088	.0160808	.3350799
Natural Introduced	156	8.81362	12.8669	0	69.16116
Natural House Committee	156	7.168493	8.909313	0	46.35248
Natural Passed House	156	2.078726	2.430846	0	13.24504
Natural Senate Committee	156	6.237031	7.610872	0	35.36118
Natural Passed Senate	156	2.037874	2.643581	0	18.4443

Natural Vetoed	156	.0855499	.2240208	0	1
Natural Signed	156	1.406398	1.740347	0	9.002033
Natural Sector Volume	159	.0045531	.0019081	.0023436	.0136412
Natural Sector Volatility	159	.0148926	.0091656	.0036447	.0874667
Renewable Introduced	181	26.54977	40.33314	0	184.2073
Renewable House Committee	181	21.26736	25.87822	0	142.82
Renewable Passed House	181	6.522309	7.811829	0	42.03496
Renewable Senate Committee	181	18.21253	21.67227	0	130.2135
Renewable Passed Senate	181	6.456288	6.970699	0	42.56415
Renewable Vetoed	181	.4420333	1.004109	0	7
Renewable Signed	181	4.048781	4.962551	0	38.58353
Renewable Sector Volume	183	.0058748	.0028372	.0011384	.0163421
Renewable Sector Volatility	183	.0381344	.0516733	.0086762	.4907233
Utility Introduced	109	9.889528	19.80964	0	105.155
Utility House Committee	109	7.904413	13.57037	0	95.7819
Utility Passed House	109	2.692647	3.663685	0	17.90551
Utility Senate Committee	109	7.015801	11.30167	0	59.44711
Utility Passed Senate	109	2.589258	3.821744	0	19.80575
Utility Vetoed	109	.1857353	.5492623	0	3
Utility Signed	109	1.761615	3.039963	0	20.58353
Utility Sector Volume	111	.005855	.0009353	.0042581	.0105049
Utility Sector Volatility	111	.0141383	.0074247	.006545	.0748372
Transportation Introduced	181	13.01838	21.89663	0	126.042
Transportation House Committee	181	11.24883	15.05582	0	69.55037
Transportation Passed House	181	3.663771	5.066177	0	32.34546
Transportation Senate Committee	181	8.882478	11.09721	0	57.29697
Transportation Passed Senate	181	3.491286	4.580402	0	28.97542
Transportation Vetoed	181	.2493486	.5858542	0	4
Transportation Signed	181	2.360806	3.519885	0	25
Transportation Sector Volume	183	.0135152	.0057855	.0067628	.0361885
Transportation Sector Volatility	183	.0253667	.0143429	.0113642	.1178532

Table 5: Legislative Productivity Index, Volatility, and Trading Volumes Summary Statistics, All Sectors

3.2. Methodology

The empirical approach I adopted is designed to test whether state legislatures' legislative productivity has a relationship with stock market volatility and trading. If my hypothesis that markets are responsive to higher legislative productivity holds, months in which state legislatures are more productive should see higher volatility and trading volumes. To test this, I use the econometric specification described below, using the two sets of time series variables—the legislative productivity indices and the financial markets indices—as constructed above.

Each regression corresponds to one of the five specified sectors (Fossil Fuels, Coal, Natural Gas, Renewable Energy, and Transportation), and seven legislative stages (Introduction, State House Committee, Passing State House, State Senate Committee, Passing State Senate, Signing by Governor, Veto by Governor). Because of their geographic nature, Utility bills/firms were analyzed using an alternative specification. The motivation for running separate sector-specific regressions is that most bills only impact a specific sector, and thus only a small set of companies would be expected to be impacted by bills in any given policy area. In the results section, I present three analyses: the basic specification below, the basic specification below using only enacted bills, and the utility panel which uses a separate but related specification.

The basic econometric specification that I use is as follows:

$$R_t^s = \beta_0 + \beta_1 R_t^m + \alpha^{is} X_t^{is} + \text{Month Fixed Effects} + \varepsilon$$

Here, R_t^s refers to the financial metric (either trading volumes or market volatility) of the sector s specific stock in month t. R_t^m refers to the metric of the overall market in month t, and it was included as a way of controlling for external market conditions. Controlling for the volatility/trading volumes of the overall market is important because a substantial portion of volatility is typically driven by exogenous conditions. Empirically, tangentially related sectors tend to send ripples to each others' stock prices, and shocks to the price of oil transmit to many sectors of the stock market (Kilian and Park 2009), additionally motivating the inclusion of a control for broader market conditions.

In this specification, X_{it}^s is the legislative productivity index. Here, i refers to the legislative stage (one of bill introduction, passing the state house, passing the state senate, house committee action, senate committee action, being signed by the governor, and being vetoed by the governor). As in the financial markets indices, sectors are identified by s, the month is indicated by t.

In principle, in order to conclude that the announcement effects are statistically significant, I would need to see that the α coefficient term is statistically significantly different from zero. Because certain sectors do not appear in the database before a certain year, I exclude all years from before the first bill announcement in a given sector. The slow nature of the legislative process makes it unlikely that reverse causality would be a driver of any potential estimated effect; a negligible portion of the state-level legislation that would enter into this database is likely to have occurred in response to short-term shocks that would cause an increase in volatility/trading volumes.

Trading volumes and volatility were chosen as measures that would be responsive even given the heterogeneity of bills and firms in the set. In the set of fossil fuel companies, a specific bill may help certain fossil fuel companies at the expense of others. Thus, if returns had been chosen as an outcome variable, the effect of a given bill would frequently cancel out across all of the firms in the sample. In contrast, any market response to the advancement of a particular bill would necessarily involve abnormally large trading activity, and should in principle increase the volatility of that firm's stock value in that particular month. Empirically, trading volumes and volatility are positively correlated (Chen, Firth, and Rui 2001). To the extent that these two separately constructed measures yield similar findings, they provide convergent validity.

While this analysis could, in principle, be run using a wide variety of time intervals, there are two relevant factors that motivated the selection of the monthly time interval. First, the market reaction to news cannot be assumed to be the same for every bill. Empirically, there is quite a lot of variability in the speed at which stock markets respond to news, depending on the nature of the news, such as whether it is beneficial or detrimental to a firm (Chan 2003). Second, as the length of each time period gets longer, the theoretical impact of any given bill gets smaller, meaning that shorter time periods would be more likely to show an effect, if it exists. Thus, a monthly time window was chosen to balance these two considerations.

The basic methodology outlined above has two obvious vulnerabilities, and thus two additional analyses were run.

First, because only 15% of the bills introduced were ultimately enacted, the vast majority of bills introduced and a large percentage of the bills that passed a legislative chamber may have been predictably doomed. The regression specification to address this issue is identical to the basic specification, with the sole exception that X_t^{is} is replaced by an alternate measure, constructed identically, using only the bills that were ultimately enacted.

Second, because this study investigates the link between state-level legislation and national firms, an obvious concern is that the vast majority of the bills are insufficiently relevant to any of the national firms in the stock portfolios. Utilities provide a novel setting because they are frequently publicly traded corporations that are tied to a particular location. Utilities are generally shareholder-owned, meaning that financial performance data are easily obtainable, and the fact that utilities are generally tightly regulated by the states in which they operate means that utilities are potentially a setting in which, if an effect exists to be measured, it would be found. This analysis uses a panel that tests the relationship between Utility legislation in a particular state and the trading volumes/volatility of the utilities that operate in that particular state. The specification for this analysis is given below:

$$R_{t\ \text{State}}^{i\ \text{Utilities}} = \beta_0 + \beta_1 R_t^m + \alpha^{i\ \text{Utilities}} X_{t\ \text{State}}^{i\ \text{Utilities}} + \text{Month Fixed Effects} + \varepsilon$$

As with the analysis above, i denotes the stage and t denotes time, in months.

4. Results

In this section, I present the results of the six regressions outlined in the methodology section. The first two are the basic regression structure outlined above; of these two, the first uses the volatility metric, and the second uses the trading volumes metric. The remaining pairs use the same ordering: volatility first, trading volumes second. The second pair of regressions use an identical structure to the first two, but uses the alternative legislative productivity index that keeps only bills that were ultimately enacted. The third and final pair of regressions presents the results of the state-matched utility panel. For the purpose of this section, only the Fossil Fuels sector regressions are discussed; all four other sectors are included in Appendix 2, though the interpretations are extremely comparable.

Across these analyses, I repeatedly get null results for the estimated announcement effect, for nearly all combinations of state, stage, and policy area, and for both the volume and volatility metrics I constructed. In principle, since volatility and trading volumes are both measures of financial market response, sector-stage combinations that return a significant coefficient on one metric but not the other are more plausibly explained as being spurious rather than meaningful. To the extent that certain legislative productivity index coefficients are occasionally statistically significantly different from zero, it being the result of random chance is more plausible than it being indicative of some broader phenomenon.

In Tables 6 and 7 below, I present the result of the basic regression. For both volatility and volume, the total market volatility is an extremely significant predictor of the fossil fuel index's volume and volatility. However, none of the announcement effects appear to significantly predict the index volatility/trading volumes when adjusting for the overall market's performance during that month.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Market Volatility	1.148***	1.147***	1.148***	1.146***	1.147***	1.158***	1.155***
	(16.61)	(16.54)	(16.70)	(16.62)	(16.58)	(16.93)	(16.64)
Introduced	0.0000356						
	(0.68)						
House Committee		0.0000168					
		(0.24)					
Passed House			0.000351				
			(1.48)				
Senate Committee				0.000102			
				(1.16)			
Passed Senate					0.0000584		
					(0.28)		
Vetoed						0.00426*	
						(2.19)	
Signed							0.000329
							(1.00)
Constant	-0.00156	-0.000385	-0.000317	-0.00237	-0.00000640	-0.000436	-0.000106
	(-0.47)	(-0.13)	(-0.14)	(-0.76)	(-0.00)	(-0.19)	(-0.05)
Month effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	180	180	180	180	180	180	180

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6: Announcement Effect of Fossil Bills on Fossil Firm Return Volatility

The regression specification here was designed to test if, when adjusting for seasonal effects and the volatility in the financial markets, fossil fuel stocks are more volatile in months in which there is higher state legislative productivity. Recalling the descriptive statistics presented in Table 5, the average month saw a Fossil Fuel volatility measure of 0.0227403, meaning that the standard deviation of the return of the market capitalization-weighted average fossil fuel firm was around 2.27%. In comparison, the largest estimated effect of any particular announcement was that for the extent of vetoes, which taken at face value would imply that an additional veto in California (equivalently two vetoes in New York, four in North Carolina, or ten in Oregon) would on average increase the volatility of the fossil fuel sector by an additional 0.426 percentage points (around a 19% increase). Given that there is no corresponding effect of a veto on fossil fuel trading volumes, this estimate should probably not be taken at face value. The other estimated effects are almost negligible compared to the average amount of volatility.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Market Volumes	0.707***	0.703***	0.709***	0.719***	0.701***	0.699***	0.704***
	(13.88)	(13.87)	(13.89)	(14.13)	(13.72)	(13.61)	(13.55)
Introduced	0.0000136						
	(1.43)						
House Committee		0.0000163					
		(1.28)					
Passed House			0.0000652				
			(1.48)				
Senate Committee				0.0000367*			
				(2.27)			
Passed Senate					0.0000263		
					(0.68)		
Vetoed						0.000121	
						(0.33)	
Signed							0.0000431
							(0.70)
Constant	0.00149*	0.00170*	0.00202***	0.00112	0.00213***	0.00216***	0.00212***
	(2.02)	(2.53)	(3.61)	(1.55)	(3.81)	(3.88)	(3.80)
Month effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	180	180	180	180	180	180	180

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7: Announcement Effect of Fossil Bills on Fossil Firm Trading Volumes

The analogous regression using trading volumes instead of volatility tells a similar story. Whereas the market capitalization-weighted average firm sees a daily average trading volume of 0.769% across a typical month, the most statistically significant estimated announcement effect—in this case for senate committee action—is 0.00367 percentage points (less than a 0.5% increase in trading volume) per additional state senate committee event. Without a corresponding effect on the volatility metric, this statistical significance is best interpreted as being spurious.

The most plausible explanation for this lack of significant results is that, given that only 15% of the bills that are introduced are ultimately enacted, the vast majority of legislative action on bills that are forseeably doomed would not be meaningful. This was the motivation for the second set of analyses, which are featured in Tables 8 and 9 below. I present the result of the same basic structure, but in this case only actions on bills that were ultimately enacted are included—hence the lack of a veto estimate. For both volatility and volume, the total market volatility is an extremely significant predictor of the fossil fuel index's volume and volatility. However, none of the announcement effects appear to significantly predict the index volatility/trading volumes when adjusting for the overall market's performance during that month.

	(1)	(2)	(3)	(4)	(5)	(6)
Market Volatility	1.082***	1.085***	1.082***	1.082***	1.081***	1.085***
	(13.78)	(13.80)	(13.86)	(13.78)	(13.78)	(13.89)
Introduced	-0.00000351					
	(-0.01)					
House Committee		-0.000142				
		(-0.49)				
Passed House			0.000428			
			(1.26)			
Senate Committee				0.0000449		
				(0.15)		
Passed Senate					0.000146	
					(0.53)	
Signed						0.000440
						(1.32)
Constant	0.00130	0.00176	0.00101	0.00107	0.00117	0.00120
	(0.42)	(0.67)	(0.42)	(0.38)	(0.48)	(0.49)
Month effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	177	177	177	177	177	177

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8: Announcement Effect of Enacted Fossil Bills on Fossil Firm Return Volatility

Despite addressing one of the main weaknesses with the initial set of analyses, the regressions shown in Tables 8 and 9 yield similarly null results. Here, the estimated effects of legislative productivity are extremely small, and statistically indistinguishable from zero. As with the initial analyses, overall market conditions are an extremely significant predictor of fossil fuel volatility and trading volumes. There are numerous causal relationships that would explain this relationship, and that this pattern is extremely consistent across the different sectors suggests that there is validity in the methods used to construct these financial variables.

	(1)	(2)	(3)	(4)	(5)	(6)
Market Volumes	0.658***	0.658***	0.664***	0.668***	0.660***	0.664***
	(11.93)	(12.01)	(11.98)	(12.00)	(11.94)	(12.04)
Introduced	0.0000234					
	(0.48)					
House Committee		0.0000354				
		(0.68)				
Passed House			0.0000583			
			(0.93)			
Senate Committee				0.0000638		
				(1.13)		
Passed Senate					0.0000324	
					(0.63)	
Signed						0.0000636
						(1.04)
Constant	0.00234**	0.00237***	0.00242***	0.00213**	0.00246***	0.00246***
	(3.32)	(3.77)	(4.14)	(3.13)	(4.21)	(4.26)
Month effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	177	177	177	177	177	177

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9: Announcement Effect of Enacted Fossil Bills on Fossil Firm Trading Volumes

A second alternative explanation for the lack of a statistically significant relationship between state-level legislative productivity and the volatility and trading volumes of policy-relevant firms is that, as all of the corporations in the financial dataset are national corporations, an average bill in any given state has an extremely minuscule impact on the firm. Tables 10 and 11 feature the following analysis in which I constructed a panel of state utility bills and the utilities that operate in the corresponding states. This analysis aimed to ameliorate this concern with the original methodology.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Market Volatility	0.953***	0.952***	0.958***	0.955***	0.964***	0.956***	0.958***
	(8.12)	(8.11)	(8.16)	(8.13)	(8.19)	(8.15)	(8.15)
Introduced	0.000132						
	(0.62)						
House Committee		0.000109					
		(0.39)					
Passed House			-0.000277				
			(-0.36)				
Senate Committee				-0.00000224			
				(-0.01)			
Passed Senate					-0.000603		
					(-0.77)		
Vetoed						-0.00112	
						(-0.22)	
Signed							-0.000276
							(-0.30)
Constant	0.0114**	0.0118**	0.0121***	0.0121**	0.0120**	0.0121***	0.0121***
	(2.95)	(3.12)	(3.32)	(3.20)	(3.29)	(3.32)	(3.30)
Month effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1527	1527	1527	1527	1527	1527	1527

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 10: State-Matched Utilities Panel, Return Volatility

Despite featuring a much tighter connection between bills and their respective firms, this panel yielded null results as well. As with the previous analyses, the performance of the S&P 500 market index strongly predicts volatility and the level of trading volume in the state-level utility indices, but the extent of the legislative progress does not.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Market Volatility	0.953***	0.952***	0.958***	0.955***	0.964***	0.956***	0.958***
	(8.12)	(8.11)	(8.16)	(8.13)	(8.19)	(8.15)	(8.15)
Introduced	0.000132						
	(0.62)						
House Committee		0.000109					
		(0.39)					
Passed House			-0.000277				
			(-0.36)				
Senate Committee				-0.00000224			
				(-0.01)			
Passed Senate					-0.000603		
					(-0.77)		
Vetoed						-0.00112	
						(-0.22)	
Signed							-0.000276
							(-0.30)
Constant	0.0114**	0.0118**	0.0121***	0.0121**	0.0120**	0.0121***	0.0121***
	(2.95)	(3.12)	(3.32)	(3.20)	(3.29)	(3.32)	(3.30)
Month effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1527	1527	1527	1527	1527	1527	1527

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 11: State-Matched Utilities Panel, Trading Volumes

Through the original analysis and two alternative approaches designed to address some potential issues with the original methodology, and across the other sectors not included in this section, the general pattern is extremely consistent. Higher legislative productivity in a specific sector does not appear to be systematically associated with abnormal volatility or trading volumes in relevant publicly traded firms. The fact that none of the stages of the legislative process—even those at the very end of the process—seem to elicit a market response, is very consequential. This surprising result points to additional questions that warrant further consideration.

5. Discussion/Conclusion

Using a variety of specifications, financial markets do not appear to be responsive to state legislative activity. This pattern was consistent across numerous sectors, with two distinct but related financial metrics, and for all of the legislative stages included in the analysis.

This pattern of null results is consistent in two additional analyses that were included to allay a few concerns with the original methodology. One concern was that the market may not respond to proposed bills because the vast majority of the bills introduced are not ultimately enacted. To address this concern, the same analysis was repeated keeping only announcements associated with the bills that were ultimately enacted. This analysis produced similarly null results. Another concern was that the null results may have been the consequence of insufficiently close matching between bills and firms (i.e., since the analyses matched state-level bills with national firms). Thus, a panel was constructed in which state-level utilities were matched with bills in their corresponding states, and this analysis yielded similarly null results.

Taken together, these results raise a strong possibility that there is no statistically meaningful relationship between the productivity of state legislatures, and the expected profitability of national publicly traded companies. There are three possibilities that would explain this lack of relationship, and they present potential avenues for future work.

First, the vast majority of legislative activity is potentially largely inconsequential, and only a small number of idiosyncratic bills are actually important enough to impact markets. A very large percentage of bills that are introduced at the state level are too specific and narrow to have a measurable impact on national financial markets. A large percentage of the bills included in the database, for example, are small budgetary changes that have a minor impact on their respective sectors that are included in a much larger omnibus budget bill. Such a measure would not register as a meaningful policy change for the sectors that they are coded under.

Future analysis could consider systematically coding the expected scope/scale of bills and examine whether the expected impact of a bill should predict abnormal market activity. An alternative potential approach would be to measure the abnormal return for each event day, examine whether some bills are systematically associated with an abnormal return, and distill a set of characteristics shared by the important bills in the database. Then, bills may be categorized based on the characteristics for their expected impact.

Second, although the bills and firms were sorted, the bills in the database and the firms in the financial indices were very heterogeneous. Because of this, the link between bills and firms may have been insufficiently tight for an effect to be measured. To address this concern, future research could analyze the text of the bills (which appears in the NCSL database) in conjunction with a more sophisticated computational technique (e.g., Natural Language Processing). If the set of bills can be further partitioned based on the contents of the policies they contain, it would be easier to match bills and firms more closely according to relevance.

Third, the legislative process and its outcomes are often expected. Every so often, a massively consequential omnibus bill (e.g., the Inflation Reduction Act of 2022) will be introduced, passed, and enacted, and every stage of the legislative process will be unexpected and thus, may move the market. However, numerous state-level bills contain routine policy changes that, ex-ante, the market can easily predict will survive through the legislative process. For example, in states that consistently see unified control by one party or another, a bill that is introduced by a member of the majority party leadership may be extremely likely to pass, and this is generally understood by everyone who watches the legislative process. Additionally, it may also be the case that uncertainty is resolved in other, more informal, events that are not formal legislative steps (as assessed in the present dataset). In the case of the Inflation Reduction Act example, cited at the beginning of the Introduction, Senator Joe Manchin's surprise announcements would not have coincided with any formal legislative steps, and following his announcements very little uncertainty remained. If firms indeed are closely monitoring the legislative process, they may also be highly sensitive to these informal events. Given that these analyses focus solely on the formal steps of the legislative process, the current dataset could not incorporate these independent occurrences.

The present project found that financial markets were not responsive to state-level legislative progress (including even the enactment of state bills) in the period between 2008 and 2022. Given the limitations and unanswered questions in the project, this finding is not conclusive. Nevertheless, these results raise the possibility that, at least in the domain of environmental policies, policymaking process announcement effects may not exist or at least, may be weaker than previously observed when looking for a generalized pattern of the relationship rather than a case-based analysis. If this possibility is supported by future research, there are perhaps some insights for policymakers to take away. If financial markets do not respond to legislative progress of environmental policies on average, legislators may be partially insulated from the negative financial consequences of the policies they promote. More new policy ideas could be tested at the state level without instantaneous financial backlash from changes to national industry expectations. This knowledge could give legislators the freedom to test innovative climate policies at the state level. If legislators use this freedom wisely, they could help to create a more environmentally sustainable world.

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Appendix 1 Number of Bills and Announcements by State

State	# of Bills	# of Announcements	Announcements Per Bill
AK	582	4421	7.59622
AL	264	1732	6.560606
AR	246	2150	8.739838
AZ	508	5428	10.68504
CA	3221	51648	16.03477
CO	424	4950	11.67453
CT	769	6611	8.596879
DE	149	1150	7.718121
FL	815	11942	14.65276
Federal	92	1156	12.56522
GA	461	2384	5.171367
HI	2989	38955	13.03279
IA	1081	5143	4.757632
ID	118	765	6.483051
IL	1998	24377	12.2007
IN	371	2395	6.455525
KS	424	2671	6.299528
KY	406	3235	7.96798
LA	344	3381	9.828488
MA	3534	20083	5.682796
MD	1035	8466	8.17971
ME	1366	12702	9.298682
MI	1056	4233	4.008523
MN	2433	9616	3.952322
MO	746	5624	7.538874
MS	516	3063	5.936047
MT	912	9812	10.75877
NC	747	8049	10.7751
ND	291	3004	10.32302
NE	500	3319	6.638
NH	916	10960	11.96507
NJ	3748	14017	3.739861
NM	567	3786	6.677248
NV	289	2407	8.32872
NY	5694	22887	4.019494
OH	421	3003	7.133017
OK	862	6140	7.12297
OR	794	8241	10.37909
PA	1529	7755	5.071942
RI	1197	10598	8.853801
SC	530	2672	5.04151

SD	154	1273	8.266233
TN	569	4084	7.177505
TX	1176	9330	7.933673
UT	349	5382	15.4212
VA	1535	14745	9.605864
VT	789	4661	5.907478
WA	1424	16264	11.42135
WI	366	2861	7.81694
WV	809	4132	5.10754
WY	267	1977	7.404494

Table 12: Number of Bills/Announcements by State, All Years

Appendix 2 Monthly Legislative Productivity By Stage

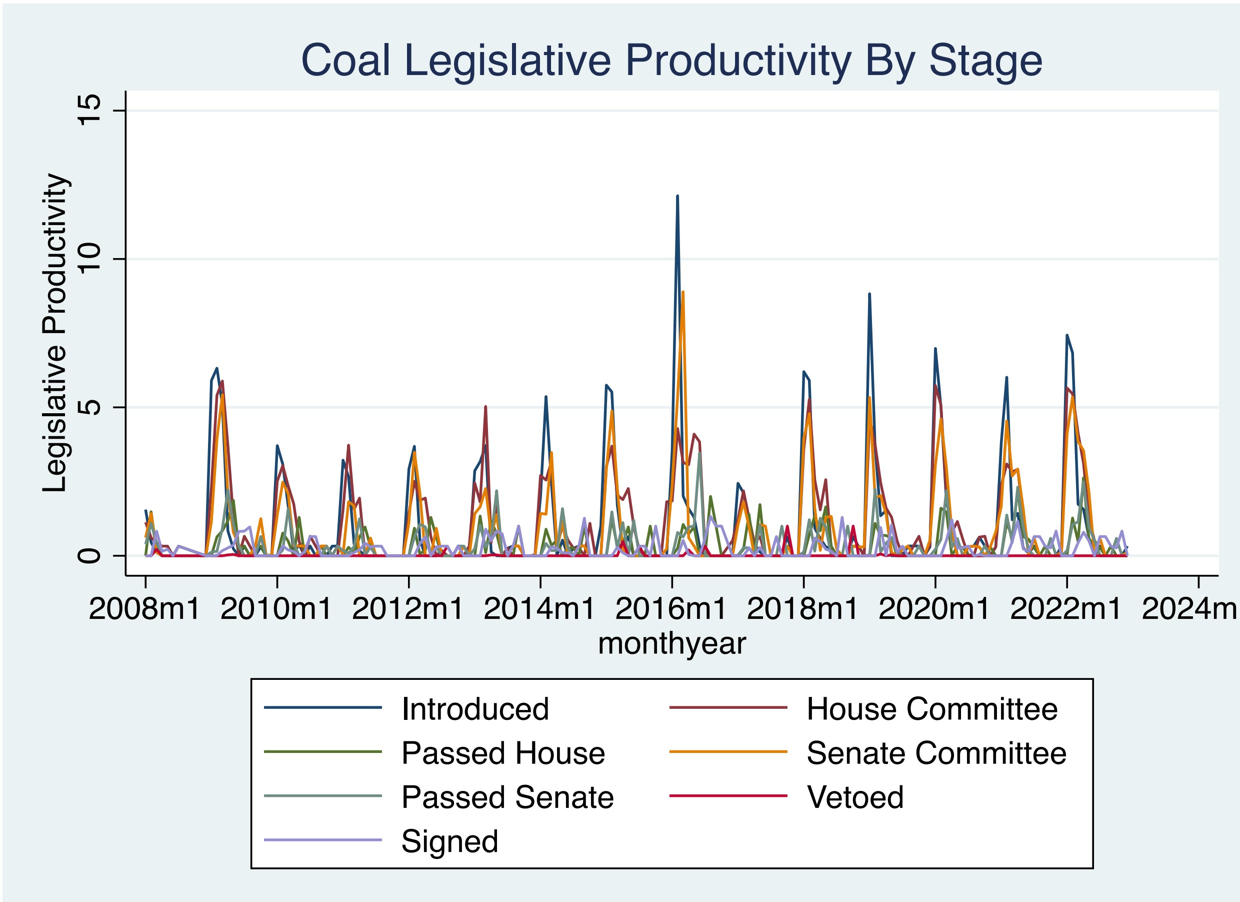

Figure 7: Coal Legislative Productivity by Stage

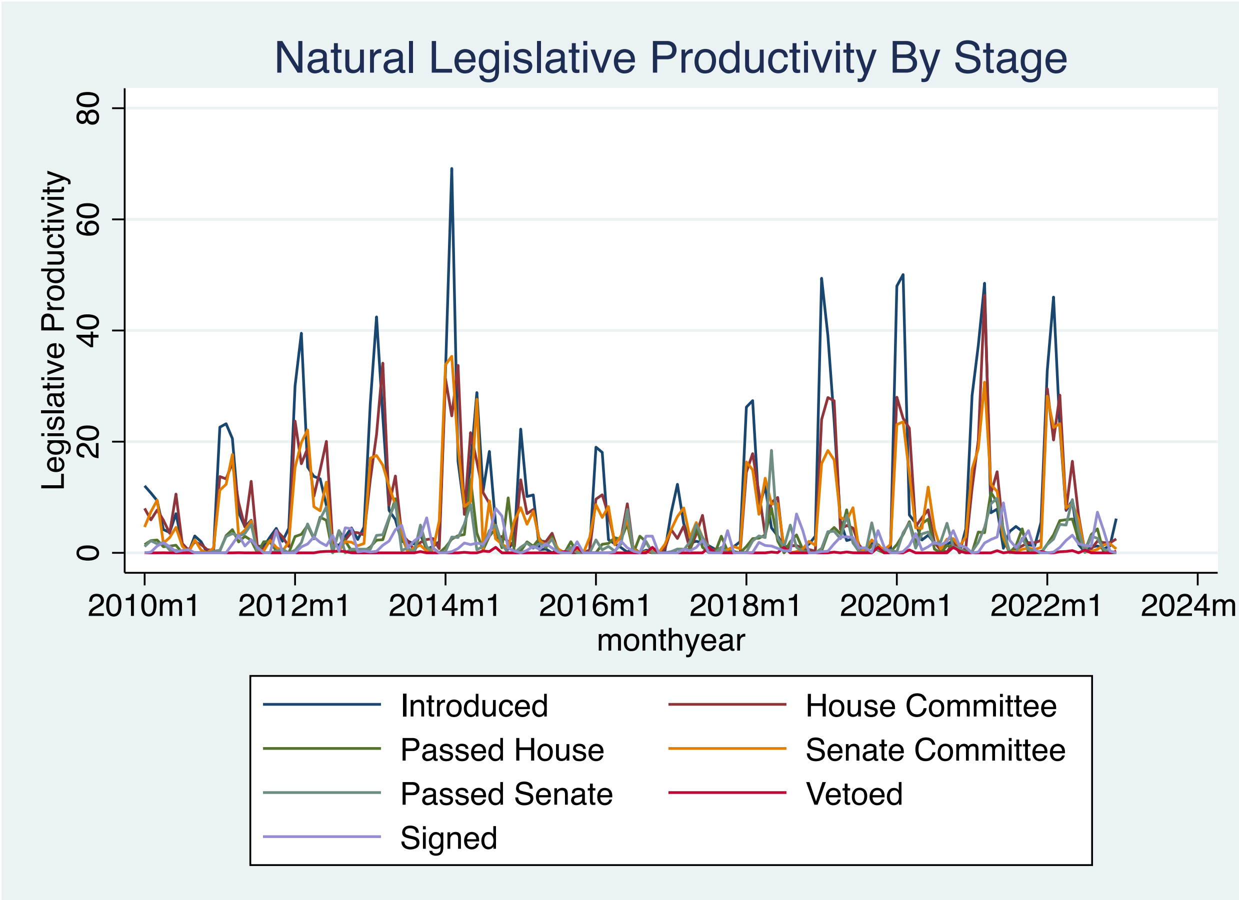

Figure 8: Natural Gas Legislative Productivity by Stage

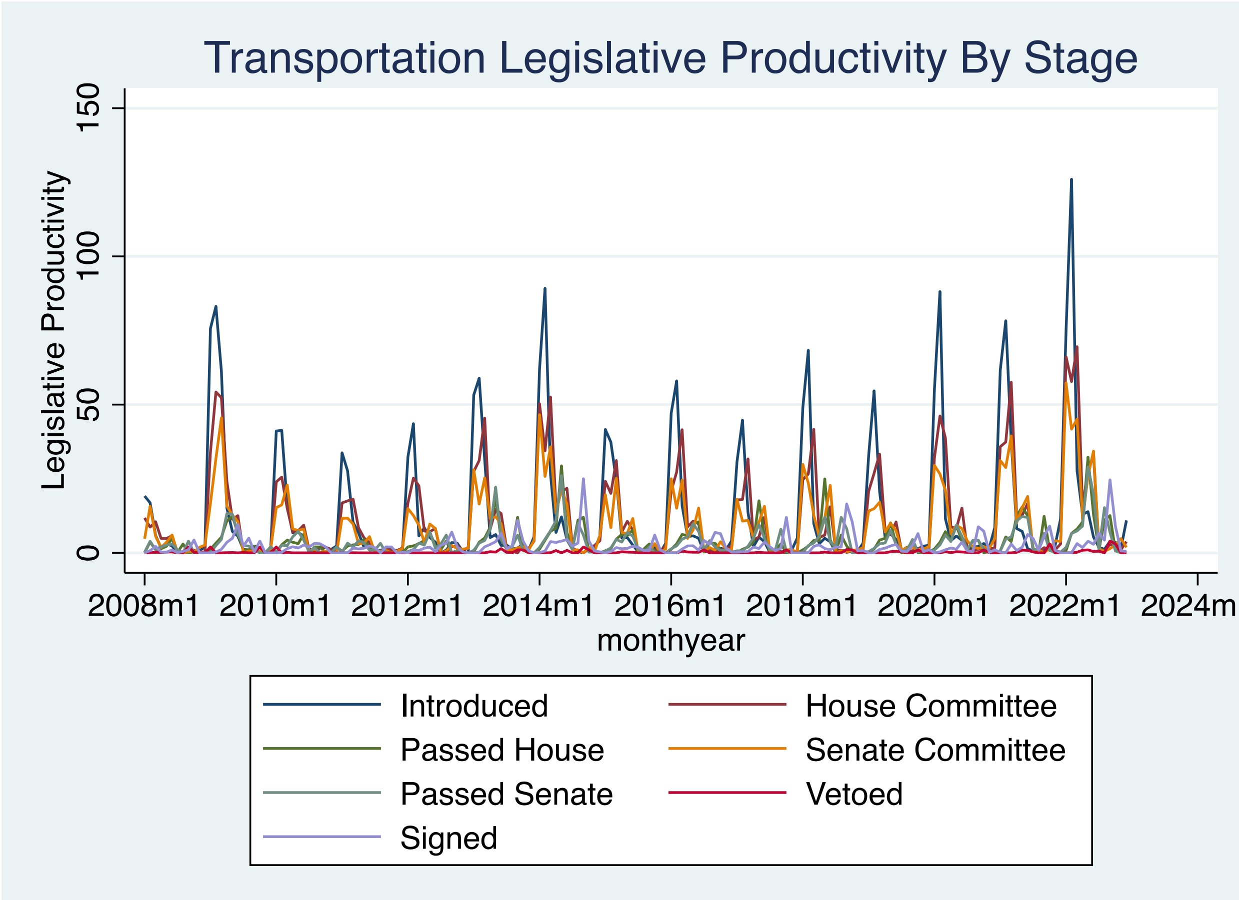

Figure 9: Transportation Legislative Productivity by Stage

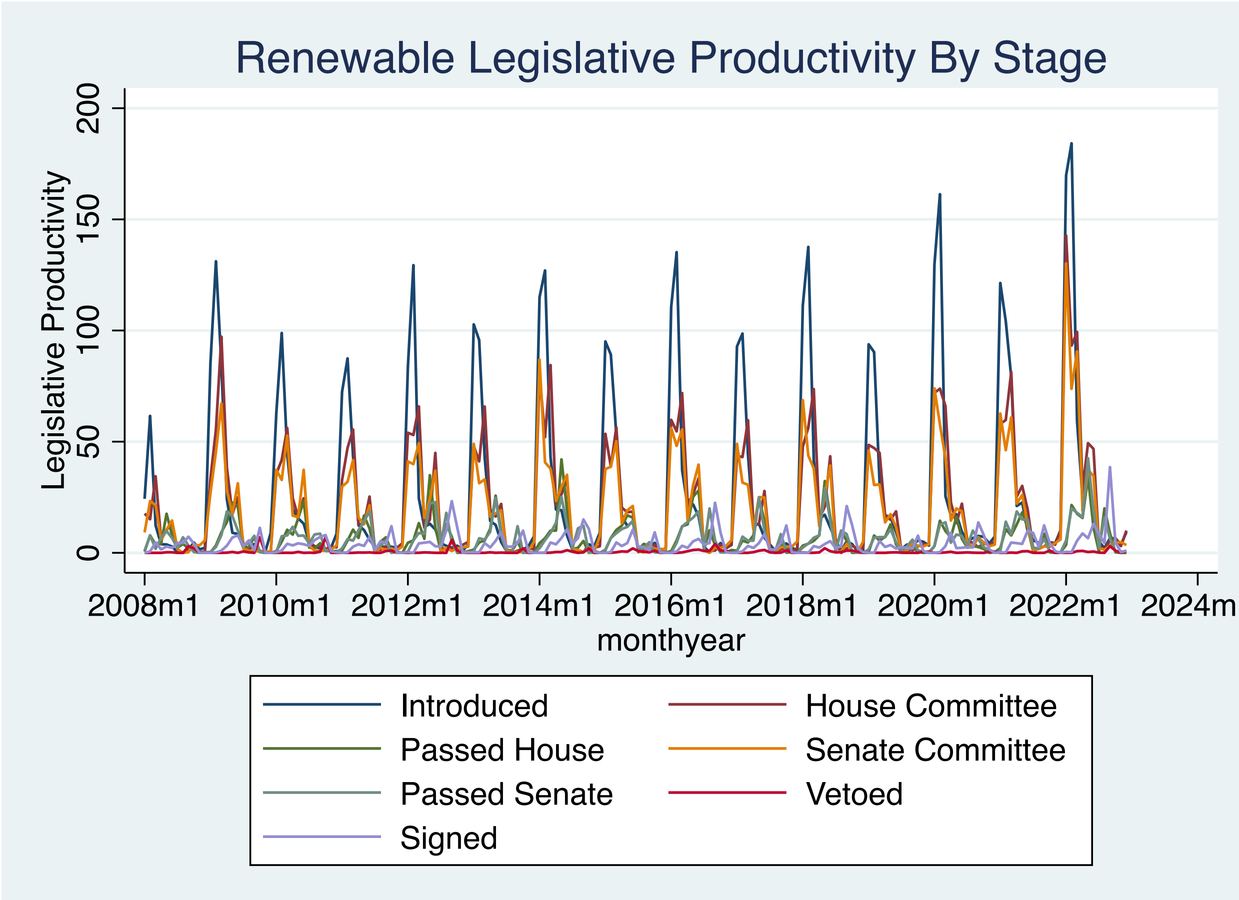

Figure 10: Renewable Energy Legislative Productivity by Stage

Appendix 3

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Market Volatility	0.886**	0.907**	0.907**	0.895**	0.910**	0.889**	0.889**
	(2.86)	(2.95)	(2.94)	(2.90)	(2.95)	(2.90)	(2.93)
Introduced	0.000654						
	(0.32)						
House Committee		-0.00165					
		(-0.68)					
Passed House			-0.00172				
			(-0.31)				
Senate Committee				0.000165			
				(0.07)			
Passed Senate					-0.00175		
					(-0.38)		
Vetoed						-0.0148	
						(-0.78)	
Signed							0.0155*
							(2.07)
Constant	0.0154	0.0226	0.0180	0.0178	0.0181	0.0183	0.0183
	(1.22)	(1.97)	(1.91)	(1.72)	(1.92)	(1.95)	(1.97)
Month effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	175	175	175	175	175	175	175

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 13: Announcement Effect of Coal Bills on Coal Firm Volatility

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Market Volumes	3.113***	3.111***	3.124***	3.112***	3.120***	3.090***	3.132***
	(12.51)	(12.41)	(12.26)	(12.29)	(12.26)	(12.23)	(12.30)
Introduced	-0.00119**						
	(-2.82)						
House Committee		-0.00119*					
		(-2.31)					
Passed House			-0.000259				
			(-0.22)				
Senate Committee				-0.000721			
				(-1.46)			
Passed Senate					-0.000727		
					(-0.74)		
Vetoed						-0.00760	
						(-1.86)	
Signed							0.00123
							(0.75)
Constant	-0.00452	-0.00650*	-0.00996***	-0.00834**	-0.00985***	-0.00968***	-0.0100***
	(-1.40)	(-2.16)	(-3.76)	(-2.92)	(-3.72)	(-3.69)	(-3.79)
Month effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	175	175	175	175	175	175	175

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 14: Announcement Effect of Coal Bills on Coal Firm Trading Volumes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Market Volatility	1.070***	1.073***	1.069***	1.072***	1.067***	1.063***	1.072***
	(16.73)	(16.66)	(16.90)	(16.67)	(16.73)	(16.47)	(16.80)
Introduced	-0.0000580						
	(-0.99)						
House Committee		-0.0000337					
		(-0.43)					
Passed House			0.000496*				
			(1.98)				
Senate Committee				-0.0000362			
				(-0.39)			
Passed Senate					0.000289		
					(1.28)		
Vetoed						0.00184	
						(0.84)	
Signed							0.000421
							(1.24)
Constant	-0.00303	-0.00409	-0.00506**	-0.00410	-0.00479*	-0.00451*	-0.00467*
	(-1.22)	(-1.80)	(-2.70)	(-1.76)	(-2.54)	(-2.38)	(-2.49)
Month effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	156	156	156	156	156	156	156

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 15: Announcement Effect of Natural Gas Bills on Natural Gas Firm Volatility

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Market Volumes	0.725***	0.721***	0.747***	0.732***	0.745***	0.740***	0.742***
	(7.66)	(7.66)	(7.94)	(7.79)	(7.92)	(7.91)	(7.86)
Introduced	0.00000838						
	(0.48)						
House Committee		0.0000278					
		(1.19)					
Passed House			0.000151*				
			(2.01)				
Senate Committee				0.0000428			
				(1.54)			
Passed Senate					0.000129		
					(1.92)		
Vetoed						0.00133*	
						(2.06)	
Signed							0.000165
							(1.62)
Constant	-0.00106	-0.00127	-0.00113	-0.00154	-0.00107	-0.000942	-0.000961
	(-1.05)	(-1.35)	(-1.31)	(-1.57)	(-1.24)	(-1.11)	(-1.12)
Month effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	156	156	156	156	156	156	156

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 16: Announcement Effect of Natural Gas Bills on Natural Gas Firm Trading Volumes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Market Volatility	1.176***	1.178***	1.187***	1.178***	1.176***	1.192***	1.196***
	(12.11)	(11.95)	(12.33)	(12.03)	(12.11)	(12.26)	(12.36)
Introduced	0.0000969						
	(1.24)						
House Committee		0.0000680					
		(0.66)					
Passed House			0.000299				
			(1.32)				
Senate Committee				0.0000973			
				(0.81)			
Passed Senate					0.000310		
					(1.26)		
Vetoed						-0.0000177	
						(-0.01)	
Signed							0.000178
							(0.61)
Constant	-0.00269	-0.0000633	0.00147	-0.000492	0.00170	0.00161	0.00153
	(-0.57)	(-0.02)	(0.45)	(-0.12)	(0.52)	(0.49)	(0.47)
Month effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	180	180	180	180	180	180	180

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 17: Announcement Effect of Transportation Bills on Transportation Firm Volatility

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Market Volumes	0.808***	0.837***	0.912***	0.863***	0.887***	0.852***	0.878***
	(4.13)	(4.33)	(4.51)	(4.47)	(4.47)	(4.29)	(4.33)
Introduced	0.000118**						
	(3.02)						
House Committee		0.000179***					
		(3.57)					
Passed House			0.000219				
			(1.85)				
Senate Committee				0.000216***			
				(3.66)			
Passed Senate					0.000278*		
					(2.21)		
Vetoed						0.00133	
						(1.69)	
Signed							0.000160
							(1.04)
Constant	0.00201	0.00231	0.00655**	0.00192	0.00674**	0.00687**	0.00700**
	(0.73)	(0.91)	(2.99)	(0.75)	(3.12)	(3.16)	(3.20)
Month effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	180	180	180	180	180	180	180

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 18: Announcement Effect of Transportation Bills on Transportation Firm Trading Volumes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Market Volatility	0.883	0.902	0.888	0.894	0.884	0.884	0.889
	(1.86)	(1.89)	(1.87)	(1.88)	(1.87)	(1.87)	(1.88)
Introduced	0.0000576						
	(0.21)						
House Committee		-0.0000889					
		(-0.27)					
Passed House			0.0000178				
			(0.02)				
Senate Committee				-0.0000813			
				(-0.23)			
Passed Senate					0.000163		
					(0.18)		
Vetoed						-0.00296	
						(-0.65)	
Signed							-0.00136
							(-1.22)
Constant	0.00963	0.0198	0.0152	0.0194	0.0150	0.0153	0.0153
	(0.31)	(0.84)	(0.94)	(0.79)	(0.93)	(0.95)	(0.96)
Month effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	180	180	180	180	180	180	180

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 19: Announcement Effect of Renewable Bills on Renewable Firm Volatility

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Market Volatility	0.883	0.902	0.888	0.894	0.884	0.884	0.889
	(1.86)	(1.89)	(1.87)	(1.88)	(1.87)	(1.87)	(1.88)
Introduced	0.0000576						
	(0.21)						
House Committee		-0.0000889					
		(-0.27)					
Passed House			0.0000178				
			(0.02)				
Senate Committee				-0.0000813			
				(-0.23)			
Passed Senate					0.000163		
					(0.18)		
Vetoed						-0.00296	
						(-0.65)	
Signed							-0.00136
							(-1.22)
Constant	0.00963	0.0198	0.0152	0.0194	0.0150	0.0153	0.0153
	(0.31)	(0.84)	(0.94)	(0.79)	(0.93)	(0.95)	(0.96)
Month effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	180	180	180	180	180	180	180

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 20: Announcement Effect of Renewable Bills on Renewable Firm Trading Volumes

	(1)	(2)	(3)	(4)	(5)	(6)
Market Volatility	0.968**	0.956**	0.973**	0.965**	0.985**	0.951**
	(2.91)	(2.87)	(2.92)	(2.89)	(2.94)	(2.87)
Introduced	0.00518					
	(0.87)					
House Committee		-0.00381				
		(-0.70)				
Passed House			-0.00231			
			(-0.34)			
Senate Committee				-0.00113		
				(-0.22)		
Passed Senate					-0.00289	
					(-0.48)	
Signed						0.0115
						(1.36)
Constant	0.0104	0.0194	0.0167	0.0178	0.0168	0.0171
	(0.85)	(1.85)	(1.71)	(1.65)	(1.71)	(1.76)
Month effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	147	147	147	147	147	147

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 21: Announcement Effect of Enacted Coal Bills on Coal Firm Volatility

	(1)	(2)	(3)	(4)	(5)	(6)
Market Volumes	3.070***	3.079***	3.087***	3.108***	3.078***	3.077***
	(10.95)	(10.97)	(11.02)	(11.12)	(10.97)	(10.95)
Introduced	-0.000905					
	(-0.68)					
House Committee		0.000215				
		(0.18)				
Passed House			0.00105			
			(0.70)			
Senate Committee				0.00156		
				(1.35)		
Passed Senate					-0.000324	
					(-0.25)	
Signed						-0.000377
						(-0.20)
Constant	-0.00840*	-0.00972**	-0.00967***	-0.0111***	-0.00955**	-0.00958**
	(-2.50)	(-3.31)	(-3.38)	(-3.64)	(-3.33)	(-3.35)
Month effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	147	147	147	147	147	147

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 22: Announcement Effect of Enacted Coal Bills on Coal Firm Trading Volumes

	(1)	(2)	(3)	(4)	(5)	(6)
Market Volatility	1.067***	1.067***	1.067***	1.068***	1.066***	1.071***
	(16.43)	(16.29)	(16.57)	(16.36)	(16.42)	(16.54)
Introduced	-0.000186					
	(-0.75)					
House Committee		0.00000679				
		(0.02)				
Passed House			0.000593			
			(1.76)			
Senate Committee				-0.0000438		
				(-0.14)		
Passed Senate					0.000237	
					(0.88)	
Signed						0.000463
						(1.31)
Constant	-0.00370	-0.00460*	-0.00488*	-0.00445*	-0.00469*	-0.00466*
	(-1.64)	(-2.25)	(-2.57)	(-2.09)	(-2.46)	(-2.45)
Month effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	152	152	152	152	152	152

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 23: Announcement Effect of Enacted Natural Gas Bills on Natural Gas Firm Volatility

	(1)	(2)	(3)	(4)	(5)	(6)
Market Volumes	0.736***	0.745***	0.756***	0.751***	0.755***	0.749***
	(7.58)	(7.80)	(7.87)	(7.77)	(7.78)	(7.74)
Introduced	0.0000161					
	(0.22)					
House Committee		0.000187*				
		(2.18)				
Passed House			0.000208*			
			(2.07)			
Senate Committee				0.000143		
				(1.60)		
Passed Senate					0.000124	
					(1.53)	
Signed						0.000149
						(1.41)
Constant	-0.000989	-0.00153	-0.00117	-0.00151	-0.00112	-0.00101
	(-1.02)	(-1.67)	(-1.33)	(-1.59)	(-1.27)	(-1.16)
Month effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	152	152	152	152	152	152

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 24: Announcement Effect of Enacted Natural Gas Bills on Natural Gas Firm Trading Volumes

	(1)	(2)	(3)	(4)	(5)	(6)
Market Volatility	1.228***	1.239***	1.231***	1.232***	1.213***	1.232***
	(12.13)	(12.14)	(12.22)	(12.15)	(12.02)	(12.16)
Introduced	0.0000441					
	(0.16)					
House Committee		-0.000266				
		(-0.76)				
Passed House			0.000445			
			(1.35)			
Senate Committee				-0.000171		
				(-0.49)		
Passed Senate					0.000562	
					(1.59)	
Signed						0.000182
						(0.62)
Constant	0.000611	0.00185	0.000597	0.00153	0.000910	0.000837
	(0.16)	(0.52)	(0.18)	(0.43)	(0.28)	(0.25)
Month effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	178	178	178	178	178	178

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 25: Announcement Effect of Enacted Transportation Bills on Transportation Firm Volatility

	(1)	(2)	(3)	(4)	(5)	(6)
Market Volumes	0.865***	0.894***	0.887***	0.909***	0.886***	0.884***
	(4.18)	(4.32)	(4.22)	(4.44)	(4.27)	(4.21)
Introduced	0.000180					
	(1.28)					
House Committee		0.000342				
		(1.89)				
Passed House			0.000188			
			(1.08)			
Senate Committee				0.000458*		
				(2.58)		
Passed Senate					0.000288	
					(1.57)	
Signed						0.000157
						(1.01)
Constant	0.00582*	0.00542*	0.00681**	0.00494*	0.00679**	0.00695**
	(2.34)	(2.25)	(3.01)	(2.09)	(3.04)	(3.10)
Month effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	178	178	178	178	178	178

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 26: Announcement Effect of Enacted Transportation Bills on Transportation Firm Trading Volumes

	(1)	(2)	(3)	(4)	(5)	(6)
Market Volatility	0.889	0.889	0.882	0.872	0.892	0.888
	(1.88)	(1.89)	(1.87)	(1.85)	(1.89)	(1.88)
Introduced	0.000167					
	(0.16)					
House Committee		-0.00161				
		(-1.37)				
Passed House			-0.00164			
			(-1.11)			
Senate Committee				-0.00142		
				(-1.11)		
Passed Senate					-0.00110	
					(-0.80)	
Signed						-0.00138
						(-1.23)
Constant	0.0126	0.0295	0.0173	0.0282	0.0164	0.0153
	(0.55)	(1.55)	(1.07)	(1.42)	(1.02)	(0.96)
Month effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	180	180	180	180	180	180

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 27: Announcement Effect of Enacted Renewable Bills on Renewable Firm Volatility

	(1)	(2)	(3)	(4)	(5)	(6)
Market Volumes	-0.0800	-0.0852	-0.0791	-0.0818	-0.0876	-0.0885
	(-0.74)	(-0.79)	(-0.73)	(-0.76)	(-0.81)	(-0.82)
Introduced	0.0000222					
	(0.38)					
House Committee		-0.0000148				
		(-0.22)				
Passed House			0.0000232			
			(0.28)			
Senate Committee				0.00000849		
				(0.12)		
Passed Senate					-0.0000200	
					(-0.25)	
Signed						-0.0000283
						(-0.44)
Constant	0.00592***	0.00644***	0.00623***	0.00620***	0.00635***	0.00634***
	(3.90)	(4.79)	(5.24)	(4.48)	(5.33)	(5.41)
Month effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	180	180	180	180	180	180

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 28: Announcement Effect of Enacted Renewable Bills on Renewable Firm Trading Volumes