Shifting Tides: the Effect of Institutional Divestments on the Global Market

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Abstract

This paper investigates the impact of ESG divestments on the share prices of listed equities. The study employs a two-fold approach: (i) an event study analyzing divestment announcements and (ii) a panel regression covering a longer divestment period, considering the actual purchase/sale of shares. We use a diversified historical portfolio of the Norges Bank Investment Management (NBIM), the world's largest Sovereign Wealth Fund. Incorporating sectoral and dynamic effects, the study captures the short- to medium-term effects of exclusion and non-exclusion on stock prices. We find three significant results. First, the exclusion of firms in the oil and gas industry substantially negatively impacts their share prices. Second, if a company belongs to the same sector as an excluded firm, it experiences a negative effect on stock prices from an exclusion shock. Importantly, exclusion announcements lower prices more than actual divestments. Lastly, divestitures by NBIM have the opposite effect on firms' share prices in the Electric Utilities and Independent Power Producers' (EUIPP) sector, increasing their share price over a year. However, this effect is narrow and limited to this specific sector.

Keywords: Institutional investors; Sustainable finance; Divestments; Portfolio balance.

JEL classifications: F65, G11, G23

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1 Introduction

In February 2023, Norway's and the world's largest Sovereign Wealth Fund announced that it would vote against the re-election of board members of 80 companies for failing to meet or set environmental and social targets (Neate, 2023). The Norges Bank Investment Management (NBIM) is widely regarded for taking an active stance against high-emission companies and accelerating the sustainability transition. More recently, it has begun taking an even more active approach through proxy voting and putting companies on exclusion and observation lists (SWF Institute, 2023). Given that GPFG commands an institutional investor status and is an active market investor, smaller fund managers and asset managers may closely monitor or sometimes even follow price trends closely correlated with GPFG's investment strategy. This phenomenon would ultimately change the prices of stocks before and after NBIM makes an exclusion announcement.

NBIM is also a governmental entity that ensues a dichotomy of institutional investment mandates between maintaining price stability and concurrently transitioning from 'brown' and stigmatised assets to green ones. Moreover, the assessment of institutional investors' portfolio transition also addresses the debate between short-term and long-term price stability: Are countries and their pension funds, Sovereign Wealth Funds and institutional investors willing to forego short-term price stability instead of long-term protection against climate shocks? Large institutional investors like the GPFG and NBIM have actively excluded stocks from their portfolios. They are widely known for publicly announcing their ex-ante and ex-post divestments. The primary aim of announcing such divestments is to reduce long-term exposure, which NBIM preemptively does anyway, and to punish the bad companies on a set of Environmental, Social and Governance (ESG) criteria. As of 31 December 2022, the GPFG equity portfolio stood at US $941.53 billion across 11,243 firms. Furthermore, since its inception, the GPFG has made 187 public divestments/warnings, of which 119 were due to environmental damages and high emissions. This motivates the topic of our paper: If GPFG or NBIM exits from a firm, does it trigger price movements during exits for specific stocks and industries?

The paper aims to contribute to three main points of literature: first, institutional ESG portfolio performance. Various authors have written about the growing relevance of ESG in portfolio preferences for institutional investors and how that affects performance. However, existing literature has focused on pension funds, mutual funds, sovereign wealth funds, and central banks to simulate portfolios with different scenarios or identify the impact of divestments on emissions and prices for mutual funds. While many authors have assessed NBIM's divestment and exclusion effects, few have empirically evaluated the impact of actual divestitures on stock prices. In this paper, we use both actual divestment data and announcements from NBIM's portfolio to estimate their impact on stock prices. We find that in the short term, announcements matter for non-excluded firms and some excluded firms in industries such as oil and gas, metals, and mining. Announcements strongly negatively affect the prices of stocks of excluded firms and those in the same industry. However, the effect of announcements disappears in the medium term. Actual divestments only have a marginally negative effect on stock price, and only in the medium term. However, much of the negative effect in the short term is driven by the Oil and gas industry, which suffers significantly if NBIM offloads shares.

Secondly, this paper contributes to the literature on stock exclusion by estimating the effect of announcements of excluded firms and the entire industry. There is widespread research on the impact of excluding stocks and their announcements on market prices. However, no known study assesses the impact of non-excluded firms belonging to the same sector. Large funds such as NBIM often diversify their portfolio by investing in multiple companies from the same sector. They exclude only a few based on conduct-based or sector-specific reasons. NBIM sometimes holds up to 1% in some of these entities; sectorally, this can add to a significant exposure. Consequently, even though NBIM may not exclude a firm, there can still be an effect on the company's stock price if a significant player within the same industry gets excluded. A natural extension to this theory is to rebalance a portfolio. If NBIM excludes a firm from a sector due to environmental practices, it would ideally rebalance by buying shares of firms from the same sector to balance the sectoral exposure. This implies that an excluded firm's stock price should fall, whereas non-excluded, same-sector firms (friends or competitors) should increase. We explore this by constructing a "sectoral spillover effect." However, we find a contrarian result to the above. Instead of an increase in prices for being a non-excluded firm, prices decrease if a firm is non-excluded and from the same sector. We attribute this to a 'sin industry' or 'bad industry' factor, stigmatising specific industries.

The third strand of literature I intend to contribute to is purely methodical. In this paper, We use the portfolio balance model approach, which is widely used in asset purchase programmes of Central Banks. The closest research is by Kettemann and Krogstup (2014), who studied how announcements, days of purchase, and actual sales/purchases of corporate and covered bonds by the SNB affect credit spreads. In addition to the widely used event study approach, we empirically use this model as it has not been used in institutional divestment literature. We attempt to use a similar model for NBIM's equity positions when it places the firms on an observation status and thereafter liquidates their shares over a few months. The paper is organised as follows: Section 2 discusses the existing literature on how ESG-based exclusion affects stock prices and portfolio returns. Section 3 describes the Data, the descriptive statistics and the shortlisting methodology behind the dataset. Section 4 provides the methodology and results of an event study, complemented by a stylised example that shares how a "sectoral spillover" variable was created. Section 5 presents the Methodology and Results behind the panel regression and sector-wise regressions. Section 6 concludes with a brief discussion of the limitations and scope of future research.

2 Literature Review

Given the urgency to mitigate & adapt to climate change (Pörtner et al., 2022), considerable research in recent years has focused on the topic of a sustainable investment transition. Seminal papers since 2015 have focused on measuring, stress-testing and pricing climate risks, ultimately guiding investors to transition their portfolios. Each type of investor adopts a unique approach to portfolio transition based on their mandate and horizon (Bassen et al., 2020). The scope of this paper focuses on institutional investors and evaluates how differing strategies affect companies' share prices and returns.

2.1 Existing investors and their investment strategies

In the context of transitioning portfolios, we can categorize investors into two broad groups: corporations that are directly responsible for emissions and professional investors who finance those firms. The latter, however, encompasses several subcategories such as asset managers (divided into Exchange Traded Fund managers, Mutual Fund managers, Index fund managers, and private asset managers), public/private banks, government/Development Finance Corporations (DFCs), and asset owners such as pension funds, sovereign wealth funds, and insurers. In this literature review, we will first examine the existing research and dichotomy faced by corporations and then proceed to discuss professional investors. The focal investor group of the paper is going to be one particular asset owner, NBIM.

2.1.1 Corporate investors

Corporations impact emissions, and reducing them requires direct investments in cleaner operations and supply chains. Carbon-intensive industries, like coal and oil, find it challenging to transition as future investments might get stranded. They grapple with distributing cash flow to cleaner supply chains while avoiding stranded assets. Companies in coal mining and processing technology face the highest risk of asset stranding, leading to increased costs and credit risks (Caldecott et al., 2016; Caldecott et al., 2014).

MNCs are fully aware of this increase in capex and asset devaluation. Hence, they diversify their value chain and reduce reliance on carbon-intensive technologies/processes. For instance, hard-to-abate sectors are investing in Carbon Capture, Utilization, and Storage (CCUS), industrial Internet of Things (IoT), artificial intelligence (AI) for intelligent production, and climate technologies. In 2021, the Clean Energy Ministerial [1] invested USD 705 billion in energy transition projects across eight verticals (Bloomberg Energy Transition Factbook, 2022). A third way for MNCs to expedite this transition is by investing in alternative markets such as carbon offsets (Conte & Kotchen, 2010). For financiers too, this risk of asset stranding exposes their portfolios at risk (PaR). Consequently, not only do equity investors face the risk of asset devaluation, but lenders also face a higher risk of default (Caldecott, 2016). We address this in the following sub-section.

2.1.2 Professional and Institutional investors

Professional investors can either lower the cost of financing 'green' firms or increase the cost of capital for 'brown' assets (Danthine & Hugard, 2021). Lowering financing costs for green assets is possible at early and growth stages through venture capital and private equity or later stages through listed firms. There are two channels to invest in listed firms- as individuals or through managed funds by asset managers, such as exchange-traded funds (ETFs) or mutual funds (MFs). Often, these asset managers launch unique ESG or green funds which invest in 'greener' companies. Out of the 4,005 ESG-rated funds in the Lipper Fund Research Database, 2,655 are ESG equity ETFs and MFs, while the remainder are bond ETFs or MFs. The bias toward equity ESG investing can be attributed to the negative correlation between the cost of capital and green investments. On the one hand, high real interest rates (Eyraud et al., 2011) have a high opportunity cost of investing in green, while on the other hand, investing in ESG can lower the cost of equity capital (Ghoul et al., 2011; Fulton et al., 2012).

Green bonds are another avenue to invest in green capital. Using data from the Eikon Green Bond issuances, we found that approximately 8,500 green bonds have been issued cumulatively since 2007, amounting to a total of USD 2.4 trillion. Of these, USD 2.04 trillion remains outstanding, indicating that a majority of the issuances are either recent, long-term in nature, or have not been fully utilized. Notably, more than half of these issuances originate from China, the United States, or Germany and either possess Climate Bonds Initiative certification or are self-labelled as green. The exponential growth of green bond issuances raises the question of whether they have successfully reduced borrowing costs, often represented by a "greenium", the premium or financial return investors are willing to forego to prefer green projects over brown. While there is evidence for a greenium, Pietsch and Salakhova (2022) find that the credibility of the issuance

[1] The Clean Energy Ministerial is a forum of 29 Member countries and 22 participant countries investing in clean and renewable energy.

(indicated by the use of proceeds, the issuer, and the certifier) further reduces the spread.

Conversely, one can apply an inverse greenium to make 'brown finance' more expensive. Using the LPC Dealscan database, Zhou et al. (2021) found that loan spreads have increased by 65% for coal producers, by 30% for oil and gas production, and by 32% for oil and gas services. Two channels cause the rise in spreads: First, lenders demand a higher interest rate to compensate for holding collateralized stranded assets (Fard et al., 2020). Second, due to a capital drought- as numerous fixed income funds actively exclude 'brown' companies from borrowing too[2].

A similar exclusion approach can be extended to the equity markets wherein fund managers divest or exclude "sin stocks" from their portfolios (Danthine & Hugard, 2021). For instance, certain equity funds by UBS not only exclude sectors but also assess the ESG risk factors of companies before making investments through their asset management arm (UBS, 2023). Legal and General's MPAG fund uses the Climate Value at Risk (CVaR) by MSCI to exclude only energy providers. Each fund adopts a different screening methodology. However, it also presents several dilemmas: foremost, funds that exclude sectors from their existing positions face asset pricing risks, which can be addressed through portfolio rebalancing channels discussed in the following subsection. Secondly, sovereign funds with private holdings have a mandate for price stability. However, they also face pressure to address ESG risks in their financing, raising the debate of short-term versus long-term price stability (Maechler & Moser, 2019). Thirdly, some ESG risks, such as carbon emissions and temperature alignment, are more relevant due to rapid climate changes. Therefore, excluding stocks based on the production of tobacco, gambling, or social and governance matters may not necessarily contribute to a green transition.

Nevertheless, some institutional asset managers are more active in excluding brown firms than others. For example, exclusion and ESG alignment are more pronounced in EU-based mutual funds, sovereign wealth funds, pension funds, and ETFs due to the implementation of SFDR (Becker et al., 2022). Norges Bank Investment Management (NBIM), a prominent institutional investor, publicly excludes stocks based on ESG criteria, but it also faces the three dilemmas mentioned above.

2.2 How does exclusion affect stock prices and portfolio returns?

There is sufficient yet inconclusive evidence on whether excluding listed equities due to ESG factors impacts stock returns and prices. Much of the literature has argued that exclusions or divestment campaigns

[2]For example, the Pictet CH – CHF Sustainable Bonds Fund screens companies and does not lend to companies engaged in activities related to "weapons, coal, tobacco, alcohol, gambling, adult entertainment with a threshold of 5% of revenues, and nuclear with a threshold of 25% of revenues."

negatively affect stock prices (Hong & Kacperczyk, 2009). There are three channels through which divestments can affect the price of a stock: (i) There can be a direct effect of the sell orders on the share price, (ii) stigmatisation of a stock/company, and (iii) a decrease in the availability of financing or an increase in the cost of financing (Danthine & Hugard, 2021).

Using a large sample of divestment announcements through an event study, Dordi and Weber (2019) show that prices of fossil fuel stocks indeed go down in the short-term (1-day) and long-term (10-day intervals) once a divestment is announced. The negative effect of such announcements is not just limited to stock prices. Choi et al. (2021) use a difference-in-differences framework in an event study of 26,165 unique funds and find that excluding firms not only negatively affects prices and, therefore, the performance of those stocks in a portfolio but also other characteristics such as a lower price-to-earnings (P/E) ratio, lower price-to-book (P/B) ratio, lower capital expenditure, and overall R&D. There is also a strong spillover effect of divestments/exclusions on multiple markets. Among investment funds and professional investors, E&S-conscious investors tend to divest from funds when there is negative E&S news (Gantchev et al., 2022). This cascades into the banking market, wherein exclusion also reduces the loan uptake among fossil fuel companies (Green & Valee, 2022). The latter can happen due to a supply channel, i.e., banks stop providing credit to fossil fuel companies, or through a demand channel, wherein fossil fuel companies reduce borrowing altogether and rely on other sources of credit such as the private markets. Berle, He, and Odegaard (2023) challenge this premise: they argue that the ability to raise capital does not reduce after exclusion. Of the 151 companies excluded by NBIM, they find that 37% raised capital during exclusion, and of the firms reintroduced to the portfolio, 57% raised capital as well.

Nonetheless, the inability to refinance and a lowered earnings potential incentivise firms to invest more in green R&D due to greater climate awareness (Choi et al., 2021). The effect of such an incentive is also seen in the environment. Rohleder et al. (2021) find that if mutual funds exclude firms based on carbon intensity, not only does their stock price reduce over a sustained period due to "decarbonisation selling pressure" (Rohleder et al., 2021), but the CO2 emissions reduce as well.

Another widely anticipated question is if exclusion/divestments have a negative market impact. A divestment or negative screening of stocks should also affect the prices of associated stocks and overall portfolio returns. This is also one of the challenges portfolio managers and professionals face: minimising the deviation from their risk-return profile while negatively screening polluting stocks. Plantinga and Scholtens (2020) excluded fossil fuel companies from a synthetic portfolio and found that excluding fossil fuel companies does not affect either returns or portfolio risk. However, fossil fuel companies comprise only a small portion of a portfolio's industry universe. Blitz and Swinkels (2021) studied more excluded industries (11 in total) and found contrarian evidence that exclusion lowers portfolio return. Ghoul et al. (2022) concur with this finding, arguing that there is a sin premium. To mitigate this, they suggest overweighting those firms that have similar factors.

Instead of sector-based exclusions, Alessandrini and Jondeau (2019) screen ”sin stocks” based on ESG scores using the best-in-class approach and, after that, an industry-adjusted average score. They find that while ESG screening can deliver risk-adjusted returns, it also increases factor risks at the country, firm, and sector levels. As a result, some sectors, large firms, and regional allocations to Europe and the United States increased. Fahlenhrach and Jondeau (2021) use a similar approach to construct risk-adjusted portfolios of three large asset managers: Blackrock, NBIM, and the SNB. All three can reduce portfolios' emissions while keeping a similar risk-adjusted return. Interestingly, NBIM has a lower carbon intensity than the other two. Boermans and Galema (2019) share an opposite view, arguing that there is no evidence that pension funds decarbonise their portfolio by divesting from carbon-intensive projects.

Ayoubi and Enjolras (2021) use an event study solely on NBIM and find strong evidence that exclusion announcements negatively affect the stock prices of excluded firms. They also argue that norm-based exclusion depresses stock prices more quickly than sector-based exclusions. Del'atti, Fanelli, and Miglietta (2021) use a similar methodology to assess stock prices and abnormal returns. They use daily stock price data of 252 working days between 2015-2016 and find that the effect of the exclusions is country-dependent. While firms in the US, Japan, Chile, Canada, and India have a negative return, those in Germany, Australia, China, and the UK have a positive return. Bauer, Christiansen, and Døskeland (2022) also argue that increasing NBIM's allocation to environmental mandates increases returns but also the overall risk of the portfolio due to country weights and value weights.

This contrasts with the latest result by Berle, He, and Odegaard (2023) (from now on, BHO). BHO construct two NBIM portfolios - one with excluded firms and one without. Consistent with Blitz and Swinkels (2021), a low-quality ESG portfolio has a higher return than a high-quality ESG portfolio. Moreover, value-weighted portfolios have higher returns, suggesting that short-term price pressure on low-ESG companies creates a price premium for high-market-cap but low-ESG scoring companies. One counter to BHO's approach lies in the methodology used for screening stocks. Instead of constructing portfolios and divesting stocks, we can optimise portfolios against ESG ratings, risks, emissions, or other constraints such as tracking error and returns (alphas). This can be seen in Alessandrini and Jondeau (2021), who optimise the MSCI All Country World Index's firms against the industrial average ESG scores, carbon scores, regional and sectoral exposures, and tracking errors. They argue that instead of excluding stocks, optimising them by integrating them into portfolios improves portfolio performance, reduces tracking error, and improves ESG scores.

However, it also reduces the investment universe. One way to tackle this challenge is by defining levels of exclusions. Evers (2022) optimises a pension fund portfolio overlapping with MSCI ACWI performance. While keeping the performance, tracking error, and stock volatility the same, they can increase the ESG rating. However, at different levels of exclusions, the market capitalisation and the number of constituents of the portfolio change. In the following section, let us turn to the datasets used in this paper and their descriptive statistics.

3 Data and Descriptive Statistics

We rely on firm-level/stock-level portfolio, price and market capitalisation data from various sources depending on the type of indicator needed. These are described below:

3.1 Portfolio holdings

We retrieve the data on NBIM's portfolio holdings from Refinitiv Eikon. NBIM discloses its portfolio's holdings through various sources in addition to its website (which has an annual frequency). For portfolio holdings on Refinitiv, NBIM files U.S. holdings through Form 13F, U.K. holdings through the U.K. Registers, the Regulatory News Service and the Trade Report. Refinitiv relies on either the Shareholder's Reports or the Aggregate MFs to compile NBIM's holdings periodically for other countries. All of these filings are done every quarter; hence, the holdings dataset is at the quarterly level.

The variable of interest in our case is the number of shares of the company (in millions) owned by NBIM. Over time, NBIM has invested across 14,486 companies and exited (privately or publicly) from a number of them. In some cases, NBIM exits and then re-enters some of the holdings. The latest shareholder filing of 31 March 2023 reveals 11,664 companies in their portfolio. In our dataset, the cut-off period is 31 December 2022, when NBIM held shares in 11,738 companies. As of December 2022, the total market value of these holdings stood at USD 853.628 billion but only comprised 62% of the total value of NBIM's portfolio. The remaining portfolio share comprised fixed income, real estate and infrastructure holdings, unattainable on NBIM's website or Refinitiv Eikon. The portfolio is highly diversified across 92 countries, 60 industrial sectors and multiple stock exchanges.

A second variable of interest from the holdings' data is the % of outstanding shares. Outstanding shares are the percentage share of a company owned by NBIM. This is critical to measure as it captures whether or not NBIM can influence a company's share price. For instance, if NBIM owns a significant portion of a company and chooses to exit the industry or the firm, the exit may significantly impact the share price and the sector. As of December 2022, on average, NBIM owned 0.92% of all the companies in its portfolio, with a maximum share of 25.74% in a real estate investment trust. This is used to create a new variable, Net shares outstanding and an Adjusted Change in Shares:

$$\%\text{ Held by NBIM} = \frac{\text{Shares held by NBIM (in millions)}}{\text{Total Shares Outstanding}}$$

$$Purchase_{it} = \frac{\%Purchased_{t-(t-1)}}{\text{Total Shares Outstanding}} = \frac{\text{Purchase of Shares}}{\text{Total Shares Outstanding}}$$

Net shares outstanding reveal the total number of shares of a company (preferred or common) that are tradable in the open market. In addition, Refinitiv Eikon also allows us to capture time-invariant variables such as the country and industry groups of each company from the portfolio itself. The composite portfolio data is the number of shares held by NBIM (in millions), the market value of each stock, the total number of outstanding shares of the company (in millions), the sector and country in which the stock is listed (note that the same company can be listed in multiple countries as a subsidiary. As NBIM invests in multiple entities of the same company as well, I treat each as a different entity) at the quarterly level between December 31, 2005 and December 31, 2022.

3.2 Price and Market capitalisation

The dependent variable of our interest, the price of stocks, is taken through Refinitiv Datastream for two frequencies: quarterly and daily for the panel regression and the event study, respectively. We use the Closing Price to capture the net effect of both sell and buy orders at the end of the quarter or day based on Chan and Lakonishok (1992), who argue that the effect of institutional trades on the difference between closing and opening prices is small. The price data is available for nearly all companies between 2005 and 2022. As the portfolio holding data is at the quarterly level, we use a quarterly frequency for panel regression. Sometimes, when the data is unavailable for the exact quarter close, we pick the nearest closing price for the same quarter or the opening price of the following quarter. Similarly, we find the quarterly data on market capitalisation for each company between 2005 and 2022. The event study uses the daily closing prices of all stocks in the portfolio for April 2016.

3.3 Exclusion data

A third variable of interest is the exclusion of a company and the exclusion date. The list of exclusions can be retrieved from the press releases that NBIM publishes on its website under Observation and exclusion of companies. NBIM has two kinds of exclusions: product-based and conduct-based. Both include 14 ESG criteria based on which NBIM either excludes or observes a company. Since September 2005, 165 companies have been publicly excluded, and 22 have been put on observation due to the ESG criteria.

3.4 Condensing the data

There are two major reasons for refining the dataset. Firstly, while criteria such as ”Production of cluster munitions”, ”Serious violations of individuals' rights in situations of war or conflict”, and ”Gross corruption” are of immense relevance in ESG exclusionary policy, they are relatively less directly responsible for climate change. Given the impending urgency of climate distress (Mauro, 2021), we choose to prioritize environmentally-driven exclusions over Social and Governance ones. Importantly, NBIM identifies 119 of the 187 exclusions as environment-related. The second reason for narrowing the data is the substantial panel size, i.e. $N = 14486 \cdot 69 = 999{,}534$, which may not encapsulate a meaningful effect of environmental exclusions on prices. The approach is as follows:

(i) I only look at the following exclusion criteria: Severe environmental damage, production of coal or coal-based energy, and unacceptable greenhouse gas emissions. This gives us a list of 119 exclusions between 2006 to 2022.

(ii) The aim of the paper is mainly to contrast the effect of firms who are excluded against those who are not. Only 17 industries, out of a total of 53 industries in NBIM's portfolio, have at least one exclusion. Only seven industries have five or more exclusions. Hence, it would be inefficacious to observe the effect of exclusions in 7 industries on 53 industries. More importantly, the aim is to differentiate whether being excluded and non-excluded within the same industry affects the prices of stocks. This will help us establish whether excluding a stock through divestment or announcement makes an impact on the stock and its competitors/friends. This approach also yields more significant results in the paper.

(iii) Most of the exclusions (98 out of 111 for which other data is available) are concentrated in one of the following industries: Coal, Electric Utilities & IPPs, Freight & Logistics Services, Metals & Mining, Multiline Utilities, Oil & Gas, and Pharmaceuticals. Hence, we selected all holdings from the historical portfolio in the above sectors. This gives us a list of 1994 companies/stocks that were in the portfolio between 2005 and 2022.

(iv) Interestingly, NBIM only had three environmental exclusions before 2013. Hence, we removed data from 2005 to 2012 and only observed 2013 Q1 to 2022 Q4 for the analysis.

3.5 Descriptive statistics

The total number of observations across 71 countries and 7 shortlisted sectors is 79720. The portfolio's highest number of observations and firms are in China and the U.S., respectively. At the industry level, the most common observations are for metals and mining, pharmaceuticals, electric utilities, and independent power producers. There are relatively minimal observations for Coal and Oil and Gas producers. This indicates NBIM's long-standing approach to decarbonising its portfolio away from fossil fuels. Nonetheless, many fossil fuel providers also list themselves as Independent Power Producers even if their primary source of energy production might be thermal intensive.

Within Oil and Gas, the greatest share of observations are in the U.S. and Canada. For coal, China has the largest share of the portfolio, indicating the significant difficulty of completely removing country-dependent coal exposure while keeping a China exposure. China and the U.S. are also leaders in the number of observations in Electric Utilities and IPPs. Table I in the Appendix provides a greater overview of the country-sector breakdown.

Turning to the number of company-level characteristics in Table II, we also see the average millions of shares owned by NBIM in excluded companies. The largest share owned by NBIM is 0.032% of CESC Limited among the excluded firms, corresponding to an average of 37.17 million shares. It is also the company in which NBIM has historically held the highest share among the environmentally-excluded firms. Based on the selection strategy in Section 3.4, we can find complete portfolio, price, and exclusion data for 98 firms. These belong to 7 sectors, as highlighted above and in Table III. The largest proportion of exclusions are in Electric utilities, Coal, Metals and Mining, and Pharmaceuticals. To dive deeper into how prices change with time, assess Figure 1 below. While price changes are relatively stable over time, ranging between -1 and 1, some firms are particularly volatile: Pan Ocean Limited, Evergreen Marine Corporation Taiwan, PGRE Polska, RWEAG, Reliance Power, and Uniper. Interestingly, these stocks show greater volatility after 2019 (except PanOcean). A plausible explanation for the greater volatility in these stocks is partly the volatility in oil prices and stock-specific factors. A second chart of interest is the level of control NBIM has on these companies proxied by the share of the company owned. This can be seen in

Figure 2. Among exclusion stocks, there have been fluctuating but rising ownerships in companies such as Glencore (later reduced), Inner Mongolia and Pacific Basin Shipping, Ameren Corp, CESC, TransAlta, North Western Corp and Suncor. While there are multiple ways to explain this phenomenon, one way to ascertain is if NBIM has changed the company's emissions profile and reduced its environmental footprint post-exclusion or through engagement, which led NBIM to re-introduce the firms back into the portfolio. Another explanation of the phenomenon is portfolio-weighted balancing due to a rise in the portfolio size. This is a risk-management tool where NBIM chooses to allocate shares based on the market-cap weights as portfolio size increases.

We can further assess how energy producers, mainly coal, oil, and gas, against which NBIM has issued several conduct-based exclusions, perform. The changes in prices are still relatively volatile after 2019, even though they have stayed between -1 and 1. There is also no clear trend between the prices of the stocks. Figure 4 provides another useful insight towards this analysis. As we can see, on the one hand, NBIM completely exits from coal companies; on the other, it has continued to moderate its ownership of oil and gas and coal producers. Three unique examples of this moderation are Inner Mongolia, which saw a sharp increase in share ownership between 2013-2016; Reliance Industries, whose ownership share has grown, fallen, and is now growing again; and Suncor Energy, which is stably growing as a trend. There are also three examples of sharp exits: Lubelski Wegiei Bogdanka, Canadian Natural Resources and Gujarat Mineral Development Corp. The ownership of all these stocks reduced sharply within two quarters.

4 Event Study: Short-run Effects of Exclusion Announcements

We rely on two methodologies in this paper. The first is an event study at a daily frequency resembling commonly adopted methodologies in the institutional divestment literature. The second approach is a panel regression of prices on holdings' data at a quarterly frequency of portfolio-level data.

4.1 Methodology

The model we used in the event study is based on Glick and Leduc (2013). This methodology aims to capture the effect of the exclusion announcement on the stock prices of the excluded firms at a higher frequency and measure whether there is an immediate effect of the announcement on the market. In our data, we identified 42 total environment-related and conduct-based exclusions (i.e., Production of Coal or Coal-based energy) on April 14, 2016. Of these, we only have historical price data on 39 firms from Coal (9 exclusions), Electric Utilities and IPPs (29 exclusions), and Multiline Utilities (1 exclusion) industries. Hence, we use daily Closing Prices of all 1994 firms in the portfolio between April 11 2016, and April 19 2016, i.e. 7 trading days. The price window is crucial for the event study as many market participants can easily track NBIM's share dilution on trading terminals and expect more selling pressure before announcements. On the other hand, post-announcement of exclusion, this selling pressure might increase/decrease due to a surprise. Before April 14, 2016, there were no screenings against coal or coal-based energy in the portfolio disclosed in the dataset[3]. Hence, it can be argued that coal-based exclusions on this date were truly an element of surprise for the market. For the study, we primarily run two cross-sectional Ordinary Least Squares regressions. The first regression is the % Change in Prices of all firms between the start and end of the event window on a categorical variable that takes the value 1 if a firm was excluded and 0 if it was not. Thereafter, in equation 2, we regress % Change in Prices of all firms between the start and end of the event window on a "Sectoral Spillover" effect:

$$\Delta Price_{i,t,w} = \beta_0 + \beta_1 A_{i,t} + \beta_2 A_{non-i,t} + \varepsilon_{i,t} \tag{1}$$

- Where,

$$\Delta Price_{i,t,w} = ln(Price_{i,end}) - ln(Price_{i,beginning}).$$

[3] There are 11 historical exclusions that are based on "Severe environmental damage" in the years preceding 2016. However, given that asset managers reshuffle companies actively, their horizon would be shorter.

This is the difference between the logged prices of all the i firms at the end of the window and the beginning of the window. We take the window as $t-3$ to $t+3$, where the event takes place at time t.

- $A_{i,t}$ is a categorical variable of an exclusion announcement which takes the value 1 if a firm was excluded and 0 otherwise. This tells us the $i \in I = 39$ firms were excluded on April 14, 2016.

- $A_{non-i,t}$ is a "Sectoral Spillover" effect continuous between 0 and 1. This comprises two elements given by:

$$A_{non-i,t} = \sum_{j,non-i} \left[\frac{\text{Market Capitalisation}_{j,beginning}}{\text{Market Capitalisation}_{k,non-i,beginning}} \times A_{j,t} \right]$$

  Where $\text{Market Capitalisation}_{k,non-i,beginning} = \sum_{j,non-i} \text{Market Capitalisation}_{j,beginning}$

  Here, we first add the total market capitalisation of all the firms in the same sector by date and subtract the market capitalisation of the non-excluded firm from it. This gives us the numerator. The denominator is the total market capitalisation of the portfolio by sector and date. A_j is a binary variable which takes the value 1 if a company is from the same sector as the excluded firm. Effectively, we will get a continuous variable that multiplies the weighted market capitalisation of sectors with the sector binary variable. This is further explained using a stylised example in Section 4.2.

- This gives us $1994 - 39 = 1955 j \in J$ firms which are not excluded from the portfolio. Each excluded firm i and non excluded firm j belongs to a sector k.

- ε is the error term that captures other factors influencing the price of the stock.

4.2 A stylised example

Assume there is a portfolio of 4 firms, A, B, C and D. Say A, B belong to the Electric Utilities and IPPs sector whereas C, D belong to the Pharmaceutical sector. Furthermore, say Firm A is excluded, but B, C, D are not excluded at time t. This means that A_{it} for Firm A will be 1, but for every other Firm, it will be 0. On the other hand, since Firm B is from the same sector as Firm A, we will have $A_{jt} = 1$ for Firm B, but 0 for everyone else. This is multiplied by the market share of Firm B, which gives us 0.67, as seen in Figure 1. This can be extended to multiple sectors, firms, and periods, allowing us to measure the Sectoral Spillover effect of a threat of others' exclusion from stock prices.

Description	A_{it} If a firm was excluded or not	Market Capitalization of the company	Company's Market Share in the Sector	A_{jt} If in the same sector as excluded firm	$A_{non-i,t}$ Sectoral Spillover
Firm A	1	100	33%	0	0
Firm B	0	200	67%	1	0.33
k = Electric Utilities & IPPs		300	100%		
Firm C	0	200	57%	0	0
Firm D	0	150	43%	0	0
k = Pharmaceuticals		350	100%		

Figure 1: A stylised example with 4 firms in 2 sectors, where 1 firm is excluded.

4.3 Findings and Results

Let us differentiate between the prices of excluded firms and non-excluded firms when the exclusion event occurs. In Figure 2, we can see that among the non-excluded firms (in red), a higher proportion of Pharmaceutical, Multiline Utility and Oil & Gas companies have positive changes in prices suggesting a buying rally in those sectors. On the other hand, Coal, Electric Utilities, Freight & Logistics and Metals & Mining companies have negative changes in prices, suggesting a sell-off in those sectors even if those firms are not the ones excluded. This can be contrasted with the histograms of excluded sectors in blue colour. Among excluded firms, the Coal sector has a high proportion of negative prices, indicating a sell-off in excluded Coal companies when an announcement happens. In contrast, Electric Utilities & IPPs and Multiline Utilities have a high proportion of firms with positive prices, indicating a buying behaviour even if there is an announcement.

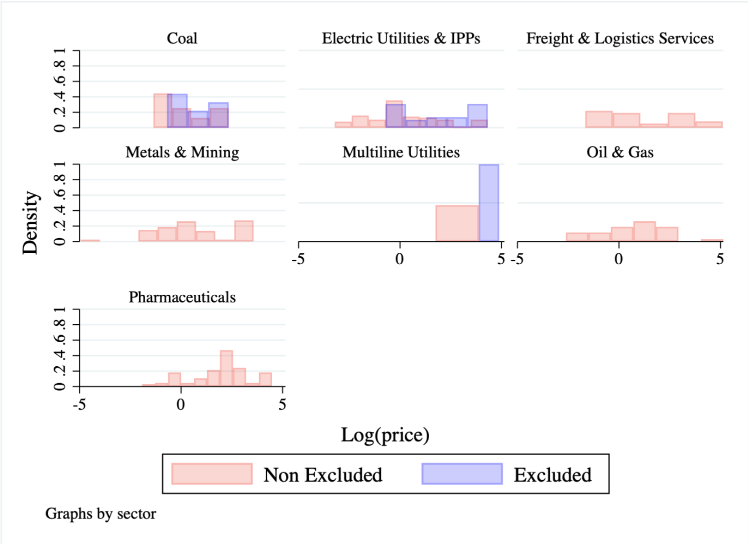

Figure 2: Histogram of Log Price of Excluded and Non-Excluded firms

In Table 1, we summarise the findings and results of the event study regressions run in equation (1). We know that the day of the event when the 40 exclusions happened is 14 April 2016. To capture a pre and post-event effect, we have a window of 3 days prior to and after the event. I subtract the closing $ln(Price_i)$ of $t-3$ from $ln(Price_i)$ on the day $t+3$. This gives us an event window of 7 trading days. As seen in Column 1, Table 1, I regress the % Change in price of all stocks in the portfolio on whether a firm has been excluded or not as seen in (1) and $A_{non-i,t}$, as seen in equation (1). We find that there is no significant immediate effect of being excluded or being from the same sector as the excluded firm on stock prices. This result contrasts that of Ayoubi and Enjolras (2021), who found that announcements had a strong effect on their event study. However, they observed several announcements that were also non-environmentally driven, such as corruption, violation of human rights, and production of munitions and weapons. These exclusions are more firm-specific and would naturally drive the effect of events more than environment-related exclusions, which are more novel. Moreover, what we also want to see is if an actual divestment affects the stock prices or whether only an announcement does. For this, we adopt a panel regression approach in the next section.

Table 1: Event study of the effect of NBIM's exclusions on stock prices

	(1)
	$\Delta ln(P_{i,t})$
A_{it}	0.00269
	(0.01)
$A_{non-i,t}$	-0.0143
	(-0.06)
Constant	0.0386***
	(20.71)
N	1576

t statistics in parentheses

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

The event study regression comprises a standard Ordinary Least Squares regression, where the dependent variable is the difference between the price of the firm between the start and the end of the event window defined in Section 4.1. The first cross-sectional regression is on the independent variable, A_{it} which is the binary variable for the firm being excluded on April 14, 2016, as seen in column (1). The other independent variable of interest is $A_{non-i,t}$ a Sectoral Spillover, as defined in Section 4.1.

5 Panel Regressions Using a Portfolio Balance Approach

5.1 Methodology

Our second approach to examine the effect of institutional divestments on stock prices is through a dynamic panel regression of stock prices on %change in shares, whether a firm was excluded or not, and a Sectoral Spillover effect. This methodology differs from the widely used event-study approach. Instead, we use the portfolio balance method derived from Krogstrup and Kettemann (2014), which encompasses the actual sale/purchase of shares. This model aims to not only capture the effect of the announcements but also measure how actual 'divestment in shares' affects stock prices. To investigate further, as seen in Equation (2), I run a panel regression quarterly data between 2013 and 2022.

$$\Delta Price_{i,t+s} = \beta_0 + \beta_1 Purchase_{it} + \beta_2 A_{it} + \beta_3 A_{non-i,t} + \gamma_{i,j} + \theta_{i,j} + \tau_t + \varepsilon_{i,j,t} \tag{2}$$

- Where, $\Delta Price_{i,t+s}$ is the first-difference between the logged prices of all the firms in the portfolio given by:

  $$\Delta Price_{i,t+s} = ln(Price_{i,t}) - ln(Price_{i,t-1}).$$

  Here, s is the lag (at a quarterly frequency) between the period when the sale starts and the exclusion is announced[4]

- $Purchase_{i,t}$ is the number of shares NBIM bought between (t) & $(t-1)$ divided by the total number of shares outstanding for a Firm $i \in I or j \in J$ [5]. Same as in Section 3.1.

- $A_{i,t}$ is a categorical variable of an exclusion announcement which takes the value 1 if a Firm i was excluded at time t and 0 otherwise.

- $A_{non-i,t}$ is the "Sectoral Spillover" effect continuous between 0 and 1 similar as in (1). The only difference is that, unlike the event study, in the panel regression, the sectoral spillover captures each period instead of the beginning period only.

[4] NBIM announces its exits ex-post to avoid distortion of the price momentum of their shares sold. This can vary from 2 lags to 24 lags. To prevent losing degrees of freedom, I use s = 1 for an immediate effect of the actual divestments on the next quarter and s = 4 as it normally takes NBIM 4 quarters to divest from a stock. The reason for adopting a quarterly lag is that most disclosures such as Form 13F, Aggregate MFs, UK Registers and Regulatory News Service are done every quarter.

[5] Important: To explain the subscripts better, imagine there are two types of firms: excluded and non-excluded. I annotate an excluded firm as i and a non-excluded firm as j. The total of all excluded firms i is $I = 98$. The total of all non-excluded firms j is $J = 1994 - 98 = 1896$. The total number of firms with I excluded and J non-excluded is $N = 1994$. Each firm i and j belongs to a sector k. Time subscripts include a quarter t and a lag s

$$A_{non-i,t} = \sum_{j,non-i} \left[\frac{\text{Market Capitalisation}_{j,t}}{\text{Market Capitalisation}_{k,non-i,t}} \times A_{j,t} \right]$$

Where $\text{Market Capitalisation}_{k,non-i,t} = \sum_{j,non-i} \text{Market Capitalisation}_{j,t}$

- γ, θ, τ are country, sector-level and time-level fixed effects. ε is the error term that captures other factors influencing the price of the stock.

5.2 Findings and Results

The dependent variable of interest is the stock price and the primary independent variable of interest is the purchase of shares. By default, we expect the Purchase of shares to be negative (i.e. NBIM should sell shares of excluded firms *i*).

Table 2: Baseline Panel Regression with a $t+1$ lag.

	(1)	(2)	(3)	(4)
	$\Delta ln(P_{i,t+1})$	$\Delta ln(P_{i,t+1})$	$\Delta ln(P_{i,t+1})$	$\Delta ln(P_{i,t+1})$
$Purchase_{it}$	0.0808	0.0801	0.0769	0.182
	(0.80)	(0.79)	(0.75)	(1.36)
A_{it}		-0.0508	-0.0587	-0.0319
		(-1.39)	(-1.61)	(-1.25)
$A_{non-i,t}$			-0.0558***	-0.0156***
			(-12.55)	(-3.77)
Constant	-0.0202***	-0.0201***	-0.0137***	0.0154*
	(-12.67)	(-12.61)	(-8.22)	(2.41)
N	37168	37168	36992	36992
$TimeFE$	No	No	No	Yes
$Sector, CountryFE$	No	No	No	Yes

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

Results of baseline panel regression seen in equation (2). The dependent variable is the % change in price of N firms. The key independent variable is the adjusted change in shares purchased. The values are lagged by 1 period and the first difference is taken to capture the changes. The second independent variable is if a firm is excluded or not at time t. The third independent variable, a sectoral spillover, seen in equation (2). Standard errors are robust and I include time fixed effects, sector fixed effects and country fixed effects.

A pure baseline result in Column (1), Table 2 shows that there is a short-term positive effect of divestment on the price change, i.e. buying (selling) shares, adjusted for outstanding, increases (decreases) the price by 8.1%. This result is not significant. Both with and without fixed effects, we continue to see an insignificant but positive correlation between the Purchase of Shares and the Change in Price. In column 4, we see that a unit increase in adjusted purchases (sales) will increase (decrease) the price of the stock by 18.2%, though insignificant. This prompts us to note that actual exclusions are positively correlated with stock price. The coefficients of the categorical variable, A_{it}, concur with this but are statistically insignificant: being excluded should reduce firms' stock price by 3.2%. More importantly, if we refer to the Sector-Spillover Effect, we see that being from the same sector as the excluded company reduces firms' stock price in the short term by 5.6% without fixed effects 1.2% with fixed effects (Column 4). This result is significant at the 1% level. To see if this effect persists, we perform the same panel regression with $s = 4$ lags instead.

Interestingly, over the medium term, the effect of Share Purchases reverses. As seen in Columns (1)-(3) in Table 3, purchasing (selling) shares of excluded firms decreases (increases) their stock price. This reversal effect is insignificant, however. Rather with fixed effects, in Table 3 Column (4), we see that the Purchase (Sales) of Shares increases (decreases) of excluded firms increases (decreases) their stock price by 22.6%. This effect is significant at the 10% level. Moving the exclusion announcement, we can see in Column (3) that being excluded reduces the firm stock price by 6.5%, significant at the 10% level.

Table 3: Baseline Panel Regression with $t+4$ lags.

	(1) $\Delta ln(P_{i,t+4})$	(2) $\Delta ln(P_{i,t+4})$	(3) $\Delta ln(P_{i,t+4})$	(4) $\Delta ln(P_{i,t+4})$
$Purchase_{it}$	-0.0813	-0.0813	-0.0641	0.226*
	(-0.34)	(-0.34)	(-0.28)	(2.53)
A_{it}		-0.0540	-0.0645*	-0.0414
		(-1.70)	(-2.04)	(-1.78)
$A_{non-i,t}$			-0.0756***	-0.0246***
			(-15.39)	(-5.61)
Constant	-0.0153***	-0.0152***	-0.00653***	0.00588
	(-10.47)	(-10.37)	(-4.22)	(0.91)
N	34412	34412	34259	34259

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

This table corresponds to the baseline panel regression seen in equation (2) *but with* $s = 4$ *instead of* $s = 1$. *All other variables remain the same as in Table 2. Standard errors are robust and I include time fixed effects, sector fixed effects and country fixed effects.*

We also see the persistence of the Sectoral Spillover effect over a medium term. Being from the same sector with an adjusted market capitalisation significantly decreases firms' stock price by 7.6% without fixed effects and 2.5% with fixed effects; both these coefficients are statistically significant at the 1% level.

We should also nest fixed effects given the ordered nature of country, sector and firm-level fixed effects.

Table 4: Nested Fixed Effects Regression with a $t+1$ lag.

	(1)	(2)	(3)	(4)
	$\Delta ln(P_{i,t+1})$	$\Delta ln(P_{i,t+1})$	$1\Delta ln(P_{i,t+1})$	$\Delta ln(P_{i,t+1})$
$Purchase_{it}$	0.0510	0.0501	0.0478	0.126
	(0.54)	(0.53)	(0.50)	(0.90)
A_{it}		-0.0524	-0.0586	-0.0396
		(-1.46)	(-1.63)	(-1.38)
$A_{non-i,t}$			-0.0546***	-0.0192***
			(-11.64)	(-4.89)
Constant	-0.0122***	-0.0121***	-0.00591***	-0.00999***
	(-10.06)	(-10.00)	(-4.76)	(-8.53)
N	37168	37168	36992	36992
$TimeFE$	No	No	No	Yes
$Country, SectorFE$	No	No	No	Yes

t statistics in parentheses

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

I run a nested fixed-effects regression where I order the fixed effects hierarchically on country, sector and time factors. The regression is with $t+1$ lags. All other variables remain similar to the regression in equation (2). The dependent variable is the % change in Price of N firms. The key independent variable is the adjusted change in shares purchased.

For this, we conduct a Nested Fixed Effects Regression in Table 4 for $t+1$ lags and then in Table 5. The only difference between fixed effects and nested fixed effects regression is that the latter hierarchically absorbs the fixed effects. From Table 4, we can see that the direction of the coefficients for $Purchase_{it}$ and A_{it} is similar to those in Table 2 and are statistically insignificant. We find that with fixed effects, a unit increase in purchasing (selling) shares of a stock, adjusted for outstanding shares, increases (decreases) the stock price by 12.6% in (Column 4).

Similarly, we find that if a firm is excluded, its price reduces by 4% (as seen in Column 4). The only major difference between Tables 2 and 4 is that the effect of the sectoral spillover increases in the short term with nested fixed effects. Being from the same industry as the excluded firm with an adjusted market capitalisation reduces one's stock price by 1.9%. This effect is significant at the 1% level.

Another iteration for the nested fixed effects regression is with $t+4$ lags. In Table 5, we can witness that exclusion reduces the firm's stock price by 6.2% in Column 3, significant at the 10% level. All other coefficients follow a similar direction as in 3. However, we witnessed that the Sectoral Spillover effect was still persistent. Being from the same sector as the excluded firm reduces a firm's stock price by 2.6% (Column (4)). This effect is significant at the 1% level.

When we run the same regression with multiple consecutive lags as in Table 6, we see two effects. First,

Table 5: Nested Fixed Effects Regression with $t+4$ lags.

	(1) $\Delta ln(P_{i,t+4})$	(2) $\Delta ln(P_{i,t+4})$	(3) $\Delta ln(P_{i,t+4})$	(4) $\Delta ln(P_{i,t+4})$
$Purchase_{it}$	-0.0877	-0.0878	-0.0702	0.210
	(-0.37)	(-0.37)	(-0.31)	(1.51)
A_{it}		-0.0537	-0.0622*	-0.0411
		(-1.74)	(-2.01)	(-1.56)
$A_{non-i,t}$			-0.0742***	-0.0261***
			(-14.77)	(-6.36)
Constant	-0.0104***	-0.0103***	-0.00180	-0.00739***
	(-8.14)	(-8.05)	(-1.39)	(-6.04)
N	34412	34412	34259	34259
$TimeFE$	No	No	No	Yes
$Country, SectorFE$	No	No	No	Yes

t statistics in parentheses

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

In this table, I run another nested fixed-effects regression where I order the fixed effects hierarchically on country, sector and time factors. This regression is with $t+4$ lags. All other variables remain similar to the regression in equation (2).

Table 6: Nested Fixed Effects Regression with multiple lags.

	(1) $\Delta ln(P_{i,t+1})$	(2) $\Delta ln(P_{i,t+2})$	(3) $\Delta ln(P_{i,t+3})$	(4) $\Delta ln(P_{i,t+4})$
$Purchase_{it}$	0.126	-0.164	0.0736	0.210
	(0.90)	(-1.18)	(0.53)	(1.51)
A_{it}	-0.0396	-0.0403	-0.0348	-0.0411
	(-1.38)	(-1.41)	(-1.35)	(-1.56)
$A_{non-i,t}$	-0.0192***	-0.0188***	-0.0186***	-0.0261***
	(-4.89)	(-4.79)	(-4.75)	(-6.36)
Constant	-0.00999***	-0.0106***	-0.00650***	-0.00739***
	(-8.53)	(-8.91)	(-5.43)	(-6.04)
N	36992	36149	35204	34259
$TimeFE$	Yes	Yes	Yes	Yes
$SectorFE$	Yes	Yes	Yes	Yes
$CountryFE$	Yes	Yes	Yes	Yes

t statistics in parentheses

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

This table corresponds to a nested fixed-effects regression where I order the fixed effects hierarchically on country, sector and time factors and regress on the dynamics with multiple lags. All other variables remain similar to the regression in equation (2).

there is no effect of actual divestment of shares on the stock prices over time. Furthermore, even announcing the exclusion of a single stock or multiple stocks over time does not affect the stock price even though the coefficients are negative for A_{it}, suggesting that divestment should negatively affect the stock prices. On the other hand, we see that the sectoral spillover effect strengthens. Being in the same industry as the firm that has been excluded reduces one's stock price by 1.9% immediately in the next quarter but recovers in Q2 by reducing only upto 1.88% and 1.86% by the end of Q3. At the end of Q4, the price reduces strongly again by up to 2.61%. This can be attributed to the fact that NBIM normally liquidates its stocks in exclusionary sectors in four quarters. Hence, investors invested in other stocks preemptively anticipate an exclusion announcement, adding to the stigmatization of an industry as a "bad industry" or a "sin industry."

However, not all industries will have the same stigma. A sector-wise panel regression of each of the 7 sectors will help us break down the Sectoral Spillover effect, actual purchase and announcement effects. The specification is similar to (2). The only difference is that for each sector $k \in N$, we have 7 sectors now, and N is smaller per column. In Table 6 $N_k =$ Oil and Natural Gas in Column 1, Coal in Column 2, Electric utilities and IPPs in Column 3, Freight and Logistic Services in Column 4, Metals and Mining in Column 5, Multiline utilities in Column 6, and Pharmaceuticals in Column 7.

5.3 Sector-wise panel regressions

A sector-by-sector panel regression reveals a deeper insight. The only significant effect of actual purchases on short-term stock prices is within the Oil and Gas industry. In Table 7 Column 1, buying (selling) a unit more of oil and gas share, adjusted for total outstanding, increases (decreases) the price of oil and gas stocks by 243% in the following quarter. This reflects a very strong effect of selling pressure from institutional investors such as NBIM on Oil and Gas firms that are on the exclusion list. This result is significant at the 5% level.

Moreover, we see that an exclusion announcement in the Oil and Gas sector reduces the stock price by 243% and in the Electric Utilities and IPPs sector by 63% (Columns 1 and 2, respectively), both significant at the 10% level. On the other hand, an exclusion announcement in the Metals and Mining sector reduces the stock prices in that sector by 135% (Column 5). This result is significant at the 1% level. We also see that the effect of a Sectoral Spillover drops in a sector-by-sector panel. Being in the same sector as the Oil and Gas sector reduces the firms' stock price by 242% in Column 1 and by 61% in Column 3 for Electric Utilities and IPPs, both significant at the 10% levels. Being in the metals and mining sector, the same as the excluded firm reduces the short-term stock price by 127% (Column 5), significant at the 5% level. It is also noteworthy that the oil and gas industries show a more significant effect than the coal industries, even though many of the exclusions are based on the production of coal. This is not surprising as the actual purchase or sale of coal stocks is less prominent in the portfolio. Rather, increasingly, other sectors which produce energy using coal or mine it are targeted by NBIM (such as Metals and Mining, EUIPPs).

We would also like to see if these effects persist over time; hence, let us run the same regression in Table 8 with a $t+4$ lag instead. We can observe that the effect of purchasing (selling) Oil and Gas stocks, which would increase (decrease) the price over a quarterly period, disappears over a year. On the other hand, we see that buying (selling) of Freight and Logistics Services by a unit increases (decreases) their price by 33%, significant at the 1% level. Similarly, a sell-off on pharmaceutical companies decreases their prices by 83% over a year, significant at the 10% level. An exclusion announcement, however, still matters marginally: being announced as an excluded Oil and Gas firm reduces their stock price by 262% at the 10% level. Lastly, this framework's two most important results are the following: the coefficients of $purchase_{it}$ in Column (3) are negative and significant at the 5% level. This shows that a sell-off from NBIM of a unit of adjusted shares in EUIPPs actually *increases the stock price* of EUIPP firms in the medium term by 211%.

Similarly, though insignificant, the coefficient of coal industries is also negative (i.e. selling a unit share of the coal industry would increase their stock price over a year by 93%). We call this a sin stock premium, as Ghoul et al. (2022) find, too. Over time, people continue to invest in electric utility and independent power producer (EUIPP) companies as the price becomes cheaper upon NBIM's divestment in the short term. Moreover, given that EUIPPs are integral in energy crises, people buy stocks from these industries. On the other hand, if we drill sector-by-sector, we can witness that the sectoral spillover effect weakens over time. Being from the Oil and Gas sector but non-excluded still reduces their stock price 268% at the 10% level, which can be attributed to stigmatization as a bad industry, however.

Table 7: Sector-wise Panel Regressions with a $t+1$ lag

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	$\Delta ln(P_{ONG,t+1})$	$\Delta ln(P_{COAL,t+1})$	$\Delta ln(P_{EUIPP,t+1})$	$\Delta ln(P_{FRLS,t+1})$	$\Delta ln(P_{MM,t+1})$	$\Delta ln(P_{MU,t+1})$	$\Delta ln(P_{PH,t+1})$
$Purchase_{it}$	2.438**	1.501	0.930	0.0618	0.330	-0.752	-0.145
	(2.96)	(1.24)	(1.21)	(0.53)	(1.61)	(-0.40)	(-0.52)
A_{it}	-2.429*	-0.607	-0.632*	0.312	-1.350***	-0.312	-0.0255
	(-2.46)	(-0.62)	(-2.20)	(1.34)	(-3.44)	(-0.49)	(-0.08)
$A_{non-i,t}$	-2.418*	-0.704	-0.607*	0.249	-1.267**	-0.365	-0.0790
	(-2.43)	(-0.66)	(-2.11)	(1.05)	(-3.24)	(-0.56)	(-0.26)
Constant	0.0333*	-0.0527	-0.00434	0.0648**	-0.0407***	0.0424	0.0812***
	(2.38)	(-1.21)	(-0.31)	(3.15)	(-3.82)	(1.36)	(5.17)
N	6088	612	5278	4638	10192	1008	9176
$TimeFE$	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$SectorFE$	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$CountryFE$	Yes	Yes	Yes	Yes	Yes	Yes	Yes

t statistics in parentheses

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

This table corresponds to a sector-wise fixed-effects regression with a $t+1$ lag. While all other variables remain similar to the regression in equation (1), the dependent variable and independent variables are for respective sectors. These are (i) ONG: Oil& Gas, (ii) COAL: Coal, (iii) EUIPP: Electric Utilities & Independent power producers, (iv) Freight & Logistics Services, (v) MM: Metals & Mining, (vi) MU: Multiline Utilities, (vii)PH: Pharmaceuticals. All are the changes in the logged values of price of all the firms in the narrowed portfolio. The key independent variable is the adjusted change in shares sold.

Table 8: Sector-wise Panel Regressions with a $t+4$ lag

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	$\Delta ln(P_{ONG,t+4})$	$\Delta ln(P_{COAL,t+4})$	$\Delta ln(P_{EUIPP,t+4})$	$\Delta ln(P_{FRLS,t+4})$	$\Delta ln(P_{MM,t+4})$	$\Delta ln(P_{MU,t+4})$	$\Delta ln(P_{PH,t+4})$
$Purchase_{i,t}$	0.584	-0.926	-2.110**	0.329***	-0.0257	3.984	0.827*
	(0.69)	(-0.56)	(-2.60)	(6.90)	(-0.08)	(1.57)	(2.35)
A_{it}	-2.622*	-1.687	-0.510	0.252	-0.473	-0.533	-0.0981
	(-2.51)	(-1.61)	(-1.85)	(1.12)	(-0.34)	(-0.98)	(-0.33)
$A_{non-i,t}$	-2.681*	-1.834	-0.461	0.211	-0.392	-0.578	-0.146
	(-2.55)	(-1.62)	(-1.67)	(0.93)	(-0.28)	(-1.04)	(-0.50)
Constant	0.000294	-0.0158	0.00698	0.0179	0.352	0.0259	0.0408**
	(0.02)	(-0.38)	(0.47)	(1.14)	(0.25)	(0.90)	(3.20)
N	5755	580	4907	4274	9446	934	8363
$TimeFE$	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$SectorFE$	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$CountryFE$	Yes	Yes	Yes	Yes	Yes	Yes	Yes

t statistics in parentheses

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

This table corresponds to a sector-wise fixed-effects regression with a $t+4$ lag. While all other variables remain similar to the regression in equation (1), the dependent variable and independent variables are for respective sectors. These are (i) ONG: Oil& Gas, (ii) COAL: Coal, (iii) EUIPP: Electric Utilities & Independent power producers, (iv) Freight & Logistics Services, (v) MM: Metals & Mining, (vi) MU: Multiline Utilities, (vii)PH: Pharmaceuticals. All are the changes in the logged values of price of all the firms in the narrowed portfolio. The key independent variable is the adjusted change in shares sold.

6 Conclusion

In this paper, we aimed to study whether exclusions based on environmental criteria actually affect the price of the stock or not. While exclusionary announcements have been relatively widely studied, we aimed to study whether actual purchases and sales of shares also affect the stock prices of those firms. This is because smaller financial market participants who monitor the market can anticipate exclusions based on share activity and selling pressure. Taking three environmentally-focused exclusion criteria, we identified 98 excluded firms for which share volume and share price data were available. Thereafter, we identified the key sectors in which they were excluded to identify the effect of exclusions on a sector-specific portfolio. To do so, we first conducted an event study and found no significant effect of an exclusion on stock prices. This was followed by two-panel regressions, one with a shorter lag and one with a longer lag.

We found that, on average, there is no effect of purchase/sales of stocks and exclusionary announcements on stock prices in the short term. In the medium term, there is a marginal effect of actual purchases or sales and exclusion announcements on stock prices. If NBIM sells a stock over a year, the prices of the excluded stocks fall. Similarly, the announcement of an exclusion does decrease the price of excluded firms, but only marginally. This paper's second and unique outcome is the 'Sectoral Spillover' effect. Being in the same sector as the excluded firm draws the risk of being the next to get excluded. Upon adjusting for market capitalisations, we find strong evidence in favour of a 'Sectoral Spillover' that being in the same sector as the excluded firm reduces one's stock price in the short-term, the effect of which strengthens in the medium term. This can be attributed to stigmatising excluded firms' industries, which strengthens over time.

This unique result naturally interests whether the stigmatisation is across all excluded industries or more focused on a few. To answer this question, we run sector-by-sector panel regressions. An exclusionary announcement in the oil and gas industry significantly affects the stocks, but the divestment matters more in the short term. People crowd out of the oil industry altogether until the next quarter. Moreover, a Sectoral Spillover Effect is limited to the Metals and Mining, Oil and Gas and Electric Utilities and IPPs sectors in the short term, meaning that people crowd out of these industries in fear of potential exclusion in the short term. However, this Sectoral Spillover effect is short-lived and disappears over the medium term. It is only visible in the Oil and Gas industry, signifying a long-term stigmatisation of the industry altogether.

Drilling down the regression by sector also reveals a new anomaly: selling shares in the Electric Utilities and IPPs sector *increases their price* over the medium term but has no significant effect in the short term. This puzzling effect shows that people may be unwilling to buy Electric Utility stocks in the short term because of an exclusion history, but they would like to invest in them over the medium term. More critically, the Electric Utilities industry also has the highest number of exclusions overall (56), truly making it a 'bad stock' or a 'sin stock' This effect could be driven by various factors such as oil and commodity price rallies, energy price increases, or simply a 'sin stock premium'. The sin stock, i.e., a stock with high emissions, premium maximises the return of sin stocks in the near term rather than waiting for production plants to be written off due to stranded asset risk. As a result, investors investing in Electric Utilities and IPPs would want to make as much return in the medium-term over the long-term but do not crowd in immediately after NBIM's exclusions. Consequently, they invest in such stocks to make a return over the medium term when there is also low volatility.

It is also important to note that while we run only panel regressions, other unique approaches to this topic include conducting a differences-in-differences regression of excluded firms and those not within the same sector to measure a sector-by-sector effect. Furthermore, it can also be noted that the R-squared in the regressions is extremely small (0.2 or less). This is because several other factors better explain the movement of the stock prices in NBIM's portfolio. Another important analysis of interest is to measure whether the portfolio volatility indicators, such as the sector-wise market-cap weighted standard deviation of price and Sharpe ratios, become volatile during exclusions, which can further explain whether people buy more during those periods and, therefore, choose to stay out of that stock for a longer period. Finally, in our analysis, we could not study whether there is more buying and selling of shares of other stocks from the market as we deduced in the 'sin stock premium' effect for EUIPPs or the Sectoral Spillover effect. A prospective study could use the FactSet Ownership (LionShares) database to study whether the % outstanding from other companies holding EUIPP stocks and Sectoral Spillover stocks are actually increasing.

In summary, this paper shows that exclusionary announcements matter significantly for both excluded and non-excluded stocks. In contrast to consensus, an announcement affects non-excluded firms from the same sector more than the excluded firms themselves. This is due to the stigmatisation of an industry and a potential threat to future exclusion. The paper concludes with a strong effect of a sin stock premium for the Electric Utilities industry, which had the highest exclusions in the portfolio. The finding concludes that selling a sin stock counter-intuitively increases the stock's price in the medium term, making it cheaper for the masses who crowd in and buy more of the same stock. This shows that while exclusion announcements have a strong effect on the markets, actual exclusions in sin industries can have a counterintuitive one.

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8 Appendix: Descriptive Statistics and Secondary Graphs

Figure 3: % Change in price of excluded firms

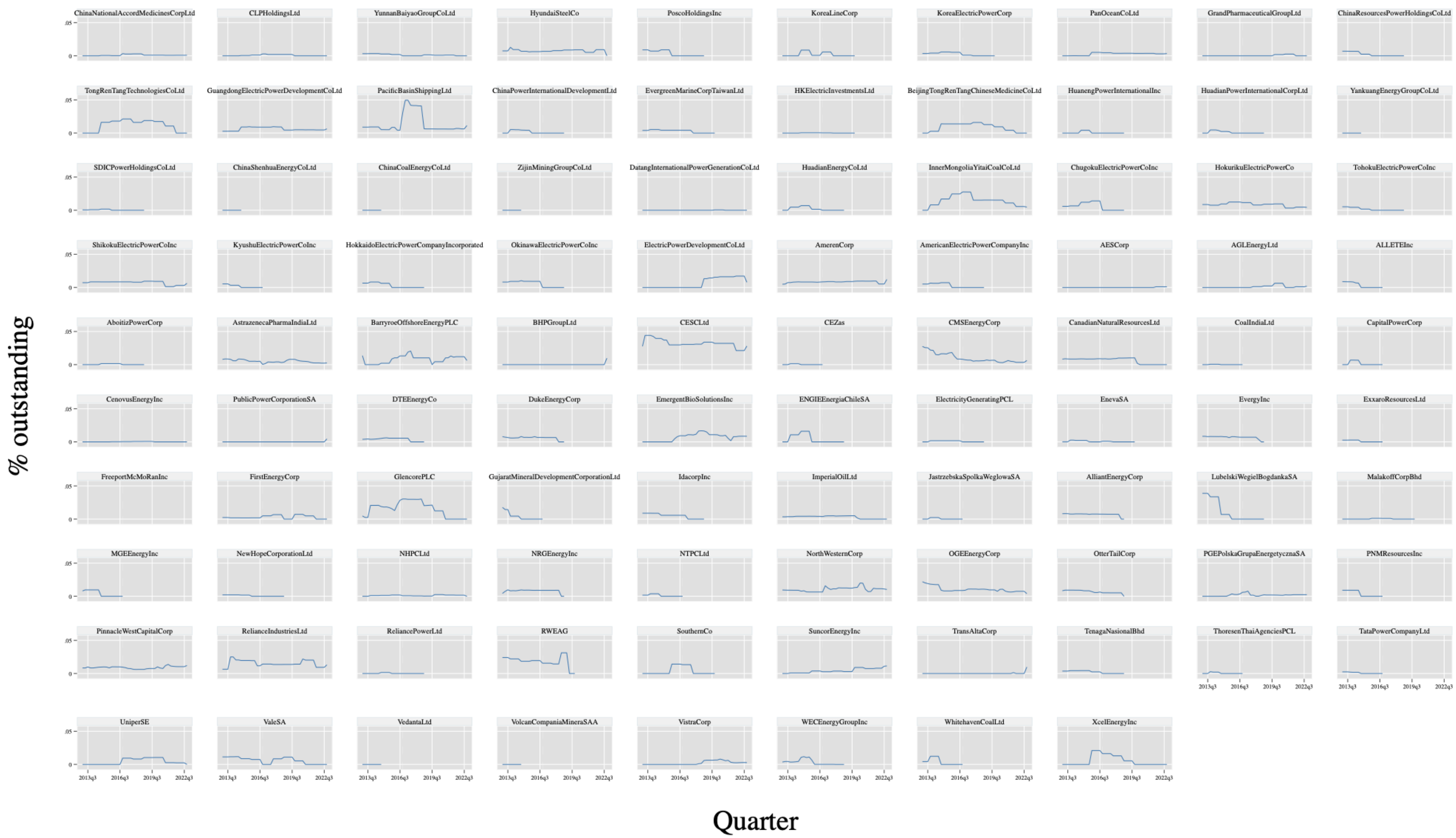

Figure 4: NBIM share of ownership in excluded companies

Figure 5: % Change in price of excluded oil, gas and coal companies.

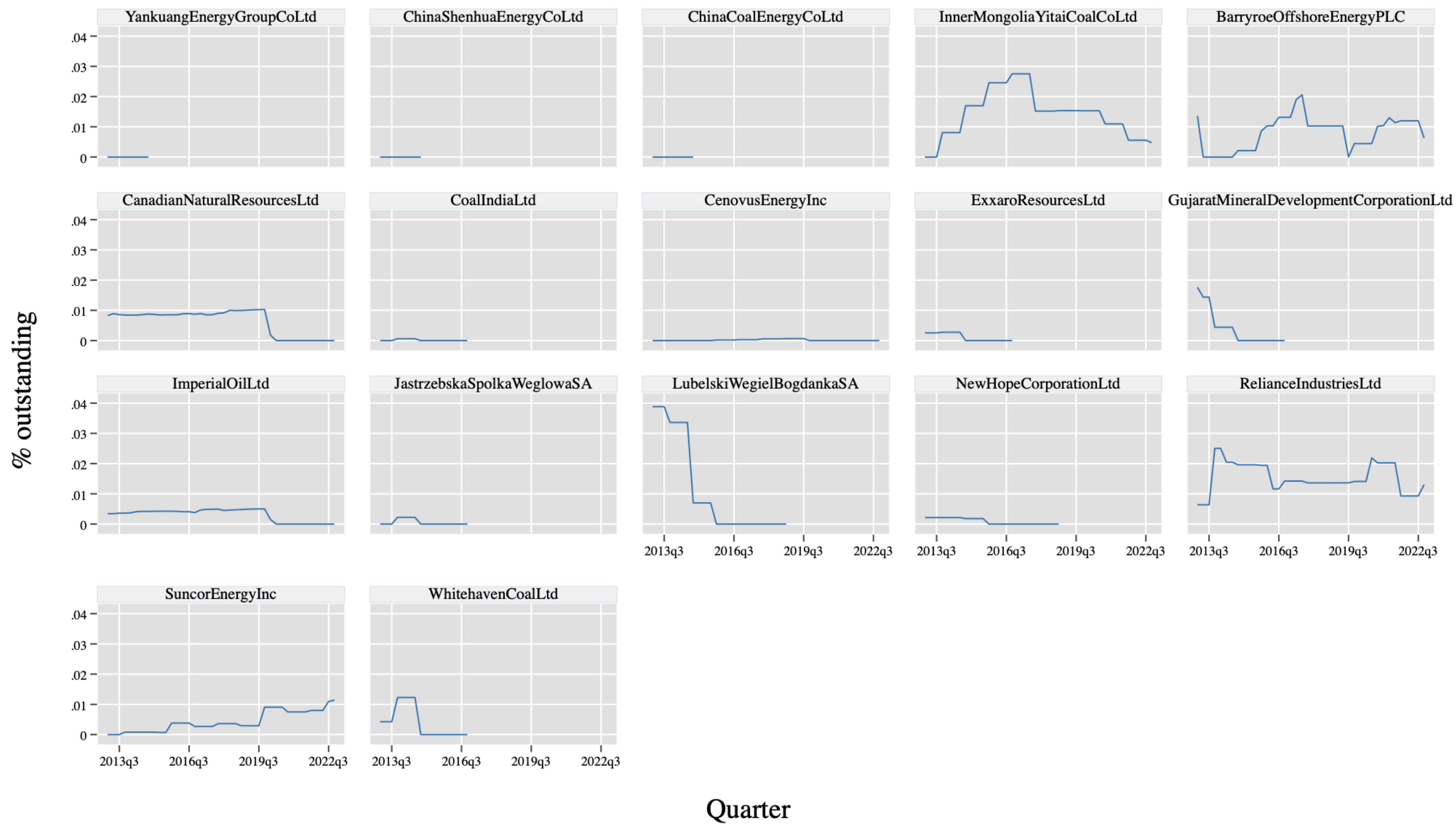

Figure 6: NBIM share of ownership in Change in price of excluded oil, gas and coal companies

Figure 7: Change in price of excluded oil, gas and coal companies on a daily frequency