



Does the fossil fuel divestment movement impact new oil and gas fundraising?

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Abstract

This article explores whether increasing fossil fuel divestment commitments are related to the reduction of capital flows into the oil and gas sector, based on an analysis of syndicated lending, equity and bond underwriting across 33 countries from 2000 to 2015. We find that increasing oil and gas divestment pledges in a country are associated with lower capital flows to domestic oil and gas companies. This effect is enhanced in more stringent environmental policy regimes and diminished in countries which heavily subsidise fossil fuels. However, the divestment movement may have an unintended effect, insofar as domestic banks situated in countries with high divestment commitments and stringent environmental policies provide more finance to oil and gas companies abroad. We explain these findings through the lens of institutional theory and show how both regulatory and socially normative elements of institutions shape this dynamic.

Keywords: Fossil fuel divestment, oil and gas finance, environmental policies, environmental finance

JEL classifications: G20, G30, Q28, Q32, Q38, Q50

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1. Introduction

Despite the pledges from countries and companies around the world to reduce their greenhouse gas (GHG) emissions and avoid the most dangerous impacts of climate change, global emissions have continued to increase over the past two decades, reaching a high of 55.3 GtCO₂e in 2018 (UN, 2019). One reason for this is that despite a record amount of new investment in renewable energy (BNEF, 2019), we have also reached historical highs in funding of fossil fuels (EY, 2014). In addition, many countries have committed to building and financing fossil fuel infrastructure which would take the world past 2°C of global warming (Pfeiffer et al., 2018). From a scientific perspective, the stabilisation of global

warming under any target requires the achievement of a net-zero emissions economy (Matthews and Caldeira, 2008). For this to be plausible, at least a third of oil reserves and 50% of gas reserves need to remain in the ground (McGlade and Ekins, 2015).

Recent years have also witnessed the emergence of the fossil fuel divestment campaign, the roots of which can be traced back to 2008, with the advocacy work of the 350.org NGO in the USA. The movement gained global visibility in 2012, thanks to the *Rolling Stone* article of environmental activist Bill McKibben titled ‘Global Warming’s Terrifying New Math’ (McKibben, 2012), which advocated cutting the supply of financial capital to the fossil fuel industry (Green and Denniss, 2018; Le Billon and Kristoffersen, 2019). By 2013, it was already identified as the fastest growing divestment campaign in history (Ansar et al., 2013), and divestment pledges reached over US\$14 trillion by early 2020.¹

Given that the divestment movement has arisen against the backdrop of a sustained period of increasing new investment in fossil fuels, this raises the question of whether the divestment movement has had any effect in reducing capital flows to the fossil fuel sector. This article aims to answer this question, by analysing empirical data from equity and bond issuance and syndicated loan transactions in 33 countries from 2000 to 2015, using institutional theory and economic geography as an explanatory theoretical lens (Scott, 1995; Bathelt and Glückler, 2014).

Institutional theory views institutions as social practices that persist over time, stabilised by a combination of regulatory, normative and cultural–cognitive elements or ‘pillars’ (Scott, 1995). Institutional theorists adopting an economic geography lens have had much to contribute in explaining the rise of responsible investment across countries, for example investigating the institutional settings that determine the signing-up to the Principles of Responsible Investment initiative by pension funds (Hoepner et al., 2019), the cross-country growth determinants of sustainable investment funds (Yan et al., 2019) or how country-level sustainability factors impact the credit risk of different industries (Hoepner et al., 2016). But institutional theorists have yet to explore how responsible investment strategies, such as fossil fuel divestment and financing denial, influence the fundraising potential of the sectors these investment strategies target.

Our study hence draws from and contributes to institutional theory. In exploring the impact of fossil fuel divestment commitments on new financing flows into the oil and gas sector, we frame the fossil fuel divestment movement as an emerging institution, which has operated primarily through normative pressure. We also contribute to theory by showing how the regulatory environment interacts with an emerging institution (i.e. the fossil fuel divestment movement), shaping its influence over valuable resources, which in turn helps explain the spatial variation in new oil and gas financing.

We find that increasing oil and gas divestment pledges in a country, particularly where these are signalled by non-financial organisations and non-governmental organisations (NGOs), are associated with lower new capital flows to domestic oil and gas companies. This effect is enhanced in more stringent environmental policy regimes and diminished in countries which heavily subsidise fossil fuels. We also find that the divestment movement may be having an unintended effect, insofar as domestic banks situated in countries with high divestment commitments and stringent environmental policies provide more finance to oil and gas companies abroad.

This article is structured as follows. In Section 2, we draw from the literature on institutional theory and economic geography to clarify our conceptual understanding of institutions and to explain why the spatiality of fossil fuel fundraising should manifest itself at

1 <https://gofossilfree.org/divestment/commitments/>. Divestment commitments as of 25th April 2020.

the country level. We further employ an institutional theory lens to conceptualise and analyse how anti-fossil fuel norms impact fossil fuel fundraising, as well as how this impact is moderated by the formal regulatory environment. Section 3 presents our empirical model and data. Section 4 provides a synthesis of our results, which are then discussed in the context of our theoretical framing in Section 5. In Section 6, we discuss the implications and conclusions of our study.

2. Theoretical background and hypotheses

2.1. Institutional theory

The central tenet of institutional theory is that individuals and organisations are rooted in and shaped by their regulatory, social and cultural environments (Scott, 1995, 2014; Hoepner et al., 2019). These correspond to Scott's (2014) three pillars of institutional theory: (i) the regulative pillar which describes the role of formal institutions or governments, which define and enforce the rules governing interactions between economic agents; (ii) the normative pillar, which embodies the norms and value systems associated with the expected behaviour of organisations and individuals and (iii) the cultural-cognitive pillar, which focuses on the behaviours of individuals, and the settings which determine their beliefs and actions. In this way, institutions can be seen as economic enablers, by creating expectations about the behaviours of economic actors and thus reducing the uncertainty associated with their interactions (North, 1990). Although institutions are founded on the three pillars or symbolic elements, they are brought to life through social interactions that are both constrained by and shape the distribution of resources (Scott, 2014).

In the institutional economic geography literature, going back to Martin (2000), institutions have traditionally been conceptualised as rules, regulations, conventions or customs (Rafiqi, 2009), or as organisations (e.g. pension funds or central banks of systemic importance) (Clark and Monk, 2013). More recently, however, Bathelt and Glückler (2014) argue that these examples are 'not yet institutions', because even though organisations and rules might persist over time, the interactions between actors that they relate to might change, and it is 'ongoing and relatively stable patterns of social practice' (p. 346), rather than the simple persistence of structures, that define an institution. This is broadly consistent with Scott (2014) who suggests that 'institutions exhibit stabilizing and meaning-making properties because of the processes set in motion by regulative, normative, and cultural-cognitive elements' (p. 57).

We find this broader conception of institutions helpful in considering the divestment movement, which has rapidly become a relatively stable pattern of social practice, with significant implications for the distribution of financial resources and the material consequences that flow from this, despite having only recently emerged and not comprising a single organisation or set of rules. Hence, we consider the fossil fuel divestment movement as an emerging institution. In the next section, we discuss how oil and gas financing—the target of the fossil fuel divestment movement—is likely to exhibit spatial variation at the country level.

2.2. The spatiality of oil and gas financing

Although institutions are socio-economic rather than spatial constructs, they may exhibit spatially defined characteristics since they develop in relation to customs, rules, regulations and organisations that often have a territorial basis (North, 1990; Bathelt and Glückler, 2014). The spatial scale at which this may be observed depends on the spatial scale at which relevant economic agents operate. In the context of the international fossil fuel

divestment movement, broadly common objectives can be discerned among responsible investment actors at a global level (to reduce and eventually phase out investment in fossil fuels). However, the way in which this becomes stabilized in patterns of interaction is likely to vary across countries, due to the spatially specific nature of the customs, rules, regulations and organisations that investors interact with at the country level. In this article, we seek to understand this emergent institution by considering country-level outcomes (i.e. the level of oil and gas fundraising) as the result of spatially determined interactions between oil and gas companies, bankers and investors, and the formal rules and regulations which shape the low-carbon energy transition, as represented by fossil fuel subsidies and environmental policy stringency (EPS).

The oil and gas sector is a producer-driven value chain in which the majority of operational control lies with the administrative headquarters of the transnational (or state owned) oil and gas company. Much of the extractives sector relies on relationships with nation states, as fossil fuel reserves are sovereign assets, even if this sovereign right is temporarily revoked through contractual agreements with commercial entities (Bridge, 2008; Le Billon and Kristoffersen, 2019). In addition, the credit-worthiness of the fossil fuel industry is highly dependent on their home country's credit rating and sustainability profile, particularly in the case of semi- or fully state-owned companies (EY, 2014; Hoepner et al., 2016). The country level is also important because in times of high oil price volatility, negotiations for ramping up or dialling down production take place among government officials (Brower et al., 2020).

The practices and investment processes of energy investors are also significantly influenced by country-specific institutional elements (Létourneau, 2015). Normative elements of the country-level institutional environment have been shown to be highly conducive to the decisions of asset owners to integrate environmental, social and governance considerations in their investment processes (Scholtens and Sievänen, 2013; Hoepner et al., 2019) or to launch socially responsible investment funds (Yan et al., 2019).

A similar pattern has been observed in bank lending after the financial crisis (Hoepner and Wilson, 2012), where recent literature shows that banks have started to consider 'soft indicators' related to the home country environmental and social sustainability profile of the companies to which they provide financial services (Weber et al., 2015, 2008; Hoepner et al., 2016). Oil and gas companies rely heavily on their domestic investment banks for arranging syndicated lending deals with other banks and for securities underwriting. These activities rely on 'relationship banking', where lending/underwriting decisions are based not only on quantitative datapoints (e.g. profitability or liquidity) but also on 'soft' information (e.g. trustworthiness, competence, impact of social norms on licence to operate and other factors) (Hoepner et al., 2016; Gropp and Guettler, 2018). This literature suggests that banks may have started to consider the reputational risks associated with financing or underwriting the oil and gas sector and would therefore be expected to decrease their overall exposure to the industry, particularly in countries where doing otherwise is highly stigmatised by the fossil fuel divestment movement (Le Billon and Kristoffersen, 2019). Overall, institutional elements which apply at the national scale have a profound influence on private-sector actors (Christopherson, 2002). In the next section, we discuss how the fossil fuel divestment movement attempts to shape the fundraising patterns of the oil and gas sector across countries.

2.3. Impact of the fossil fuel divestment movement on fossil fuel fundraising

The global anti-fossil fuel movement has focused on convincing asset owners to divest from the fossil fuel sector (Hunt et al., 2017). The movement has attracted attention to

climate issues through stigmatising fossil fuel companies, as well as by engaging in arguments about morality, economics and justice (Ansar et al., 2013; Gunningham, 2017; Mangat et al., 2018). The economic and financial arguments that the movement has adopted are rooted in the stranded assets hypothesis, which asserts that fossil fuel related assets will likely face devaluations as the world transitions to a low-carbon economy. The rationale for fossil fuel divestment is that society needs to keep >80% of fossil fuel reserves in the ground in order to limit climate warming to 2°C, which implies that any new investment in fossil fuel infrastructure should be denied (Carbon Tracker, 2011; Caldecott et al., 2016; Pfeiffer et al., 2018).

The fossil fuel divestment movement has not only focused on public pension and endowment funds (Ansar et al., 2013; Beer, 2016) but also on gaining the support of pro-environmental NGOs, many of which have, despite advocating for climate action, historically invested their own endowments and pension assets in diversified portfolios that include fossil fuel companies. Currently, there is no mandatory regulation stipulating that NGOs or any other organisations cannot invest in fossil fuels while being engaged in climate advocacy (Hoepner et al., 2019). Nevertheless, pro-environmental NGOs such as the Gates Foundation have partially divested after being publicly shamed, by the divestment movement, for investing in fossil fuels (*The Guardian*, 2015). The emergence of the divestment movement has also legitimised the launch of new financial products such as fossil fuel free indices, which are sold to institutional investors around the world (Ayling and Gunningham, 2017).

Considered as an emerging institution, it is clear that the divestment movement has to date primarily attempted to exert normative pressure to achieve its goals, relying on those institutional elements which ‘introduce a prescriptive, evaluative, and obligatory dimension into social life’ (Scott, 2014, 64). Nevertheless, there is some evidence of these normative elements now starting to spill over into regulation. For example, in 2018, the Republic of Ireland became the first country to legislate for divestment, passing the Fossil Fuel Divestment Act 2018, which requires the Irish Strategic Investment Fund (sovereign fund) to divest from its fossil fuel holdings as soon as practicable (*The Guardian*, 2018).

So far, no study has analysed whether the divestment movement has been successful in its goal to decrease the amount of new capital raised by fossil fuel companies. Hence, we test the following hypothesis:

H.1: Oil and gas divestment commitments in a country are negatively related to new oil and gas fundraising by the domestic oil and gas sector.

2.4. Interactions between normative and regulatory institutional elements

Institutional theorists have recognised that the normative and regulatory institutional pillars can interact and mutually reinforce or counteract each other (Scott, 2014). In the case of the emergent renewable energy sector, Vedula et al. (2019) showed that the growth of the industry relied heavily on pro-environmental social norms that facilitated their legitimacy in the early growth stages. Hartmann et al. (2020) provide one of the few quantitative accounts of regulatory and normative pressures on oil and gas companies, and show that their sample of 90 companies exhibit a much higher likelihood to diversify into renewable energy if they come from home countries with strong environmental regulations and pro-environmental social norms.

The interaction between regulatory and normative elements has also been the focus of human geographers seeking to understand how social movements interact with space, scale

and place (Nicholls, 2007; Miller, 2000). The uneven distribution of state power across different geographies presents a range of opportunities and challenges for social movements, as they navigate political regimes with different degrees of openness towards the goals of the social movement (Nicholls, 2007). As states themselves deploy their supportive or coercive powers on the oil and gas sector as well as on the divestment movement, government actions can have a significant influence on the impact of a social movement in a given country (Nicholls, 2007). Social norms gain more legitimacy when governments act as active norm managers by encouraging behaviours that are in line with certain expectations (Kinzig et al., 2013). This norm management can be either supportive (e.g. the government itself divesting from fossil fuels) or coercive, by explicitly penalising fossil fuels through more stringent environmental policies. In this respect, we hypothesise that:

H.2: Pro-environmental (pro-fossil fuel) country policies accentuate (attenuate) the negative impact of the fossil fuel divestment campaign on all new oil and gas fundraising.

A parallel line of enquiry into how institutions shape the decisions of fossil fuel industries is the ‘pollution haven’ hypothesis, which states that institutional environments which are more stringent towards fossil fuels will over time cause the shift of pollution intensive production to low abatement cost locations, thereby creating pollution havens (Lanoie et al., 2011; Ambec et al., 2013; Dechezleprêtre and Sato, 2017). This has been shown to be the case by Ben-David et al. (2018) studying the operations of multinational firms around the world.

While this literature shows that companies tend to relocate their carbon intensive operations as a result of more environmentally stringent policies, we know less about whether a similar approach is taken by banks, who in response to increased pressure to divest from fossil fuels in their home countries, may resort to investing in foreign oil and gas companies. Hence, we hypothesise that:

H.3: Investment banks in countries with a stronger fossil fuel divestment movement and more stringent environmental policies are more likely to invest in foreign oil and gas companies than domestic ones.

3. Data and methodology

3.1. Research design

In order to test the hypotheses outlined in the previous section, we provide the rationale for dependent and independent variables used in our statistical models, as further illustrated in Section 3.2. Our article seeks to study the reduction in fossil fuel fundraising due to the divestment movement’s normative influence, and how this is impacted by the host country’s regulatory environment.

Our dependent variable is the annual country-level fundraising by the oil and gas sector, which can be interpreted as an outcome of the correlated patterns of interaction of different economic agents (Bathelt and Glückler, 2014). These include: corporations, in our case the oil and gas companies themselves (Vasi and King, 2012; EY, 2014); their bankers, who may consider non-financial risks in their lending processes (Hoepner et al., 2016; Ascui and Cojoianu, 2019); fossil fuel divestment activists (Ayling and Gunningham, 2017; Le Billon and Kristoffersen, 2019) and policymakers (Cojoianu et al., 2020; Hartmann et al., 2020). Investment banks play an important role in this dynamic, as

lenders as well as equity and bond underwriters. Investment banks lend either directly or through syndicates to the oil and gas sector.

There are several factors which may influence banks to participate in syndicated loans (made jointly by a group of banks to a single borrower) rather than lend directly. These include the need to achieve diversification, to access markets and countries that would otherwise be inaccessible, and to meet the financing needs of borrowers that have high capital requirements, common in the oil and gas sector (Simons, 1993; Fight, 2004). Security (either equity or bonds) underwriting involves a different process. When companies issue either equity or debt to the public, several investment banks will typically buy these securities, and then sell them to other investors, marketing the opportunity through ‘roadshows’ (investor meetings in major financial centres). For example, Saudi Aramco recently hired JP Morgan to market its debt and equity issuance to western investors (Reuters, 2019). These are arguably the channels through which the oil and gas sector attracts the majority of its funding (EY, 2014), in addition to the subsidies that producers receive from governments, which we identify as one of our other independent variables.

Our key independent variable links oil and gas fundraising with the normative institutional element of the fossil fuel divestment movement in the host country. Unlike previous studies which have used the assets of environmental NGOs as a proxy for the strength of environmental social movements (Vedula et al., 2019), the assets committed for divestment by NGOs does not adequately represent the strength of the fossil fuel divestment movement in a country, because the aim of the movement is to catalyse divestment by other major shareholders. We therefore include in our proxy measure the total assets committed to divestment or denial of investment by all major shareholders including private companies, governmental investment arms, financial organisations (banks, insurance companies, venture capital firms, asset managers and pension funds), as well as environmental NGOs. We define divestment as the removal of existing invested funds, and denial as the removal of hypothetical future invested funds in fossil fuels.

Finally, we include two variables which we expect to influence the effect of the divestment movement on fossil fuel fundraising in two different directions. First, we hypothesise that a more stringent environmental policy regime will accentuate the negative impact that the divestment campaign has on new oil and gas fundraising. For this, we use a novel cross-country EPS index developed by the OECD (Botta and Koźluk, 2014), which is superior to the measures of EPS used in previous studies, which rely on either dummy variables or count of environmental policies across different countries (Cojoianu et al., 2020). Secondly, we use the year-on-year amount of oil and gas subsidies by country as a proxy for the country’s explicit regulatory support for the oil and gas industry, which we expect will attenuate the negative impact that the divestment movement may have on new oil and gas fundraising.

3.2. Dependent variable

Country oil and gas fundraising

The dependent variable is the total amount of capital raised (US\$million) by all oil and gas companies (public and private) in a given country and year. The main financial instruments through which funds are raised in the oil and gas sector are new equity and bond issues as well as syndicated loans arranged by investment banks (including project finance). Project finance is less used by the oil and gas sector compared to the power and utilities sector, mainly due to the unpredictability of oil and gas projects compared to other

infrastructure projects. Hence, much of the financial risk is taken by the companies themselves (EY, 2014).

We use the Dealogic database to construct a country variable of total fundraising by oil and gas companies (across equity, bond issuance and syndicated loans) across the world. Dealogic is a global database of investment bank transactions, which includes details on investment bank advisors and their clients for 673,102 fundraising deals across equity and debt issuance and syndicated loans between 2000 and 2015. We use the industry classification provided by Dealogic, which is based on the North American Industry Classification System, to identify oil and gas companies. The sample of public and private oil and gas companies come from sub-industries such as oil and gas extraction, distribution, oil and gas equipment manufacturing, oil and gas well drilling, oil and gas pipeline construction and operation and oil and gas refinery and marketing. Hence, we identify 19,057 fundraising events across the three financial instruments for the oil and gas sector (5,718 equity issuances; 3,754 bond issuances and 9,585 syndicated loans). We use the country of incorporation of the recipient company to aggregate the total fundraising by country, as well as the country of incorporation of the investment banks to determine whether the funding (in the case of loans) or underwriting (in the case of equity or bond issuance) was arranged by domestic or foreign banks. In addition, we quantify the total financing that a country's domestic investment banks provide to foreign oil and gas companies.

We are able to collect key independent variables and control variables over the 1999–2015 period (given the lag independent variable set-up) for 33 countries: Australia, Austria, Belgium, Brazil, Canada, China, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, India, Indonesia, Ireland, Italy, Japan, Mexico, Netherlands, Norway, Poland, Portugal, Russia, Slovak Republic, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, the UK and the USA.

To the best of our knowledge, this is one of the most comprehensive datasets of fossil fuel fundraising across asset classes from capital markets.

3.3. Independent variables

3.3.1. Country fossil fuel divestment commitments

Data to quantify the cumulative divestment commitments by NGOs, private companies and governmental organisations as well as financial organisations (banks, insurance companies, venture capital firms, asset managers and pension funds), was obtained from the Divest Invest initiative.² Divest Invest collects all the public fossil fuel divestment commitments as well as the assets pledged to be divested by these organisations, since the first public divestment commitment in 2008 of the NGO 350.org, which spearheaded the divestment initiative in the USA. The key independent variable is hence aggregated as the cumulative assets pledged for divestment (in US\$million) by country and by the type of organisation as classified by Divest Invest. We manually checked all types of divestment commitment from the announcements and websites of divesting organisations, to ensure that divestment commitments were either referring to all fossil fuels or to the oil and gas

2 <https://www.divestinvest.org/about/>

industry specifically. Hence, we exclude divestment commitments specific to coal only from our dataset.

3.3.2. Country OECD EPS

To analyse how pro-environmental regulation moderates the hypothesised negative impact of divestment commitments on oil and gas fundraising, we use the environmental policy indices constructed by the OECD which cover our 33 countries between 1999 and 2012 (Botta and Koźluk, 2014). The index has not been updated by the OECD for 2013 and 2014 and hence, given the slow changing nature of policy, we assume the same index values for the years 2013 and 2014 as in the year 2012. Our key independent variables, lagged one year, span the 1999–2014 period.

We use the EPS composite index, which is obtained from equally weighting the values of more granular groups of indicators at the individual instrument level, which are aggregated in five policy instrument categories: taxes, trading schemes, feed-in-tariffs, emission standards and R&D subsidies. The OECD scores every individual policy instrument between 0 and 6, which reflects the relative stringency across countries of a particular policy instrument (e.g. CO₂ emissions tax). These are then assigned equal weights to compose aggregate indices by policy instrument category, which then become the inputs to the overall index that we employ in our study (see [Supplementary Appendix](#)).

The term EPS is defined as ‘a higher, explicit or implicit, cost of polluting or environmentally harmful behaviour’ (Botta and Koźluk, 2014, 14). This can take the form of higher pollution taxes or stricter pollution limits, as well as greater incentives for the development of pro-environmental technologies or processes, for example through feed-in-tariffs or R&D subsidies.

3.3.3. Country oil and gas subsidies

To analyse how pro-fossil fuel regulation moderates, the hypothesised negative impact of divestment commitments on oil and gas fundraising, we use the OECD Inventory of Support Measures for Fossil Fuels, which standardise the data collection on fossil fuel subsidies for 44 countries. For each country-year, we measure the amount (US\$million) of subsidies related to oil and gas spent on producer, consumer and general service activities (OECD, 2018). The dataset is based on a reconciliation of OECD’s bottom-up approach of government support to individual programmes, with the International Energy Agency’s top-down estimates of consumer price support, thus providing a single figure on support given to fossil fuels which is comparable across countries.

3.4. Control variables

We outline the control variables we use in our models, alongside the data sources and a description in [Table 2](#). Besides oil and gas subsidies, one of our key independent variables, we use a wide set of characteristics for the oil and gas sector that partly accounts for the variation in fossil fuel fundraising. We include the country aggregate revenues of the oil and gas sector, which is an indication of the sector’s economic power and a strong determinant of whether the sector can service its debt (syndicated loans and bonds), which is consequently expected to be linked with the sector’s ability to fundraise. We further include the country’s oil and gas production and reserves, which are an indication of the

Table 1. Dependent, independent and control variables description and data sources

Variable name	Variable description	Data source
O&G Fundraising	Total oil and gas sector fundraising by country (equity issuances, bond issuances and syndicated loans to oil and gas companies)	Dealogic
O&G Divestment (All Types)	Total cumulative assets of organisations pledging to divest from fossil fuels by country from year of divestment pledge announcement.	Divest Invest Initiative
O&G Divestment (Financial)	Total cumulative assets of financial organisations pledging to divest from fossil fuels from year of announcement (banks, insurance companies, venture capital firms, asset managers and pension funds)	Divest Invest Initiative
O&G Divestment (Non-Financial)	Total cumulative assets of non-financial organisations pledging to divest from fossil fuels from year of announcement (NGOs, foundations, faith-based organisations, private companies, governmental organisations)	Divest Invest Initiative
O&G Divestment (NGO)	Total cumulative assets of NGOs pledging to divest from fossil fuels from year of announcement (NGOs, foundations and faith-based organisations)	Divest Invest Initiative
O&G Divestment (Gov)	Total cumulative assets of governmental organisations pledging to divest from fossil fuels from year of announcement (sovereign wealth funds and other investment arms of governments, city councils and regional governments)	Divest Invest Initiative
Environmental Policy Stringency (EPS)	Country level annual indices of environmental policy stringency	OECD iLibrary
O&G Subsidies	Total country-year amount (US\$ million) awarded to the oil and gas sector (spent on producer, consumer and general service activities) (OECD, 2018)	OECD-IEA Inventory of Fossil Fuel Support Measures
GDP per Capita	GDP per capita	OECD iLibrary
Environmental Patents	Fractional green patent counts per year. Fractional patents are aggregated by the country of the inventor (e.g. if a patent features two inventors, one from USA and one from Ireland, then both USA and Ireland receive 0.5 to their green patent count)	OECD REGPAT, OECD iLibrary
Renewable Energy Supply %	Country renewable energy as percentage of primary energy supply	OECD Statistics
Oil and Gas Revenue	Revenues of listed oil and gas companies by country	Sustainability Accounting Standards Board SICs Classification and Bloomberg
Oil Production	Oil production—ktonnes of oil equivalent annually by country	OECD Statistics
Gas Production	Gas production—billion cubic feet annually by country	IEA
Oil Reserves	Billion barrels oil reserves	US Energy Information Agency (EIA)
Gas Reserves	Trillion cubic feet gas reserves	US Energy Information Agency (EIA)

Table 2. Determinants of total country oil and gas financing through equity, bond issuance and syndicated loans (2001–2015)

Dependent variable: Log (Total Country Fossil Fuel Fundraising)	Controls Model 1.a	Divest all Model 1.b	Financial Model 1.c	Non-financial Model 1.d	NGO Model 1.e	Gov Model 1.f
Environmental patents	0.099 (0.282)	0.043 (0.282)	0.085 (0.283)	0.051 (0.280)	0.048 (0.280)	0.071 (0.281)
GDP per Capita	−0.608 (0.960)	−0.920 (1.003)	−0.726 (0.977)	−0.970 (1.007)	−0.981 (1.012)	−0.793 (0.981)
Oil Production	−0.153 (0.184)	−0.108 (0.181)	−0.144 (0.183)	−0.096 (0.180)	−0.099 (0.180)	−0.125 (0.183)
Gas Production	−0.624* (0.256)	−0.633* (0.255)	−0.631* (0.256)	−0.668** (0.256)	−0.669** (0.255)	−0.640* (0.260)
Oil and Gas Revenue	0.266* (0.123)	0.268* (0.123)	0.267* (0.123)	0.268* (0.123)	0.268* (0.123)	0.268* (0.123)
Oil Reserves	−0.201+ (0.111)	−0.204 (0.129)	−0.175 (0.118)	−0.192 (0.127)	−0.194 (0.127)	−0.181 (0.123)
Gas Reserves	−0.504 (0.323)	−0.396 (0.329)	−0.504 (0.323)	−0.349 (0.331)	−0.353 (0.329)	−0.448 (0.330)
Renewable Energy Supply %	−0.947* (0.380)	−0.877* (0.412)	−0.849* (0.411)	−0.865* (0.411)	−0.870* (0.411)	−0.846* (0.410)
O&G Subsidies		0.104 (0.136)	0.111 (0.138)	0.094 (0.136)	0.091 (0.136)	0.110 (0.138)
Environmental Policy Stringency		−0.131 (0.355)	−0.202 (0.346)	−0.118 (0.356)	−0.115 (0.355)	−0.176 (0.351)
O&G Divestment (All Types)		−0.131* (0.060)				
O&G Divestment (Financial)			0.041 (0.041)			
O&G Divestment (Non-Financial)				−0.202** (0.066)		
O&G Divestment (NGOs)					−0.247** (0.082)	
O&G Divestment (Gov)						−0.072 (0.048)
Constant	14.401 (9.580)	17.159+ (10.112)	15.206 (9.731)	17.447+ (10.151)	17.628+ (10.212)	15.776 (9.789)
Observations	495	495	495	495	495	495
R ²	0.7254	0.7270	0.7258	0.7280	0.7283	0.7260
Number of countries	33	33	33	33	33	33

Notes: Panel corrected standard errors in parentheses. Significance levels: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$. Models include time and country dummies.

sector's reliance on its home country to produce oil and gas. As indicated by Hoepner *et al.* (2016), the credit risk exposure of the sector is closely linked to their home country characteristics, particularly for those companies partly or fully owned by governments. Finally, we also include controls for the overall economic activity in a country (GDP per capita) which controls for consumption and oil and gas demand, as well as the country's environmental technology innovation profile (using environmental patents as a proxy) and the country's low carbon energy generation profile (using the country's renewable energy

percentage of primary energy supply as a proxy). These latter indicators control for the country's progress and openness towards environmental solutions which may compete with the oil and gas sector at several stages in the value chain, particularly in the case of environmental technology innovation.

3.5. Model specification

The analysis is carried out at the country level, with data organised in a balanced panel for 33 countries over the period 2000–2015. We employ a log normal, panel-corrected standard error OLS regression model which includes country and year dummies and robust standard errors. For this, we implement the `xtpcse` estimator in STATA. Given the high correlation between GDP per capita and the composite EPS index, which suggest that richer countries may have more resources to deal with robust environmental management, we orthogonalise the latter variables with respect to GDP per capita, to avoid multicollinearity issues. This allows us to analyse the effect of GDP-adjusted EPS on oil and gas fundraising. In addition, gas production, gas reserves and oil reserves at the country level are highly correlated with oil production; hence, we orthogonalise these measures with respect to oil production.

All regressors are lagged by one year which results in dropping the year 2000 from the analysis. The full model we estimate can be expressed by the following equation, where μ_t and d_i are the time and country effects and $\varepsilon_{i,t}$ is the stochastic error.

$$\begin{aligned} \ln(\text{OG.Fundraising}_{i,t}) &= \beta_1 * \ln(\text{Divest.Total}_{i,t-1}) + \beta_2 * \ln(\text{EPS}_{i,t-1}) + \beta_3 * \ln(\text{O\&G Subsidies}_{i,t-1}) \\ &+ \beta_4 * \ln(\text{Divest.Total}_{i,t-1}) * \ln(\text{EPS}_{i,t-1}) + \beta_5 * \ln(\text{Divest.Total}_{i,t-1}) * \\ &\ln(\text{O\&G Subsidies}_{i,t-1}) + \beta_6 * \ln(\text{GDP.Capita}_{i,t-1}) + \beta_7 * \ln(\text{Env.Patents}_{i,t-1}) \\ &+ \beta_8 * \ln(\text{OG.Revenue}_{i,t-1}) + \beta_9 * \ln(\text{Oil.Prod}_{i,t-1}) + \beta_{10} * \ln(\text{Gas.Prod}_{i,t-1}) \\ &+ \beta_{11} * \ln(\text{Oil.Reserves}_{i,t-1}) + \beta_{12} * \ln(\text{Gas.Reserves}_{i,t-1}) + \beta_{13} * \\ &\ln(\text{RE.TE}_{i,t-1}) + \mu_t + d_i + \varepsilon_{i,t} \end{aligned}$$

We also carry out five robustness tests to increase the confidence and reliability of our results. First, we provide an alternative model specification by clustering standard errors at the country level. Secondly, we explore whether the results are driven mainly by Anglo-American countries where the movement has originated, by excluding these countries from our sample statistics. The number of observations and coefficients estimated as part of the study are appropriate to ensure the statistical power of our models (Brooks et al., 2019).⁴ Next, we also run our models only over the 2008–2015 period, as the fossil fuel

4 We computed the minimum sample size required to be able to robustly infer the relationship between our dependent and independent variables at a 5% significance level and with a 5% margin of error. The result is 394, computed using the <https://statrek.com/survey-sampling/sample-size-calculator.aspx> website. Our number of observations is 495, which even after subtracting 60 degrees of freedom accounting for our independent, control and dummy variables, we remain with an adequate number of degrees of freedom (435). Secondly, Brooks et al. (2019) highlight that small sample sizes make it harder to find significant results while very large sample sizes inflate the occurrence of statistically significant results at the common levels due to the sheer statistical power. Hence, they argue that it is good research practice to avoid increasing sample size up beyond what is required for

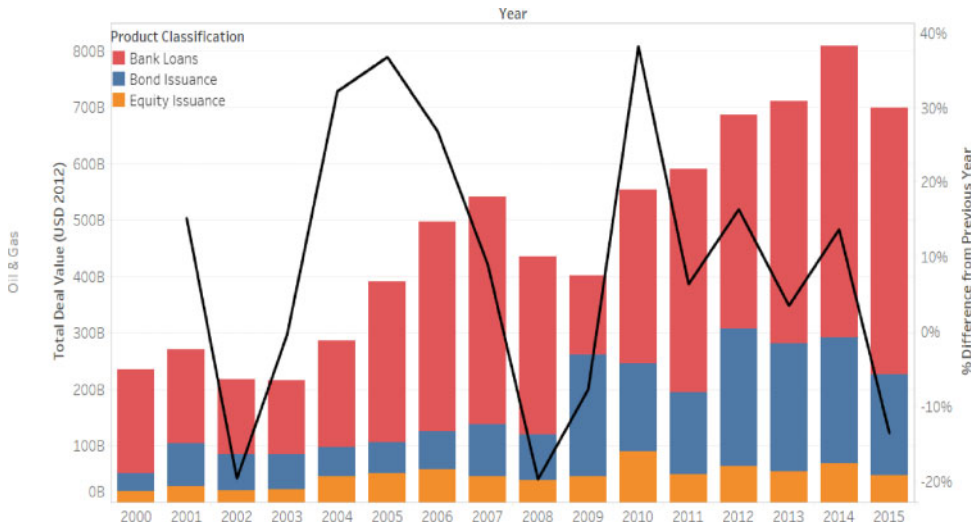


Figure 1. Global oil and gas bank loan financing, equity and bond issuance/underwriting amount (left hand Y axis). Black line represents year-on-year variation in oil and gas fundraising (right hand: Y axis). Data from Dealogic.

divestment campaign has emerged only as of 2008. That being said, in our main models, we run the analysis over the 2001–2015 period to account for the variation in fossil fuel fundraising both before and after the emergence of the divestment movement.

Fourthly, to alleviate reverse causality concerns, we use the method proposed by Godfrey et al. (2020), which is a Granger-style reverse causality minimisation procedure. It can be used in the absence of a natural experiment when reverse causality (Cojoianu et al., 2020), as in our case, is the most relevant aspect of endogeneity (please see Supplementary Appendix for a description of Godfrey et al.’s method). Finally, we scale our dependent variable as the share of a country’s investments in oil and gas. Our results are broadly robust to these alternative specifications; however, there are several discrepancies compared to our main models which we discuss in more depth in the results section.

4. Descriptive statistics

Oil and gas sector fundraising has surged from US\$234 billion in 2000 to c. US\$700 billion in 2015, with an average year-on-year growth rate of 9.17% in fundraising volume across all financial instruments (bank loans, bonds and equity issuance, Figure 1). Bank loans were by far the preferred means of fundraising for the oil and gas sector (c. 64% of total fundraising over the 2000–2015 period), followed by bonds (26%) and equities (10%). The preference towards syndicated loans is often related to the advantage of speed of transaction and lower information disclosure requirements over other financial instruments such as bonds (Fight, 2004).

robust inference. Finally, business econometricians (Hair et al., 2007) suggest that to ensure model validity, it is advisable to have a minimum of 5 to 1 ratio of observations to coefficients estimated. Our ratio is beyond that at 8.25:1.

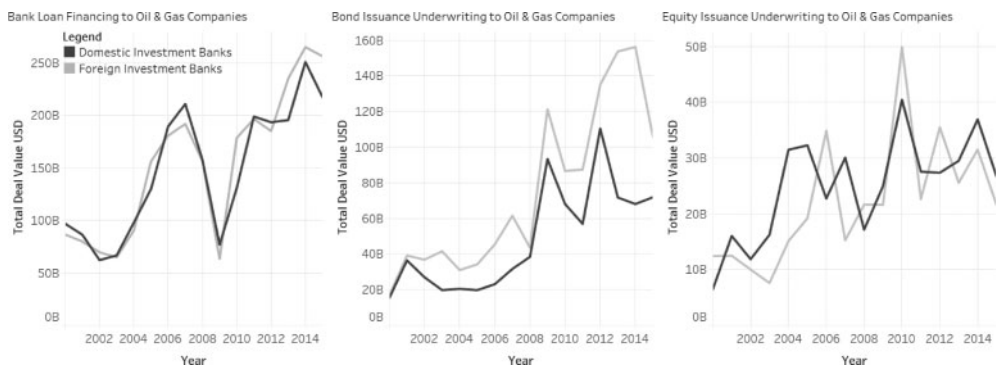


Figure 2. Global oil and gas bank loan financing, equity and bond issuance/underwriting amount by domestic banks versus foreign bank, given the home country of oil and gas companies. Data from Dealogic.

Given the large amounts fundraised by oil and gas companies, individual banks cannot take the full size of the loans on their balance sheet, and hence, they often form syndicates to provide companies with the required capital. Syndicated loan participation by domestic banks (located in the same country with the oil and gas company seeking capital) tends to be matched by foreign investment banks in terms of the amount provided to oil and gas companies in a given country (Figure 2).

5. Synthesis of results

5.1. Total oil and gas fundraising

First, we analyse the relationship between the cumulative country-level fossil fuel divestment commitments and total oil and gas financing. We further unveil the type of organisations whose oil and gas divestment commitments have the greatest influence over new oil and gas fundraising. All models are specified as log–log regressions; hence, the results should be read as: a 1% increase at the mean of the independent variable is related to a β % increase at the mean of the dependent variable.

Model 1.a shows the effect of our control variables, which remain robust throughout all other models. The revenues of the listed oil and gas sector are a significant determinant of total fundraising in the sector ($\beta = 0.266$, $p < 0.05$). In other words, a 1% increase in revenues of the oil and gas sector at the country level is related to an increase of c. 0.27% in fundraising the following year. The gas production, oil reserves and gas reserves variables are orthogonalised with respect to oil production, given that these variables are highly correlated. The models show that yearly orthogonalised gas production, which is uncorrelated with oil production, negatively impacts oil and gas fundraising ($\beta = -0.62$, $p < 0.05$). We also find that countries with higher shares of renewable energy supplies of total energy tend to display lower oil and gas financing levels (-0.947 , $p < 0.05$). On the other hand, GDP per capita, environmental innovation (measured by environmental patents) and the country's gas reserves do not have a significant effect on fundraising, nor do the direct effects of EPS and oil and gas subsidies.

Model 1.b–f shows the relationship between total cumulative oil and gas divestment commitments (including across different types of divesting organisations) and oil and gas financing. We find that oil and gas divestment commitments are negatively and

Table 3. Total oil and gas fundraising, moderating effects of policy and subsidy regime (2001–2015)

Dependent variable: Log (Total Country Fossil Fuel Fundraising)	Policy and divestment interaction Model 2.a	O&G subsidy and divestment interaction Model 2.b	Policy, O&G subsidy and divestment interaction Model 2.c
Environmental Patents	0.062 (0.282)	0.038 (0.282)	0.053 (0.282)
GDP per Capita	−0.832 (1.011)	−0.953 (1.022)	−0.881 (1.030)
Oil Production	−0.165 (0.189)	−0.135 (0.181)	−0.180 (0.188)
Gas Production	−0.702** (0.263)	−0.648* (0.254)	−0.703** (0.262)
Oil and Gas Revenue	0.267* (0.123)	0.264* (0.121)	0.263* (0.121)
Oil Reserves	−0.220+ (0.130)	−0.196 (0.128)	−0.210 (0.130)
Gas Reserves	−0.438 (0.334)	−0.478 (0.332)	−0.510 (0.335)
Renewable Energy Supply %	−0.864* (0.414)	−1.061* (0.445)	−1.045* (0.445)
O&G Subsidies	0.107 (0.137)	0.051 (0.136)	0.055 (0.137)
Environmental Policy Stringency	−0.097 (0.357)	−0.223 (0.351)	−0.192 (0.353)
O&G Divestment (All Types)	−0.104+ (0.054)	−1.015** (0.314)	−0.964** (0.308)
O&G Divestment*Env. Policy Stringency	−0.442* (0.176)		−0.358* (0.159)
O&G Divestment*O&G Subsidies		0.441*** (0.131)	0.426*** (0.129)
Constant	16.769 (10.201)	18.209+ (10.410)	17.859+ (10.488)
Observations	495	495	495
R ²	0.7277	0.7303	0.7307
Number of countries	33	33	33

Notes: Panel corrected standard errors in parentheses. Significance levels: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$. Models include time and country dummies.

significantly related to new oil and gas financing (Model 1.b, $\beta = -0.131$, $p < 0.05$), driven mostly by the commitments of non-financial organisations, in particular NGOs (Model 1.e, $\beta = -0.247$, $p < 0.01$).

In Table 3, we include the moderating role of EPS and oil and gas subsidies on the effectiveness of fossil fuel divestment commitments in discouraging new oil and gas fundraising. As hypothesised, we find strong evidence that the negative impact of fossil fuel divestment commitments on oil and gas fundraising is enhanced in countries with stringent environmental policy regimes (Model 2.c, $\beta_{\text{O\&G Divestment} * \beta_{\text{Env. Policy Stringency}}} = -0.358$, $p < 0.05$), but diminished in countries with higher oil and gas subsidies (Model 2.c, $\beta_{\text{O\&G Divestment} * \beta_{\text{O\&G Subsidies}}} = 0.426$, $p < 0.001$).

5.2. Domestic versus foreign bank financing of domestic oil and gas sector

We delve deeper into how cumulative divestment pledges in a given country are related to the ability of the domestic oil and gas sector to fundraise from domestic versus foreign banks. In Table 4, we show that cumulative oil and gas divestment pledges negatively impact fundraising from domestic banks across all models (3.a–d). In this case, we also observe a negative/positive direct effect of EPS/oil and gas subsidies on fundraising from domestic banks. The moderating effect of EPS on divestment commitments disappears, whereas the moderating effect of oil and gas subsidies remains (the effect of divestment on reducing domestic bank financing to oil and gas is weaker when the government heavily subsidises the sector; Model 3.d, $\beta_{\text{O\&G Divestment}} * \beta_{\text{O\&G Subsidies}} = 0.60, p < 0.01$).

Finally, Table 4 also shows that foreign bank financing of oil and gas seems to be lower only in countries with stringent environmental policies and high divestment commitments (Model 4.d, $\beta_{\text{O\&G Divestment}} * \beta_{\text{Env. Policy Stringency}} = -0.491, p < 0.05$), but not otherwise, as the standalone impact of either divestment commitments, subsidies or policies does not seem to be related to foreign bank financing of the oil and gas sector.

5.3. Exports of financial services to foreign oil and gas companies

In this section, we test whether increasing oil & gas divestment commitments in the home country of investment banks influence their financing of oil and gas companies outside the country. Table 5 shows that only when a country reaches a high EPS regime coupled with high oil and gas divestment commitments do domestic banks increase their financing to foreign oil and gas companies (Model 5.d, $\beta_{\text{O\&G Divestment}} * \beta_{\text{Env. Policy Stringency}} = 0.681, p < 0.01$). In countries with no fossil fuel divestment commitments, however, a more stringent environmental policy regime discourages the export of financial services to fossil fuel companies.

6. Discussion

Our study provides several contributions to institutional theory (Soule, 2012; Georgallis, 2017) and the geography of environmental social movements (Miller, 2000; Nicholls, 2007; Vasi and King, 2012), including the emerging literature on fossil fuel divestment (Green, 2018; Le Billon and Kristoffersen, 2019). We begin by theorising that fossil fuel divestment is an increasingly strong movement that can be conceptualised as an emerging institution, which seeks to exert normative influence on oil and gas fundraising. This normative influence differs across countries and also interacts with the country-level regulatory context (Hoepner et al., 2019). This interaction was previously under-explored by institutional theorists in an empirical setting. To the best of our knowledge, this is the first study providing evidence on the normative and regulatory determinants of fossil fuel fundraising.

Our central finding is that in the years in which countries witness a stronger fossil fuel divestment movement, as represented by the assets committed for oil and gas divestment by different types of organisations, the oil and gas sector fundraises less compared to its historical average. This is in line with the findings of other studies which study empirically the impact of social movements and changes in the normative institutional setting related to environmental issues (Vasi and King, 2012; Hoepner et al., 2019; Hartmann et al., 2020). However, it is the first study examining such impacts on the incumbent oil and gas sector. Although social movements can have distinct impacts at the local, regional,

Table 5. Determinants of domestic banks financing of foreign fossil fuel companies (2001–2015)

Dependent Variable: Log (Total Domestic Bank Financing to Foreign Fossil Fuel Companies)	Full Model Model 5.a	Divestment & Subsidy Interaction Model 5.b	Divestment & Policy Interaction Model 5.c	Divestment, Policy & Subsidy Interaction Model 5.d
O&G Subsidies	0.200 (0.147)	0.207 (0.149)	0.195 (0.146)	0.199 (0.148)
Environmental Policy Stringency	−0.866** (0.303)	−0.854** (0.308)	−0.918** (0.306)	−0.912** (0.310)
O&G Divestment (All Types)	0.010 (0.063)	0.120 (0.376)	−0.032 (0.061)	0.024 (0.367)
O&G Divestment*Env. Policy Stringency			0.686** (0.217)	0.681** (0.209)
O&G Divestment*O&G Subsidies		−0.055 (0.165)		−0.028 (0.161)
Observations	495	495	495	495
R ²	0.8816	0.8817	0.8828	0.8828
Number of countries	33	33	33	33
Control variables	Yes	Yes	Yes	Yes

Notes: Panel corrected standard errors in parentheses. Significance levels: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$. Models include time and country dummies.

country or transnational scale (Nicholls, 2007), we show that the country-level effect of the fossil fuel divestment movement is highly significant.

The possible mechanisms that might account for this reduction effect are manifold. While our article is not able to test empirically which mechanism applies, we suggest that the most likely scenarios are the following: (i) the social movement has some success in influencing investment banks who have yet to divest from or deny new capital to oil and gas companies; (ii) the movement affects the reputation or legitimacy of the oil and gas sector which in turn impacts on their ability to fundraise; or (iii) oil and gas companies postpone some capital fundraising activities when divestment attention is high, but may resume when attention is lower.

We are able to confirm empirically the assertion of geographers and institutional theorists that government actions can have a significant influence on the legitimacy and impact of a social movement in a given country (Miller, 2000; Nicholls, 2007). Our article illustrates that the negative effect of the fossil fuel divestment movement on oil and gas financing is enhanced in more stringent environmental policy regimes and diminished in countries which heavily subsidise fossil fuels. The variation in regulatory settings across different geographies presents a range of opportunities and challenges for social movements. This interaction between the country level of political structures and social movements is in keeping with the observation of Bathelt and Glückler (2014) that although institutions do not necessarily have an a priori spatial character, they develop in response to norms and rules that do often have territorial characteristics.

This is of particular importance to our testing of the pollution haven hypothesis (Ambec et al., 2013; Ben-David et al., 2018) in the financing context. This hypothesised that banks in countries with a strong anti-fossil fuel movement and stringent environmental policies export their financial services to foreign oil and gas companies, in the face of reduced

domestic demand. This is partly confirmed: when the home country of the investment bank experiences a combination of increased fossil fuel divestment commitments and stringent environmental policies, investment banks tend to significantly decrease their lending and underwriting to domestic oil and gas companies, but increase it to foreign oil and gas companies. In countries with strong environmental policies but weaker fossil fuel divestment commitments, investment banks reduce their allocation to both the domestic and the foreign oil and gas sector, which suggests that the pollution haven hypothesis may hold only when both regulatory and normative institutions reinforce each other.

Hence, our main models confirm H1 (that oil and gas divestment pledges are associated with lower oil and gas fundraising in a country) as well as H2 (which states that pro-environmental/pro-fossil fuel country policies accentuate/attenuate the negative impact of the fossil fuel divestment campaign on oil and gas fundraising), but they only partly confirm H3 (that investment banks in countries with a stronger fossil fuel divestment movement and more stringent environmental policies are more likely to invest in foreign oil and gas companies than domestic ones). The robustness tests we conduct further are also consistent with our main models. However, when we test for reverse causality, and also when we operationalise our dependent variable as total oil and gas fundraising out of the total amount of total amount of country lending and underwriting, the moderating effect of EPS on the effectiveness of the divestment movement no longer has statistical significance. Nevertheless, the interaction between the two variables maintains its sign (i.e. EPS still enhances the negative effect of divestment on oil and gas fundraising).

7. Implications and conclusions

This article shows that the fossil fuel divestment movement has been successful in reducing new capital flows into the oil and gas sector, but the movement's normative effect is significantly moderated by the national regulatory environment. This is consistent with an observed tendency for finance to shift from more to less environmentally stringent countries, where perhaps the movement has less influence. Furthermore, while we find that the divestment movement has an effect on capital flows within individual countries, at an aggregate level across our 33 countries, oil and gas financing has nevertheless continued to increase at an average rate of c. 8% per year since the movement started in 2008.

These findings have wide-ranging implications. For geographers interested in the impact of social movements, we show that varying norms and regulations across different countries are highly relevant in understanding the complexities of the low-carbon economy transition. Further research into the comparative impacts of the fossil fuel divestment movement at other geographical scales (e.g. local, regional and transnational) is a promising area of research that can build on the present study.

For social activists seeking to impact fossil fuel investment, our paper shows that it is not enough to monitor the finance that investment banks provide to domestic fossil fuel companies: they also need to pay close attention to the foreign investments that the targeted investors make, and to the broader context of their home government's environmental policies.

For policymakers looking to become more sophisticated in their approach to accelerating the low-carbon transition, this study suggests that it is important to appreciate the normative as well as regulative influence that governments can have. Policymakers can enhance the effectiveness of their policies by considering the social norms which may impact on or be impacted by government policies.

Our study is not without its limitations. First of all, it analyses financing dynamics solely in the oil and gas sector at the country level. Social movements are likely to have varied impacts at the local, regional, national and transnational scales, which may interact with one another. For example, at the local/regional scale, anti-fossil fuel social norms may impact the entry and financing of fossil fuel entrepreneurs (York and Lenox, 2014; Vedula et al., 2019), which we have not included in the present analysis. Finally, the study cannot discern whether lower oil and gas financing translates into more investment in low-carbon technologies, or indeed the exact transmission mechanism through which this capital reduction to fossil fuels occurs. These are all important areas which call for further research.

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Appendix

Appendix A1. Descriptive statistics and correlation matrix

Descriptive statistics:

Variables	Mean	St. dev	Min	Max
[1] O&G Fundraising	12,784.65	38,285.28	0	343,128.2
[2] O&G Divestment	183.10	2518	0	53,593
[3] O&G Subsidy	3.2	5.7	0	36.7
[4] Env. Policy Stringency	1.94	0.98	0.375	4.13
[5] Env. Patents	4548.3	11499.7	0.33	82,247
[6] GDP per Capita	27,620.49	13592.83	1895.4	67,056.12
[7] Oil Production	49,072.21	97841.17	0	505,603.4
[8] Gas Production	2372.74	5745.96	0	31,405
[9] O&G Revenue	13,4480.3	256336.3	0	1,743,056
[10] Oil Reserves	8.9	28.21	0	180.02
[11] Gas Reserves	73.98	288.96	0	1700
[12] Renewable Energy Supply %	13.29	11.9	0.4	51.54

Correlation matrix:

Variables	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
[1] O&G Fundraising	1.000											
[2] O&G Divestment	0.154	1.000										
[3] O&G Subsidy	0.456	0.191	1.000									
[4] Env. Policy Stringency	−0.099	0.032	−0.071	1.000								
[5] Env. Patents	0.459	0.184	0.393	0.122	1.000							
[6] GDP per Capita	0.083	0.177	0.003	0.000	0.529	1.000						
[7] Oil Production	0.457	0.099	0.394	−0.175	0.113	−0.313	1.000					
[8] Gas Production	0.232	0.068	0.048	−0.172	0.270	0.218	0.000	1.000				
[9] O&G Revenue	0.344	0.135	0.245	0.023	0.412	0.153	0.177	0.057	1.000			
[10] Oil Reserves	0.232	0.080	0.176	−0.254	0.026	−0.023	0.000	0.201	0.110	1.000		
[11] Gas Reserves	0.256	0.103	0.092	−0.212	0.062	0.038	0.000	0.673	0.091	0.560	1.000	
[12] Renewable Energy Supply %	−0.021	0.033	0.113	0.072	−0.219	−0.166	0.135	−0.269	0.012	0.098	−0.134	1.000

Appendix A2. OECD EPS index construction

EPS composite	EPS policy instrument	EPS Individual Policy
EPS aggregate	Taxes	CO ₂ , NO _x , SO _x
	Trading schemes	CO ₂ , renewable energy certificates, energy efficiency certificates
	Feed-in-Tariffs	Solar, wind
	Standards	Emission limit values: NO _x , SO _x and PM _x
	R&D Subsidies	Government R&D EXPENDITURE on renewable energy

Notes: Adapted from [Botta and Koźluk \(2014\)](#).