SHOWING OFF CLEANER HANDS: MANDATORY CLIMATE-RELATED DISCLOSURE BY FINANCIAL INSTITUTIONS AND THE FINANCING OF FOSSIL ENERGY

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ABSTRACT. We investigate the real effects of mandatory climate-related disclosure by financial institutions on the funding of carbon-intensive industries. Our impact metric is the amount invested into securities, bonds and stocks, issued by fossil fuel companies. A French law, which came into force in January 2016 in the aftermath of the Paris Agreement on climate change, provides us with a quasi-natural experiment. The new regulation, unique in Europe at that time, requires institutional investors (i.e., insurers, pension funds and asset management firms), but not banks, to report annually on both their climate-related exposure and climate change mitigation policy. Using a unique dataset of security-level portfolio holdings by each institutional sector in each euro area country, we compare the portfolio choices of French institutional investors with those of French banks and all financial institutions located in other EA countries. We find that investors subject to the new disclosure requirements curtailed their financing of fossil energy companies compared to investors in the control group.

Keywords: carbon disclosure, institutional investors, fossil energy, divestment.
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I. Introduction

It is widely acknowledged that curbing global greenhouse gas emissions in order to reach the objectives set in the Paris Agreement requires a major shift of global finance towards funding low-carbon activities. However, how to achieve this re-allocation of private capital rapidly enough remains an open issue. In recent years, the debate has mostly revolved about improving financial institutions' climate-related disclosure, i.e., making the carbon footprint, the exposure to climate risks and the climate-related commitments of institutions more transparent to investors and other stakeholders. On the one hand, coalitions for sustainable finance have flourished in the financial industry, urging their members to enhance the disclosure of such information on a *voluntary* basis.[1] On the other hand, regulators across the globe are increasingly concerned with allegations of greenwashing and the case for *mandatory* climate-related disclosure by financial institutions is getting up steam.[2] What benefits should we expect from moving to more stringent reporting regulations in this matter? In particular, do financial institutions actually divest from carbon-intensive activities as a consequence of more stringent climate-related disclosure standards?

To address this question, we look in this paper at the effects of a recent French law (the so-called Energy Transition and Green Growth Act), which pioneered the regulation on climate-related disclosure by financial institutions in Europe.[3] Passed in August 2015 in the run-up to the COP21, the law entered into force as soon as January 2016.[4] This new regulation imposed on institutional investors registered in France (i.e., insurance companies and pension funds on the one hand, asset management firms on the other hand, but not banks) a new detailed reporting on both their exposure to climate-related risks and their efforts to mitigate climate change.[5] While the list of required disclosures was comprehensive, firms were expected to share information on a "comply or explain" basis and were left free to choose their preferred evaluation methodologies.

By leaving such degree of freedom to respondents, the legislator explicitly aimed at spurring innovation and competition in new matters where no clear benchmark had emerged yet. We

[1]Two prominent examples are the Task Force for climate-related financial disclosure (TCFD) and the *Climate Action 100+* initiative.

[2]For instance, the G7 leaders endorsed in June 2021 moves towards mandatory climate-related financial disclosures that are based on the TCFD framework (cf. the Carbis Bay G7 Summit Communique of June 2021).

[3]In French: *Loi pour la Transition Energétique et la Croissance Verte*, or *Loi TECV*). The new requirement on climate-related disclosure by financial institutions is defined in article 173-6 of the law and is usually referred to as "compliance with article 173-6" by French market participants and supervisors.

[4]Article 173-6 of the TECV law was replaced in November 2019 by article 29-II of the Energy and Climate Act. The modified article extends the requirements to a majority of financial entities and includes part of banks' activities. We therefore end our period of study in 2019 Q3.

[5]E.g., by sharing their estimate of the global temperature trajectory on which their portfolio is aligned.

avoid here entering into the complex debates about the relative merits of alternative "alignment" methodologies and look instead directly for an impact of the new transparency requirements in terms of divestment out of carbon-intensive securities.[6] More precisely, we focus on investors' holdings of securities, bonds and stocks, issued by firms in the fossil energy industry (i.e., firms operating in the extraction, production and transport of fossil fuels). Such a focus on the financing of fossil energy companies is vindicated by several important facts. First, it is acknowledged that the bulk of cumulated global greenhouse gas (GHG) emissions and thus global warming comes from the combustion of fossil fuels.[7] Second, current production and development plans in the fossil energy industry are obviously inconsistent with the transition to a low-carbon economy.[8] Last, the investments of large financial institutions into fossil fuels, be they conventional ones (oil and gas) or unconventional ones (such as sand oil, shale gas and arctic drilling, and including coal), have been the object of much public scrutiny by environmental NGOs in recent years.[9] Faced with increased transparency requirements on the carbon footprint of their portfolios, financial institutions have then large incentives to cut in priority their holdings of the "brownest" securities, both to comply more rapidly with enhanced climate-related targets, whatever the metrics used, and to communicate their plans more easily to the public (by publishing for instance plans of exiting out of coal).

To conduct our analysis, we first construct an exhaustive dataset of all securities, bonds and stocks, that were issued by fossil energy companies worldwide and were outstanding during the period from 2013 Q4 to 2019 Q3. For this purpose, we combine two industry classifications widely used by market participants: Thomson Reuters' Business Classification (TRBC) and Bloomberg's Industry Classification system (BICS). For both nomenclatures, we focus on the energy sector and pick up all securities issued by companies in sub-sectors related to fossil fuels.[10] We partition the resulting list of fossil energy securities into two sub-categories: conventional oil and gas vs unconventional fossil fuels and coal. All in all, we end up with a comprehensive list of some 15,523 fossil energy securities (12,167 bonds and 3,356 stocks).

In a second step, we merge this list of securities with the Securities Holdings Statistics (SHS) database, a unique proprietary dataset of the Eurosystem which covers the entire universe of

[6]On methodological issues related to the measure of portfolio alignment with climate objectives, see for instance Raynaud et al. (2020).

[7]In 2019, coal, oil and natural gas accounted for 81% of world primary energy supply according to the IEA, for 75% of global GHG emissions and 90% of carbon dioxide emissions (SEI et al., 2019).

[8]According to SEI et al. (ibid.), governments worldwide are planning to produce about 50% more fossil fuels by 2030 than would be consistent with a 2°C pathway and 120% more than would be consistent with a 1.5°C pathway for global temperature.

[9]Cf. for instance the report *Banking on climate change 2019* published by a consortium of NGOs (RAN-Oxfam-Friends of the Earth).

[10]For instance: "Coal mining", "Oil drilling offshore","Oil pipeline transportation", "Petroleum refining", "Gasoline stations", etc.

securities (bonds and stocks) held by investors domiciled in the euro area. The information on holdings is available quarterly at the individual security-level for each institutional sector (such as, e.g., households or credit institutions) in each euro area country. The dataset also includes useful complementary information about each security (e.g., market price, total capitalization, redemption date etc.).

We first provide new information about the financing of the global fossil energy industry. Euro area investors held in September 2019 a market value of some EUR 600 billion of securities issued by 2,757 fossil energy firms worldwide. This amounts to around 10% of the total market funding (bonds and stocks) of these companies. Unsurprisingly, financial institutions dominate other investors (households, non-financial companies and public administrations), holding 82% of the total amount held in the euro area in September 2019. Importantly, investments into the fossil energy sector by euro area financial institutions have grown steadily in market value terms since 2013, from EUR 390 billion to EUR 528 billion as of September 2018. They however leveled off thereafter, to reach EUR 494 at the end of our period, which may reflect the recent commitments by many large European financial institutions to curb the carbon footprint of their business.

We then exploit this dataset to analyze the consequences of the French TECV law of 2015. The granularity of our data allows for a proper causal identification of its effects on the amount of funding allocated into the fossil energy industry. In line with the Eurosystem' statistical framework, the SHS-S dataset classifies euro area financial institutions into nine sub-sectors.[11] We group these sub-sectors into three broad types of institutions: credit institutions (deposit-taking institutions, in short: banks), insurance companies and pension funds (in short ICPF), and all other asset management firms and mutual investment funds (in short: AM). The provisions of article 173-6 explicitly target the last two types of financial institutions (ICPF and AM), commonly dubbed "institutional investors", but not banks. Besides, the law only applies to financial institutions domiciled in France, while no similar legislation exists in any other euro area country before the end of 2019. In the spirit of a triple difference-in-differences exercise, this therefore provides us with neat treated and control groups of holder sectors: we then compare, before and after December 2015, the holdings of individual fossil energy securities by institutional investors in France (treated) with those by banks in France and all financial sub-sectors in all other countries (controls). We control for heterogeneous average holdings of each ISIN across sector-country pairs. We saturate our empirical model with holding sector-time, country-time and even security-time fixed effects, which absorb all possible demand-side and supply-side confounding factors.

[11] Excluding here central banks.

We find evidence of a sharp relative decrease in holdings of fossil energy securities in the portfolios of France-based institutional investors once the TECV law is implemented, as compared to holdings by financial institutions in our control group. The effect of the mandatory climate-related disclosure on investments into these carbon-intensive companies is both statistically and economically significant. The estimated coefficient points to a relative reduction in holdings by 44% on average in the portfolios of treated French investors. Compared to outstanding investments into fossil energy by French institutional investors at the end of 2015, an average cut by 44% points to some EUR 31 billion of funding that has been redirected out of this industry by French entities (mutatis mutandis). Furthermore, beyond this adjustment along the intensive margin of holdings, we also look at the extensive margin of portfolio adjustments. We find complementary evidence that treated investors are less likely to hold fossil energy securities altogether under the new regulation on climate-related disclosure.

We check for the robustness of our findings along several dimensions. First we check that our results do not hinge at the inclusion within the control group of investors of a given country (where for instance some regulatory or tax change we would be unaware of could have lifted investments into carbon-intensive securities). Second, we ensure that the estimated effect actually reflects active divestment, i.e., a decrease in volumes held, and not merely price fluctuations.[12] Although our baseline regressions control for prices, we also perform additional econometric tests that show unambiguously that this is the case. Third, on a more technical note, we also provide additional evidence of the significance of the estimated effect by running complementary cross-sectional regressions and by using PPML as an alternative estimation method to the standard OLS.

We complement the main results by asking a series of additional questions. First, we highlight differentiated effects of the new disclosure policy across financial instruments, types of investors and of issuers. We notably find that the impact of this regulation is about twice larger for investments in companies exploiting mostly coal and unconventional fossil fuels instead of conventional oil and gas. We also find evidence of a strong home bias in the reaction of euro area investors, since divestment by treated institutions is 3.5 times larger when it comes to reducing the exposure to non-euro area issuers.

Second, we look for a "real", indirect impact of the TECV law on the behaviour of fossil fuel companies themselves. intuitively, we may expect that treated financial entities may not only divest from fossil companies but also increase their ESG engagement with the ones whose

[12]Note that the average price of all fossil securities held either by treated investors or investors in the control group *increased* markedly in 2017, in line with broad fluctuations in European and global stock indexes, which would play against our results. For instance, as stocks are concerned, the Euro Stoxx 50 jumped by some 700 points (almost a quarter) between November 2016 and April 2017, to reach a peak at some 3,700 points on April 30th, 2017.

shares they keep in their portfolios.[13] As a result of this increased pressure by some of their shareholders, these fossil energy companies may in turn endeavor to decrease their contribution to climate change. We test this assumption by looking at the adoption of explicit emission reduction targets by fossil firms after 2016. On a sub-sample of some 800 companies for which the relevant information is available, we indeed find evidence that fossil firms are more likely to commit to such targets in the years following the implementation of the TECV law when French institutional investors hold (as of 2015) a higher share of their equity.

The remainder of this paper is organized as follows. Section II briefly summarizes the relevant literature. Section III presents the French TECV law and the institutional context in details. Section IV describes our data and provides aggregate statistics on euro area holdings of fossil energy securities. Section V explains our empirical strategy. Section VI details our results. Last, section VII concludes.

II. Literature review

Our study fits in the new and rapidly evolving literature dealing with climate finance (for a survey, see Hong et al., 2020). More precisely, we contribute to at least two main strands of recent research.

First, this paper fits in the abundant literature on the financial and real effects of information disclosure in financial markets. Going back to at least Stigler (1963), an important stream of research has discussed the pros and cons of the mandatory disclosure of financial information by firms that are listed on stock exchanges (see, e.g., for surveys and recent analyzes Greenstone et al., 2006; Goldstein and Yang, 2017; Jayaraman and Wu, 2019). More recently, researchers have investigated the real effects of mandatory disclosure regarding firms' environmental, social and governance (ESG) performance (see for instance Christensen et al., 2017; Ioannou and Serafeim, 2017). More specifically, as concerns associated with climate change and environmental damages have been growing, several recent studies take a closer look at the real consequences of mandatory carbon disclosure.[14] Existing studies on carbon disclosure however test whether transparency regulation leads GHG emitting, *non-financial companies* to pollute less.[15] In contrast, our paper is however the first to investigate the effects of a regulation

[13] Krueger et al. (2020) run a survey among over 400 global institutional investors and find that many investors consider risk management and engagement, rather than divestment, to be a better approach for addressing climate risks.

[14] Crifo and Sinclair-Desgagné (2014) survey the literature on corporate environmental responsibility (CER) and analyze reasons for firms to *voluntarily* implement CER programs.

[15] Downar et al. (2019) for instance find that a 1993 regulation requiring UK-incorporated listed companies to disclose standardized information on their annual greenhouse gas (GHG) emissions led to a significant decrease in emissions (see also Jouvenot and Krueger, 2020).

that mandates *investors* to disclose the carbon footprint of their portfolio, i.e. their indirect responsibility for the GHG emissions of the companies they fund.

Second, this study relates to the rapidly expanding stream of research that asks whether financial institutions have become more aware of climate change, and whether they act accordingly. Available findings point to a mixed answer so far, although there are more and more signs that global investors are now awakening to the issue. A first type of studies looks at asset prices and investigate whether investors correctly price climate-related risks. For instance, Bolton and Kacperczyk (2020b) find evidence of a carbon risk premium in the cross-section of US stocks in recent years, and Ramelli et al. (2020) show that stocks prices of high-carbon intensity firms reacted strongly to the first Global Climate Strike of March 2019. Ilhan et al. (2020) show that put option prices also reflect the downside risks associated with higher carbon emissions. Last, Koelbel et al. (2020) exploit US firms' mandatory climate-related disclosure (to the SEC) and find that CDS spreads are responsive to this information.[16] A second line of studies exploits information about investors' self-reported perception of risks and strategies and track changes in various measures of their ESG performance. For instance, Gibson and Krueger (2017) find that institutional investors with longer-term horizons exhibit better sustainability footprints, while Dyck et al. (2019) show that institutional investors push for an improved ESG performance of the firms they invest in when these investors come from countries where ESG issues are perceived as important. Looking more precisely at one such country, Boermans and Galema (2019) document that Dutch pension funds that opted for active portfolio management strategies have substantially reduced their carbon footprint by divesting from carbon-intensive industries over the last decade.[17] In contrast with these papers, we look at investors's divestment from carbon-intensive industries whenever they are obliged to publicly reveal their carbon footprint. Considering the ongoing debate about the divergence of available ESG ratings (Berg et al., 2019) and climate-related metrics (Raynaud et al., 2020), we prefer to focus on changes in holdings of securities commonly viewed as "brown" instead of more sophisticated, but possibly noisy, ESG performance or temperature-alignment indicators.

III. The 2015 French regulation on climate-related disclosure

In the run-up to the COP21 conference in Paris, which led to the Paris Agreement on Climate change of December 2015, France passed on 17 August 2015 a law on Energy transition and

[16] As far as bank loan spreads are concerned, Kleimeier and Viehs (2018) and Delis et al. (2018) look for evidence of a carbon risk premium in the spreads of syndicated bank loans and find somewhat conflicting results over the last decade.

[17] In a similar vein, Gibson et al. (2020) exploit a survey of responsible investing (RI) by institutional investors around the world and find that portfolios of European, but not US-based, RI funds exhibit higher ESG scores.

green growth.[18] In its article 173-6, this law pioneered the first mandatory disclosure by institutional investors of both their climate-related risks and their contribution to national climate change mitigation goals. This new regulation went well beyond previous regulations on ESG reporting already applying to financial firms in France and in the world alike. French legislators aimed first at making institutional investors aware of the emissions induced by their investments and the resulting financial risks. By facilitating the access to more transparent information, they also wished to enable public authorities as well as NGOs and citizens to incentivize them to align their investments with the required transition to a low-carbon economy.

The 2015 law was enacted by a decree published on 29 December 2015 and its provisions entered into force as soon as 1 January 2016. The decree lists the institutions that must comply with the new disclosure requirements. These are (i) asset management firms (in French, *Sociétés de gestion de portefeuilles*, or SGP), i.e., all types of mutual and investment funds but pension funds (in short in what follows, AM), and (ii) insurance companies and a variety of state-owned and private financial institutions managing pension funds (in short, insurance companies and pensions funds, ICPF).[19]

To sum up the decree, domestic institutional investors must report on three dimensions of their climate-related impact and responsibility (see, e.g., Cardona et al., 2018). First, they must measure the carbon footprint of their investment portfolio and display the greenhouse gas emissions generated by their investments. Second, they must provide a detailed analysis of their exposure to both so-called physical risks and transition risks, i.e., to potential losses due to more frequent and damaging natural disasters brought about by climate change (e.g., destruction of physical capital of the invested non-financial firms) on the one hand, and also to potential losses due to more stringent environmental policies aimed at mitigating climate change (e.g., stranded assets of invested firms which operate in the fossil energy sector). Third, investors must also measure how they themselves contribute (or not) to mitigating climate change, by sharing information about whether their portfolio aligns with a 2 degree trajectory of global climate and also by computing the green share and the brown share of their investments (i.e., in the jargon of green finance, the share of their portfolio which is invested in low-carbon and highly-emitting companies or industries, respectively). Last but not least, the regulation is meant on a "comply or explain" basis: institutions that fail to provide the required numbers and analysis must explain why they cannot comply with the law.

[18] *Loi 2015-992 sur la transition énergétique pour la croissance verte*, in short TECV law, available at: https://www.legifrance.gouv.fr/eli/loi/2015/8/17/2015-992/jo/article_173

[19] See Decree 2015-1850 of 29 December 2015 for details: https://www.legifrance.gouv.fr/eli/decret/2015/12/29/2015-1850/jo/texte. This decree also defines a threshold of EUR 500 million of total (consolidated) assets, below which the targeted institutions are allowed to comply with a simplified reporting.

Since 2016 and over the years, several NGOs, think tanks and French public bodies have published assessments of how these new provisions on climate-related disclosure have been implemented by the regulated financial firms.[20] These reports typically focus on the quality and sincerity of the information disseminated by the regulated institutions in their annual reports, ESG reports, specific publications dedicated to their compliance with article 173-6 of the 2015 law and their websites more generally. They converge in pointing to insufficiently detailed information, somewhat inconsistent methodologies and lack of efforts overall, at least in the first two years, while a lot of heterogeneity in commitments and compliance still prevailed as of the end of 2018. For instance, an official monitoring exercise conducted jointly by the French ministries (for Environment and Finance) and supervisory authorities (ACPR and AMF) in charge finds that only a half of the 48 largest institutions publish at least some information on all required dimensions of the mandatory disclosure (ACPR et al., 2019). In contrast with these assessment of compliance with the new legal disclosure requirements, we evaluate the impact of the mandatory climate-related transparency on investment behaviours and focus on the induced divestment out of fossil energy companies, a sector much scrutinized by the public for its large carbon footprint.

To conclude on institutional matters, note that article 173-6 of the French TECV law (now replaced by article 29-II of the 2019 Climate and Energy Act and the associated Decree of 27 May 2021) takes part in the broader picture of a global move since the COP21 towards increasing the climate-related disclosure of financial institutions, be it on a voluntary or mandatory basis.

A first significant private-based initiative was the Task Force on Climate-related Financial Disclosure (TCFD), a coalition of the willing set-up in 2015 under the patronage of the G20's Financial Stability Board. The TCFD released in 2017 an influential report setting widely approved disclosure guidelines for financial institutions. While the TCFD aims at improving voluntary carbon disclosure by participating institutions, new regulations in the spirit of the French law are also in the baking at the European level in the context the EU Green Deal launched in 2019 by the van der Leyen Commission.

A strenghtening of mandatory climate-related reporting by European financial institutions is indeed underway. This regulatory move towards more environmental disclosure takes inspiration from the recommendations of the TCFD, but it goes beyond and also insists on the so-called double materiality (i.e., including the impact of firms' activity on climate and not only their exposure to climate-related risks). As a first step, the EU commission published in June 2019 new guidelines on reporting climate-related information that apply to large financial and non-financial corporations. The revision of the 2014 EU directive on non-financial reporting

[20]See notably Cardona et al. (2018), ACPR et al. (2019), Novethic (2017) and WWF (2017)

(NFRD), resulted in April 2021 in the Commission's proposal of a Corporate Sustainability Reporting Directive (CSRD), which notably extends ESG reporting requirements to SMEs. In February 2020, the EU Commission also launched a public consultation on its renewed sustainable finance strategy. The new Sustainable Finance Disclosure Regulation (SFDR), which targets market participants providing investment products to end-investors as well as financial advisers, applies since March 2021. These European regulations enhancing climate-related disclosure complete a sustainable finance framework that also encompasses the EU Taxonomy of green activities and a set of benchmarks, standards and labels offering more transparency to market participants and investors.[21]

Importantly for the validity of our identification strategy, no extended climate-related disclosure requirements had however been implemented in the euro area, except in France, over the period of our study (December 2013-September 2019).

IV. Data

We are interested in tracking investments in debt securities and stocks issued by fossil energy companies. To identify them, we rely on two market-based industry classifications (TRBC and BICS) which are widely used to sort companies by their activity, for instance in order to devise stock market sub-indices. In what follows we present briefly each classification and how we map them with securities holdings.

A. Identifying fossil energy securities

Thomson Reuters Business Classification (TRBC) is an industry classification developed and owned by Refinitiv (formerly Thomson Reuters) that tracks 72,000 public companies and around 250,000 securities in all asset classes. Companies are classified mainly based on their primary source of revenue.[22] TRBC classifies companies into 5 levels of granularity: economic sectors, business sectors, industry groups, industry and activities. For our purpose, we search bonds and stocks issued by companies classified in the economic sector "Energy" and the industry groups and activities related to fossil subcategories (eg. "Oil & Gas Storage", "Natural Gas Pipeline Transportation", etc...). We recover 12,437 unique securities (9,684 bonds and 2,753 stocks) active between 2013Q4 and 2019Q3. Table A.1 gives an overview of the 31 TRBC subcategories related to fossil energy we found in our database and Appendix B shows an extract of the full classification.

The Bloomberg Industry Classification Systems (BICS)[23] is an industry classification developed by Bloomberg. It is used as a reference for instance for all Barclays/Bloomberg indices

[21] For instance, the EU Commission adopted on 6 July 2021 a proposal for a standard of European green bonds.
[22] https://www.refinitiv.com/en/financial-data/indices/trbc-business-classification
[23] https://www.bloomberg.com/professional/product/reference-data/

used for passive investment. This classification system is based on companies' main business line, wich is identified according to each activity's contribution to net income, operating income, total assets and also incorporates some judgement or market perception. BICS includes "more than 2.5 million legal entities" and industry classification data are available for around 1.5 million securities. Companies are sorted into 10 macro sectors ("Energy", "Transportation"...), each sector being further broken down into 8 levels of classification.[24] For our purpose, we select the BICS level 1 "Energy" and the BICS level 2 corresponding to industry groupings related to fossil energy (eg. "Coal Operations","Pipeline", "Integrating oils" etc...). We retrieve 12,085 unique securities (9,998 bonds and 2,087 stocks) active between 2013Q4 and 2019Q3.

Our aim is to get a comprehensive view of the universe of outstanding fossil energy securities, using the financial industry standards. We are agnostic on which source would be the most accurate, or whether one better classifies than another. We therefore combine the two sources and keep all identified securities. All in all, our list consists of 15,523 unique securities identified by their ISIN (12,167 bonds and 3,356 stocks). We map the BICS classification into the TRBC one (see table A.1), which offers the greatest level of granularity. Our objective is here to sort out companies operating mostly in conventional oil and natural gas industries, from companies operating mostly in the coal-related and unconventional fossil fuel industries (such as shale gas, oil sands, arctic drilling etc.). To do so, we recover the implicit mapping between the TRBC and BICS classifications by using securities which are reported simultaneously in both datasets. For securities that are registered only in the Bloomberg database (and as such have a BICS industry classification), we then infer to which TRBC industry category they are most likely to belong.[25] Overall, TRBC and BICS largely overlap: around 75 % of the securities appear in both databases. Adding information from Bloomberg then augments our list with some 3,000 securities.

B. Euro area investors holdings in fossil energy

Securities holdings statistics (SHS) are collected at the security level by the ECB and Euro area national central banks (constituting the Eurosystem) from custodians and reporting financial institutions.[26] Data are reported on an end-of-quarter basis from 2013Q4 onwards and are aggregated at the holder sector/holder country level for each country in the euro area (EA): ie. SHS tracks the holdings of each individual security – identified by its ISIN code – as soon as at least one euro is held by at least one euro area investor, e.g., French banks, Spanish insurers,

[24] See Appendix B for the detailed classification.
[25] See Table A.2 in the Appendix for details of this mapping.
[26] According to Regulation ECB/2012/24 and amended by Regulation ECB/2015/18.

German Pension funds, etc.[27] The SHS database also includes useful auxilliary information about each security, be it a debt security or a stock, such as the market price, the nominal amount outstanding, coupons and redemption dates (for bonds) or the total market capitalization and number of shares (for stocks). A public version is available on the ECB website along with a detailed documentation on the holdings data collection methodology[28].

Holder sectors are defined according to the European System of Accounts 2010 (ESA 2010) and their country is defined on a locational basis, i.e., for instance, BNP Paribas Belgium is reported within the Belgian banking sector and BNP Paribas France within the French banking sector. For our purpose, we group the available financial (sub-)sectors (excluding central banks) into three blocks: (i) banks (S_122 in the ESA 2010 classification), (ii) insurance companies and pension funds, in short ICPF (S_128 and S_129), and (iii) asset management firms and all other financial institutions, i.e., mostly investment and mutual funds (S_123, S_124, S_125, S_126, S_127 and S_16), which we denote in short AM. For convenience, we label ICPF and AM firms throughout "institutional investors".

We obtain our final dataset by merging our extended list of securities issued by fossil fuel firms worldwide with euro area holdings data from the SHS database.[29] The raw database includes a number of negative holdings of individual securities. These are occasionnaly reported in SHS to materialize short sales or lending of securities. We drop them throughout. We also drop a few hundreds positive holdings with a market value below one euro. The merged dataset includes 7,428 unique securities (5,214 bonds and 2,214 stocks) issued by 3,082 distinct fossil energy firms worlwide and held in the portfolios of euro area investors at some point between December 2013 and September 2019. Table A.3 provides a breakdown by instrument (bonds vs stocks) and by source (either Refinitiv or Bloomberg) of these euro area holdings. The Refinitiv and Bloomberg lists of fossil fuel securities account each for some EUR 520 billion of investments by euro area investors.

C. Additional data on fossil energy companies

While our main analysis relies on securities-level data, we run some additional tests on a cross-section of fossil energy companies. For this purpose, we first collect information about the adoption of GHG emissions targets by fossil firms, as provided by Refinitiv ESG Statement (field named "Targets emissions"). This information is available for some 1,000 firms. We

[27]For instance, the database allows to track the holdings of the bond XS1327914062 issued on December, 12, 2015 by the French Oil company Total SA in the portfolios of, e.g., insurance companies in France.

[28]https://www.ecb.europa.eu/stats/financial_markets_and_interest_rates/securities_holdings/html/index.en.html

[29]We follow the latest recommendations outlined in the Securities Holdings Statistics Database User guide published by ECB and the Deutsche Bundesbank, version 1, as of July 2020, regarding in particular the third party holding aggregation.

define a dummy variable which takes the value of one whenever a firm has committed to such an emission reduction target between 2015 and 2019. For instance, if a firm made a public commitment in 2016 to cut its GHG emissions by 20% by 2025, the dummy takes the value of one. Second, at the firm level, we compute the ratio of equity held by French institutional investors to the firm's total market capitalization in December 2015. We use this ratio as a measure of the firm's indirect treatment by the TECV Act, as explained in the results section below.

Last, we also collect standard balance sheet and income statement items for all fossil fuel firms whose shares are held by European investors when available in Datastream Worldscope database. This acounting information is denominated in the firm's local currency. We therefore use it to compute financial ratios only. In our firm-level regressions, we focus on two main control variables: the return on assets (ROA), defined as the ratio of EBITDA to assets, as a measure of firm profitability and (log) market capitalization (in euros, from the SHS database) as a measure of *ex ante* firm size. Both are measured ex ante, i.e., as of 2015. We drop observations with ROA below -100% or above 100% and winsorize remaining observations at the 1% and 99% level. We end up with a sample of some 800 fossil firms.

D. Descriptive Statistics

This merged dataset provides us with interesting new insights on the funding of the fossil energy industry by European investors. As of September 2019, euro area investors collectively held some EUR 600 billion of securities issued by fossil fuel companies (see Figure 1). The area's investors thus account for around 9% of the total market funding of these companies, which amounted at that time to some EUR 6,590 billion (see table A.3).[30] Among euro area investors, financial institutions unsurprinsingly own the lion's share of these portfolios. As shown by figure 2, above 80% of the euro area exposure to fossil energy securities is concentrated in the area's financial sector. Furthermore, their "brown" investments have been on a rising trend, at least up to September 2018. Over the period from 2013 Q4 to 2019 Q3, euro area financial institutions indeed increased their market funding to global fossil fuel firms by EUR 100 billion, from EUR 390 billion to around EUR 490 billion. This notwithstanding, investments into firms specialized in coal and unconventional fuels account for only a small share of the total, and remain quite stable at around EUR 10 bns throughout the period.

Figure 3 shows that the bulk of these funds flow into firms located in a limited number of countries, mostly in Europe, North America including Mexico and Russia. As of September 2019, around 40% of the fossil portfolios of euro area financial institutions are invested in

[30]Note that the SHS database by construction ignores securities which are not held at all in the euro area. This total therefore underestimates the total market value of all fossil fuel in the world, including for instance Chinese companies that would be entirely owned and funded by Chinese investors.

three countries, the USA, France and the Netherlands, while issuers located in only 15 countries –over 90 destinations– account for almost three quarters of holdings. Last, the fossil fuel investments of euro area financial institutions are also largely concentrated in a few global companies: three European major oil companies benefited alone from some EUR 108 billion of funding in September 2019, around 20% of total holdings, while 20 issuers received nearly a half of this total funding.

In the remainder of this study, we focus on securities holdings by euro area financials only. Table 1 provides descriptive statistics about the securities included in our baseline regression sample. The sample consists of 587,660 observations, for 7,041 unique securities (5,144 bonds and 1,897 stocks), issued by 2,757 distinct companies. The average "individual" holding of one security (at the holding sector-country level) hoovers at EUR 20 million, but the median value of individual holdings is ten times smaller. For bonds, we report statistics on the yield to maturity (with a median of 3.81% over our period) and the residual maturity (median residual maturity around 6 years). Furthermore, Table 3 shows summary statistics for the firm-level auxiliary data we use to assess the real effects of the disclosure regulation on climate-related policies of fossil fuel companies.

Figure 4 shows fluctuations in the average price of fossil energy securities over the period of study, rebased at 100 in December 2015. The figure compares the average price of securities held by treated institutions vs institutions in the control group. The average prices of securities held in these two portfolios roughly moved in synch from 2013 to 2019, which suggests that the list of included securities is similar across groups.

Last, figure 5 gives a preview of our main evaluation exercise in the spirit of a difference in differences framework, which we present formally in the next section. The figure compares the cumulated amounts (at market value) of fossil energy securities held by "treated" institutions (French ICPF and asset management firms) with amounts held by "control" institutions (French banks and all types of financial institutions in all other euro area countries). Both time series are scaled at 100 in Decembre 2015, just before the French disclosure regulation is enacted. While both series arguably comove before this date, the figure shows that they diverge afterwards: the market value of holdings by "treated" investors is then set on a decreasing trend from 2017 on (in spite of the booming stock markets), while the holdings of control financial institutions in the euro area keep on an increasing trend.

V. Empirical models

We present formally in this section the baseline empirical model which we estimate to evaluate the impact of the new French regulation on climate-related disclosure by investors. Remember that the intuition for our analysis is a triple difference in differences, whereby we compare the holdings of fossil-energy securities in the portfolios of treated holding sectors (institutional investors) in the country where the new regulation applies (France), with holdings in the portfolios of all financial sectors in all other euro-area countries as well as the non-treated sector (banks) in France, before and after the implementation date of the treatment (January 2016, when the French law of December 2015 enters into force).

Our observation unit is the amount held of a given security i by a given holding sector h of a given country c at the end of quarter t. We are first interested in changes in the outstanding amounts invested. Accordingly, the baseline model we estimate to assess the impact of the 2015 French regulation on the *intensive margin* of fossil-energy security holdings reads as follows:

$$\begin{aligned} b_{ihct} = {} & \beta_1 POST_t \times InstInv_h \times FR_c \\ & + \beta_2 POST_t \times FR_c + \beta_3 POST_t \times InstInv_h + \beta_4 InstInv_h \times FR_c \\ & + \gamma_i + \gamma_t + \gamma_c + \gamma_h + u_{ihct} \end{aligned} \tag{1}$$

where b_{ihct} is the market value (in log) of portfolio holdings of security i by institutional sector h of country c at time t, $POST_t$ denotes the post-treatment period from January 2016 to September 2019, FR_c is a dummy variable that takes the value of one when the holders of security i are located in France and $InstInv_h$ is a dummy variable that takes the value of one when the holder sector is an institutional investor (i.e., here, either an ICPF or an AM, not a bank). The γ's are additional dummy variables that control respectively for the average value of holdings of security i, quarterly macroeconomic (euro area-wide) shocks, the average value of holdings in country c and in sector h. The main coefficient of interest is β_1, which we expect to be negative since we assume that the new regulation should lead French institutional investors to decrease their investments in fossil-energy securities. Note that we correct the standard deviations of the coefficients' estimators for plausible auto-correlation of the residuals by clustering the covariance matrix of residuals within the dimension of the treatment (i.e., we define clusters as country-sector pairs).

In more constrained specifications of the same baseline set-up, we saturate the model with richer combinations of fixed effects, such as holder country-holder sector, holder country-time,

holder sector-time and even ISIN-time. We are therefore able to control effectively for structural features and national specifics that may impinge on the average investment levels of different sectors in fossil energy securities, as well as for whatever unspecified shocks may affect portfolio holdings, such as national macroeconomic or market shocks, shocks to the European financial firms holding these bonds and stocks and shocks to the supply of each security. ISIN-time fixed effects also control for the change in the price of the security at each quarter.

Furthermore, we also want to have a say on the *extensive margin* of the change in investment behaviour possibly caused by the new disclosure regulation. For this purpose, we consider all possible combinations (c,h,t) of country, sector and date for each security i that is observed at least one quarter in the portfolio of at least one financial sector of one euro area country. We then estimate a similar model as before and explain the probability of holding fossil energy securities by running linear regressions such as:

$$\begin{aligned} I_{(b_{ihct}>0)} &= \beta_1 POST_t \times InstInv_h \times FR_c \\ &+ \beta_2 POST_t \times FR_c + \beta_3 POST_t \times InstInv_h + \beta_4 InstInv_h \times FR_c \\ &+ \gamma_i + \gamma_t + \gamma_c + \gamma_h + u_{ihct} \end{aligned} \tag{2}$$

where $I_{(b_{ihct}>0)}$ is an indicator variable that takes the value of one whenever we observe a positive holding of i in the portfolio of sector h in country c at time t, and zero otherwise. As for the intensive margin of fossil energy investments, we also consider various alternative specifications with richer sets of fixed effects. We also expect here β_1 to be negative since the new French regulation should induce a lower probability of local institutional investors investing in the securities of highly GHG-emitting firms.

VI. Results

We discuss in this section the results of our empirical investigations in details. We first present the results of the baseline analysis using our database of securities, followed by a series of robustness checks. We shed light on differentiated effects across types of fossil fuel companies, types of securities and types of institutional investors. We also look for evidence of an home bias in the response of treated investors. Second, we ask whether the policy imposed on investors has an impact on the behavior of invested companies (so-called "real" effects). We turn to our auxiliary dataset at the level of fossil companies and look at the propensity of these firms to commit to reducing their GHG emissions.

A. Baseline results

Using our main dataset at the level of fossil fuel securities, we first look at the effects of the new disclosure requirements along the intensive margin of investments into fossil energy companies. Table 3 shows the estimation results of equation (1). Column (1) corresponds to the baseline specification, while columns (2) to (5) include step by step more stringent sets of fixed effects. Controling for simple security, time, country and sector fixed effects yields the expected negative estimate of the main coefficient of interest, β_1, which measures the relative impact of the climate disclosure regulation on the treated holder sector-country pairs. The impact then grows stronger and becomes much more significant (now at the 1% level) whenever one controls for heterogenous average invested amounts across institutional sectors of different countries by adding sector-country fixed effects. Further, the estimate of β_1 remains quite stable when all possible unobserved demand and supply shock are also controlled for by including country, sector and security fixed effects interacted with time.

Note that in our preferred specification, the most stringent one shown in column (4), the effects of fluctuations in the price of individual securities are absorbed by the $ISIN \times Time$ fixed effects. The estimated β_1 therefore accounts for the (relative) divestment out of fossil fuel companies by French institutional investors, which reduced the *volumes* of such securities in their portfolio after 2015 (either sold them or did not roll over their portfolios by purchasing similar securities after redemption), net of price effects. Last, column (5) shows the results of within regressions, where identification now relies entirely on changes over time in holdings of a given security by a given investing sector-country pair. This restriction does not however significantly affect the estimate of β_1.

Our estimate of the policy impact is economically quite significant. A coefficient of -0.585 (column 4) implies that holdings of fossil energy securities by French institutional investors is lower by 44% on average after 2015, relative to what would have been the case absent the policy.[31] To get a sense of the implied magnitude expressed in euros, let us consider the value of French institutional investors' investments into fossil energy as of the end of 2015, around EUR 71 bns. An average cut by 44% therefore points to some EUR 31 bns of fundings that have been (on average) redirected out of this industry by French insurance companies and investment funds.

Last, Figure 6 shows the estimated coefficients of interest for a dynamic version of equation (1), where $InstInv_h \times FR_c$ is interacted with yearly dummies instead of the $Post_t$ indicator. The precise specification of the estimated equation is otherwise the same as in column (4) of Table 3 above. The figure confirms that pre-policy trends were identical for treated and control

[31] More precisely: $1 - e^{-0.585} = 0.44$

sector-country pairs, which vindicates our identification strategy. Furthermore, it comes out that, after a transition in the first year of enforcement of the new regulation, the average impact on holdings of fossil energy securities remains roughly constant from 2017 onward.

Climate-burdening investments may be adjusted by decreasing holdings of fossil energy securities (the intensive margin) but also by banning such securities altogether out of the portfolios of treated actors (the extensive margin). Table 4 therefore presents additional results of linear probability regressions that we estimate in order to assess the extensive margin of the policy impact (see equation (2) above). As explained above, we evaluate the probability that a given sector-country pair holds a given fossil energy security at a given point in time against the universe of all possible combinations for all the securities that are registred at least once in the SHS database. We find that the new disclosure policy caused a reduction by 1.8% of the probability of holding such a security.

B. Robustness

We check the robustness of our findings along several dimensions. First, our results may hinge on the inclusion within the group of controls of the investors of a given country, which may face after 2015 some unobserved, confounding policy change (e.g., some fiscal treatment) that may lead to relative increases in their exposures to fossil energy. Although we are not aware of any national policy in the euro area (excluding France) that would systematically foster fossil energy investments after 2015, we test for the robustness of our baseline regression results when sequentially excluding each of the largest countries in terms of the total portfolio size of their domestic financial industry.[32] As table 5 shows, the estimate of the main coefficient of interest remains roughly unchanged whatever the excluded country in the control group.

Beyond, we provide further evidence that the observed reduction in holdings caused by the new disclosure policy reflects changes in volumes, i.e., real disinvestments, and not confounding declines in the prices of the securities held in portfolios (including potentially endogenous price declines as a consequence of asset sales). For this purpose, we express holdings at constant prices, so that $b^{CP}_{ihct} = b_{ihct} - ln(P_{it}) + ln(P_{i,2015Q4})$, where $P_{i,2015Q4}$ is the market price of i at the end of December 2015, and run again similar regressions as in equation (1) and table 3. Columns (1) and (2) of table C.1 show the results (the columns compare with columns 4 and 5 of table 3, respectively). Again, the estimated β_1 coefficient barely changes.

[32]Beyond France, the largest holder countries are Germany, Italy, Luxemburg, the Netherlands, Ireland and Belgium. Together, these 7 countries account for 75% of observations in our sample and some 90% of holdings of fossil energy securities at the end of 2015.

Second, one may worry that the significativity of our main result may be lower than what we claim, due to potential serial correlation of the residuals that is pervasive in difference-in-differences-type panel regressions (Bertrand et al., 2004). Although this concern should be alleviated in our baseline regressions by the use of clustered standard-errors in the dimension of the treatment (i.e., the holder sector-country level), we also run for robustness a cross-sectional regression, whereby we collapse the time dimension into two 3-years periods (2013-2015 vs 2016-2019), take the average of (nominal) holdings values within each period and compute the growth rate (in logs) across periods to get our dependent variable. In such a setup, changes in (period-average) prices are absorbed by the ISIN fixed effects, while demand shocks are absorbed by the country and holder sector fixed effects. As shown in column (4) of table C.1, the estimate of the coefficient of interest (now the coefficient of $InstInv \times FR$) is still negative and strongly significant.

Last, recent research in applied econometrics has pointed to potential biases in the estimated coefficients of log-linearized models when using OLS (Santos Silva and Tenreyro, 2006). Such biases are more likely to be sizeable when (i) the log-linearized error is strongly heteroskedastic and its variance depends on the regressors of interest and (ii) there are many observations where the dependent variable takes the value of zero. The standard gravity equation for international trade, where the dependent variable is the log of bilateral exports between countries, epitomizes this problem. In our case, where the dependent variable is defined as log individual holdings, there are very few zero observations (we dropped the few observations with holdings below 1 euro, and only a few individual holdings amount to only 1 euro in our dataset). Besides, our empirical regression is not explicitely derived from a multiplicative theoretical model (as is the case for gravity equations). However, it is still possible that our errors are heteroskedastic in a dimension that is not correctly corrected by the usual clustering of the covariance matrix. Therefore, we also re-estimate our baseline regression in levels (i.e., the level of holdings is our dependent variable) using the aternative Poisson pseudo-maximum likelihood estimator (PPML).[33] Column (3) of table C.1 shows the results. The coefficient estimated by PPML is somewhat smaller than before (in absolute value), pointing to a relative reduction in fossil holdings by some 20% on average, but still negative and strongly significant.

C. Extensions: heterogeneity across instruments and issuers

We now go beyond the main results and first enrich the baseline specification of the empirical model in order to shed light on potentially differentiated effects of the new disclosure policy along several dimensions of the data. The results are summarized in table 7, where all

[33]We implement PPML using the new community-contributed STATA command PPMLHDFE, cf. Correia et al. (2020).

regressions include a stringent set of fixed effects as controls (see column 4 of table 3 above, replicated in column 1 here for convenience).

First, we acknowledge that the classification of issuers by activity based on TRBC and BICS does not allow us to discriminate fundings that would be earmarked, even in the more carbon-intensive industries, to projects linked to the transition. We recover the list of bonds labelled as "green bonds" in Refinitiv and Bloomberg. The list consists of around 4,500 unique bonds issued by all industries, but only 2 match our final sample of fossil securities held by EA financial investors. This removes only a few hundred observations, which forbids to test for a specific reaction as regards green bonds.[34] However, our results are then of course robust to excluding green bonds (cf. column 2).

Second, we compare the impact of the new disclosure regime on holdings of securities issued by more or less polluting energy companies, as gauged by the type of fossil fuels they produce. Columns (2) and (3) show that the impact is about twice larger for investments in companies exploiting coal and unconventional fossil fuels (such as arctic drilling, shale gas, oil sands etc.), which are responsible for larger GHG emissions and overall environmental damages. Third, we also find that divestment goes through the shedding of stocks rather than bonds out of portfolios (columns 4 and 5). Fourth, we look for possibly different reactions of the French insurers (and pension funds -ICPF) and asset managers (AM). As column (6) shows, the latters' reaction is about twice larger than the formers' and more significant.

Last, we ask ourselves whether all issuers, whatever their nationality, are treated in the same way by investors when they have to comply with a more severe climate-related disclosure policy. In other words, does some sort of home bias tilt the reaction of investors? To answer this question, we compare in the last two columns of table 7 the estimated treatment effect we get when focusing on holdings of securities issued either by non-euro area (or "foreign") fossil energy companies or by euro area ones. We find evidence in support of a home bias, since the reaction of treated investors is 3.5 times larger when it comes to reducing their exposure to non-euro area issuers. This is consistent with the results of Boermans and Galema (2020), who show that European investors exhibit a strong EU-home bias and refrain from divesting from carbon-intensive stocks when these are issued by EU firms.[35]

D. Real effects of divestments on issuers

In this last section, we look after possible real effects on fossil companies of the more stringent disclosure regulation imposed on French institutional investors. We focus on fossil fuel firms' incentives to embark more decisively on transition efforts. Intuitively, treated investors,

[34]Note also that there are controversies on the green bond labelling itself, sometimes merely declarative. This debate is beyond the scope of the paper.

[35]See also Bolton and Kacperczyk (2020a)

who have to disclose the climate impact of their portfolio, are more likely to, in turn, better monitor the climate-related policies of the firms they invest in. In order to improve their own carbon statements, they may choose to act as impact investors and foster the adoption of more ambitious climate-related policies by the companies they buy and hold.

As a test of this hypothesis, we run additional regressions using firm-level data. More precisely, we test whether fossil firms more often commit to reducing their GHG emissions whenever treated investors hold a higher share of their equity. We collect information about fossil fims' adoption of explicit reduction targets over 2016-2019 and define a dummy variable that takes the value of one whenever it is the case. We then run Probit regressions, where the probability of setting such a climate-related target at the firm level after 2015 is explained by the share of the firm's equity held by treated French institutional investors as of 2015 (denoted here the firm's treatment intensity). We control for *ex ante* firm size and profitability, and for all unobservable factors at the level of the issuer's country (such as other local regulations) using fixed effects.

Table 7 reports the results. In columns (1-2), we consider all fossil firms for which we have all the relevant information, the bulk of which are however not owned at all by French institutional investors. In columns (3-4), in contrast, we restrict the sample of fossil firms to those with a positive treatment intensity (i.e., which were at least partially owned by French institutional investors in 2015) as these firms may arguably be more comparable. All regressions yield a positive and significant coefficient of interest. When all available firms are included in the sample, the average marginal effect for a fossil firm to be "fully" treated (ie. the share of treated investors in the firm's equity in 2015 goes from zero to one) almost doubles (+95%) the probability that this firm commits to an explicit GHG emission reduction target (cf. column 2) in 2016 or later on. When we consider only firms that are partially owned by treated French investors, the average marginal effect is even stronger.

VII. Conclusion

In this paper, we provide evidence that institutional investors tend to decrease the carbon footprint of their portfolios when they are forced to disclose detailed climate-related information about their investments. We exploit for identification a French law that requires insurance companies, pension funds and asset management firms to disclose annually a wide range of information on both their exposure to climate-related risks and their strategy to contribute to mitigating climate change. This law has been enforced since January 2016. We compare the investment behaviour of French institutional investors, which have to abide by this law, with all other unaffected financial institutions in the euro area and find that this disclosure requirement

led affected institutions to cut sharply their holdings of securities issued by fossil fuel companies, everything else equal. The identified change in holdings does not reflect price fluctuations of individual securities, but real divestment out of companies in this highly emitting sector. Interestingly, these relative portfolio adjustments are prone to home bias, as treated institutions priorily shed securities issued by non-euro area fossil energy companies.

Two main policy implications of this research stand out, which seem to us to be of interest in the context of the ongoing efforts to renew the EU strategy for sustainable finance. First, the relative effect that we identify after 2016 still holds out at the end of our sample in 2019, although many large financial institutions in Europe have joined coalitions of investors committing to fight against climate change in recent years.[36] This suggests that, while voluntary moves for enhanced carbon disclosure are welcome, more stringent regulations on carbon reporting are of the essence to effectively speed up the alignment of finance with transition needs.[37]

Second, the French law requires institutional investors to provide wide-ranging information on their climate-related risks and the alignment of their portfolio with climate mitigation goals (or to explain why they cannot comply), but in the same time let them free to choose on each item both the methodology and metrics. A lesson from this experiment is therefore that even loosely defined carbon reporting standards may be enough to get a real effect on investment decisions. However, whether such reporting requirements would benefit from being standardized, and to what extent, remains an open issue (on the stronger effects of standardized carbon reporting requirements, see for instance Jouvenot and Krueger, 2020).

[36] See for instance the list of signatories of the TCFD (https://www.fsb-tcfd.org/), the *Portfolio Decarbonation Coalition* (https://unepfi.org/pdc/members/) or of the Climate Action 100+ (http://www.climateaction100.org/) an initiative launched by the *Global investor coalition on climate change* (GIC).

[37] This conclusion echoes those of Bingler et al. (2021), who perform an AI-based language analysis of the climate-related disclosure by TCFD-supporting companies and find that these firms mostly serve cheap climate talk and cherry pick to report non-material information.

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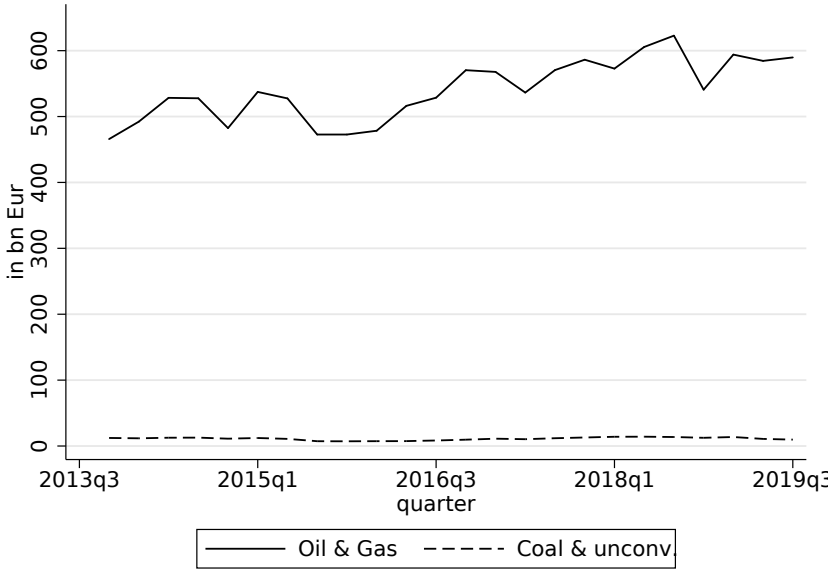
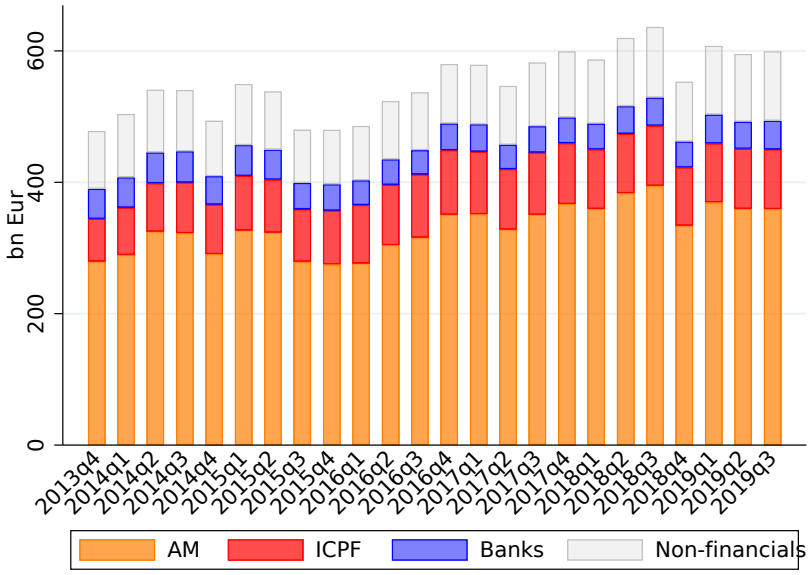
FIGURE 1. Holdings of fossil energy securities in the euro area



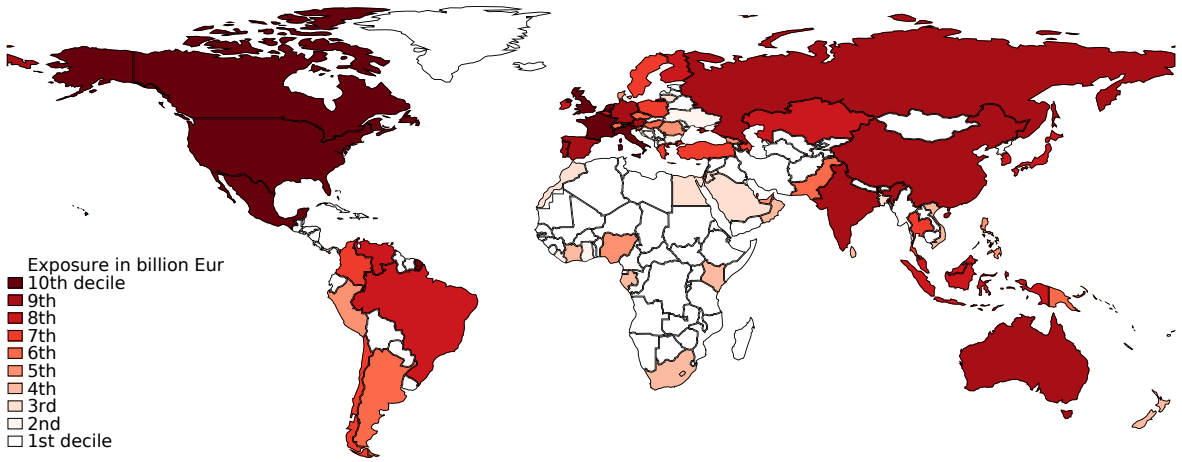
Note. Holdings of bonds and stocks reported by euro area investors (all sectors) in the SHS database. Current market value.

FIGURE 2. Fossil energy investments of euro area investors: breakdown by holder sector



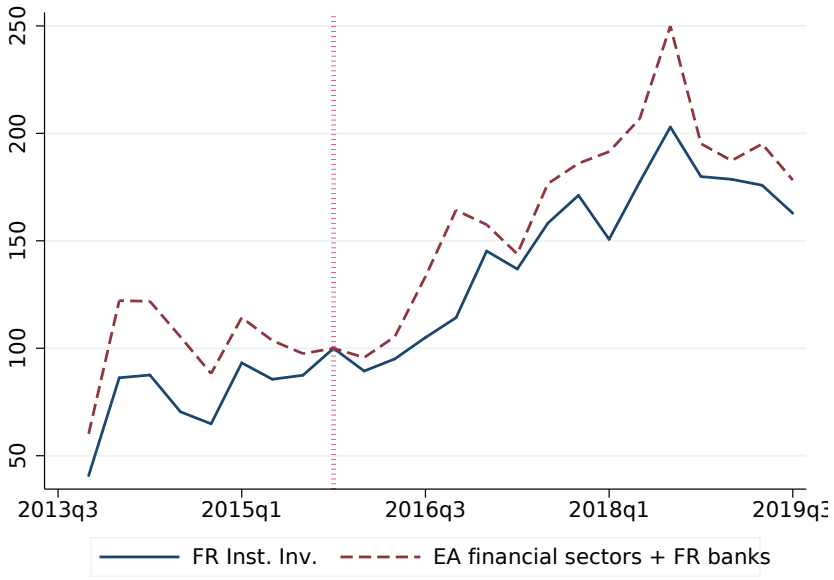
Note. Holdings of bonds and stocks reported by Euro area investors, breakdown by holder sector. Current market values. *Non-financials* include households, non-financial corporations and governement entities.

FIGURE 3. Fossil energy investments of euro area financial institutions: breakdown by country of destination



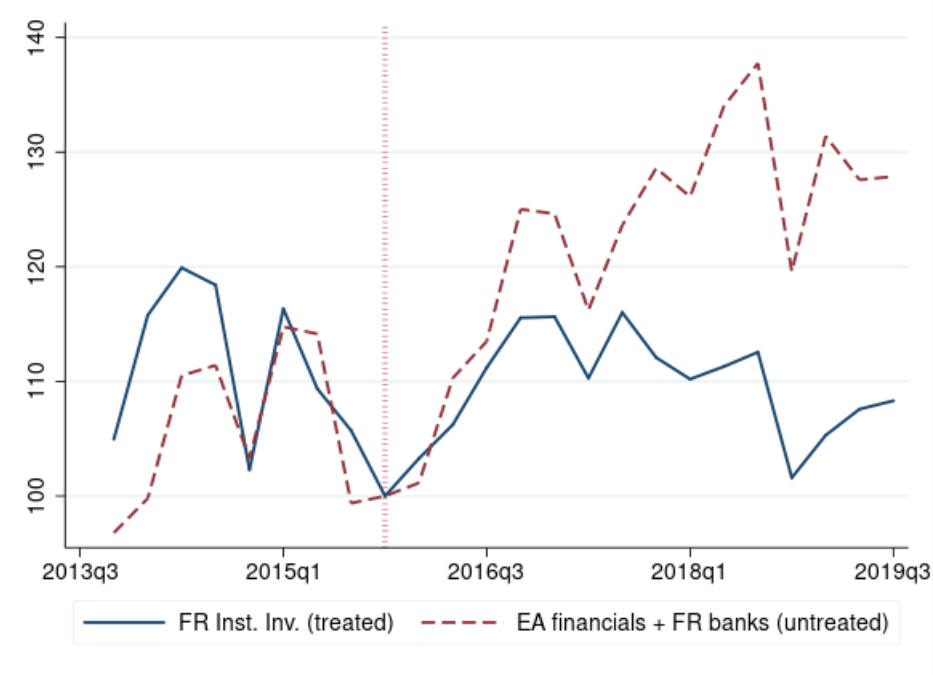
Note. Holdings of fossil energy securities by euro area financials are cumulated at the level of the country of residence of issuer companies. Countries are grouped into deciles of holding amounts. Countries in the last decile benefit from the largest amounts invested by euro area financials. Holdings are expressed at market value as of 2015Q4.

FIGURE 4. Price of fossil energy securities held in portfolio, treated vs control financial institutions (2015Q4=100)



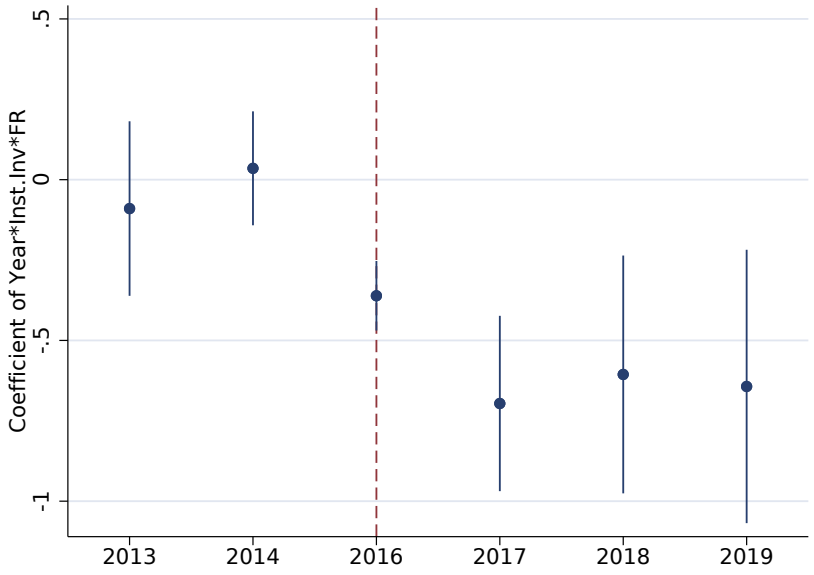
Note. This figure compares the (unweighted) average price of fossil energy securities held by "treated" institutions (French ICPF and AM firms) vs securities held by "control" institutions (French banks and all types of financial institutions in all other euro area countries). Both time series are scaled at 100 in December 2015 (vertical dotted line), just before the French disclosure regulation is enacted.

FIGURE 5. Cumulated holdings of fossil energy securities, treated vs control financial institutions (2015Q4=100)



Note. This figure compares amounts of fossil energy securities held by "treated" institutions (French ICPF and AM firms) with amounts held by "control" institutions (French banks and all types of financial institutions in all other euro area countries). Both time series are scaled at 100 in December 2015 (vertical dotted line), just before the French disclosure regulation is enacted. Holdings are expressed at market value.

FIGURE 6. Estimated impact of the 2015 French regulation on climate-related disclosure: dynamic specification



Note. This figure shows the estimated coefficients of the triple interaction terms $Year \times InstInv \times FR$ in a dynamic version of equation (1). 2015 is taken as a reference year and hence omitted. The vertical dotted line in 2016 corresponds to the first year of implementation of the climate-related disclosure regulation in France.

TABLE 1. Summary statistics, security level: cleaned sample

Variable	Obs	Mean	Std. Dev.	P10	P25	P50	P75	P90
Holdings (Mn Eur)	587660	18.71	181.2	.04	.27	1.61	8.51	31.25
Log Holdings	587660	14.02	2.83	10.59	12.51	14.29	15.96	17.26
Bond price	405359	101.44	22.77	89.49	99.24	103.06	107.95	114.52
Stock price	182272	2335.01	21529.3	.53	4.42	19.29	63.7	400.05
Log Price	587625	4.03	1.8	1.92	4.06	4.61	4.66	4.75
Period return (ann.), %	542292	-1.56	67.8	-53.02	-13.34	.28	11.82	40
Yield-to-maturity (bonds), %	390071	4.72	5.26	.5	1.91	3.81	5.75	8.31
Resid. maturity (yr, bonds)	405362	7.87	8.29	1.67	3.27	5.56	8.5	20.1

TABLE 2. Summary statistics, firm level: sample of fossil fuel firms with balance sheet information.

	Obs.	Mean	Std. Dev.	Min.	p25	Median	p75	p90	Max.
Panel 1: All firms									
Co2 target	814	0.06	0.23	0.00	0.00	0.00	0.00	1.00	
Treatment intensity	814	0.00	0.03	0.00	0.00	0.00	0.00	0.49	
Market cap(2015) (ln)	814	19.36	2.49	10.89	17.46	19.56	21.19	26.42	
ROA(2015)	814	0.01	0.18	-0.68	-0.03	0.05	0.11	0.32	
Panel 2: Firms with positive treatment intensity									
Co2 target	361	0.12	0.33	0.00	0.00	0.00	0.00	1.00	
Treatment intensity	361	0.01	0.04	0.00	0.00	0.00	0.00	0.49	
Market cap(2015) (ln)	361	21.02	1.90	15.44	19.89	21.10	22.31	26.42	
ROA(2015)	361	0.04	0.16	-0.68	0.00	0.07	0.12	0.32	

Note. The treatment intensity is the ratio of a firm's shares held by treated investors to the market capitalization of these shares, as of December 2015. *CO2 Target* is a dummy variable that takes the value of one whenever the firm has committed between 2016 and 2019 to meet an explicit GHG emissions target by a given horizon (e.g., 2030). Source: Refinitiv ESG.

TABLE 3. Impact of the French climate disclosure regulation on holdings of fossil energy securities: intensive margin

	(1)	(2)	(3)	(4)	(5)
Post × InstInv × FR	-0.470**	-0.569***	-0.628***	-0.585***	-0.580***
	[0.208]	[0.197]	[0.169]	[0.148]	[0.107]
Post × FR	0.168	0.199	0.239*		
	[0.150]	[0.146]	[0.127]		
Post × InstInv	0.180	0.245	0.274**		
	[0.150]	[0.147]	[0.125]		
InstInv × FR	-0.543				
	[0.485]				
ISIN FE	Yes	Yes			
Time FE	Yes	Yes			
Country FE	Yes				
Sector FE	Yes				
Country × Sector FE		Yes	Yes	Yes	
Country × Time FE				Yes	Yes
Sector × Time FE				Yes	Yes
ISIN × Time FE			Yes	Yes	Yes
ISIN × Sect. × Count. FE					Yes
Nb clusters	57	57	57	57	57
Observations	587,455	587,455	571,967	571,967	565,672
Adj. R2	0.56	0.62	0.59	0.59	0.90

Note. Dependent variable: holdings at market value (in log) at the ISIN-holder sector-holder country level. Estimation period: 2013-2019. The 2015 French regulation affects institutional investors in France from January 2016 on. The coefficient of the dummy interaction term *Post*InstInv*FR* therefore reads directly as our estimate of the effect of the new disclosure regulation. Standard errors are clustered at the holder sector-holder country level.

TABLE 4. Impact of the French climate disclosure regulation on holdings of fossil energy securities: extensive margin

	(1)	(2)	(3)	(4)	(5)
Post × InstInv × FR	-0.018**	-0.018**	-0.018**	-0.018**	-0.013**
	[0.007]	[0.007]	[0.007]	[0.008]	[0.006]
Post × FR	0.007***	0.007***	0.007***		
	[0.002]	[0.002]	[0.002]		
Post × InstInv	0.015**	0.015**	0.015**		
	[0.006]	[0.006]	[0.006]		
InstInv × FR	-0.112**				
	[0.056]				
ISIN FE	Yes	Yes			
Time FE	Yes	Yes			
Country FE	Yes				
Sector FE	Yes				
Country × Sector FE		Yes	Yes	Yes	
Country × Time FE				Yes	Yes
Sector × Time FE				Yes	Yes
ISIN × Time FE			Yes	Yes	Yes
ISIN × Sect. × Count. FE					Yes
Nb clusters	57	57	57	57	57
Observations	5079156	5079156	5079156	5079156	5053107
Adj. R2	0.29	0.41	0.40	0.40	0.80

Note. Linear probability regressions. Dependent variable: dummy variable for positive holdings at the ISIN-holder sector-holder country level. The estimation sample includes all possible holder country-sector pairs for each ISIN, at all dates when the security is reported to exist. Estimation period: 2013-2019. The 2015 French regulation affects institutional investors in France from 2016 on. The coefficient of the dummy interaction term *Post*InstInv*FR* therefore reads directly as our estimate of the effect of the new disclosure regulation. Standard errors are clustered at the holder sector-holder country level.

TABLE 5. Impact of the climate disclosure regulation on holdings of fossil energy securities: robustness (excluding one control country at a time)

	Excluding in turn one control-country:					
	DE	IT	LU	IE	NL	BE
Post × InstInv × FR	-0.399**	-0.573***	-0.636***	-0.610***	-0.551***	-0.621***
	[0.162]	[0.165]	[0.124]	[0.158]	[0.153]	[0.143]
Country × Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Country × Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector × Time FE	Yes	Yes	Yes	Yes	Yes	Yes
ISIN × Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Nb clusters	54	54	54	54	54	54
Observations	488,637	528,060	478,671	483,045	499,897	540,056
Adj. R2	0.56	0.60	0.57	0.59	0.60	0.59

Note. Dependent variable: holdings at market value (in log) at the ISIN-holder sector-holder country level. Estimation period: 2013-2019. The 2015 French regulation affects institutional investors in France from 2016 on. The coefficient of the dummy interaction term *Post*InstInv*FR* therefore reads directly as our estimate of the effect of the new disclosure regulation. Standard errors are clustered at the holder sector-holder country level.

TABLE 6. Impact of the French climate disclosure regulation on holdings of fossil energy securities: complementary analysis

	Fossil	Excl. greenbonds	Oil/gas	Coal/Unc.			Fossil		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
					Bonds	Stocks		For.	EA
Post × InstInv × FR	-0.585***	-0.587***	-0.537***	-1.402***	-0.021	-1.358***		-0.793***	-0.143
	[0.148]	[0.149]	[0.154]	[0.288]	[0.117]	[0.202]		[0.192]	[0.100]
Post × ICPF × FR							-0.406**		
							[0.164]		
Post × OFI × FR							-0.643***		
							[0.134]		
Country × Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country × Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector × Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ISIN × Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Nb clusters	57	57	57	51	57	57	57	57	57
Observations	571,967	571,646	547,307	26,085	397,139	174,828	571,967	452,014	134,152
Adj. R2	0.59	0.59	0.59	0.74	0.49	0.68	0.59	0.67	0.52

Note. Dependent variable: holdings at market value (in log) at the ISIN-holder sector-holder country level. Estimation period: 2013-2019. The 2015 French regulation affects institutional investors in France from 2016 onwards. The coefficient of the dummy interaction term *Post*InstInv*FR* therefore reads directly as our estimate of the effect of the new disclosure regulation. Column 2 runs the baseline specification excluding bonds categorized as "Green bonds" either by Refinitiv or Bloomberg, resulting in removing 2 unique securities from the sample and 321 observations. Column 3 and 4 restrict the sample to securities issued by firms of conventional oil/gas industries and coal/unconventional fuel industries respectively. Columns 5-6 look at bonds and equity shares separately. In column 7, the impact on holdings by two subtypes of institutional investors is investigated: ICPF (insurance companies and pension funds) vs AM (other mutual funds and hedge funds). In the last two columns, the sample is split into two subsamples, depending on the location of the issuer. *For.* stands for foreign issuers, i.e. entities outside of the euro area. *EA* stands for euro area issuers. Standard errors are clustered at the holder sector-holder country level.

TABLE 7. Firm-level regressions: *ex post* adoption of CO2 emission reduction targets by fossil fuel companies.

	All firms		Firms held>0 FR II	
	(1)	(2)	(3)	(4)
	Co2 target	Co2 target	Co2 target	Co2 target
Treatment intensity	5.344***	12.857***	4.442***	11.136***
	[1.492]	[3.003]	[1.440]	[2.828]
ROA(2015)	-1.215**	-2.121***	-1.053**	-1.933***
	[0.474]	[0.603]	[0.516]	[0.654]
Market cap(2015) (ln)	0.423***	0.633***	0.361***	0.531***
	[0.049]	[0.075]	[0.059]	[0.082]
Country FE	No	Yes	No	Yes
Observations	814	504	361	248
Pseudo R^2	0.30	0.46	0.17	0.35

Note. Cross-sectional probit regressions. Dependent variable: dummy equal to one when the firm has adopted a target for reducing its CO2 emissions as of the end of 2019. *Treatment intensity* is defined at the firm level as the share of equity held by French institutional investors, as of 2015Q4. Market capitalization in expressed in euros, as of 2015Q4. Columns 1-2: all fossil fuel firms, even if not held by French institutional investors in 2015. Columns 3-4: sample restricted to firms with positive treatment intensity. All firm-level controls as of end 2015. White-robust standard errors.

Online appendix - not for publication.

A. Additional tables

TABLE A.1. Fossil energy classification according to TRBC

TRBC classification	Oil/Gas Conv.	Coal/Unconv.
Coal (NEC)		✓
Coal Mining Support		✓
Coal Wholesale		✓
Gasoline Stations	✓	
Integrated Oil & Gas	✓	
LNG Transportation & Storage	✓	
Natural Gas Exploration & Production - Offshore	✓	
Natural Gas Exploration & Production - Onshore	✓	
Natural Gas Pipeline Transportation	✓	
Oil Drilling - Offshore	✓	
Oil Exploration & Production - Offshore	✓	
Oil Exploration & Production - Onshore	✓	
Oil Pipeline Transportation	✓	
Oil Related - Surveying & Mapping Services	✓	
Oil Related Equipment	✓	
Oil Related Services	✓	
Oil Related Services and Equipment (NEC)	✓	
Oil & Gas Drilling (NEC)	✓	
Oil & Gas Exploration and Production (NEC)	✓	
Oil & Gas Refining and Marketing (NEC)	✓	
Oil & Gas Storage	✓	
Oil & Gas Transportation Services (NEC)	✓	
Petroleum Product Wholesale	✓	
Petroleum Refining	✓	
Pyrolytic & Synthetic Fuels	✓	
Sea-Borne Tankers	✓	
Stationary Fuel Cells	✓	
Unconventional Oil & Gas Drilling		✓
Unconventional Oil & Gas Production		✓
Uranium (NEC)	✓	
Uranium Mining	✓	

Note. TRBC classification from Refinitiv. Split between Oil/Gas/Conventional and Coal/Unconventional is ours.

TABLE A.2. Mapping between Bloomberg's BICS energy sectors and Refinitiv's TRBC ones

BICS Level2	TRBC Activity
Coal Operations	Coal (NEC)
Exploration & Production	Oil & Gas Exploration and Production (NEC)
Integrated Oils	Integrated Oil & Gas
Oil & Gas Services & Equipment	Oil Related Services and Equipment (NEC)
Pipeline	Oil & Gas Transportation Services (NEC)
Refining & Marketing	Oil & Gas Refining and Marketing (NEC)

Note. This implicit mapping is built from securities classified in both TRBC and BICS according to the most frequent pairs.

TABLE A.3. Total euro area holdings of fossil fuel securities by source and instrument, market value in billions euro

	SHS		Instrument		Source	
Quarter	Outstanding	Holdings	Bonds	Stocks	TRBC	BICS
2013q4	5697	478	178	300	424	396
2014q1	5591	504	187	317	446	419
2014q2	6220	541	201	340	480	451
2014q3	6199	541	210	331	475	455
2014q4	5620	494	207	286	427	419
2015q1	6311	550	232	317	477	469
2015q2	6588	538	229	310	467	458
2015q3	4924	480	216	264	410	408
2015q4	5067	480	211	269	408	406
2016q1	5009	486	215	271	412	412
2016q2	5460	524	233	291	445	446
2016q3	5663	537	245	292	452	458
2016q4	6455	580	251	329	494	493
2017q1	6340	579	252	327	494	499
2017q2	5840	547	246	301	463	475
2017q3	6134	582	249	333	497	508
2017q4	6521	599	250	349	514	521
2018q1	6309	587	242	345	505	508
2018q2	7027	620	236	384	543	537
2018q3	7150	637	237	399	560	552
2018q4	6065	553	228	326	479	481
2019q1	6867	608	236	372	533	528
2019q2	6933	595	239	356	518	518
2019q3	6590	599	249	351	519	526

Note. This table reports in column (1) the outstanding of fossil energy securities existing in SHS, ie. which are held for at least 1 euro by an investor resident in the euro area, as well as in column (2) the corresponding total holdings in the euro area. Amounts are expressed at market value. TRBC and BICS refer to the scope of fossil energy companies according to the industry classifications of respectively Refinitiv and Bloomberg. Row totals exceed SHS holdings as in column (2) because of overlaps between the two sources.

B. Classifications

A. Bloomberg BICS

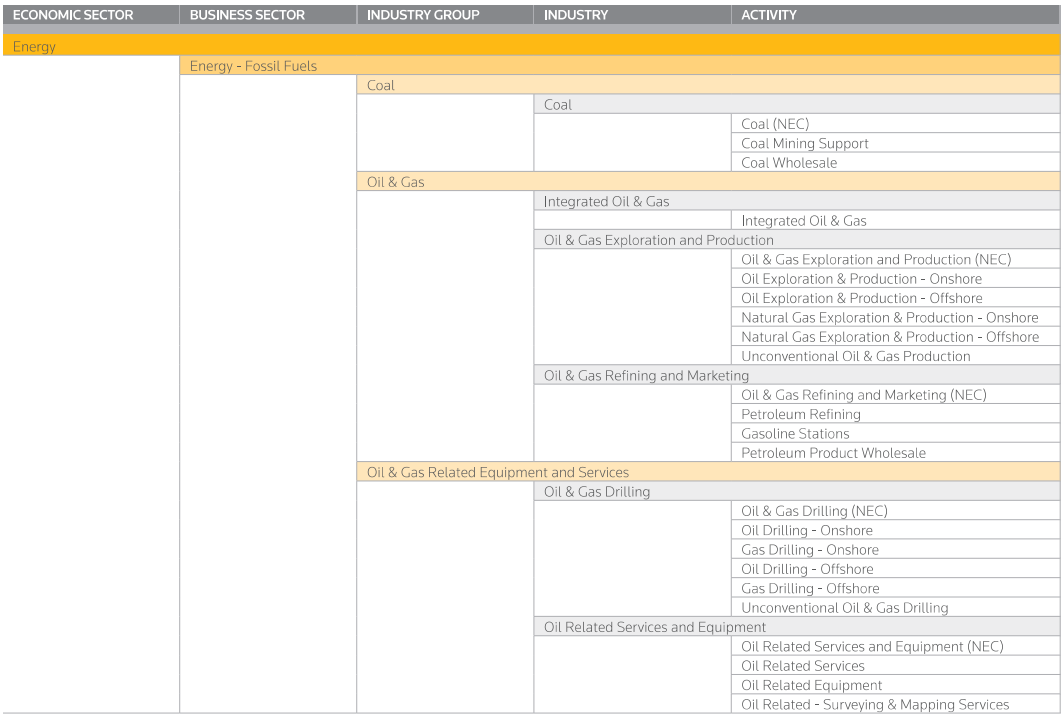
FIGURE 7. Bloomberg BICS classification

SECTOR (LEVEL 1)	INDUSTRY GROUP (LEVEL 2)
Communications	Cable & Satellite
	Entertainment
	Media Non-Cable
	Wireless Telecom Services
	Wireline Telecom Services
Consumer Discretionary	Airlines
	Apparel & Textile Products
	Automotive
	Casinos & Gaming
	Consumer Services
	Distributors
	Educational Services
	Entertainment Resources
	Home & Office Products
	Home Builders
	Home Improvements
	Leisure Products
	Restaurants
	Travel & Lodging
Consumer Staples	Consumer Products
	Food & Beverage
	Retail Staples Supermarkets
	Tobacco
Energy	Exploration & Production
	Integrated Oils
	Oil & Gas Services
	Pipeline
	Refining & Marketing
	Renewable Energy
Financials	Banking
	Commercial Finance
	Consumer Finance
	Financial Services
	Life Insurance
	Property & Casualty
	Real Estate
Health Care	Health Care Facilities & Services
	Managed Care
	Medical Equipment & Devices
	Pharmaceuticals
Industrials	Aerospace & Defense
	Electrical Equipment
	Industrial Other
	Machinery
	Manufactured Goods
	Railroad
	Transportation & Logistics
	Waste & Environment Services Equipment & Facilities
Materials	Chemicals
	Construction Materials
	Construction & Packaging
	Forest & Paper Products
	Metals & Mining
Technology	Communications Equipment
	Hardware
	Software & Services
Utilities	Utilities
Government	Sovereign
	Government Agency
	Government Regional/Local
	Supranational
	Development Bank
	Winding Up Agency

Source: Bloomberg

B. Refinitiv TRBC

FIGURE 8. Refinitiv TRBC classification - Extract of the energy sector



ECONOMIC SECTOR	BUSINESS SECTOR	INDUSTRY GROUP	INDUSTRY	ACTIVITY
Energy				
	Energy - Fossil Fuels			
		Coal		
			Coal	
				Coal (NEC)
				Coal Mining Support
				Coal Wholesale
		Oil & Gas		
			Integrated Oil & Gas	
				Integrated Oil & Gas
			Oil & Gas Exploration and Production	
				Oil & Gas Exploration and Production (NEC)
				Oil Exploration & Production - Onshore
				Oil Exploration & Production - Offshore
				Natural Gas Exploration & Production - Onshore
				Natural Gas Exploration & Production - Offshore
				Unconventional Oil & Gas Production
			Oil & Gas Refining and Marketing	
				Oil & Gas Refining and Marketing (NEC)
				Petroleum Refining
				Gasoline Stations
				Petroleum Product Wholesale
		Oil & Gas Related Equipment and Services		
			Oil & Gas Drilling	
				Oil & Gas Drilling (NEC)
				Oil Drilling - Onshore
				Gas Drilling - Onshore
				Oil Drilling - Offshore
				Gas Drilling - Offshore
				Unconventional Oil & Gas Drilling
			Oil Related Services and Equipment	
				Oil Related Services and Equipment (NEC)
				Oil Related Services
				Oil Related Equipment
				Oil Related - Surveying & Mapping Services

Source: Refinitiv

C. Additional robustness

TABLE C.1. Impact of the climate disclosure regulation on holdings of fossil energy securities: constant 2015 prices and cross-sectional analysis)

	Panel regressions			CS reg
	(1)	(2)	(3)	(4)
	OLS	OLS	PPML	OLS
Post × InstInv × FR	-0.624***	-0.582***	-0.232***	
	[0.144]	[0.108]	[0.085]	
InstInv × FR				-0.329***
				[0.055]
Country × Sector FE	Yes		Yes	
Country × Time FE	Yes	Yes	Yes	
Sector × Time FE	Yes	Yes	Yes	
ISIN × Time FE	Yes	Yes	Yes	
ISIN × Sect. × Count. FE		Yes		
Nb clusters	57	57	57	
Observations	468,112	465,632	571,967	23,389
Adj. R2	0.60	0.90		0.23
Pseudo R2			0.77	

Note. Dependent variable: fossil securities holdings (at the ISIN-holder sector-holder country level). Holdings are expressed at 2015 Q4 prices (in log) in columns (1-2), vs at current market price (in nominal value in euros) in column (3). Estimation method: OLS regressions in columns (1-2), Poisson pseudo-maximum likelihood (PPML) in column (3). Estimation period: 2013-2019. In column (4), the dependent variable is the (log) growth rate of average holdings (at current market prices) over 2016-2019 vs 2013-2015. The 2015 French regulation affects institutional investors in France from January 2016 on. Standard errors are clustered at the holder sector-holder country level (col. 1-3) or White-robust (col. 4).