

## FIRMS' ENVIRONMENTAL PERFORMANCE AND THE COVID-19 CRISIS

### Chapter 5 at a Glance

- Tighter financial constraints and weaker economic conditions can act as a drag on firms' environmental performance.
- The coronavirus disease (COVID-19) crisis could substantially reduce firms' green investments, reversing gains in their environmental performance made in past years.
- Climate policies and green investment packages are therefore warranted to support a green recovery and the transition to a low-carbon economy.
- Policies aimed at fostering sustainable finance such as better disclosure standards and product standardization could further help mobilize green investments and alleviate firms' financial constraints.

*The shutdown in economic activity as a result of the COVID-19 crisis has resulted in a temporary decline in global carbon emissions, but the long-term impact of the pandemic on the transition to a low-carbon economy remains uncertain. While the economic fallout from the crisis may constrain firms' ability to invest in green projects, thus slowing down the transition, the COVID-19 crisis could also induce a structural shift in consumer and investor preferences toward environmentally friendly products, providing an opportunity to introduce mitigation policies that help diversify away from fossil fuel production. Looking back at previous episodes of financial and economic stress, this chapter finds that tighter financial constraints and adverse economic conditions are generally detrimental to firms' environmental performance, reducing green investments, and setting back their progress by several years. This suggests that the COVID-19 crisis could potentially slow down the transition to a low-carbon economy. In light of the urgent need to reduce global greenhouse gas emissions, it also underlines the importance of climate policies and green investment packages to support a green recovery and the energy transition. Policies aimed at fostering sustainable finance, such as improved transparency and standardization, could further help mobilize green investments and alleviate firms' financial constraints.*

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### Introduction

The shutdown in economic activity as a result of the COVID-19 crisis resulted in a sharp decline in global carbon emissions (Figure 5.1, panel 1).<sup>1</sup> Daily emissions in early April 2020 fell by about 17 percent compared with 2019 levels, though most of this decline has reversed since then as economic activity has picked up across countries. Such a reversal in emissions is in line with what turned out to be only a temporary decline in the price of carbon emission allowances in March 2020 (Figure 5.1, panel 2). Overall, recent studies forecast a temporary reduction in emissions of about 4 to 7 percent in 2020, far from the large and sustained decrease in emissions required under the Paris Agreement to limit the increase in global temperature to well below 2°C (Le Quéré and others 2020).<sup>2</sup>

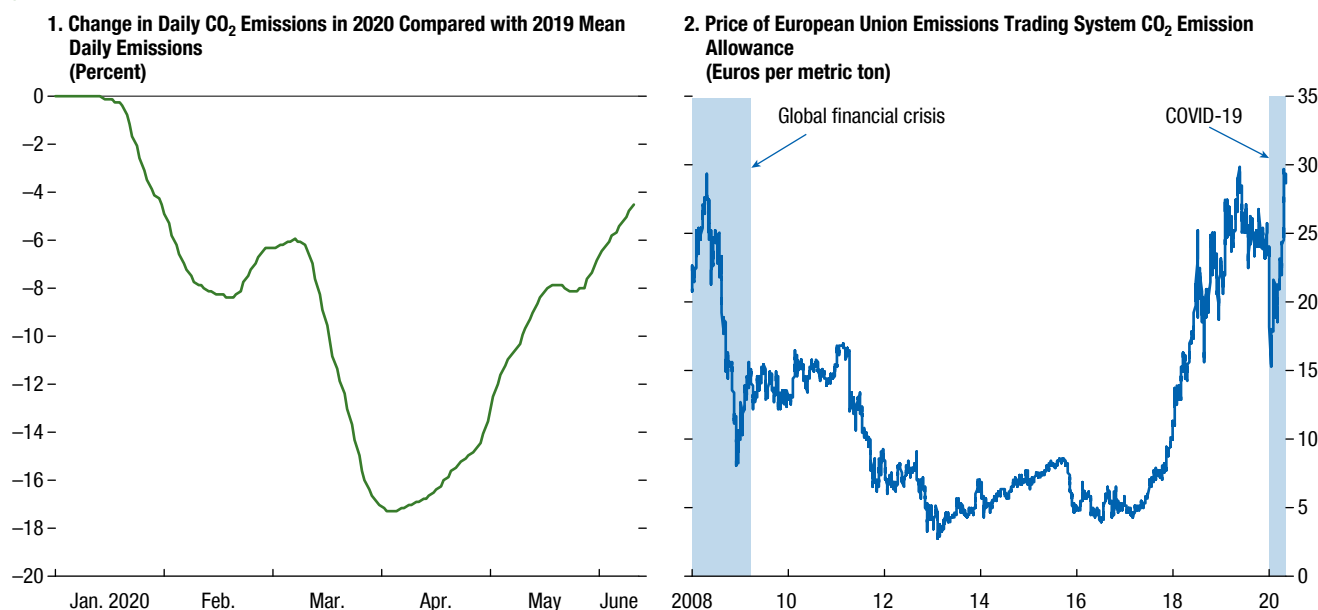
There is also a possibility that the transition to a low-carbon economy could be delayed should the economic scarring from the pandemic crisis run deep, inducing economic agents and policymakers to sideline or postpone environmental objectives. Heightened economic uncertainty, a sharp drop in energy prices, and corporate balance sheet vulnerabilities may result in a reduction in investments and research in long-horizon, capital-intensive green

<sup>1</sup>In the short term, there is an almost one-to-one relationship between economic growth and emissions (Hale and Leduc 2020).

<sup>2</sup>The UN Environment Programme (2019) estimates that emissions need to decline by 2.7 percent annually in order to reach the 2°C goal by 2030.

**Figure 5.1. The Energy Transition during the COVID-19 Crisis**

Carbon emissions declined rapidly as COVID-19 became a global pandemic ...



... but, unlike during the global financial crisis, the decline has been short-lived, with a rebound in emissions.

Sources: Global Carbon Project; Refinitiv Datastream; and IMF staff calculations.  
 Note: Panel 1 shows the reduction in daily CO<sub>2</sub> emissions in 2020 compared with 2019 mean levels. Panel 2 shows the price of futures contracts on carbon emission allowances traded on the Intercontinental Exchange. The European Union Emissions Trading System was subject to several changes in regulation over the sample period that may have affected the price level.

projects. In addition, subsidies or economic rescue packages aimed at softening the impact of the crisis may slow the transition—for example, by supporting firms or activities not compatible with long-term climate mitigation goals.

At the same time, the current crisis could also present an opportunity to accelerate the transition to a low-carbon economy by inducing structural shifts in consumer and investor preferences toward environmentally friendly products in the event economic agents change their beliefs about the likelihood of other catastrophic events, such as those linked to climate change.<sup>3</sup> In the corporate sector, for example, climate change has become an increasingly important topic since the onset of the pandemic, as is evident from firms’ earnings calls transcripts (see Box 5.1). More generally, an increased awareness of the benefits of long-term disaster prevention could facilitate

<sup>3</sup>Survey evidence suggests that voters have become more worried about other global threats, such as climate change, after experiencing the COVID-19 pandemic (Geman 2020).

implementation of green policy measures such as carbon taxes.<sup>4</sup>

Against this backdrop, this chapter aims to address the following two key questions: (1) How has the COVID-19 crisis affected green financing so far? (2) What can be learned from past economic crises about the likely behavior of the corporate sector in the near and medium terms with respect to the greening of the economy?

### The COVID-19 Crisis and Financing the Energy Transition

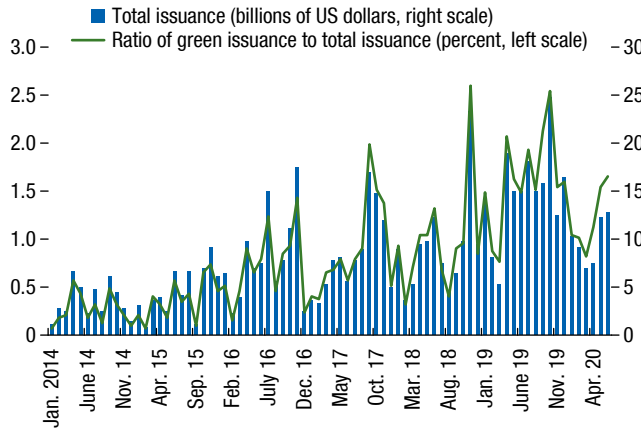
The COVID-19 crisis has not led to a sustained decline in green financing so far. Issuance of green corporate bonds, which has trended up over the past decade, declined in March 2020 in the midst of the financial market turmoil, but it has picked up since,

<sup>4</sup>Calls for implementing “green recovery” packages in the aftermath of the COVID-19 crisis have come from different quarters, including the private sector in some cases. For example, in June 2020 more than 100 global investors called for a green European Union recovery plan. The EU coronavirus recovery package earmarks about 37 percent of the funds for climate protection.

**Figure 5.2. The COVID-19 Crisis and Green Investments**

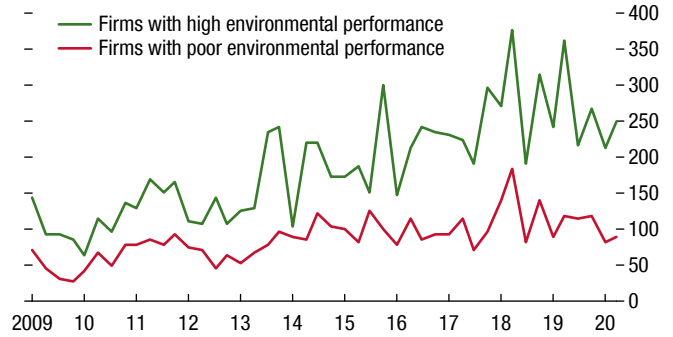
Green bond issuance dropped in the first quarter of 2020 before picking up again beginning in April 2020.

**1. Green Corporate Bond to Total Corporate Bond Issuance and Total Green Corporate Bond Issuance, January 2014–June 2020**



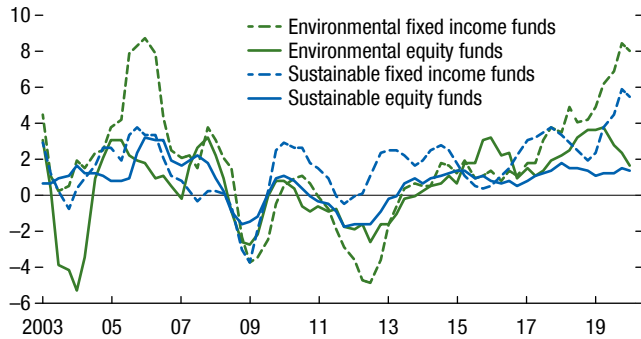
Bank lending has shifted to green firms over the past decade.

**2. Total Amount of Syndicated Loans to Firms with Environmental Scores Higher than Median and Firms with Environmental Scores Lower than Median, 2009:Q1–2020:Q1 (Billions of US dollars)**



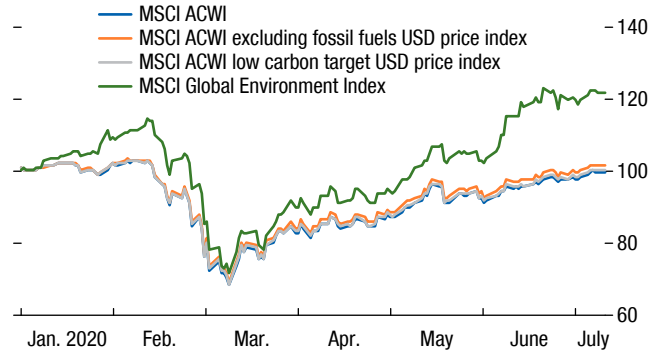
Flows into sustainable and environmental equity funds slowed in the first quarter of 2020 but remained positive.

**3. Sustainable and Environmental Fund Flows as a Share of Fund Size, 2003:Q1–2020:Q1 (Moving averages; percent)**



Equity indices with a focus on environmental issues performed at least as well as the overall market.

**4. Cumulative Returns of Green and Conventional Equity Market Indices (Percent)**



Sources: Bloomberg Finance L.P.; Dealogic; Morningstar; Refinitiv Datastream; and IMF staff calculations.

Note: Panel 1 shows global green corporate bond issues. Panel 3 shows quarterly flows into sustainable or environmental fixed-income or equity funds. MSCI ACWI = Morgan Stanley Capital International All Country World Index.

with the share of green bonds in total corporate bond issuance returning to 2019 levels (Figure 5.2, panel 1). In the syndicated loan market, loans to firms with an above-median score in environmental performance have increased over the past decade compared with loans to firms with a below-median score.<sup>5</sup> Lending to both

types of firms dropped slightly in the first quarter of 2020 (Figure 5.2, panel 2).

Investment funds with a focus on sustainable or environmental investments have continued to attract investors throughout the crisis, especially fixed-income funds, with only a small drop in aggregate inflows in

<sup>5</sup>Firm-level environmental, social, and governance data come with several caveats. First, the data cover only publicly listed firms, so the results do not necessarily carry over to the entire economy, which includes unlisted small- and medium-sized enterprises. Second, there is a lack of standardization and transparency across data providers, so environmental scores from different providers

may capture different features of environmental performance. Third, as some scores are self-reported by firms, accuracy may vary across the sample. See Online Annex 5.1 for a description of the variables used in this chapter. All annexes are available at [www.imf.org/en/Publications/GFSR](http://www.imf.org/en/Publications/GFSR).

some asset classes (Figure 5.2, panel 3).<sup>6</sup> A possible driver of the good performance of sustainable and environmental funds may have been the relatively high returns that green investments have experienced during this crisis in general (Figure 5.2, panel 4).

Overall, the impact of the COVID-19 crisis on the financing of green investments so far seems to have been modest and short-lived. However, given the severity and possible persistence of the shock—in terms of output decline, the extent of potential scarring, and the heightened economic uncertainty—there could be significant strains on corporate balance sheets. It is therefore challenging to forecast whether such trends will continue and ultimately what the overall impact of the crisis will be on firms' environmental performance and on their ability to contribute to global climate change mitigation efforts. In view of this concern, the analysis in the next section examines firms' environmental performance during previous episodes of financial and economic stress to draw possible implications for the current episode.

### Lessons from Past Economic Crises for Firms' Environmental Performance during the COVID-19 Crisis

Existing research focusing on the United States suggests that the environmental, social, and governance (ESG) performance of financially constrained firms—that is, firms that face difficulties in raising external capital—is generally weaker relative to unconstrained firms (Hong, Kubik, and Scheinkman 2012).<sup>7</sup> Therefore, a deterioration in financial or economic conditions that results in a tightening of firms' financial

constraints is likely to reduce their ability to invest in green projects and cut greenhouse gas emissions.

Extending this analysis to a global sample and specifically analyzing firms' environmental performance shows that tighter financial constraints are indeed associated with worse environmental performance (Figure 5.3, panel 1). Proxying firms' financial constraints by firm size (logarithm of total assets), rating status, interest coverage ratio, ability to pay dividends, and the commonly used Kaplan-Zingales index, the environmental performance of financially constrained firms is in each case significantly weaker than that of unconstrained firms. Specifically, environmental performance falls by 10 points when firm size drops from the median to the 25th percentile of the firm size distribution. When a firm does not pay dividends or when it is not rated, its environmental score is 4 points and 3 points lower, respectively, than the score of dividend-paying and rated firms. The environmental score is 1 point lower when an aggregate measure of financial constraints (the Kaplan-Zingales index) is above the median of the sample distribution. Similar results are obtained when considering firms' carbon intensity instead of their environmental performance.

A key channel through which financial constraints can affect firms' environmental performance is a decline in investments in green technologies. Constrained firms may postpone or reduce such investments if they do not directly contribute to revenue generation. Moreover, financially constrained firms may face difficulties in borrowing against future profits to invest in research and development, consequently postponing investments in intangibles that could potentially improve their environmental performance. Regression analyses support these hypotheses and suggest that financially constrained firms are less likely to make investments that reduce future environmental risks, such as treatment of emissions or installation of cleaner technologies (Figure 5.3, panel 2). For example, the probability that a firm will make an environmental investment falls by 6 percentage points when firm size drops from the median to the 25th percentile of the firm size distribution.

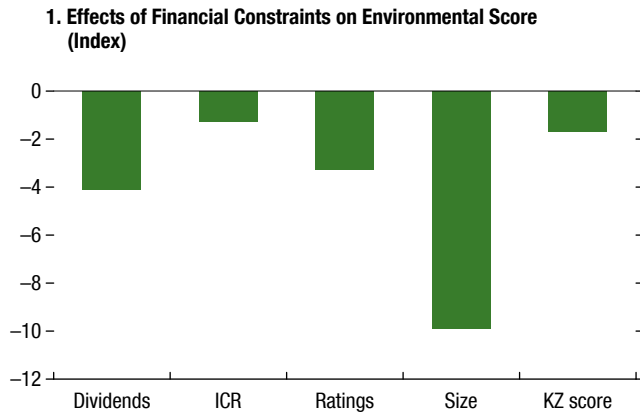
These results have important implications in the current COVID-19 context. An adverse macro-financial shock that increases uncertainty and amplifies firms' financial constraints is likely to affect firms' environmental performance and has the potential to significantly impede their ability to invest in

<sup>6</sup>Sustainable funds explicitly indicate all kinds of sustainability; impact; and environmental, social, and governance (ESG) strategies in their prospectus. Environmental funds invest in environmentally oriented industries. See the October 2019 *Global Financial Stability Report* for a discussion of sustainable finance and financial stability.

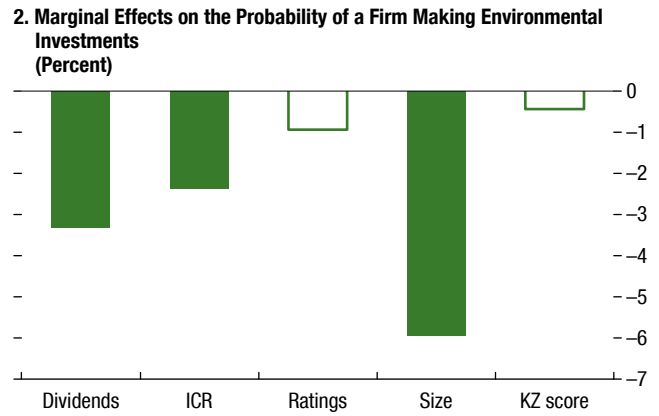
<sup>7</sup>Because financial constraints are not directly observable, different proxies are used in the literature (see Online Annex 5.2): firm size (large firms are expected to be less financially constrained than small firms), rating status (firms with a rating may have easier access to capital markets than those without), the interest coverage ratio (defined as earnings before interest and taxes divided by interest expenses, reflecting a firm's debt repayment capacity with higher values indicating less financially constrained firms), the ability to pay dividends, and the Kaplan-Zingales index (an aggregate measure of financial constraints).

**Figure 5.3. Financial Constraints, Financial Stress, and Environmental Performance**

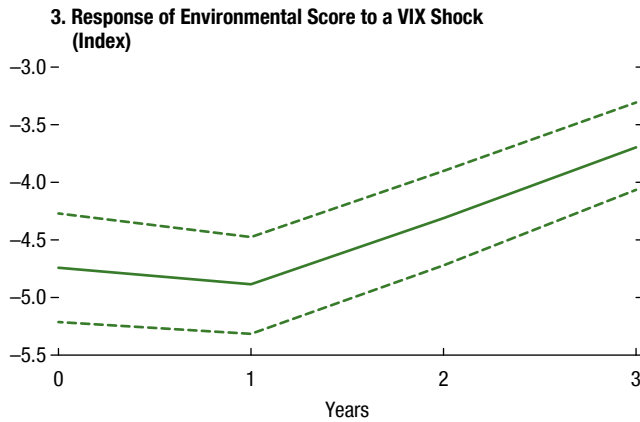
Financially constrained firms have weaker environmental performance ...



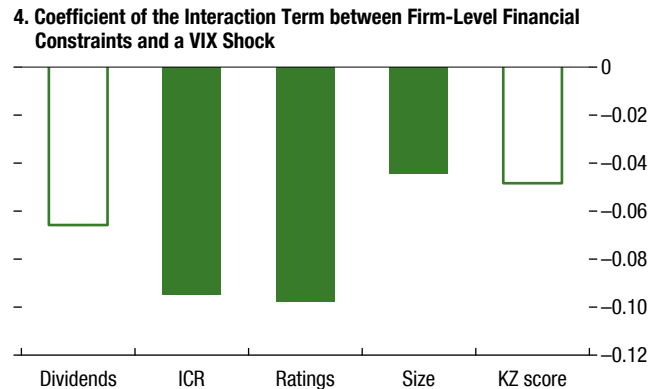
... and are less likely to make environmental investments.



Severe financial stress leads to poorer corporate environmental performance ...



... and the effects of financial stress are stronger for financially constrained firms.



Sources: Refinitiv Datastream; Standard & Poor's; and IMF staff calculations.

Note: "Dividends" refers to firms that do not pay dividends, "ICR" to firms with earnings below interest expenses, "Ratings" to firms that do not have a rating from Standard & Poor's, "Size" to the log of total assets (the sign of this variable is reversed so that higher values indicate smaller firms), and "KZ score" to firms above the median of the Kaplan-Zingales index score distribution (more financially constrained firms have higher KZ scores). Panel 1 shows regression estimates of environmental scores on financial constraints. Regressions include firm-level controls as well as industry, country, and time fixed effects. Firm-level controls are the log of total assets and earnings, except when using "Size" as a measure of financial constraint, when only earnings are used as a firm-level control. Panel 2 shows the marginal effects of a given financial constraint measure on the probability of a firm making an environmental investment. The probit models include the same control variables and fixed effects as in panel 1. In panel 3,  $t = 0$  is the year of the shock. The Chicago Board Options Exchange Volatility Index (VIX) shock is the average value of the VIX over the calendar year. The solid line denotes the response to a 16.3 point increase in the VIX (corresponding to the difference in the average value of the VIX in 2020, using data up to July 31, 2020, relative to the average value in 2019). The dashed lines denote 90 percent confidence intervals. Responses are obtained with the local projection approach from firm-level panel regressions that include firm-level controls, country-specific output gaps, the price of oil, and country and industry fixed effects. Panel 4 shows interaction terms at a one-step horizon between the VIX shocks and the lagged firm-level financial constraint variables. The same control variables as in panel 3 are used. In panels 1, 2, and 4, solid bars indicate significance at the 10 percent level. ICR = interest coverage ratio.

green projects. To quantify the extent of the impact, two types of shocks are analyzed here: (1) a global financial stress shock (proxied by the Chicago Board Options Exchange Volatility Index [VIX]) and (2) a real economic activity shock capturing a sudden drop in domestic output.<sup>8</sup>

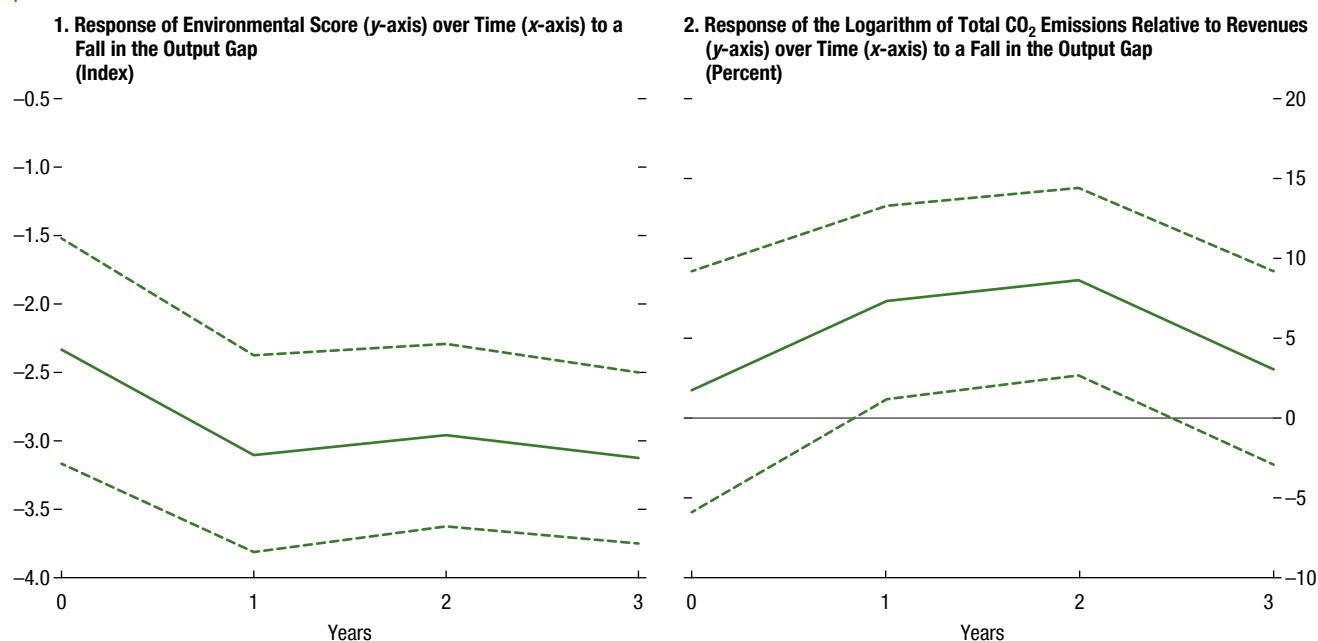
The analysis shows that a sudden jump in the VIX, comparable to the average level that prevailed in the first half of 2020 during the COVID-19 pandemic, would lead to a persistent drop in firms' environmental performance by up to 5 points, with the pre-shock performance level not attained for at least three years after the shock (Figure 5.3, panel 3). Absent policy actions and behavioral changes, this would imply that

<sup>8</sup>See Online Annex 5.3.

**Figure 5.4. Economic Shocks and Environmental Performance**

Contractionary economic shocks lead to lower corporate environmental performance ...

... and carbon intensity deteriorates following contractionary economic shocks.



Sources: Refinitiv Datastream; and IMF staff calculations.

Note: In panels 1 and 2, the real economic activity shock is scaled as a 10 percentage point drop in the output gap. The regression includes firm-level controls (log of total assets, earnings, and a dividend dummy variable), the price of oil (log West Texas Intermediate), the Chicago Board Options Exchange Volatility Index, and country and sector fixed effects. Dashed lines represent 90 percent confidence interval.

average corporate environmental performance would return to the levels that were last observed in 2006. Moreover, the adverse effect of global financial shocks on environmental performance is magnified when firms are financially constrained (Figure 5.3, panel 4). For example, for firms with an interest coverage ratio below 1 or for unrated firms in 2019, the global financial stress shock observed thus far in 2020 is estimated to lower environmental performance by 2 additional points, compared to firms with an interest coverage ratio above 1 or rated firms.<sup>9</sup>

A large decline in the output gap (10 percentage points, about 50 percent larger than that observed in the Group of Seven [G7] economies during the global financial crisis), would lead to a 3 point

decline in firms' environmental performance in the medium term (Figure 5.4, panel 1).<sup>10</sup> Similarly, firms' carbon intensity—captured by their total carbon emissions relative to revenue—could increase by up to 8.5 percent in the medium term after such a decline in the output gap (Figure 5.4, panel 2), even though the initial response of carbon intensity to economic shocks may be small because of the cyclical dynamics of carbon dioxide emissions observed during recessions (Figure 5.1, panel 1; Hale and Leduc 2020).

In addition to direct global financial and economic shocks, changes in oil prices could also impact corporate environmental performance by affecting

<sup>9</sup>These economic effects are calculated by multiplying the interaction term by a 16.3 point increase in the VIX (corresponding to the difference in the average value of the VIX in 2020, using data up to July 31, 2020, relative to the average value in 2019).

<sup>10</sup>Other more global measures of economic activity shocks such as the forecast error for the current-year global GDP growth relative to the *World Economic Outlook* projection, or the global economic activity shock from Baumeister and Hamilton (2019) also lead to a fall in corporate environmental performance in the medium term.

firms' incentives and their financial constraints. The onset of the COVID-19 crisis was accompanied by a steep decline in the international price of oil.<sup>11</sup> The effect of such a decline in oil prices on firms' environmental performance is, however, ambiguous. On the one hand, it may relax firms' financial constraints and reduce the incentives for businesses to improve their energy efficiency and shift away from fossil fuels, including by hindering the development of clean energy sources by making investments in new projects less profitable.<sup>12</sup> On the other hand, low oil prices could benefit the energy transition by hurting the profitability of the oil sector and leading to lower investments in the fossil fuel sector and a decline in production, thereby making it easier for clean energy firms to compete.

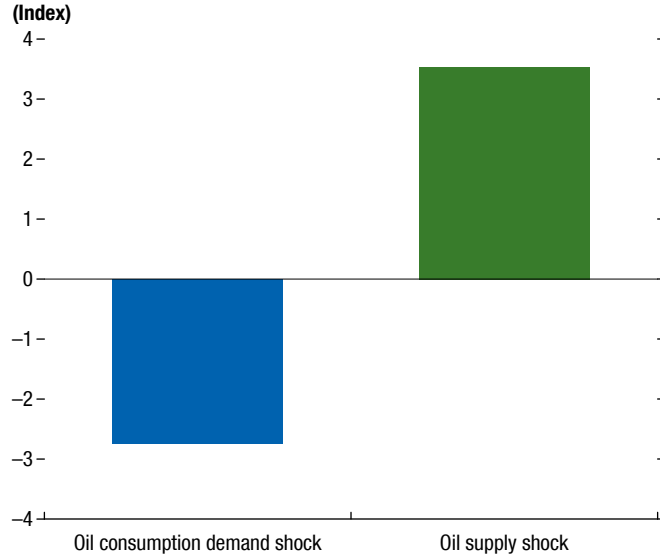
In principle, the effect of an oil price shock on environmental performance is likely to depend on the underlying source of the shock—that is, whether it is a demand- or supply-driven shock. A negative global demand shock associated with a decline in economic activity that reduces the demand for oil could be associated with lower corporate environmental performance as investments into cleaner energy sources are delayed because of already tight financial conditions for firms. Conversely, a drop in oil prices due to an oil supply shock could trigger an increase in global economic activity (Baumeister and Hamilton 2019), easing firms' financial constraints and allowing them to improve their environmental performance.

Econometric analysis suggests that the source of the oil price fluctuation is indeed key to understanding firms' environmental response to a shock. Historically, when oil prices have fallen due to demand-side factors, environmental corporate performance has been weaker. By contrast, when oil prices have declined due to an oil supply shock, environmental performance of firms has improved (Figure 5.5). To the extent that the COVID-19-induced oil price shock is largely a

**Figure 5.5. Oil Market Shocks and Environmental Performance**

Lower oil prices due to demand factors are associated with lower corporate environmental performance.

**Response of Environmental Scores to Oil Market Shocks that Lower the Real Price of Oil across all Industries (Index)**



Sources: Refinitiv Datastream; and IMF staff calculations.

Note: The oil market shocks are obtained from Baumeister and Hamilton (2019). All shocks are unit shocks that lead to a fall in the real price of oil. Responses at a two-year horizon are represented. Controls in the regression are the log of total assets, earnings, a dividend dummy variable, country-specific output gaps, the Chicago Board Options Exchange Volatility Index, and the price of oil (log West Texas Intermediate). The regressions include country and sector fixed effects. Solid bars indicate significance at the 10 percent level.

demand-driven shock, firms' environmental performance is thus likely to suffer.<sup>13</sup>

Overall, these results indicate that tighter financial constraints are associated with weaker corporate environmental performance. Adverse global financial and output shocks that increase uncertainty and amplify firms' financial constraints weigh significantly on their environmental performance. Furthermore, a reduction in oil prices against the backdrop of a decline in global economic activity is unlikely in itself to lift corporate environmental performance. Thus, absent strong supportive policy actions, tighter financial constraints and weaker economic activity related to the COVID-19 crisis are likely to act as a drag on firms' environmental performance in the future.

<sup>11</sup>Global energy demand declined by 3.8 percent in the first quarter of 2020. The demand for oil, coal, and to a lesser extent gas and nuclear energy is projected to decline substantially by the end of 2020 (IEA 2020).

<sup>12</sup>Acemoglu and others (2019) discuss the long-term effects of the shale gas boom, which reduces carbon dioxide emissions from coal in the short term, while increasing aggregate production and directing energy innovation to shift away from clean energy to fossil fuels.

<sup>13</sup>Difficulties to reach an agreement among the OPEC+ coalition also contributed to the collapse in oil prices in early 2020, but a decomposition of the oil price shock in March and April 2020 suggests that it was largely driven by demand-side factors. See Online Annex 5.3.

## Conclusions and Policy Recommendations

The COVID-19 crisis has resulted in a temporary decline in global carbon emissions, but its long-term impact is uncertain. On the one hand, the crisis may increase awareness of catastrophic risks and bring about a major shift in consumer preferences, corporate actions, and investor behavior. On the other hand, the historical evidence presented in this chapter suggests that there is a real possibility that, barring public interventions, investment by firms to improve their environmental performance may decline in this time of macro-financial stress.

To achieve the reduction in emissions needed to keep global warming below 2°C, an increase in green

investments, in combination with steadily rising carbon prices, is critical (October 2020 *World Economic Outlook*; October 2019 *Fiscal Monitor*). Public policies and green recovery packages are important to offset the potential deterioration in firms' environmental performance resulting from the crisis (see the October 2020 *Fiscal Monitor*).

In addition, to alleviate firms' financial constraints and to aid green investment, it will be key to put in place policies that support the sustainable finance sector, such as better disclosure standards, development of green taxonomies, and product standardization (see the October 2019 *Global Financial Stability Report*).



### Box 5.1. Climate Index Based on Firms' Earnings Calls

To measure how firms' exposure to and awareness of climate change have evolved over time, a firm-level climate index was constructed for this chapter based on quarterly earnings call transcripts using a climate change dictionary built from four climate change glossaries.<sup>1</sup> To construct the index, earnings call transcripts from 4,109 firms located in 46 countries are used.

Panel 1 of Figure 5.1.1 shows the share of earnings call transcripts that mention specific phrases related to climate change, such as "climate change," "CO<sub>2</sub>,"

This box was prepared by Alan Feng and Germán Villegas Bauer.

<sup>1</sup>Following a similar approach as Engle and others (2020), the glossaries are obtained from the British Broadcasting Corporation, the Intergovernmental Panel on Climate Change, the United Nations, and the US Environmental Protection Agency. See Online Annex 5.4 for a list of all terms. All annexes are available at [www.imf.org/en/Publications/GFSR](http://www.imf.org/en/Publications/GFSR).

or "emissions." A sharp increase in discussions involving climate change topics is observed in 2020, coinciding with the COVID-19 pandemic. This could, for example, be the result of the COVID-19 crisis increasing firms' focus on catastrophic events and long-term risks.

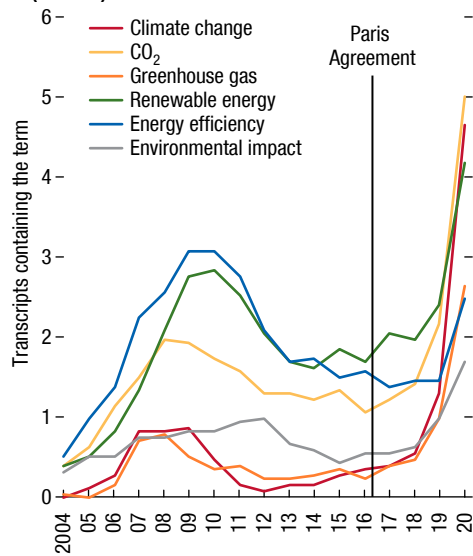
The *climate change discussion index* is then constructed for each firm by assigning a value of 1 to each earnings call transcripts that contains a phrase included in the dictionary. Panel 2 shows the average of the index over time. It is noteworthy that in the earnings calls of energy sector firms, mentions of climate-change-related terms spiked after the Paris Agreement in 2016, highlighting the importance of policy risk for this sector. The increase in discussions involving climate change over the past few years is consistent across countries (Online Annex 5.4).

**Figure 5.1.1. Climate Index**

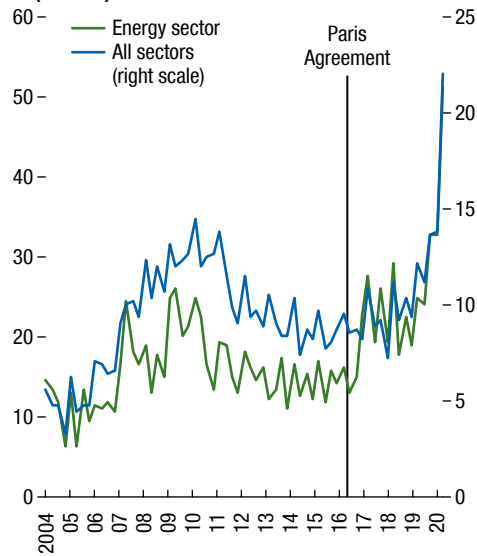
Climate change discussions have increased during the COVID-19 crisis.

After the Paris Agreement, firms in sectors exposed to transition risk became more aware of climate risks—or opportunities.

**1. Annual Share of Earnings Call Transcripts Containing Specific Climate-Change-Risk-Related Terms (Percent)**



**2. Quarterly Share of Firms with Climate Discussions, All Sectors and Energy Sector (Percent)**



Sources: FactSet; and IMF staff calculations.

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