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Supplementary Materials for

Mandatory disclosure would reveal corporate carbon damages

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Data Description

Greenhouse Gas (GHG) Emissions

We obtain data on corporate GHG emissions from Trucost through the Standard and Poor's (S&P) Capital IQ (CIQ) Pro platform. We download data for 2019. Trucost reports Scope 1 and Scope 2 emissions in accordance with the GHG Protocol.[1] In addition, Trucost provides information on companies' Scope 3 downstream and upstream emissions. We use only Scope 1 emissions (Key Field: 319413), i.e., emissions from sources that are owned or controlled directly by a company. We do so to avoid the issue of double counting, which can arise with indirect emissions (see discussion below). Trucost reports Scope 1 emissions for a company's global operations in tons of carbon dioxide equivalent (tCO_2e). In accordance with the Kyoto Protocol, CO_2e includes the following seven gases: carbon dioxide (CO_2), perfluorocarbons (PFCs), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), methane (CH_4), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3).

Trucost follows a standardized four-step research process for its emissions data (*4*).[2] As a first step, Trucost searches for companies' carbon emissions data from a variety of sources, including company financial reports, sustainability reports, websites, and other publicly disclosed sources. Emissions that companies report to other third-party datasets, such as disclosures to the Carbon Disclosure Project (CDP), are also reviewed and used. In a next step, the reported emissions are standardized so that they can be compared across companies, regions, and business activities. For example, Scope 1 emissions are adjusted if they do not cover a company's global operations or do not include all 7 Kyoto Protocol gases. Additionally, Trucost applies various procedures to detect reporting errors. In the third step, Trucost completes reporting gaps with economic modeling. In the absence of disclosures, Trucost uses an environmentally extended input/output (EEIO) model to estimate carbon emissions for a company's own operations and across its entire global supply chain. The model estimate for a company's Scope 1 emissions of its global operations relies on three inputs: the company's business sectors, its revenue share by sectors, and sector-specific environmental intensities. To calculate Scope 1 emissions, the sector-specific environmental intensity factors are expressed as GHG emissions per unit of revenue for each of the sectors in which a company operates. According to Trucost, the environmental intensities are obtained from a wide array of data sourced from supra-national, international, national, and industry bodies across a wide range of sectors and geographies. The final step in Trucost's process is to engage with companies annually to give them the opportunity to verify the emissions data.

For each Scope 1 data point, Trucost indicates whether the value has been disclosed by the company, it has required some form of adjustment, or whether it has been modelled. In our 2019 global public firm sample, 11% (N=1,725) of the firm-level Scope 1 emissions are company-disclosed values without adjustment (*disclosed value*). 20% (N=3,050) of disclosed Scope 1 emissions are adjusted (*adjusted value*) and 69% (N=10,406) are estimated by Trucost (*modelled value*). Within the disclosed value category, Scope 1 emissions data come primarily from company disclosures to the CDP (80%), followed by disclosures in environmental (13%) and financial (6%) reports (see Fig. S1). Less than 1% of the disclosed values come from personal communications between Trucost and the companies. In the adjusted value category, more than half of the values (52%) are derived from disclosures to the CDP, in environmental and financial reports and personal communication. 16% of adjusted values are derived from the previous year. Within the modelled value category, 95% of the values represent estimates in the absence of disclosures. We refer to Scope 1 emissions in the disclosed value category as reported emissions and those in the adjusted and modelled value category as estimated

[1] https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf.

[2] For this documentation and more information on Trucost's data and methods, see also our code repository.

emissions. In the supplementary analyses below, we provide estimates using only reported emissions or emissions that are reported as verified by a third-party.

Financial Information

We supplement the carbon emissions data with financial information from the S&P CIQ Pro database. In particular, we obtain information on companies' operating income (Key Field: 271485) and revenues (Key Field: 319522). Operating income is before taxes and interest and measures the pre-tax operating performance of a company's assets, irrespective of capital structure. We classify a company's industry group according to S&P CIQs Global Industry Classification Standard (GICS) system (Key Field: 329068).

Sample Description

Global Public Firm Sample

To construct the global sample of public firms, we start with the ESG Coverage List from the S&P CIQ Pro Platform as of 01/11/2022.[3] We do not apply any of the available filters within the platform, i.e., we include all sectors, data sets, company types, and geographies resulting in a sample of 23,441 firms. We use S&P's company type classification (Key Field: 322992) to identify firms that are publicly traded. As this field is static, it indicates whether firms were publicly traded as of the date of our download. We drop 6,839 firms that are privately owned and 26 because they have an invalid company ID. We lose 1,395 public firms with missing information on their carbon emissions. In total, we have 15,181 publicly-traded firm observations with non-missing reported or estimated Scope 1 emissions in 2019. None of these firms have missing revenue information. Information on operating income is missing for 63 observations. 12,969 firms have positive operating income.

U.S. S&P 1500 Sample

We obtain the S&P 1500 Constituent List from the S&P CIQ Pro database as of 12/16/2021. The list covers 1,499 firms, of which 1,447 firms have non-missing information on reported or estimated Scope 1 emissions in 2019. None of these firms have missing revenue information. Information on operating income is missing for 2 observations. 1,370 firms have positive operating income.

Our Approach to Computing Corporate Carbon Damages

We measure corporate carbon damages as the expected monetary value of each company's climate damages associated with its GHG emissions, scaled by an operational measure. Specifically, (unscaled) corporate carbon damages are the product of firm-level Scope 1 emissions measured in tCO_2e and the monetary value of the damages associated with the release of an additional ton of CO_2, also known as the social cost of carbon (SCC).

In order to give a sense of scale, we report corporate carbon damages as a share of the firms' operating profits or alternatively its revenues. When scaling carbon damages by operating income, we keep only firms for which operating income is positive. To reduce the influence of extreme observations, we truncate scaled corporate carbon damages that are below the 1st percentile or above the 99th percentile. Importantly, the computation of corporate carbon damages as a fraction of profits does not simulate the impact of a carbon tax (set at the SCC) on operating profits. The latter's impact on profits would be different because its incidence

[3] Trucost's data revision process is continuous. Historical revisions and data updates may occur at any point in the year.

would be split between the firm, its workers, and its customers, and the split would depend on industry and a variety of other factors. In particular, it requires knowing the demand and supply elasticities to compute the producer and consumer incidence (*3*). When we normalize carbon damages with revenues, our estimates are conceptually similar to Trucost's impact ratios, which use an environmental valuation coefficient (i.e., an estimate of the damages associated with the release of GHG emissions) for monetization and divide by revenues (*4*).

Monetizing firms' environmental impacts and externalities is an idea that has been around for at least a decade and related approaches can be broadly grouped into three categories (Table S1): First, conceptual proposals that extend the income statement with additional line items reflecting the monetized value of corporate externalities. Second, studies that propose or analyze new accounting methods for GHG emissions or emission rights. Third, empirical estimates or analyses of monetized corporate environmental impacts. For example, (*6*) use Scope 1, 2 and 3 GHG emissions to estimate the impact of a carbon tax on net income for a sample of U.S. companies. This approach ignores the important question of tax incidence as well as thorny issues related to attribution and double-counting of emissions, which arise especially for Scope 3 emissions. Similarly, (*14*) provides monetized impact estimates for a broad set of pollutants, including Scope 1 and 2 GHG emissions, and water usage and compares them to operating income and revenue.

Our approach of estimating corporate carbon damages for a large global sample has three core features and differs in important ways from these related approaches. First, we focus only on Scope 1 emissions to avoid issues of double counting (see our discussion on using higher level scopes below). Second, we use recent estimates for the SCC to measure the damages associated with the release of an additional ton of CO_2. To reflect the uncertainties in estimating climate damages, we provide estimates for three different established values of the SCC: (i) \$51 per tCO_2e, which matches the Obama administration's estimate and the Biden administration's temporary one;[4] (ii) \$190 per tCO_2e, which follows the US Environmental Protection Agency's (EPA) estimate in its recent November 2022 proposal;[5] and \$250 per tCO_2e based on recent research described in (*5*). Third, we lay out the conceptual underpinnings of corporate carbon damages and explain that they measure neither fossil fuel (or carbon) subsidies nor the effect of carbon taxes on corporate profits.

Using Scope 1 vs. Higher-Level Scope Emissions in the Computation

We restrict our analysis to Scope 1 emissions to avoid double counting when using Scope 2 or Scope 3 emissions. For example, a manufacturing firm's Scope 2 emissions for electricity that it purchased are also included in the Scope 1 emissions of the utility that sold this electricity. Similarly, upstream Scope 3 emissions from suppliers are also reported as Scope 1 emissions by the respective suppliers. In contrast, Scope 1 emissions do not include other firms' emissions. Avoiding double counting inherent in Scope 2 and 3 emissions also reduces the duplication in measurement effort and costs.

We acknowledge that information about Scope 2 or Scope 3 emissions can provide useful information. For example, Scope 2 and upstream Scope 3 information are relevant for consumers who want to assess the total carbon footprint that comes with a particular product or service. At the same time, there are important issues of attribution to downstream users. Moreover, as (*15*) show, one can produce carbon footprint or cradle-to-gate carbon information entirely based on firms' Scope 1 emissions by creating an accounting system that passes on

[4] https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf.

[5] https://www.epa.gov/system/files/documents/2022-11/epa_scghg_report_draft_0.pdf.

emissions from firm to firm (or user) as they exchange products and services similar to a value-added tax system.

That said, we acknowledge that downstream Scope 3 emissions (e.g., for oil and gas firms) that arise with household consumption (e.g., heating, driving) are relevant for total global GHG emissions. Our focus on corporate Scope 1 emissions means that emissions from downstream use by households, non-corporate entities, and the public or government sector are excluded in our analysis.

Finally, we recognize that Scope 1 emissions are not always comparable across firms. For instance, if one firm self-generates electricity and another firm purchases it from utilities, their reported Scope 1 emissions will differ, even if they otherwise have the same emissions. Similarly, if one firm outsources its production and receives finished goods from a supplier and another firm manufactures in house, their Scope 1 emissions will be predictably different. In fact, companies could have incentives to outsource production to countries that have weaker carbon regulation or do not require emissions reporting. However, if there were a mandatory disclosure regime for Scope 1 emissions that covers all privately owned *and* publicly traded firms globally, as we discuss and call for in the manuscript, then all corporate emissions would be accounted for somewhere. In this case, the sum of firms' Scope 1 reported emissions in each country would equal the total emissions of its corporate sector and summing across all countries would yield corporate emissions globally. This logic provides a rationale for conducting our analysis for Scope 1 emissions. But we acknowledge that we are currently still far from such a worldwide and comprehensive carbon reporting regime.

Supplementary Analyses

Results Using Trucost Data for 2021

Our main results are based on Scope 1 emissions and financial information in 2019. We chose this year as it is the most recent year not affected by the Covid-19 pandemic. As several years have passed since, it is useful to reassess the level of carbon damages. The most recent year for which GHG emissions are reported by almost all sample firms is 2021. We therefore roll forward the estimates of corporate carbon damages to 2021.[6] Table S2 shows that the level and distribution of damages look very similar when damages are scaled by revenue. However, average damages in 2021 are substantially lower than in 2019 when scaling with profits, even though the medians and the distribution of damages remain fairly similar. Closer inspection of the 2021 data reveal that several countries are still heavily influenced by later waves of Covid (e.g., Brazil). For this reason, we consider 2019 as our main analysis.

Results for Different Social Cost of Carbon Estimates

We compute corporate carbon damages for different SCC estimates and tabulate descriptive statistics for these damages. For the global sample and using $51 for the SCC, average corporate carbon damages equal less than 1% of firms' revenues and 12% of corporate operating profits (Table S3). For U.S. firms, average damages are 0.5% and 5%, respectively (Table S4). In the global sample, the 10^{th} percentile of carbon damages is less than 0.03% of operating profits and the 90^{th} percentile is 23%. Thus, there is substantial variation across firms.

Using a SCC of $250 and the global firm sample, average corporate carbon damages rise to 4% of firms' revenues and 58% of corporate operating profits. For this value of the SCC, the

[6] We downloaded Trucost data for 2021 from WRDS on 05/17/2023. We use S&P's company type classification (Key Field: 322992) to identify firms that are publicly traded. As this field is static, it indicates whether firms were publicly traded as of the date of our download.

10th percentile of carbon damages is equal to 0.1% of corporate profits and the 90th percentile rises to 113%.

We provide detailed descriptive statistics for the corporate carbon damages in different industries using both the global sample and the U.S. sample as well as different SCC estimates (Table S5 and Table S6). The largest carbon damages are in the energy-intensive industries (i.e., utilities, materials, energy, transportation and food, beverage and tobacco), for which average damages are well above the mean of the global sample. Using a SCC of $51 and the global sample, average carbon damages in Utilities, Materials, and Energy are 55%, 47%, and 36%, respectively. The magnitudes of these estimates, even when using $51, are remarkable considering that we use only Scope 1 emissions. With a SCC of $250, average carbon damages in Utilities, Materials, and Energy increase to 270%, 228%, and 177% of profits, respectively. In contrast, average damages for Banks and Insurance are only 0.3% each (Table S6).

We provide detailed descriptive statistics for the carbon damages across countries and compute average corporate carbon damages by country using alternative estimates for the SCC (Table S7 and Table S8). Using a SCC of $51, average carbon damages in Russia, Indonesia, and India are 35%, 24%, and 21%, respectively. Average damages for the U.S., the UK, and the European Union countries range from 6% to 11%. Using a SCC of $250, average carbon damages in Russia, Indonesia, and India rise to 171%, 118%, and 104%, respectively. The average damages for the U.S., the UK, and the European Union range from 29% to 56%.

We note that the Trucost database does not necessarily have the same depth of coverage of publicly listed companies in each country and caution readers to keep this in mind when comparing (average) carbon damages across countries.

Industry-Adjusted Country Estimates

Average carbon damages across countries can also reflect countries' industrial composition. As we discuss in the manuscript, industries in certain sectors are more carbon intensive than industries in other sectors (e.g., transportation versus technology) and relative overrepresentation of firms in these sectors can skew country comparisons. We therefore compute also industry-adjusted corporate carbon damages and provide country ranks based on adjusted numbers (Table 1). The industry adjustment is performed by regressing scaled firm-level damages on a complete set of binary industry indicators (see Fig. 2 for industries). We use firm-level damages scaled by operating income and apply the natural logarithm, given the skewed distribution. The adjusted R-squared from a regression of firm-level Scope 1 emissions on 24 industry indicators is 0.86, highlighting the importance of industry factors (*14*).

Results for Profit-Weighted Averages across Industries and Countries

Our main results are based on simple averages, which weight all scaled carbon damage observations equally. However, firms differ in their scale and hence their emissions and carbon damages matter to varying degrees, with the largest firms being the most important for the accumulation of atmospheric concentrations of CO_2 and ultimately climate change. To take this into account, we also compute profit-weighted averages, weighting each firm-level damages by the respective firm's operating income. We use operating profits as weights because carbon damages are scaled by operating profits. Thus, the profit-weighted average of the firm-level corporate carbon damages represents the aggregate scaled corporate carbon damages for the respective industry or the country, which one would obtain by dividing the respective sum of unscaled carbon damages by the corresponding sum of profits. Fig. S2 provides profit-weighted averages for different SCC estimates. Fig. S3 shows profit-weighted averages by industry. Fig. S4 shows simple and profit-weighted averages by country side-by-side for comparison.

The profit-weighted averages tend to be lower than the simple averages, suggesting that firms with better operational performance have lower corporate carbon damages. Fig. S3 shows

that, using profit-weighted averages, the largest carbon damages are still found in energy-intensive industries (i.e., utilities, materials, energy, and transportation). In the global public firm sample (Panel A), the largest ranking changes are in the Capital Goods and the Household and Personal Products sector, with the former rising from 12th (19%) to 6th (16%) place and the latter moving down from 8th (21%) to 14th (4%) place. In the U.S. sample (Panel B), the largest ranking changes are in the Diversified Financials, the Health Care Equipment and Services, and the Software and Services sector. While Diversified Financials rises from 22nd (<1%) to 9th (7%) place, Health Care Equipment and Services and Software and Services move down from 12th (6%) to 17th (1%) and 17th (3%) to 22nd (<1%) place, respectively.

In Fig. S4, countries with high equally-weighted average damages are Russia (130%), Indonesia (90%), and India (79%). Average damages for the U.S., the UK, and the European countries range from 22% to 42%. Taking into account firms' relative scale and weighting by operating income, India, Russia, and China have the highest profit-weighted average damages, with Russia (96%) moving down to 2nd place and India (99%) rising to 1st place. The U.S., the UK, and most European Union countries show stable rankings across simple and profit-weighted average damages. However, Italy jumps from 12th (37%) to 5th (42%) place and Germany moves from 8th (42%) down to 13th (28%) place.

Results Using Scope 1 and Scope 2 Emissions

Our main results are based on Scope 1 emissions, mainly to avoid double counting. We acknowledge, however, that the focus on Scope 1 could influence within as well as across industry comparisons (e.g., depending on firms' energy sources). To this end, we repeat our analyses using higher-level scope emissions. In particular, we compute corporate carbon damages using Scope 1 and 2 emissions. In Table S9, we tabulate descriptive statistics for these damages. Unsurprisingly, the inclusion of Scope 1 and 2 emissions increases the estimates of corporate carbon damages. But firms' relative rankings are fairly stable. Pairwise correlations between carbon damages based on Scope 1 emissions versus Scope 1 and Scope 2 emissions are very high (0.96 using operating income; 0.98 using revenue).

Table S10 shows that the relative cross-industry comparison in terms of average carbon damages is similar when Scope 1 or Scope 1 and 2 are used to estimate damages. Utilities (237%), Materials (223%), Energy (153%) and Transportation (129%) have the largest carbon damages, while Insurance and Banks (both <1%) have the lowest. The largest ranking changes are in the Commercial and Professional Service (from 9 to 14) and Food and Staples Retailing (from 11 to 6) sector. Overall, the inclusion of Scope 2 emissions does not seem to have a major impact on the ranking using the GICS industry classification.

In Table S11, Russia (166%), Indonesia (122%), and India (95%) remain the countries with the highest average carbon damages. The lowest damages for the U.S., UK, and France range from 29% to 36%. Including Scope 2, Germany moves from 8th (43%) down to 13th (46%) and Australia jumps in the opposite direction from 13th (36%) to 8th (52%).

Assessing the Scope for Benchmarking: Alternative What-if Estimates

One of our key findings is the substantial variation across firms within the same industry. This heterogeneity means that peer benchmarking has the potential to induce meaningful reductions in GHG emissions. To illustrate this potential, we compute the decline in firms' total emissions, if all the firms with carbon damages above their industry's median were to reduce their emissions such that their damages would equal the respective median industry damages. We report in the manuscript that, in our data set, total emissions would fall by more than 70%, with either the operating profit or revenue normalization. Here, we gauge how this number changes when we limit the what-if calculation to the firms with the highest carbon damages in their respective industries. Table S12 provides estimates of the "what-if" reductions in Scope 1

emissions if the firms with the top 1%, 5% and 10% of carbon damages in each industry were to reduce their emissions so that their damages are equal to the respective industry's median damages. Naturally, the percentages go down as fewer firms are presumed to make adjustment, but the declines in total emissions are still large and material when we consider only reductions by the firms with the top 10% or top 5% of carbon damages in each industry. We conclude from these statistics that even when focusing on large emitters, benchmarking induced by mandatory disclosure has the potential to lead to meaningful reductions in GHG emissions.

Assessing the Scope for Benchmarking: Within-Sector Analysis

The documented heterogeneity within industry is striking. It offers substantial potential for peer benchmarking. In this regard, it is interesting to consider the results in (*10*). The study provides evidence that mandatory disclosure for facilities in the U.S. GHGRP has resulted in significant emissions reductions likely through peer benchmarking. However, the GICS classification we use in our analyses is relatively coarse and benchmarking makes the most sense within a set of relatively comparable companies. We therefore illustrate within-industry variation for finer industry groups within a single sector. Table S13 presents descriptive statistics for the estimated carbon damages of more granular industry groupings within the transportation sector, which is one of the sectors with the largest carbon damages. Despite the relatively small number of observations in some industry groups within this sector, there is still considerable heterogeneity across firms in each of the respective industry groups, which would allow for peer benchmarking among more comparable firms.

Estimates with Alternative Data Sets

Our analysis relies on Trucost data, which are proprietary and largely estimated. In Table S14, we repeat the computation of corporate carbon damages using three alternative data sets for firm-level emissions to gauge the robustness of our results. First, we use a subset of the Trucost data and focus on company reported emissions only, i.e., excluding emissions from Trucost proprietary estimation model (Panel A). Company reported emissions in Trucost come for the most part from firms reporting to CDP. Using reported emissions only and a SCC of $190, average carbon damages are 61% (5.2%) of operating income (revenue). The average estimates are higher than those using reported and estimated emissions (44% and 3.1%, respectively (Table S3)). The median carbon damages are similar when using reported versus reported and estimated emissions.

Second, we use data from CDP to identify verified emissions that are reported as being subject to some form of third-party verification. The latter refers to verification carried out by an independent external organisation accredited and competent to perform GHG verification. CDP requires verification to be completed in accordance with recognized verification standards. Any third party verification standard referenced in a company's submission to CDP will be assessed to determine acceptability.[7]

When answering the CDP survey, companies have to provide information on which fraction of their emissions are verified. We treat Scope 1 emissions as verified if a given firm indicates that 100% of its reported Scope 1 emissions are subject to third-party assurance. The distribution of carbon damages across firms appears to be broadly similar when we use only verified Scope 1 emissions (Panel B).

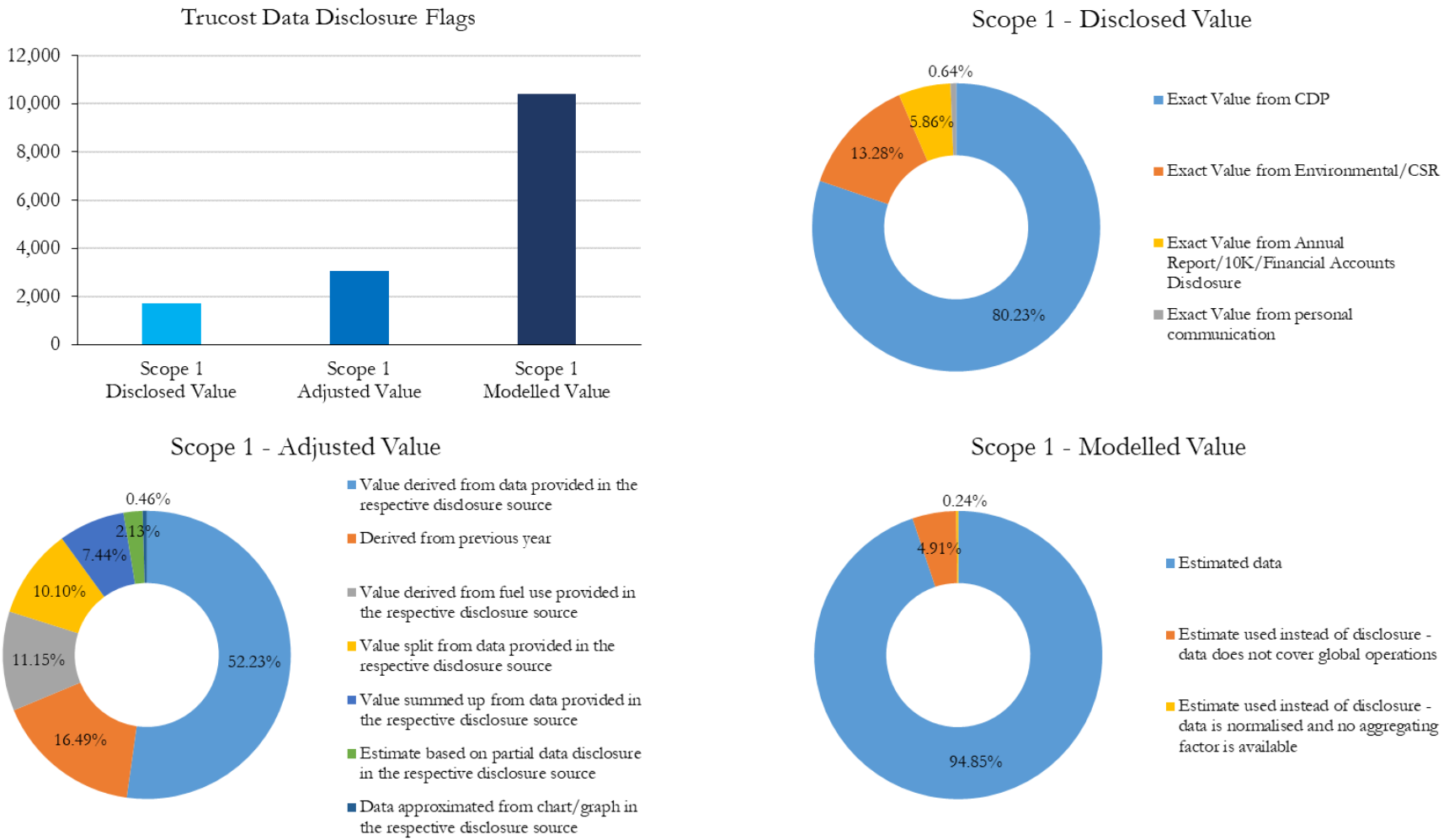
Third, we used MSCI as another data provider for GHG emissions. The sample is smaller using MSCI than Trucost. The firm-level estimates of carbon damages are somewhat lower when using the MSCI data and normalizing by operating income, but similar when we

[7] https://cdn.cdp.net/cdp-production/cms/guidance_docs/pdfs/000/000/490/original/CDP-and-verification-partners-FAQ.pdf?1557418260.

normalize by revenue (Panel C). Qualitatively, however, the insights are similar whether we are using MSCI or Trucost data. In fact, the pairwise correlations between Trucost and MSCI based estimates is quite high (0.80).

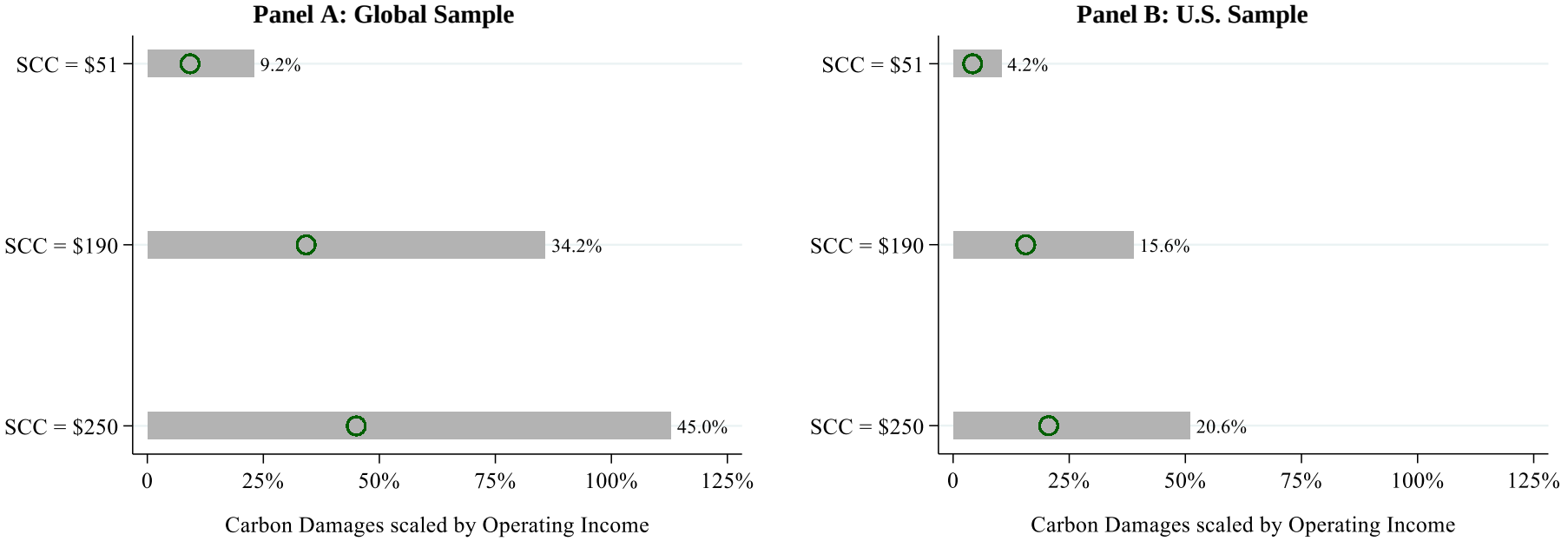
Overall, the general patterns of our damage estimates appear to be consistent across various data sets.

Fig. S1. Trucost Emissions Data Disclosure Flags



Notes: The figure presents a breakdown of the firm-level Scope 1 emissions data by Trucost as well as additional information on its disclosure flags using the global public firm sample. Trucost indicates for each Scope 1 value whether it is company disclosed, has required some form of adjustment, or it has been modelled. For adjusted values, the respective disclosure source can refer to Environmental/CSR, Annual Report/10-K/Financial Accounts Disclosure, personal communication, and/or CDP.

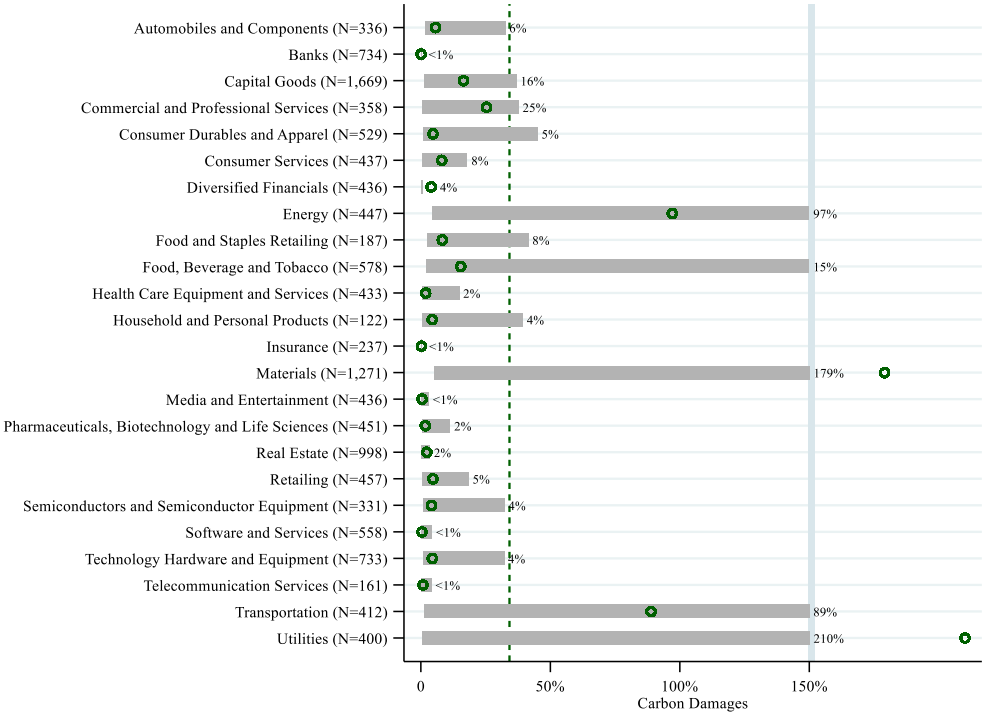
Fig. S2. Profit-Weighted Averages for Different SCC Estimates



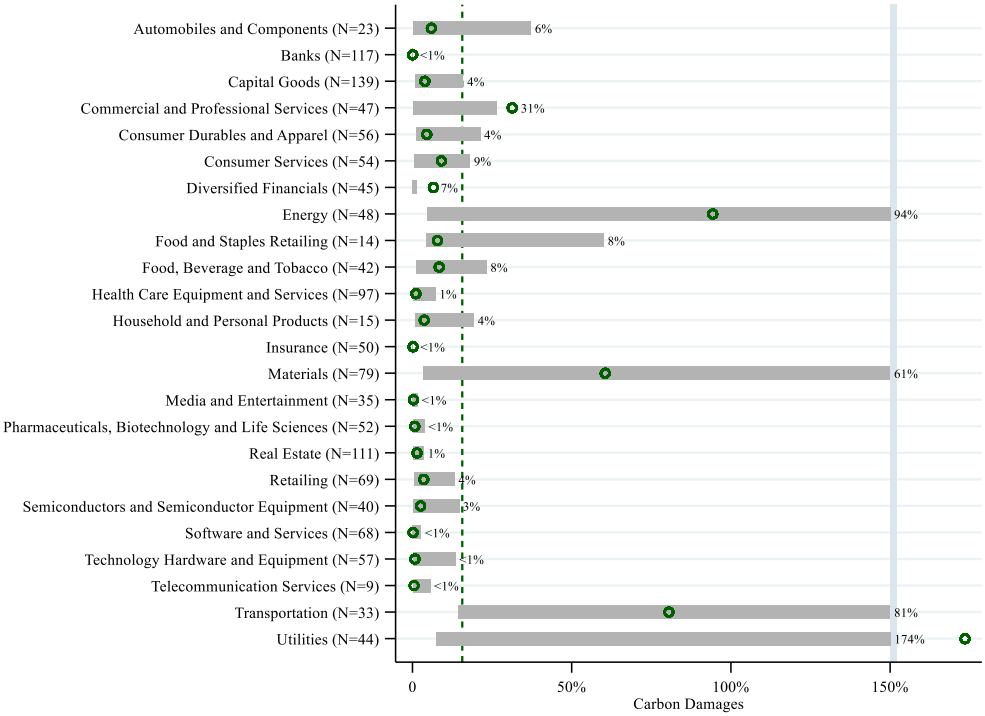
Notes: The figure provides estimates of corporate carbon damages, reporting the profit-weighted mean (in % and indicated by the green circle) and the range of the 10th and 90th percentiles (indicated by the grey horizontal bar). Carbon damages are computed by multiplying the social cost of carbon (SSC) with firms' GHG Scope 1 emissions in 2019 and then normalizing with firms' operating profits. We compute profit-weighted averages using $51, $190, and $250 per tCO_2e for values for the SCC. Panel A (B) shows the carbon damages for the global public firm (U.S. S&P 1500) sample. We keep only firms for which operating income is positive. We truncate observations of the scaled carbon damages that are below the 1st or above the 99th percentile.

Fig. S3. Profit-Weighted Averages by Industry

Panel A: Global Sample

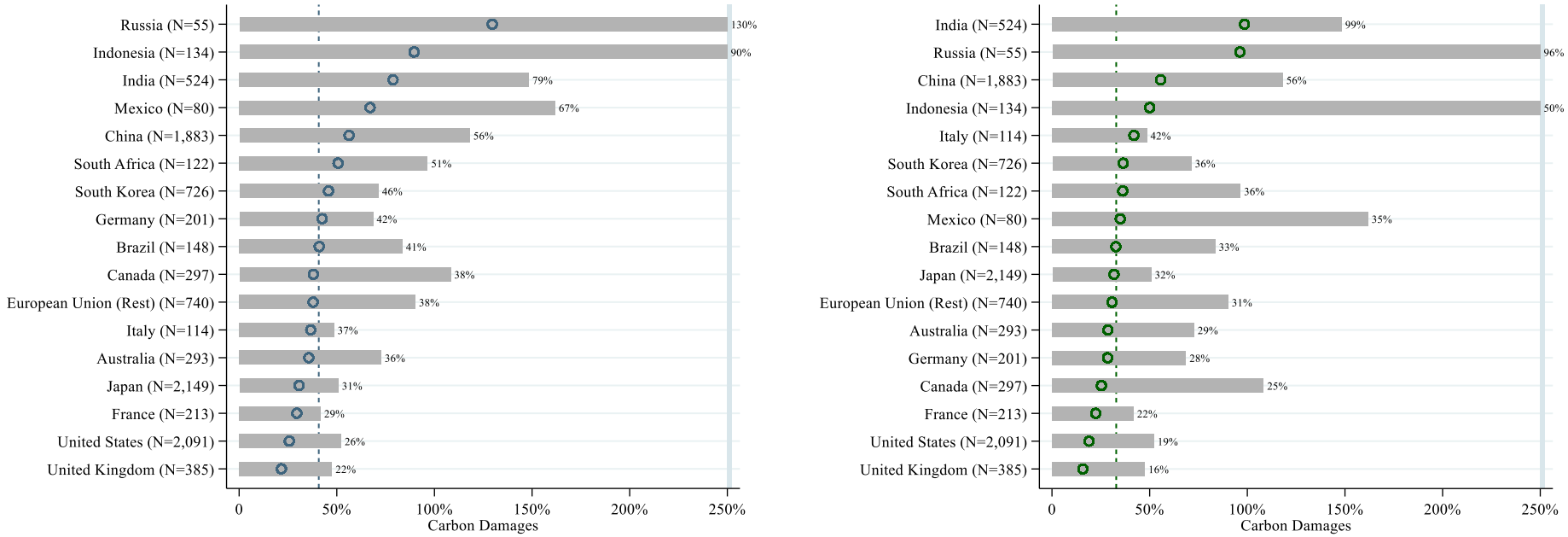


Panel B: U.S. Sample



Notes: The figure shows the distribution of carbon damages by industry when the SCC is $190, reporting the profit-weighted mean (in % and indicated by the green circle) and the range of the 10th and 90th percentiles (indicated by the grey horizontal bar). Panel A (Panel B) provides the industry distribution for the global public firm (U.S. S&P 1500) sample. Industry groups are classified according to S&P CIQs GICS system. The number of firms (N) in each industry group are in parentheses. Carbon damages are expressed as a percentage of operating income. The green dashed line represents the profit-weighted mean across industries. The graph is truncated at 150%. In Panel A (B), the value of the 90th percentile for Energy, Food, Beverage and Tobacco, Materials, Transportation, and Utilities is 383% (234%), 160%, 567% (178%), 358% (201%), and 675% (342%), respectively.

Fig. S4. Simple versus Profit-Weighted Averages by Country



Notes: The figure shows the distribution of carbon damages (between the 10th and 90th percentiles) by country when the SCC equals $190 using the global public firm sample. The country sample is restricted to those listed by the Major Economies Forum on Energy and Climate. This list includes the European Union as well as three of its individual member states (France, Germany and Italy). We report these countries separately and combine the remainder of the European Union countries. The number of firms (N) in each country are in parentheses. Carbon damages are expressed as a percentage of operating income. The blue (green) circle represents the simple (profit-weighted) country mean. The blue (green) dashed line represents the (profit-weighted) sample mean across countries. The graph is truncated at 250%. The values of the 90th percentile for Indonesia and Russia are 416% and 465%, respectively.

Table S1. Overview of Related Approaches

Author(s), Year	Type	Label for Key Construct	Reference (Journal Volume)	Title
(i) Extended income statement				
Barker & Mayer, 2021	Conceptual proposal	Sustainable profit with double materiality	Oxford Working Paper	Seeing double - financial accounting and reporting from the perspectives of both financial materiality and environmental materiality
Quattrone, 2022	Conceptual proposal	Provision for nature in value-added statement	*Accounting, Auditing & Accountability Journal* (35)	Seeking transparency makes one blind: how to rethink disclosure, account for nature and make corporations sustainable
(ii) Alternative accounting methods				
Comello et al., 2023	Conceptual proposal	Time-consistent corporate carbon reporting (TCCR)	*One Earth* (6)	Corporate carbon reporting: Improving transparency and accountability
Ertimur et al., 2020	Conceptual proposal & empirical analysis of financials	"As-if" financial statements with cap-and-trade program	*Management Science* (66)	Financial reporting for pollution reduction programs
Griffin, 2013	Empirical analysis of financials	"As-if" financial statements with cap-and-trade program	*Sustainability Accounting, Management and Policy Journal* (4)	Cap-and-trade emission allowances and U.S. companies' balance sheets
Kaplan & Ramanna, 2021	Conceptual proposal	E-liability	HBS Working Paper Series	How to fix ESG reporting
(iii) Empirical analyses and estimates				
Coady et al., 2017	Monetization & empirical analysis	Fossil fuel energy subsidies	*World Development* (91)	How large are global fossil fuel subsidies?
Eccles et al., 2022	Monetization & empirical analysis	"As-if" earnings after a carbon tax	Responsible Investor	How a carbon tax would hit the earnings of U.S. companies
Freiberg et al., 2021	Monetization & empirical analysis	Impact-weighted accounts	HBS Working Paper Series	Corporate environmental impact: measurement, data and information
Kotchen et al., 2021	Monetization & empirical analysis	Implicit fossil fuel subsidies	*PNAS* (118)	The producer benefits of implicit fossil fuel subsidies in the United States
Randers, 2012	Conceptual proposal & empirical analysis	GHG emissions per unit of value added (GEVA)	*Energy Policy* (48)	Greenhouse gas emissions per unit of value added ("GEVA") - a corporate guide to voluntary climate action
Trucost	Monetization & empirical estimates	Environmental damage costs and impact ratios	S&P Global Sustainable1	What you need to know: environmental costs and impact ratios or how to quantify environmental and climate issues

Table S2. Descriptive Statistics for Corporate Carbon Damages - 2021

Panel A: Carbon Damages/Operating Income								
SCC Estimates	N	Mean	SD	p10	p25	p50	p75	p90
SCC = $51	13,463	0.087	0.278	0.000	0.002	0.008	0.036	0.175
SCC = $190	13,463	0.325	1.034	0.001	0.006	0.031	0.136	0.651
SCC = $250	13,463	0.428	1.361	0.001	0.008	0.041	0.179	0.857
Panel B: Carbon Damages/Revenue								
SCC Estimates	N	Mean	SD	p10	p25	p50	p75	p90
SCC = $51	16,609	0.008	0.026	0.000	0.000	0.001	0.002	0.013
SCC = $190	16,609	0.029	0.098	0.000	0.001	0.003	0.008	0.050
SCC = $250	16,609	0.038	0.129	0.000	0.002	0.004	0.010	0.066

Notes: The table presents estimates of corporate carbon damages in 2021. In Panel A (B), we compute corporate carbon damages by multiplying the social cost of carbon (SCC) with firms' GHG Scope 1 emissions in 2021 and then normalize with firms' operating profits (revenues). We use $51, $190, and $250 per tCO_2e for the SCC. When computing carbon damages scaled by operating income, we keep only firms for which operating income is positive. We truncate observations of the scaled carbon damages that are below the 1st or above the 99th percentile.

Table S3. Descriptive Statistics for Corporate Carbon Damages - Global Sample

Panel A: Carbon Damages/Operating Income								
SCC Estimates	N	Mean	SD	p10	p25	p50	p75	p90
SCC = $51	12,711	0.118	0.391	0.000	0.002	0.010	0.042	0.230
SCC = $190	12,711	0.440	1.456	0.001	0.008	0.036	0.158	0.858
SCC = $250	12,711	0.579	1.916	0.001	0.010	0.047	0.208	1.129
Panel B: Carbon Damages/Revenue								
SCC Estimates	N	Mean	SD	p10	p25	p50	p75	p90
SCC = $51	14,879	0.008	0.029	0.000	0.000	0.001	0.002	0.015
SCC = $190	14,879	0.031	0.107	0.000	0.001	0.003	0.009	0.054
SCC = $250	14,879	0.041	0.140	0.000	0.002	0.004	0.011	0.071

Notes: The table presents estimates of corporate carbon damages using the global public firm sample. In Panel A (B), we compute corporate carbon damages by multiplying the social cost of carbon (SCC) with firms' GHG Scope 1 emissions in 2019 and then normalize with firms' operating profits (revenues). We use $51, $190, and $250 per tCO_2e for the SCC. When computing carbon damages scaled by operating income, we keep only firms for which operating income is positive. We truncate observations of the scaled carbon damages that are below the 1st or above the 99th percentile.

Table S4. Descriptive Statistics for Corporate Carbon Damages - U.S. Sample

Panel A: Carbon Damages/Operating Income								
SCC Estimates	N	Mean	SD	p10	p25	p50	p75	p90
SCC = $51	1,344	0.050	0.140	0.000	0.001	0.006	0.020	0.104
SCC = $190	1,344	0.185	0.522	0.000	0.004	0.022	0.074	0.388
SCC = $250	1,344	0.243	0.686	0.001	0.005	0.029	0.097	0.510
Panel B: Carbon Damages/Revenue								
SCC Estimates	N	Mean	SD	p10	p25	p50	p75	p90
SCC = $51	1,419	0.005	0.019	0.000	0.000	0.001	0.002	0.010
SCC = $190	1,419	0.020	0.070	0.000	0.001	0.002	0.006	0.038
SCC = $250	1,419	0.027	0.093	0.000	0.001	0.003	0.008	0.050

Notes: The table presents estimates of corporate carbon damages using the U.S. S&P 1500 sample. In Panel A (B), we compute corporate carbon damages by multiplying the social cost of carbon (SCC) with firms' GHG Scope 1 emissions in 2019 and then normalize with firms' operating profits (revenues). We use $51, $190, and $250 per tCO_2e for the SCC. When computing carbon damages scaled by operating income, we keep only firms for which operating income is positive. We truncate observations of the scaled carbon damages that are below the 1st or above the 99th percentile.

Table S5. Descriptive Statistics for Corporate Carbon Damages by Industry

Panel A: Global Public Firm Sample

Industry	N	Mean	SD	p10	p25	p50	p75	p90
Automobiles and Components	336	0.252	1.142	0.015	0.025	0.047	0.129	0.326
Banks	734	0.002	0.023	0.000	0.000	0.000	0.001	0.002
Capital Goods	1,669	0.195	0.595	0.012	0.026	0.054	0.122	0.369
Commercial and Professional Services	358	0.207	0.690	0.005	0.011	0.030	0.080	0.377
Consumer Durables and Apparel	529	0.225	0.794	0.007	0.020	0.045	0.132	0.451
Consumer Services	437	0.139	0.612	0.006	0.014	0.035	0.079	0.180
Diversified Financials	436	0.024	0.215	0.000	0.000	0.001	0.001	0.007
Energy	447	1.345	2.016	0.045	0.160	0.601	1.665	3.829
Food and Staples Retailing	187	0.199	0.486	0.025	0.039	0.068	0.142	0.415
Food, Beverage and Tobacco	578	0.616	1.554	0.021	0.052	0.125	0.362	1.599
Health Care Equipment and Services	433	0.134	0.801	0.005	0.013	0.025	0.053	0.148
Household and Personal Products	122	0.210	0.690	0.007	0.015	0.030	0.081	0.394
Insurance	237	0.002	0.006	0.000	0.000	0.001	0.002	0.004
Materials	1,271	1.734	2.849	0.051	0.158	0.477	1.674	5.675
Media and Entertainment	436	0.018	0.062	0.001	0.002	0.005	0.015	0.031
Pharmaceuticals, Biotechnology and Life Sciences	451	0.081	0.567	0.006	0.012	0.020	0.040	0.114
Real Estate	998	0.034	0.219	0.002	0.004	0.007	0.017	0.036
Retailing	457	0.102	0.291	0.005	0.017	0.042	0.098	0.185
Semiconductors and Semiconductor Equipment	331	0.204	0.559	0.008	0.027	0.069	0.161	0.323
Software and Services	558	0.029	0.097	0.002	0.004	0.010	0.022	0.044
Technology Hardware and Equipment	733	0.166	0.528	0.008	0.023	0.059	0.146	0.322
Telecommunication Services	161	0.075	0.610	0.002	0.003	0.007	0.017	0.042
Transportation	412	1.150	2.069	0.012	0.046	0.259	1.382	3.581
Utilities	400	2.053	3.230	0.004	0.067	0.458	2.744	6.746

Panel B: U.S. S&P 1500 Firm Sample

Industry	N	Mean	SD	p10	p25	p50	p75	p90
Automobiles and Components	23	0.108	0.185	0.003	0.015	0.035	0.064	0.372
Banks	117	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Capital Goods	139	0.076	0.124	0.009	0.019	0.034	0.081	0.160
Commercial and Professional Services	47	0.100	0.269	0.002	0.009	0.023	0.040	0.264
Consumer Durables and Apparel	56	0.109	0.262	0.011	0.022	0.036	0.067	0.213
Consumer Services	54	0.092	0.202	0.006	0.012	0.030	0.084	0.181
Diversified Financials	45	0.005	0.019	0.000	0.000	0.000	0.001	0.013
Energy	48	0.805	0.790	0.045	0.213	0.557	1.214	2.337
Food and Staples Retailing	14	0.344	0.714	0.044	0.053	0.095	0.298	0.601
Food, Beverage and Tobacco	42	0.245	0.624	0.013	0.027	0.057	0.125	0.233
Health Care Equipment and Services	97	0.064	0.191	0.002	0.013	0.024	0.046	0.073
Household and Personal Products	15	0.062	0.071	0.010	0.020	0.032	0.115	0.193
Insurance	50	0.002	0.004	0.000	0.000	0.001	0.001	0.002
Materials	79	0.684	0.865	0.034	0.071	0.289	0.929	1.780
Media and Entertainment	35	0.009	0.012	0.001	0.002	0.005	0.012	0.017
Pharmaceuticals, Biotechnology and Life Sciences	52	0.020	0.025	0.003	0.006	0.010	0.024	0.038
Real Estate	111	0.018	0.032	0.003	0.005	0.008	0.017	0.036
Retailing	69	0.050	0.045	0.006	0.017	0.034	0.062	0.132
Semiconductors and Semiconductor Equipment	40	0.062	0.069	0.002	0.012	0.033	0.098	0.146
Software and Services	68	0.027	0.096	0.001	0.002	0.004	0.014	0.027
Technology Hardware and Equipment	57	0.048	0.053	0.002	0.006	0.032	0.061	0.135
Telecommunication Services	9	0.017	0.017	0.001	0.003	0.013	0.021	0.056
Transportation	33	0.868	0.834	0.145	0.252	0.388	1.467	2.007
Utilities	44	1.394	1.326	0.074	0.218	0.966	2.674	3.418

Notes: The table shows the distribution of carbon damages by industry when the SCC equals \$190 using the global public firm (U.S. S&P 1500) sample in Panel A (B). Industry groups are classified according to S&P CIQs GICS system. Carbon damages are expressed as a percentage of operating income. We keep only firms for which operating income is positive. We truncate observations of the scaled carbon damages that are below the 1st or above the 99th percentile.

Table S6. Corporate Carbon Damages by Industry and SCC Estimate

Panel A: Global Public Firm Sample

	SCC = $51	SCC = $190	SCC = $250
Industry	Mean	Mean	Mean
Automobiles and Components	0.068	0.252	0.332
Banks	0.001	0.002	0.003
Capital Goods	0.052	0.195	0.257
Commercial and Professional Services	0.056	0.207	0.273
Consumer Durables and Apparel	0.061	0.225	0.297
Consumer Services	0.037	0.139	0.183
Diversified Financials	0.007	0.024	0.032
Energy	0.361	1.345	1.770
Food and Staples Retailing	0.053	0.199	0.262
Food, Beverage and Tobacco	0.165	0.616	0.811
Health Care Equipment and Services	0.036	0.134	0.177
Household and Personal Products	0.056	0.210	0.276
Insurance	0.001	0.002	0.003
Materials	0.465	1.734	2.281
Media and Entertainment	0.005	0.018	0.024
Pharmaceuticals, Biotechnology and Life Sciences	0.022	0.081	0.106
Real Estate	0.009	0.034	0.044
Retailing	0.027	0.102	0.134
Semiconductors and Semiconductor Equipment	0.055	0.204	0.268
Software and Services	0.008	0.029	0.038
Technology Hardware and Equipment	0.044	0.166	0.218
Telecommunication Services	0.020	0.075	0.098
Transportation	0.309	1.150	1.513
Utilities	0.551	2.053	2.701
Total	0.118	0.440	0.579

Panel B: U.S. S&P 1500 Firm Sample			
	SCC = $51	SCC = $190	SCC = $250
Industry	Mean	Mean	Mean
Automobiles and Components	0.029	0.108	0.142
Banks	0.000	0.000	0.001
Capital Goods	0.020	0.076	0.100
Commercial and Professional Services	0.027	0.100	0.132
Consumer Durables and Apparel	0.029	0.109	0.144
Consumer Services	0.025	0.092	0.120
Diversified Financials	0.001	0.005	0.007
Energy	0.216	0.805	1.060
Food and Staples Retailing	0.092	0.344	0.453
Food, Beverage and Tobacco	0.066	0.245	0.323
Health Care Equipment and Services	0.017	0.064	0.085
Household and Personal Products	0.017	0.062	0.082
Insurance	0.000	0.002	0.002
Materials	0.184	0.684	0.901
Media and Entertainment	0.002	0.009	0.012
Pharmaceuticals, Biotechnology and Life Sciences	0.005	0.020	0.026
Real Estate	0.005	0.018	0.023
Retailing	0.013	0.050	0.065
Semiconductors and Semiconductor Equipment	0.017	0.062	0.082
Software and Services	0.007	0.027	0.036
Technology Hardware and Equipment	0.013	0.048	0.063
Telecommunication Services	0.004	0.017	0.022
Transportation	0.233	0.868	1.142
Utilities	0.374	1.394	1.834
Total	0.050	0.185	0.243

Notes: The table presents average carbon damages by industry using $51, $190, and $250 for the SCC. Panel A (B) uses the global public firm (U.S. S&P 1500) sample. Industry groups are classified according to S&P CIQs GICS system. Carbon damages are expressed as a percentage of operating income. We keep only firms for which operating income is positive. We truncate observations of the scaled carbon damages that are below the 1st or above the 99th percentile.

Table S7. Descriptive Statistics for Corporate Carbon Damages by Country

Country	N	Mean	SD	p10	p25	p50	p75	p90
Australia	293	0.356	1.208	0.001	0.004	0.022	0.171	0.728
Brazil	148	0.410	1.094	0.001	0.006	0.036	0.258	0.836
Canada	297	0.380	1.053	0.001	0.005	0.034	0.241	1.084
China	1,883	0.563	1.681	0.003	0.014	0.045	0.194	1.182
European Union (Rest)	740	0.379	1.302	0.001	0.005	0.024	0.117	0.903
France	213	0.295	1.101	0.002	0.005	0.027	0.110	0.418
Germany	201	0.425	1.423	0.002	0.007	0.028	0.117	0.686
India	524	0.788	2.376	0.001	0.011	0.041	0.216	1.484
Indonesia	134	0.896	2.083	0.001	0.007	0.052	0.265	4.160
Italy	114	0.367	1.378	0.001	0.004	0.017	0.117	0.487
Japan	2,149	0.307	1.102	0.004	0.016	0.050	0.156	0.509
Mexico	80	0.670	1.936	0.001	0.005	0.038	0.206	1.619
Russia	55	1.296	2.729	0.003	0.039	0.158	0.731	4.647
South Africa	122	0.507	1.755	0.001	0.004	0.043	0.171	0.966
South Korea	726	0.458	1.548	0.006	0.024	0.081	0.253	0.714
United Kingdom	385	0.217	0.786	0.001	0.003	0.013	0.072	0.476
United States	2,091	0.257	0.891	0.000	0.002	0.021	0.088	0.523

Notes: The table shows the distribution of carbon damages by country when the SCC equals $190 using the global public firm sample. The country sample is restricted to those listed by the Major Economies Forum on Energy and Climate. This list includes the European Union as well as three of its individual member states (France, Germany and Italy). We report these countries separately and combine the remainder of the European Union countries. Carbon damages are expressed as a percentage of operating income. We keep only firms for which operating income is positive. We truncate observations of the scaled carbon damages that are below the 1st or above the 99th percentile.

Table S8. Corporate Carbon Damages by Country and SCC Estimate

	SCC = $51	SCC = $190	SCC = $250
Country	Mean	Mean	Mean
Australia	0.096	0.356	0.469
Brazil	0.110	0.410	0.540
Canada	0.102	0.380	0.500
China	0.151	0.563	0.741
European Union (Rest)	0.102	0.379	0.499
France	0.079	0.295	0.388
Germany	0.114	0.425	0.559
India	0.212	0.788	1.037
Indonesia	0.240	0.896	1.179
Italy	0.098	0.367	0.483
Japan	0.082	0.307	0.404
Mexico	0.180	0.670	0.882
Russia	0.348	1.296	1.705
South Africa	0.136	0.507	0.667
South Korea	0.123	0.458	0.602
United Kingdom	0.058	0.217	0.285
United States	0.069	0.257	0.338
Total	0.109	0.408	0.536

Notes: The table presents average carbon damages by country using $51, $190, and $250 values for the SCC in the global public firm sample. The country sample is restricted to those listed by the Major Economies Forum on Energy and Climate. This list includes the European Union as well as three of its individual member states (France, Germany and Italy). We report these countries separately and combine the remainder of the European Union countries. Carbon damages are expressed as a percentage of operating income. We keep only firms for which operating income is positive. We truncate observations of the scaled carbon damages that are below the 1st or above the 99th percentile.

Table S9. Descriptive Statistics for Corporate Carbon Damages using Scope 1 & 2

Panel A: Carbon Damages/Operating Income								
SCC Estimates	N	Mean	SD	p10	p25	p50	p75	p90
SCC = $51	12,711	0.161	0.465	0.002	0.007	0.025	0.087	0.346
SCC = $190	12,711	0.602	1.731	0.006	0.027	0.094	0.325	1.290
SCC = $250	12,711	0.791	2.277	0.008	0.036	0.124	0.427	1.697
Panel B: Carbon Damages/Revenue								
SCC Estimates	N	Mean	SD	p10	p25	p50	p75	p90
SCC = $51	14,879	0.011	0.031	0.000	0.001	0.002	0.005	0.022
SCC = $190	14,879	0.041	0.115	0.002	0.004	0.008	0.019	0.081
SCC = $250	14,879	0.054	0.151	0.002	0.005	0.011	0.025	0.107

Notes: The table presents estimates of corporate carbon damages using the global public firm sample. In Panel A (B), we compute corporate carbon damages by multiplying the social cost of carbon (SCC) with firms' GHG Scope 1 and 2 emissions in 2019 and then normalize with firms' operating profits (revenues). We use $51, $190, and $250 per tCO_2e for the SCC. When computing carbon damages scaled by operating income, we keep only firms for which operating income is positive. We truncate observations of the scaled carbon damages that are below the 1st or above the 99th percentile.

Table S10. Comparison of Corporate Carbon Damages by Industry using Scope 1 & 2

	Scope 1		Scope 1 & 2		
	Rank	Mean	Rank	Mean	Rank difference
Industry	(1)	(2)	(3)	(4)	(5)
Automobiles and Components	6	0.252	8	0.393	2
Banks	24	0.002	24	0.007	0
Capital Goods	12	0.195	11	0.333	-1
Commercial and Professional Services	9	0.207	14	0.301	5
Consumer Durables and Apparel	7	0.225	9	0.350	2
Consumer Services	14	0.139	12	0.325	-2
Diversified Financials	21	0.024	22	0.040	1
Energy	3	1.345	3	1.533	0
Food and Staples Retailing	11	0.199	6	0.521	-5
Food, Beverage and Tobacco	5	0.616	5	0.870	0
Health Care Equipment and Services	15	0.134	16	0.189	1
Household and Personal Products	8	0.210	10	0.349	2
Insurance	23	0.002	23	0.009	0
Materials	2	1.734	2	2.230	0
Media and Entertainment	22	0.018	20	0.065	-2
Pharmaceuticals, Biotechnology and Life Sciences	17	0.081	19	0.099	2
Real Estate	19	0.034	18	0.108	-1
Retailing	16	0.102	15	0.295	-1
Semiconductors and Semiconductor Equipment	10	0.204	7	0.414	-3
Software and Services	20	0.029	21	0.062	1
Technology Hardware and Equipment	13	0.166	13	0.323	0
Telecommunication Services	18	0.075	17	0.137	-1
Transportation	4	1.150	4	1.286	0
Utilities	1	2.053	1	2.373	0

Notes: The table shows the relative industry rankings in terms of average carbon damages using the global public firm sample and a SCC of $190. Industry groups are classified according to S&P CIQs GICS system. In column 2 (4), carbon damages are computed using Scope 1 (and 2) emissions and expressed as a percentage of operating income. We keep only firms for which operating income is positive. We truncate observations of the scaled carbon damages that are below the 1st or above the 99th percentile.

Table S11. Comparison of Corporate Carbon Damages by Country using Scope 1 & 2

	Scope 1		Scope 1 & 2		
	Rank	Mean	Rank	Mean	Rank difference
Country	(1)	(2)	(3)	(4)	(5)
Australia	13	0.356	8	0.519	-5
Brazil	9	0.410	10	0.510	1
Canada	10	0.380	11	0.479	1
China	5	0.563	5	0.749	0
European Union (Rest)	11	0.379	9	0.512	-2
France	15	0.295	16	0.356	1
Germany	8	0.425	13	0.460	5
India	3	0.788	3	0.946	0
Indonesia	2	0.896	2	1.219	0
Italy	12	0.367	14	0.446	2
Japan	14	0.307	12	0.478	-2
Mexico	4	0.670	4	0.843	0
Russia	1	1.296	1	1.655	0
South Africa	6	0.507	6	0.711	0
South Korea	7	0.458	7	0.698	0
United Kingdom	17	0.217	17	0.287	0
United States	16	0.257	15	0.362	-1

Notes: The table shows the relative country rankings in terms of average carbon damages using the global public firm sample and a SCC of $190. The country sample is restricted to those listed by the Major Economies Forum on Energy and Climate. This list includes the European Union as well as three of its individual member states (France, Germany and Italy). We report these countries separately and combine the remainder of the European Union countries. In column 2 (4), carbon damages are computed using Scope 1 (and 2) emissions and expressed as a percentage of operating income. We keep only firms for which operating income is positive. We truncate observations of the scaled carbon damages that are below the 1st or above the 99th percentile.

Table S12. Alternative What-if Reductions in Scope 1 Emissions

Top X% of Corporate Carbon Damages	Reduction in Scope 1 Emissions
(1)	(2)
10%	35.70%
5%	19.62%
1%	3.56%

Notes: This table presents alternative what-if estimates of the reduction in total Scope 1 emissions across all industries if all firms with the top 10%, 5% and 1% of carbon damages in an industry were to reduce their emissions to the median of the respective industry group. The idea behind these estimates is to gauge the potential for within-industry benchmarking.

Table S13. Within-Sector Analysis Using More Granular Industry Groupings

Sector: Transportation	N	Mean	SD	p10	p25	p50	p75	p90
Air Transportation	68	2.640	2.273	1.129	1.334	1.783	3.130	4.417
Automotive equipment rental and leasing	16	0.324	0.530	0.004	0.012	0.042	0.361	1.451
Couriers and messengers	18	1.014	2.175	0.068	0.169	0.265	0.430	3.731
Other nonresidential structures	11	0.015	0.013	0.006	0.006	0.008	0.022	0.030
Rail transportation (Diesel)	12	0.214	0.072	0.147	0.164	0.225	0.244	0.310
Rail transportation (Electric)	12	0.157	0.172	0.009	0.043	0.100	0.243	0.446
Support activities for transportation	126	0.307	1.165	0.002	0.014	0.055	0.176	0.442
Transit and ground passenger transport	17	0.521	0.722	0.012	0.134	0.261	0.554	1.673
Truck transportation	31	1.172	2.415	0.225	0.271	0.381	0.724	3.581
Warehousing and storage	13	0.338	0.511	0.032	0.046	0.191	0.259	0.922
Water transportation	58	2.909	2.753	0.548	0.983	1.686	4.151	7.346

Notes: This table presents estimates of corporate carbon damages for various industry groupings within the transportation sector using a social cost of carbon of $190 and the global public firm sample. Industry is defined according to Trucost Business Activity.

Table S14. Estimates with Alternative Data Sets

Panel A: Company reported Emissions only								
Carbon Damages/Operating Income	N	Mean	SD	p10	p25	p50	p75	p90
SCC = $51	1,610	0.164	0.494	0.000	0.001	0.008	0.064	0.401
SCC = $190	1,610	0.612	1.840	0.001	0.006	0.030	0.239	1.493
SCC = $250	1,610	0.805	2.420	0.002	0.007	0.039	0.315	1.965
Carbon Damages/Revenue	N	Mean	SD	p10	p25	p50	p75	p90
SCC = $51	1,691	0.014	0.040	0.000	0.000	0.001	0.006	0.038
SCC = $190	1,691	0.052	0.149	0.000	0.001	0.003	0.022	0.141
SCC = $250	1,691	0.069	0.196	0.000	0.001	0.004	0.028	0.186
Panel B: Emissions Reported to CDP as Verified								
Carbon Damages/Operating Income	N	Mean	SD	p10	p25	p50	p75	p90
SCC = $51	1,020	0.105	0.342	0.000	0.001	0.004	0.028	0.258
SCC = $190	1,020	0.391	1.274	0.000	0.002	0.016	0.106	0.960
SCC = $250	1,020	0.515	1.676	0.001	0.003	0.021	0.140	1.263
Carbon Damages/Revenue	N	Mean	SD	p10	p25	p50	p75	p90
SCC = $51	1,048	0.010	0.029	0.000	0.000	0.000	0.003	0.026
SCC = $190	1,048	0.036	0.109	0.000	0.000	0.002	0.010	0.097
SCC = $250	1,048	0.047	0.143	0.000	0.000	0.002	0.013	0.128
Panel C: MSCI								
Carbon Damages/Operating Income	N	Mean	SD	p10	p25	p50	p75	p90
SCC = $51	7,634	0.076	0.242	0.000	0.001	0.004	0.023	0.167
SCC = $190	7,634	0.285	0.903	0.001	0.002	0.014	0.087	0.622
SCC = $250	7,634	0.375	1.188	0.001	0.003	0.019	0.114	0.818
Carbon Damages/Revenue	N	Mean	SD	p10	p25	p50	p75	p90
SCC = $51	8,376	0.007	0.024	0.000	0.000	0.000	0.002	0.015
SCC = $190	8,376	0.026	0.088	0.000	0.000	0.002	0.007	0.057
SCC = $250	8,376	0.034	0.116	0.000	0.000	0.002	0.009	0.075

Notes: This table presents estimates of corporate carbon damages by different values of the social cost of carbon (SCC) for alternative datasets. In Panel A, we restrict the Trucost dataset to those firms with reported emissions. In Panel B, we use emissions that are reported to the Carbon Disclosure Project (CDP) as being subject to third-party verification. We treat Scope 1 emissions as verified if a given firm indicates that 100% of its reported Scope 1 emissions are subject to third-party assurance. In Panel C, we use Scope 1 emissions obtained from MSCI.

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