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Mandatory disclosure would reveal corporate carbon damages:

Accurate reporting is critical for markets and climate policies

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Motivation

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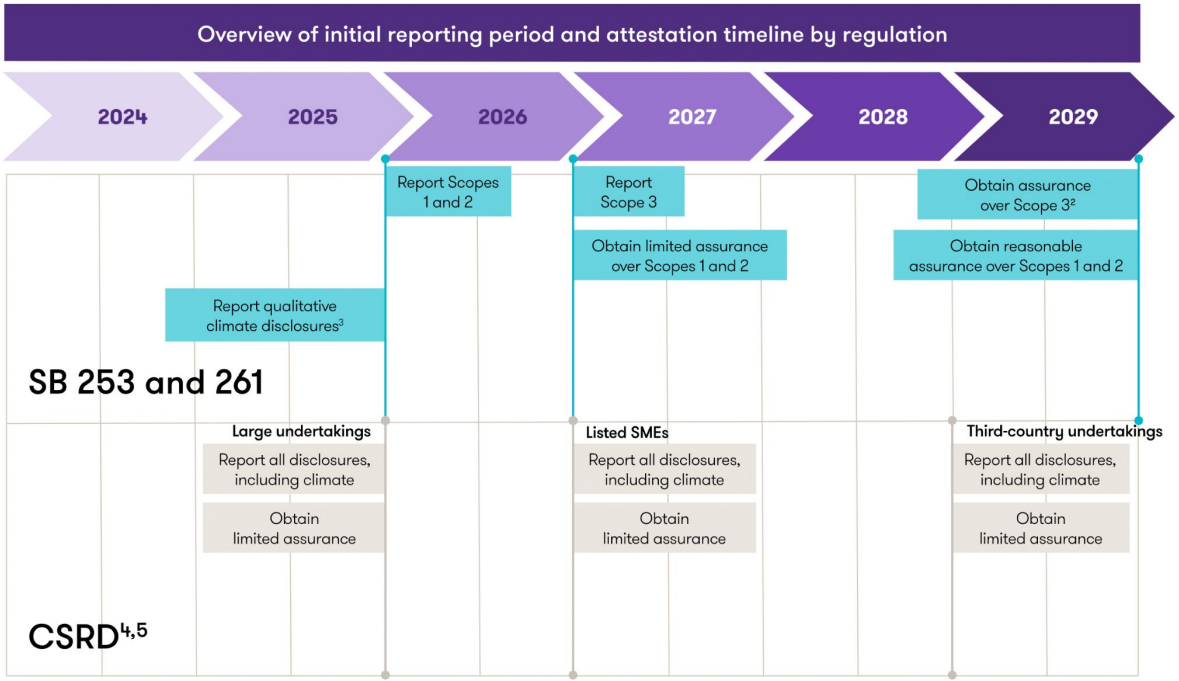
- US Securities and Exchange Commission (SEC)
  - Account for greenhouse gas (GHG) emissions
  - Environmental risks, and
  - Mitigating measures
- Climate-related disclosure regulations across the world
  - European Union (EU)
  - United Kingdom
- Mandatory vs voluntary disclosures
  - Voluntary disclosures currently precede mandatory regulation
  - Neither SEC, the EU or UK currently has a fully mandatory system
  - Task Force on Climate-Related Financial Disclosures (TCFD) permeate

Motivation

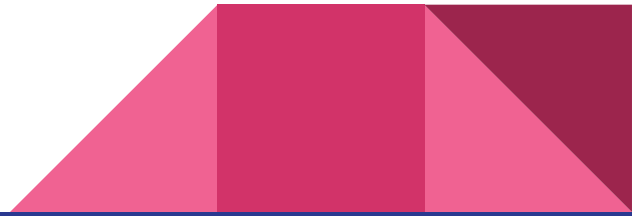


Source: Grant Thornton LLP

- US SEC
  - Final Rule in late 2023 or early 2024
  - Accelerated firms disclose from 2024 or 2025
- SB 253 & 261:
  - Senate Bill in California
- CSRD
  - EU

Motivation

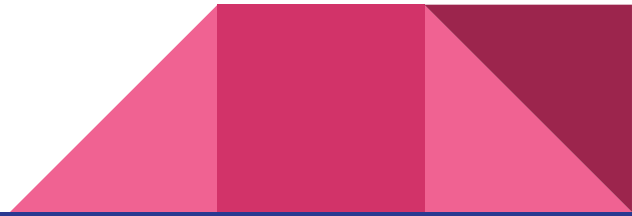
- Relevance of the Disclosures
  - Investor’s source of climate policy exposures
  - Multistakeholder pressure to reduce emissions voluntarily
- 3rd wave of environmental policy
  - Direct regulation and market-based approaches
- Benefits of mandatory disclosure on GHG emissions
  - Reliable measurement and policy impact
  - Distributional and political economy concerns
  - Across firm benchmarking



Research Question

Research Question

- What is the level of corporate carbon damages?
  - Special focus on the heterogeneity across firms, industries, and countries
  - Use voluntary disclosures as a means to explore the relevance of a mandatory regime



Explanation of Concepts

Concepts

- GHG emissions in scope
  - Scope 1 - direct emissions
  - Scope 2 - indirect and purchase of energy
  - Scope 3 - indirect and across value chain
- Corporate carbon damages
  - Total cost to society (i.e. CO2 equivalent emissions by costs to society)
  - Normalised across firms by profit (PBIT) or sales
- Accounting for Scopes 1, 2, and 3
  - Arbitrary nature of Scope 1 in accounting for carbon damages
    - Steel maker vs energy consumer damage rank distortion
  - Possibility of outsourcing across borders (“spin off”)
    - Domestic regulations in ways to export to another country
  - Double counting risks

Question: Based on the institutional setting discussed so far, why do the firms globally disclose GHG emissions and estimates currently:

a) Mandatory disclosure mandate
b) Voluntary disclosures

Concepts

- Accounting for monetization of environmental impact of firms
  - Income statement line item
  - Accounting methods of GHG reporting
  - Monetized corporate environmental impacts or carbon taxes
- Concerns with GHG estimates
  - Voluntary
  - No independent verification
  - No penalty for underreporting
-

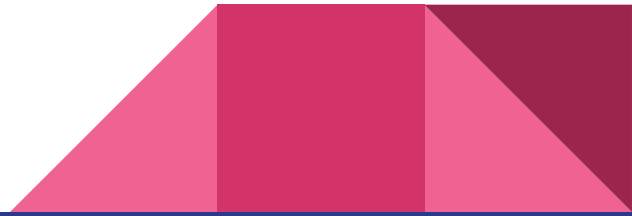
Data and Research Design

Data and Sources

- Data sourced from Trucost (S&P Global)
  - Reported and estimated corporate GHG emissions
  - 2019 data which reflects pre-COVID situation (2021 added as supplement)
  - Focus on Scope 1
    - Alternatively analysed based on sum Scope 1 & 2 (for corroboration)
- 14,879 publicly traded firms
  - Over 80% of global market capitalisation
- Societal cost of carbon [per CO_2 equivalent emissions (tCO_2e)]
  - 3 estimates
    - US Environmental Protection Agency: \$190 per tCO_2e (*baseline*)
    - Obama Administration: \$51 per tCO_2e
    - US EPA + (migration and conflict effects): \$250 per tCO_2e

Data and Sources

- Emissions reporting by sample firms
  - Reported directly: 31%
  - Estimated by Trucost (using a model): 69%
    - Same result using sub-sample verified by Carbon Disclosure Project (CDP)
    - Same result using alternative data from MSCI
    -
- Research Design
  - Cross-sectional data analysis
    - Frequency statistics
    - Simple regression (when needed)
  - Ratios and Simple Financial Arithmetic



Question: Given the simple nature of the method of analysis, why do you think this article was well suited for publication in Science, a globally leading outlet?

Limitations and Future Research

Limitations and Future Research Areas

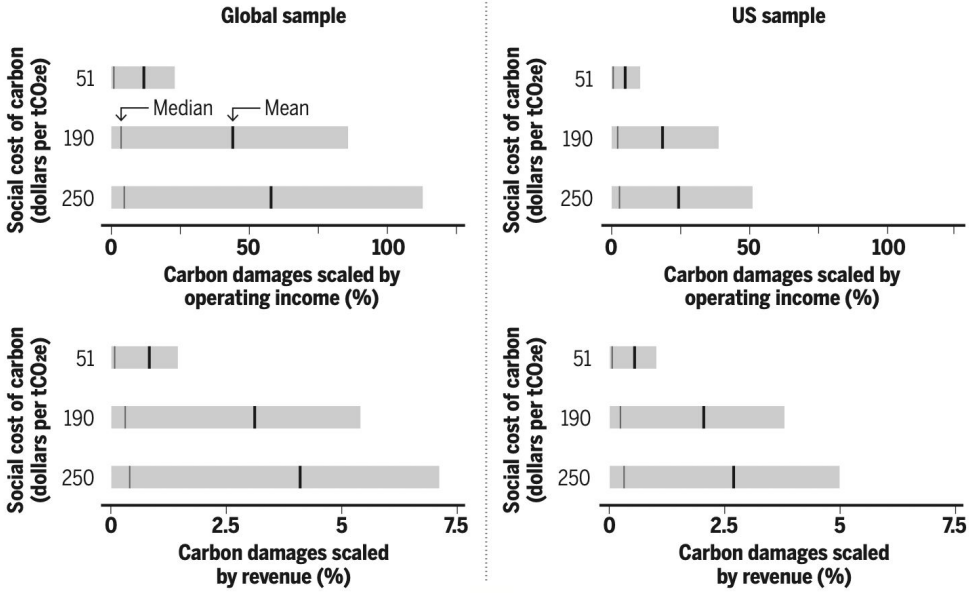
- Carbon damages attributed to only firms but not consumers
- Inclusion of effect of carbon taxes on profit or revenue
  - Decomposing the impact of carbon taxes on profit (firm, consumers and workers)
  - Implicit subsidy due to weak carbon regulation or taxes
    - Cost of price and nonprice regulation needed for subsidy analysis
- Avenues for Local Global South Studies of Global Impact

Results and Conclusions

Results and Conclusions

Corporate carbon damages based on operating income and revenue

Gray horizontal bars indicate ranges from the 10th to 90th percentiles. When computing carbon damages scaled by operating income, only firms for which operating income is positive are used. Observations of the scaled carbon damages are truncated if they are below the first or above the 99th percentile.

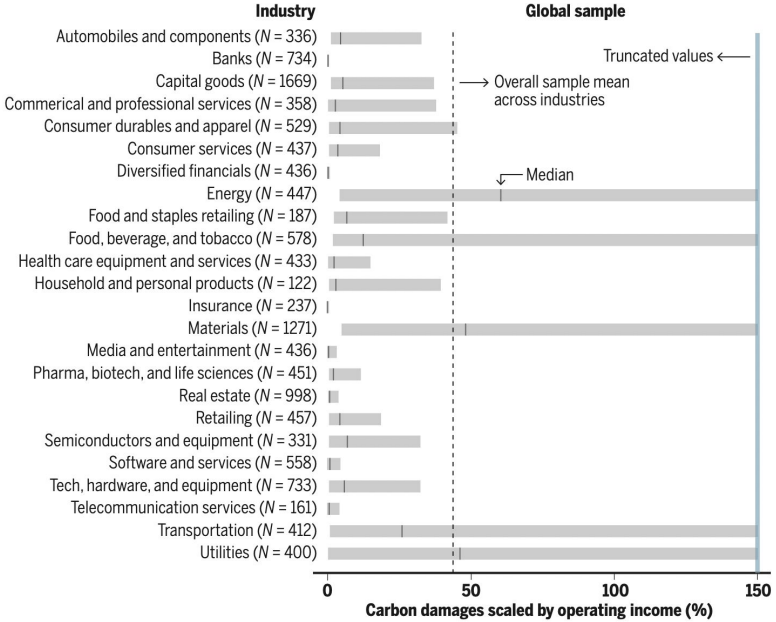


- Carbon damage as percentage of income or revenue
  - Heterogeneity
- Mean and median comparison
  - Extremely large carbon damages by some firms

Results and Conclusions

Corporate carbon damages by industry

Carbon damages are shown for a social cost of carbon of $190 per ton of CO_2-equivalent emissions. Gray horizontal bars indicate ranges from the 10th to 90th percentiles. The number of firms (*N*) in each industry group are in parentheses. Graphs are truncated at 150%. In the global (US) sample, the values of the 90th percentile for energy; food, beverage, and tobacco; materials; transportation; and utilities are 383% (234%); 160%; 567% (178%); 358% (201%); and 675% (342%), respectively.



- Carbon damages occur in energy-intensive industries
  - Utilities, materials, energy, transportation, and food, beverage, and tobacco
  - The account to 89% of global carbon damages

Results and Conclusions

Corporate carbon damages by country

The table presents estimates of average corporate carbon damages by country as well as country rankings based on the (unadjusted) damages and industry-adjusted corporate carbon damages.

COUNTRY	*N*	UNADJUSTED MEAN (%)	UNADJUSTED RANKING	INDUSTRY-ADJUSTED RANKING
Australia	293	35.6	13	14
Brazil	148	41.0	9	16
Canada	297	38.0	10	15
China	1883	56.3	5	5
European Union	740	37.9	11	12
France	213	29.5	15	13
Germany	201	42.5	8	6
India	524	78.8	3	7
Indonesia	134	89.6	2	2
Italy	114	36.7	12	10
Japan	2149	30.7	14	4
Mexico	80	67.0	4	9
Russia	55	129.6	1	3
South Africa	122	50.7	6	8
South Korea	726	45.8	7	1
United Kingdom	385	21.7	17	17
United States	2091	25.7	16	11

- Industry has strong effect on country estimates
- Carbon damage export not adjusted

Conclusions

- Industry heterogeneity
  - Benchmarking of peers and industry to reduce emissions
    - Target to median could lead to 70% decline in emissions
- Need for mandatory GHG disclosure
  - Availability of data for policies and for the market
  - Market discipline by reflecting in prices
- Audit and Assurance of GHG information and data availability

Q&A

Questions

As Pointers

- What new climate regulation or policy was introduced to your country that affects public or private organisations, or individuals?
- What new data registries or surveys have been introduced in your country that is on climate change?
- Are there climate science databases at the African or Asian level that provide detailed information on inputs or outputs?
- What methods of analyses could be useful for country-level issues on ~~clim~~ate change?

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