Recent Developments in Climate Change and Corporate Finance

Alex von Hafften

UW-Madison

February 13, 2022

Motivation

- The economic and financial implications of climate change is a growing area of research, including within corporate finance.

Motivation

- The economic and financial implications of climate change is a growing area of research, including within corporate finance.
- The most recent programs of all top five financial conferences had presentations on related topics.

Motivation

- The economic and financial implications of climate change is a growing area of research, including within corporate finance.
- The most recent programs of all top five financial conferences had presentations on related topics.
- Four out of five had entire sessions dedicated to it.

Methodology

- In this literature review, I summarized the recent development in the intersection of climate change and corporate finance.

Methodology

- In this literature review, I summarized the recent development in the intersection of climate change and corporate finance.
- The starting point is related papers in the most recent programs of the following finance conferences:

Methodology

- In this literature review, I summarized the recent development in the intersection of climate change and corporate finance.
- The starting point is related papers in the most recent programs of the following finance conferences:
  1. Western Finance Association Meetings 2021

Methodology

- In this literature review, I summarized the recent development in the intersection of climate change and corporate finance.
- The starting point is related papers in the most recent programs of the following finance conferences:
  1. Western Finance Association Meetings 2021
  2. American Finance Association Meetings 2022

Methodology

- In this literature review, I summarized the recent development in the intersection of climate change and corporate finance.
- The starting point is related papers in the most recent programs of the following finance conferences:
  1. Western Finance Association Meetings 2021
  2. American Finance Association Meetings 2022
  3. Society for Financial Studies Cavalcade North America 2021

Methodology

- In this literature review, I summarized the recent development in the intersection of climate change and corporate finance.

- The starting point is related papers in the most recent programs of the following finance conferences:
  1. Western Finance Association Meetings 2021
  2. American Finance Association Meetings 2022
  3. Society for Financial Studies Cavalcade North America 2021
  4. Utah Winter Finance Conference 2022

Methodology

- In this literature review, I summarized the recent development in the intersection of climate change and corporate finance.

- The starting point is related papers in the most recent programs of the following finance conferences:
  1. Western Finance Association Meetings 2021
  2. American Finance Association Meetings 2022
  3. Society for Financial Studies Cavalcade North America 2021
  4. Utah Winter Finance Conference 2022
  5. NBER Corporate Finance Summer Institute 2021

Methodology

- In this literature review, I summarized the recent development in the intersection of climate change and corporate finance.
- The starting point is related papers in the most recent programs of the following finance conferences:
  1. Western Finance Association Meetings 2021
  2. American Finance Association Meetings 2022
  3. Society for Financial Studies Cavalcade North America 2021
  4. Utah Winter Finance Conference 2022
  5. NBER Corporate Finance Summer Institute 2021
- All told, there ended up being twenty-seven related papers from these conferences alone.

Terminology

- ESG = "Environmental, Social, and Governance"
- E&S = "Environmental and Social"
- SRI = "Socially Responsible Investing"
- CSR = "Corporate Social Responsibility"
- Impact investing

- "Green investors" or "social investors" are investors who care about monetary and non-monetary payoffs.
- "Traditional investors" or "commercial investors" are investors who only care about monetary payoffs.

- CEI = "Carbon Emission Intensity"
- GHG = "Greenhouse Gas"

Motivating Facts

- As of 2020, one-third of U.S. assets under management ($17 trillion) have some sort of ESG objective.

Motivating Facts

- As of 2020, one-third of U.S. assets under management ($17 trillion) have some sort of ESG objective.
- Possible change in the "social contract" for firms.

Motivating Facts

- As of 2020, one-third of U.S. assets under management ($17 trillion) have some sort of ESG objective.
- Possible change in the "social contract" for firms.
  - Friedman (1970): "The social responsibility of business is to increase its profits."

Motivating Facts

- As of 2020, one-third of U.S. assets under management ($17 trillion) have some sort of ESG objective.

- Possible change in the "social contract" for firms.
  - Friedman (1970): "The social responsibility of business is to increase its profits."
  - Business Roundtable (2019): The purpose of a corporation is to promote "an economy that serves all Americans."

Major Questions

- How to measure a firm's social impact?

Major Questions

- How to measure a firm's social impact?
- How should we characterize investors' preferences about firm ethical behavior?

Major Questions

- How to measure a firm's social impact?
- How should we characterize investors' preferences about firm ethical behavior?
- How do investors with heterogenous preferences affect asset prices and capital allocation?

Major Questions

- How to measure a firm's social impact?
- How should we characterize investors' preferences about firm ethical behavior?
- How do investors with heterogenous preferences affect asset prices and capital allocation?
- How costly is ESG investing relative to traditional investing?

Major Questions

- How to measure a firm's social impact?
- How should we characterize investors' preferences about firm ethical behavior?
- How do investors with heterogenous preferences affect asset prices and capital allocation?
- How costly is ESG investing relative to traditional investing?
- What does ESG investing look like outside of public equity?

Major Questions

- How to measure a firm's social impact?
- How should we characterize investors' preferences about firm ethical behavior?
- How do investors with heterogenous preferences affect asset prices and capital allocation?
- How costly is ESG investing relative to traditional investing?
- What does ESG investing look like outside of public equity?
- What are the real effects of ESG investing?

How to measure a firm's ESG impacts?

There's a lot of ESG rating agencies with ad hoc methodology (weighted average of emissions, board diversity, etc.) and conflicting results.

- Using survey data, Allcott et al (2021) measure social impact as the social welfare loss from a firm's exit in equilibrium. Consumer surplus dominates profits, worker surplus, and externalities. Their ratings are largely orthogonal to existing ESG ratings.

How to measure a firm's ESG impacts?

There's a lot of ESG rating agencies with ad hoc methodology (weighted average of emissions, board diversity, etc.) and conflicting results.

- Using survey data, Allcott et al (2021) measure social impact as the social welfare loss from a firm's exit in equilibrium. Consumer surplus dominates profits, worker surplus, and externalities. Their ratings are largely orthogonal to existing ESG ratings.
- Huang et al (2020) measure ESG impact based on firm's internet search intensity around ESG-related topics. Increases in attention to ESG topics predicts improvements in that firm's ESG ratings.

How to measure a firm's ESG impacts?

There's a lot of ESG rating agencies with ad hoc methodology (weighted average of emissions, board diversity, etc.) and conflicting results.

- Using survey data, Allcott et al (2021) measure social impact as the social welfare loss from a firm's exit in equilibrium. Consumer surplus dominates profits, worker surplus, and externalities. Their ratings are largely orthogonal to existing ESG ratings.
- Huang et al (2020) measure ESG impact based on firm's internet search intensity around ESG-related topics. Increases in attention to ESG topics predicts improvements in that firm's ESG ratings.
- Sautner et al (2021) measure a firm's climate change exposures using text analysis of earnings conference calls.

How to measure a firm's ESG impacts?

There's a lot of ESG rating agencies with ad hoc methodology (weighted average of emissions, board diversity, etc.) and conflicting results.

- Using survey data, Allcott et al (2021) measure social impact as the social welfare loss from a firm's exit in equilibrium. Consumer surplus dominates profits, worker surplus, and externalities. Their ratings are largely orthogonal to existing ESG ratings.
- Huang et al (2020) measure ESG impact based on firm's internet search intensity around ESG-related topics. Increases in attention to ESG topics predicts improvements in that firm's ESG ratings.
- Sautner et al (2021) measure a firm's climate change exposures using text analysis of earnings conference calls.
- Berg et al (2021) refine ESG ratings using classical errors-in-variables approach with ESG ratings from other agencies as instruments. OLS of stock prices on ESG ratings are biased downward by 60% compared to 2SLS (attenuation bias). Average signal-to-noise is 60%.

How to measure a firm's ESG impacts? (con't)

What are the effects of more detailed mandatory ESG disclosures?

- Kreuger et al (2021) find that mandatory ESG reporting improves firm's information environment (analysts' earnings forecasts become more accurate and less dispersed), negative ESG incidents become less likely, and stock price crash risk declines.

How to measure a firm's ESG impacts? (con't)

What are the effects of more detailed mandatory ESG disclosures?

- Kreuger et al (2021) find that mandatory ESG reporting improves firm's information environment (analysts' earnings forecasts become more accurate and less dispersed), negative ESG incidents become less likely, and stock price crash risk declines.

- Goldstein et al (2021) show that an improvement in the quality of non-monetary information can reduce overall price informativeness for traditional investors and increase firm's cost of capital.

How should we characterize investors' preferences about firm ethical behavior?

A couple paper use experiments to learn about how investors' "moral" preferences about firm behavior.

- Bonnefon et al (2021) find participants are willing to pay \$0.70 more for buying a share in a firm that gives one more dollar per share to charities. Symmetrically, a firm that makes profits by exercising a negative externality of \$1 on a charity is valued \$0.90 less. Scaling of non-pecuniary preferences is linear.

How should we characterize investors' preferences about firm ethical behavior?

A couple paper use experiments to learn about how investors' "moral" preferences about firm behavior.

- Bonnefon et al (2021) find participants are willing to pay \$0.70 more for buying a share in a firm that gives one more dollar per share to charities. Symmetrically, a firm that makes profits by exercising a negative externality of \$1 on a charity is valued \$0.90 less. Scaling of non-pecuniary preferences is linear.

- Heeb et al (2021) find that investors have a higher WTP for a sustainable investment, but it does not grow with the social impact of the investment.

How should we characterize investors' preferences about firm ethical behavior?

A couple paper use experiments to learn about how investors' "moral" preferences about firm behavior.

- Bonnefon et al (2021) find participants are willing to pay \$0.70 more for buying a share in a firm that gives one more dollar per share to charities. Symmetrically, a firm that makes profits by exercising a negative externality of \$1 on a charity is valued \$0.90 less. Scaling of non-pecuniary preferences is linear.
- Heeb et al (2021) find that investors have a higher WTP for a sustainable investment, but it does not grow with the social impact of the investment.
- Colonnelli and Gormsen (2021) find evidence of "big business discontent" using perceptions of ESG impact. They find that higher discontent leads to lower support for corporate bailouts.

How do investors with heterogenous preferences affect asset prices?

- Goldstein et al (2021) create a rational expectation equilibrium model with two types of investors: green and traditional. Heterogeneous preferences contaminate price informativeness to different type.

How do investors with heterogenous preferences affect asset prices?

- Goldstein et al (2021) create a rational expectation equilibrium model with two types of investors: green and traditional. Heterogeneous preferences contaminate price informativeness to different type.
  - Positive signal about non-monetary payoff $\rightarrow$ increase green investor demand $\rightarrow$ traditional investors cut back demand because they infer from the price a worse realization of the monetary payoff.

How do investors with heterogenous preferences affect capital allocation?

- Green and Roth (2020) argue against "value-aligned" investment strategies for green investors:

"Value-aligned" strategy would be to invest in Firm A, then commercial investor invests in Firm C. Better to invest in Firm B and allow commercial investor to invest in Firm A.

How do investors with heterogenous preferences affect capital allocation?

- Green and Roth (2020) argue against "value-aligned" investment strategies for green investors:
  - Firm A generates a 10% profit and 10 units of social value.

"Value-aligned" strategy would be to invest in Firm A, then commercial investor invests in Firm C. Better to invest in Firm B and allow commercial investor to invest in Firm A.

How do investors with heterogenous preferences affect capital allocation?

- Green and Roth (2020) argue against "value-aligned" investment strategies for green investors:
  - Firm A generates a 10% profit and 10 units of social value.
  - Firm B generates a 8% profit and 5 units of social value.

  "Value-aligned" strategy would be to invest in Firm A, then commercial investor invests in Firm C. Better to invest in Firm B and allow commercial investor to invest in Firm A.

How do investors with heterogenous preferences affect capital allocation?

- Green and Roth (2020) argue against "value-aligned" investment strategies for green investors:
  - Firm A generates a 10% profit and 10 units of social value.
  - Firm B generates a 8% profit and 5 units of social value.
  - Firm C generates a 9% profit and 0 units of social value.

  "Value-aligned" strategy would be to invest in Firm A, then commercial investor invests in Firm C. Better to invest in Firm B and allow commercial investor to invest in Firm A.

How do investors with heterogenous preferences affect capital allocation?

- Green and Roth (2020) argue against "value-aligned" investment strategies for green investors:
  - Firm A generates a 10% profit and 10 units of social value.
  - Firm B generates a 8% profit and 5 units of social value.
  - Firm C generates a 9% profit and 0 units of social value.

  "Value-aligned" strategy would be to invest in Firm A, then commercial investor invests in Firm C. Better to invest in Firm B and allow commercial investor to invest in Firm A.

- Landier (2021) argue that a socially responsible fund should prioritize investments in companies with acute negative externalities and facing strong capital search friction that commit to capping their emissions.

How costly is ESG investing?

- Lindsey et al (2021) find that implementing ESG strategies in equities sacrifices negligible profits.

How costly is ESG investing?

- Lindsey et al (2021) find that implementing ESG strategies in equities sacrifices negligible profits.
- Lo and Zhang (2021) derive conditions under which impact investing detracts from, improves on, or is neutral to the performance of traditional mean-variance optimal portfolios. These conditions depend on whether the correlation between the impact and unobserved excess return are negative, positive, or zero, respectively.

How costly is ESG investing?

- Lindsey et al (2021) find that implementing ESG strategies in equities sacrifices negligible profits.
- Lo and Zhang (2021) derive conditions under which impact investing detracts from, improves on, or is neutral to the performance of traditional mean-variance optimal portfolios. These conditions depend on whether the correlation between the impact and unobserved excess return are negative, positive, or zero, respectively.
- Pastor et al (2021) construct a "green factor", a return spread between environmentally friendly and unfriendly stocks. They show that U.S. green stocks outperformed peers as climate concerns strengthened, but their positive performance would disappear without climate-concern shocks.

What does ESG investing look like outside of public equity?

ESG investing has been until recently been confined to public equity markets but has moved into corporate bonds, options, and bank lending.

- Diep et al (2021) find that there are only modest distortions to incorporate ESG objectives in corporate bond portfolio, but ESG measures do not predict future credit excess returns.

What does ESG investing look like outside of public equity?

ESG investing has been until recently been confined to public equity markets but has moved into corporate bonds, options, and bank lending.

- Diep et al (2021) find that there are only modest distortions to incorporate ESG objectives in corporate bond portfolio, but ESG measures do not predict future credit excess returns.
- Duan et al (2021) find the bonds of high CEI firms are riskier on average than those of low CEI firms (higher bond market beta, higher downside risk, higher illiquidity, and lower credit ratings). However, no evidence of a "carbon risk premium" in pricing.

What does ESG investing look like outside of public equity?

ESG investing has been until recently been confined to public equity markets but has moved into corporate bonds, options, and bank lending.

- Diep et al (2021) find that there are only modest distortions to incorporate ESG objectives in corporate bond portfolio, but ESG measures do not predict future credit excess returns.
- Duan et al (2021) find the bonds of high CEI firms are riskier on average than those of low CEI firms (higher bond market beta, higher downside risk, higher illiquidity, and lower credit ratings). However, no evidence of a "carbon risk premium" in pricing.
- Cao et al (2021) find that uncertainty around ESG issues is priced in the option market. The implied volatility is higher (thus, the option prices higher) for firms with poor ESG ratings.

What does ESG investing look like outside of public equity?

ESG investing has been until recently been confined to public equity markets but has moved into corporate bonds, options, and bank lending.

- Diep et al (2021) find that there are only modest distortions to incorporate ESG objectives in corporate bond portfolio, but ESG measures do not predict future credit excess returns.
- Duan et al (2021) find the bonds of high CEI firms are riskier on average than those of low CEI firms (higher bond market beta, higher downside risk, higher illiquidity, and lower credit ratings). However, no evidence of a "carbon risk premium" in pricing.
- Cao et al (2021) find that uncertainty around ESG issues is priced in the option market. The implied volatility is higher (thus, the option prices higher) for firms with poor ESG ratings.
- Ivanov et al (2021) estimate how CEI affect bank loans. High-emission firms face shorter loan maturities, lower access to permanent forms of bank financing, higher interest rates, and higher

What are the real effects of ESG investing?

- Gantchev et al (2021) find that negative news coverage of ESG risks $\rightarrow$ green investors divest $\rightarrow$ temporary decline in valuation $\rightarrow$ firms improve ESG policies.

What are the real effects of ESG investing?

- Gantchev et al (2021) find that negative news coverage of ESG risks $\rightarrow$ green investors divest $\rightarrow$ temporary decline in valuation $\rightarrow$ firms improve ESG policies.

- Heath et al (2021) find that SRI funds select firms with higher E&S standards, but there is no evidence that they improve firm behavior.

What are the real effects of ESG investing?

- Gantchev et al (2021) find that negative news coverage of ESG risks $\rightarrow$ green investors divest $\rightarrow$ temporary decline in valuation $\rightarrow$ firms improve ESG policies.
- Heath et al (2021) find that SRI funds select firms with higher E&S standards, but there is no evidence that they improve firm behavior.
- Naaraayan et al (2020) find that shareholder environmental activism leads to firms reducing pollution by taking on costly abatement initiatives.

What are the real effects of ESG investing?

- Gantchev et al (2021) find that negative news coverage of ESG risks $\rightarrow$ green investors divest $\rightarrow$ temporary decline in valuation $\rightarrow$ firms improve ESG policies.
- Heath et al (2021) find that SRI funds select firms with higher E&S standards, but there is no evidence that they improve firm behavior.
- Naaraayan et al (2020) find that shareholder environmental activism leads to firms reducing pollution by taking on costly abatement initiatives.
- Krueger (2021) find that firm's sustainability policies reduce labor costs and enable firms to recruit and retain high skilled workers. Workers earn about 10% lower wages in firms that operate in more sustainable sectors.

What are the real effects of ESG investing? (con't)

- Hong et al (2021) build a DSGE model to evaluate the welfare consequences of mandates to invest in sustainable firms. They argue that existing mandates are insufficient to achieve first best.

Other Papers

- **Greenwashing:** Gibson et al (2020) find that U.S. institutional investors that make public commitments to responsible investing have portfolios with weakly worse ESG ratings.

Other Papers

- **Greenwashing:** Gibson et al (2020) find that U.S. institutional investors that make public commitments to responsible investing have portfolios with weakly worse ESG ratings.

- **Effect of competition on pollution:** Grinstein and Larkin (2021) find that electric utilities polluted less following increased competition pressures. Utilities moved to cheaper and less polluting production processes and competition improved allocation across plants.

Other Papers

- **Greenwashing:** Gibson et al (2020) find that U.S. institutional investors that make public commitments to responsible investing have portfolios with weakly worse ESG ratings.
- **Effect of competition on pollution:** Grinstein and Larkin (2021) find that electric utilities polluted less following increased competition pressures. Utilities moved to cheaper and less polluting production processes and competition improved allocation across plants.
- **Political ideology:** Kaviani et al (2021) find that the CSR rating of firms declined significantly after increased exposure to conservative media. Change in local ideology drives the results.

Conclusions

- This literature is big and it's growing. Lots of angles and sub-areas to explore.

Conclusions

- This literature is big and it's growing. Lots of angles and sub-areas to explore.
- The approach of this literature review focused on the frontiers.

Conclusions

- This literature is big and it's growing. Lots of angles and sub-areas to explore.
- The approach of this literature review focused on the frontiers.
- But it led to more breadth than depth.

Conclusions

- This literature is big and it's growing. Lots of angles and sub-areas to explore.
- The approach of this literature review focused on the frontiers.
- But it led to more breadth than depth.
- Next steps: Hone in on one more specific sub-area (maybe one of the major questions) and review older/seminal papers.

References

- Allcott, Montanari, Tan. (2021) "An Economic View of Corporate Social Impact." NBER Corporate Finance SI 2021 Working Paper.
- Berg, Koelbel, Pavlova, Rigobon. (2021) "ESG Confusion and Stock Returns: Tackling the Problem of Noise." AFA Annual Meeting 2022 Working Paper.
- Bonnefon, Landier, Sastry, Thesmar. (2021) "Do Investors Care about Corporate Externalities? Experimental Evidence." AFA Annual Meeting 2022 Working Paper.
- Cao, Goyal, Zhan, Zhang. (2021) "Unlocking ESG Premium from Options." AFA Annual Meeting 2022 Working Paper.
- Colonnelli, Gormsen. (2021) "Selfish Corporations." WFA Meeting 2021 Working Paper.
- Diep, Pomorski, Richardson. (2021) "Sustainable Systematic Credit." AFA Annual Meeting 2022 Working Paper.
- Duan, Li, Wen. (2021) "Is Carbon Risk Priced in the Cross-Section of Corporate Bond Returns." SFS Cavalcade North America 2021 Working Paper. "
- Gantchev, Giannetti, Li. (2021) "Does Money Talk? Market Discpline through Selloffs and Boycotts." SFS Cavalcade North America 2021, AFA Annual Meeting 2022 Working Paper."
- Brandon Gibson, Glossner, Krueger, Matos, Steffen. (2020) "Do Responsible Investors Invest Responsibly?." SFS Cavalcade North America 2021 Working Paper.
- Goldstein, Kopytov, Shen, Xiang. (2021) "On ESG Investing: Heterogeneous Preferences, Information, and Asset Prices." SFS Cavalcade North America 2021, AFA Annual Meeting 2022 Working Paper.

References (con't)

- Green, Roth. (2020) "The Allocation of Socially Responsible Capital." SFS Cavalcade North America 2021, Utah Winter Conference 2022, WFA Meeting 2021 Working Paper.
- Grinstein, Larkin. (2021) "Minimizing Costs, Maximizing Sustainability." SFS Cavalcade North America 2021 Working Paper.
- Heath, Macciocchi, Michaely, Ringgenberg. (2021) "Does Socially Responsible Investing Change Firm Behavior?." AFA Annual Meeting 2022 Working Paper.
- Heeb, Koelbel, Paetzold, Zeisberger. (2021) "Do Investors Care about Impact?." AFA Annual Meeting 2022 Working Paper.
- Hong, Wang, Yang. (2021) "Welfare Consequences of Sustainable Finance." AFA Annual Meeting 2022 Working Paper.
- Huang, Karolyi, Kwan. (2020) "Paying Attention to ESG: Evidence from Big Data Analytics." SFS Cavalcade North America 2021, AFA Annual Meeting 2022 Working Paper.
- Ivanov, Kruttli, Watugala. (2021) "Banking on Carbon: Corporate Lending and Cap-and-Trade Policy." SFS Cavalcade North America 2021 Working Paper.
- Kaviani, Li, Maleki. (2021) "Media, Partisan Ideology, and CSR." AFA Annual Meeting 2022 Working Paper.
- Krueger, Metzger, Wu. (2021) "The Sustainability Wage Gap." AFA Annual Meeting 2022 Working Paper.
- Krueger, Sautner, Tang, Zhong. (2021) "The Effects of Mandatory ESG Disclosure around the World." AFA Annual Meeting 2022 Working Paper.
- Landier, Lovo. (2021) "Socially Responsible Finance: How to Optimize Impact?." AFA Annual Meeting 2022 Working Paper.

References (con't)

- Lindsey, Pruitt, Schiller. (2021) "The Cost of ESG Investing." AFA Annual Meeting 2022 Working Paper.
- Lo, Zhang. (2021) "Quantifying the Impact of Impact Investing." AFA Annual Meeting 2022 Working Paper.
- Pastor, Stambaugh, Taylor. (2021) "Dissecting Green Returns." AFA Annual Meeting 2022 Working Paper.
- Sautner, van Lent, Vilkov, Zhang. (2021) "Firm-level Climate Change Exposure." AFA Annual Meeting 2022 Working Paper.