Environmental, Social, and Governance Criteria: Why Investors Should Care*

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1 Introduction

We examine why professional money managers should consider Environmental, Social and Governance (ESG) criteria when making investment decisions, focusing on the E part of ESG to illustrate the issues and mechanisms involved. The rapid growth of the global economy during the post-World War II era, especially over the past three decades, has strained the environment.[1] Much of this growth can be attributed to the rise of China, which went from being the seventh-largest economy in 1997 to the second-largest economy today[2]. To put the potential environmental impact into perspective, China now produces as much steel in a year as the entire world did in 1980.[3]

Cumulative environmental stress has not only made environmental crises more severe and more likely to occur, but has also changed how governments and consumers respond. Now, when a crisis occurs, it is more likely to incite sudden changes in regulation and consumer behavior, causing large swings in asset prices over a short period of time. Assessing such risks, and their impact on long-term returns, requires understanding how environmental crises, from global climate change to regional pollution, may lead to political disruptions and subsequent regulatory changes.

If regulation and consumer responses arrive quickly, investors will have limited time to react. The same concerns that lead to regulation also contribute to the emergence of alternative technologies that pose a competitive threat to firms generating negative externalities. Firms, however, are heterogeneously exposed to these risks. Even investors who only care about maximizing returns subject to risk budgets may ESG criteria to

[1] According to Olivier, Janssens-Maenhout, Muntean, and Peters (2016) global emissions of carbon dioxide increased by nearly 60% from 22.7 billion tonnes in 1990 to 36.2 billion tonnes in 2016. U.S. emissions increased marginally from 5.0 billion tonnes to 5.2 billion tonnes. In contrast, Chinese emissions increased from 2.4 billion tonnes to 10.7 billion tonnes. As Daniel, Litterman, and Wagner (2016) point out, the world has only one atmosphere with limited capacity for absorbing carbon dioxide - and it may become full.

[2] We chose 1997, as this was the year Hong Kong was returned to China by the United Kingdom. Chinese growth expanded rapidly post 2001, when it joined the World Trade Organization.

[3] Data from Statistical Yearbooks of the World Steel Association

identify firms which are well prepared to deal with changes in regulations and consumer preferences and potential threat from new technologies.

To put our analysis into context, we start with the history of ESG criteria in investment decisions. Next, we provide a brief background on current environmental issues, focusing on carbon emissions, which may shape regulatory policy through emerging political movements and coalitions. We then discuss two commodities which have a large impact on the environment through their consumption and production: coal and palm oil. For coal producers and industrial/utility users are subject to stringent environmental regulations. The unexpected election of Donald Trump led stock market investors to expect significant deregulation of the coal industry, and coal firms' shares rose sharply. For palm oil, which is primarily used to produce consumer goods, we find that voluntary commitments, presumably due to fear of consumer action and anticipated policy changes, have altered the industry.

2 The Use of ESG Criteria in Asset Management

Assets under management of professional investors whose strategies mention Environmental, Social and Governance (ESG) criteria has grown from $13.3 trillion in 2012 to $22.9 trillion in 2016.[4] This represents 52.6% of the total managed assets in Europe, 21.6% in USA, 37.8% in Canada, 50.6% in Australia/New Zealand, and 0.8% in Asia.

While the principal fiduciary responsibility of institutional investors and money managers is to maximize returns, the call for taking into account ESG criteria while making investment decisions is not new. For example, Powers and Gunnemann (1969) "called on universities and other nonprofit institutions to consider the social consequences of corporate activities from which these institutions derive an endowment return."[5] In 1972 Yale established its advisory committee on investor responsibility as suggested in Simon, Powers, and Gunnemann (1972). However, the attention to environmental, social, and

[4] 2016 Global Sustainable Investment Review, page 8 & 2012 Global Sustainable Investment Review, pages 9-10

[5] Yale Advisory Committee on Investment Responsibility: Committee History and Mission

governance issues in investment decisions among professional money managers has only become widespread since the launch of the Principles for Responsible investment in 2006 by the United Nations.[6]

The following factors have contributed to increased investor attention to ESG criteria. First, firms may produce public bads which are not socially desirable, even when operating within the laws of the land, as regulation may take time to catch up with social concerns. For example, it took time for the public to realize that many cigarette advertisements were targeted at increasing addiction among the youth, and to enact legislation to regulate these advertisements.

In response to these negative externalities, local protests and resistance, alongside global media shaming, can harm firms' images and hurt their profits – more easily now due to the increased use of social media by the general public[7] – increasing the risks to investors in those firms. ESG criteria are useful in identifying firms that are inattentive to these issues, and whose returns will be compromised when the changes come.

Second, stocks are long lived assets as most of the value is from cash flows that occur in the distant future. For example, from 1926-2015, on average, less than 30% of the present value of an investment in the S&P 500 index came from cash dividends received during the ten years following the investment. The rest of the present value came from capital gains realized at the end of the ten year period, which in turn depended on investors' expectations about what will happen over the years that followed.[8]

[Figure 1 about here.]

Such long horizon cash flows are difficult to forecast and are likely to be significantly

[6] https://www.unpri.org/

[7] On 25 April 2017, a CNBCC news article mentioned that scandals may have knocked the valuation of Uber from $60 billion to $50 billion. The article mentioned, "Uber has suffered a litany of negative headlines that would have arguably dinged a publicly traded company...."

[8] Dividends are not the only method firms use for returning cash to investors. For every dollar of cash dividend paid, firms paid out $0.40 during 1990-2002 and $0.95 during 2003-2015 through repurchase of shares net of issuances. We considered the case of an investor who did not participate in repurshases or issuances.

affected by future changes in regulations and socially acceptable business practices. It is not surprising that active portfolio managers, who rely on fundamental analysis and take concentrated positions, tend to invest in well managed firms in good businesses, which are in a better position to adapt to changing regulatory conditions and consumer tastes. Further, there is growing evidence that all else being equal, the returns on stocks of well governed socially responsible firms may contribute less to portfolio risk[9]

Finally, many individual investors have ethical considerations about investments that are somewhat blind to fiduciary responsibilities[10]. Increased access to information has allowed more people to become informed on these issues, and put pressure on money managers and firms to reduce negative externalities.

3 Environmental Issues

3.1 Carbon Emissions

There is a consensus among scientists[11] that excessive carbon emissions should be of concern to society because of its contribution to global warming. Climate change can threaten human health, well-being, and economic productivity[12], as well as the world's biodiversity and natural ecosystems.[13] As Daniel, Litterman, and Wagner (2016) argue, there is a strong case for acting sooner than later to reduce carbon emissions. These threats are also increasingly recognized by the American and global public.[14]

As a result, curbing carbon emissions is rising as a political and policy priority in international spaces such as the United Nations Framework Convention on Climate Change Conference of Parties. At the Paris climate conference in December 2015, 195 countries

[9] Frazzini, Kabiller, and Pedersen (2013)

[10] Consistent with the views of such investors, Hart and Zingales (2016) argue that maximizing shareholder value following the advice of Friedman (1970) is not necessarily the same as maximizing shareholder welfare, and advocate voting by shareholders on corporate policies.

[11] Pachauri, Allen, Barros, Broome, Cramer, Christ, Church, et al. (2014)

[12] Knox, Hess, Daccache, and Wheeler (2012)

[13] Bellard, Bertelsmeier, Leadley, Thuiller, and Courchamp (2012).

[14] Saad and Jones (2016)

adopted the climate deal.[15] In the agreement, countries made specific commitments to curb emissions.[16] Further changes were made at the sub-national level, where some jurisdictions like California are taking additional steps to limit emissions from the private sector[17].

3.2 Carbon Regulation: Present and Future

Although many view the Paris Agreement of 2015 as a milestone achievement for coordinated international climate change mitigation policy, the agreement had limited practical effects.[18] The broad commitment to limiting warming to 2 degrees Celsius was non-binding, and countries were left to determine their own contributions to the international climate change mitigation campaign (so-called Nationally Determined Contributions, or NDCs).

There are divergent views regarding the importance of the Paris agreement for investment managers. Some institutional investors and fund managers take the stand that international climate policy is non-threatening to profits, assuring their investors that there is no reason to fear that existing policies will generate stranded assets or severely compromised revenue streams.[19]

Others take the view that while international climate policy has yet to threaten firm profitability, investors need to be concerned that firms' cash flows may be impaired by impending regulations. Environmental regulations surrounding pollution have been bolstered by the political energy of the climate movement, both in the United States and elsewhere. For example, in California, stricter emissions regulations, supported by a broad political coalition for environmental health and justice, have been passed with the support of a galvanized climate justice coalition.[20] These types of regulations are likely to emerge in other sub-national jurisdictions in the United States, even as the federal

[15] http://ec.europa.eu/clima/policies/international/negotiations/paris/index_en.htm

[16] There are no penalties for noncompliance, except loss of reputation.

[17] http://www.arb.ca.gov/cc/ab32/ab32.htm

[18] Nordhaus and Lovering (2016)

[19] London (2016)

[20] London (2016).

government under President Donald Trump seeks to roll back environmental regulations.

3.3 Why Firms and Investors Should Care

While carbon emissions caps have yet to seriously alter the operations of firms, there is the possibility that growing emissions would cause permanent and irreversible environmental damage resulting in serious harm to living conditions of households around the world. This should motivate firms and investors to seriously consider limiting carbon emissions for several reasons.

First, many consumers feel an ethical obligation to shift production towards lower emissions, as the negative externalities disproportionately affect the already poor and marginalized.[21] Given increased awareness of these issues, and desire by consumers for ethically produced goods, it makes sense for firms to change their business practices. Second, public concern over climate change is growing, with alarming recent events underscoring the magnitude of the problem. For example, global temperature records are broken with greater frequency[22], and February 2016 was by far the hottest month on record, generating concern among scientists at NASA and NOAA.[23] As communities around the world feel the effects of climate change, there is good reason to expect future policies will cap private sector emissions. Studies have shown that perceptions of risk animate policy action, both at the local level and national levels[24], although at the national level, many factors interact in complex ways to shape climate change mitigation policy[25]. As environmental regulations proliferate, firms and investors that explore strategies to reduce carbon emissions, and position themselves effectively to take advantage of emerging and increasingly robust carbon markets, will be more competitive and ultimately more likely to succeed.

There is also the possibility that, beyond regulation, political movements can also

[21] Wheeler and Von Braun (2013), and Mendelsohn, Dinar, and Williams (2006)

[22] Tollefson (2016), and Pachauri, Allen, Barros, Broome, Cramer, Christ, Church, et al. (2014).

[23] CBS News March 17, 2016

[24] Dilling, Pizzi, Berggren, Ravikumar, and Andersson (2017).

[25] Lachapelle and Paterson (2013).

shift markets, and even strand assets as citizens organize to penalize firms they perceive as inattentive to their values. For example, in Boulder, Colorado, citizens voted in 2011 to authorize a municipal takeover of Xcel Energy's generating capacity and transmission infrastructure to set up a municipal utility, exercising their power of eminent domain. While at time of writing, the legal battle over the cost of this infrastructure is still ongoing, the event marked a new precedent: political movements animated by the urgent threat of global climate change can use the power of the State to strip private entities of their productive assets if the public does not believe that private firms are sufficiently sustainable. As the perceived material impacts of climate change increase over time, we should expect this public discontent and the political action that it produces to increase, and for regulations that these movements demand to become more common – in a probabilistic sense. These relatively unpredictable political events challenge investors' assumptions about stable property rights, and can introduce truly stranded assets even without international climate policy.

There is some international support for this view. In the UK and Germany, policy-makers have promised to shut down coal plants in the near future, with Britain aiming to be coal-free by 2025. While private firms operating coal plants have historically succeeded in demanding compensation for these shutdowns[26], it is conceivable that future payouts will be lower, and that firms tied entirely to these fuel sources will not be profitable for long, and could lose value quickly as new policies emerge and long term contracts expire. Further, investors need to pay attention to potentially disruptive technologies, inspired by anticipated regulatory changes.

4 The Case of Two Commodities

4.1 Coal

Both regulation and deregulation can come fast, and if unanticipated, can lead to sudden moves in asset prices. In this section, we explore the effect of the 2016 US presidential

[26] http://energypost.eu/realistic-uk-governments-promise-phase-coal/

election on coal firms.

One of Donald Trump's campaign promises was to end the "war on coal." According to President Trump's twitter,"Obama's war on coal is killing American jobs, making us more energy dependent on our enemies & creating a great business disadvantage." Further, his America First Energy Plan[27] discusses his commitment to "reviving America's coal industry." If Donald Trump's win was unanticipated, we would expect coal producers' stocks to rise in response, as investors expect higher profits in a deregulated environment.

Based on political betting markets[28] and sophisticated prediction algorithms[29], Trump was an unlikely winner. Consistent with this, there was a large swing in coal stock prices on November 9, 2016, suggesting Trump's proposed regulatory changes were not already incorporated into asset prices. Table 1 shows the firm-level results.

Almost all the coal firms greatly outperformed the market, and there are reasonable explanations for the weaker performances: (1) NACCO is not a pure coal firm - for example, it also owns Hamilton Beach appliances. It was included in this list because it is still the 8th largest coal producer in the US. (2) Yanzhou Coal Mining Co Ltd is majority owned by Yankuang Group, a Chinese state-owned enterprise, with no US operations. (3) Natural Resource Partners is a diversified mining company (4) Suncoke is not a coal mining firm, but a substantial part of its revenue comes from its coal logistics business. Notably, Peabody Energy, the largest US coal producer, is omitted from this list because it declared bankruptcy in April, 2016.

[Table 1 about here.]

Consistent with his campaign promises, Trump's administration has already rolled back regulation on coal: He signed resolutions disapproving the Stream Protection Rule under the Congressional Review Act;[30] He also signed an Executive Order regarding the

[27] Available at: https://www.whitehouse.gov/america-first-energy

[28] As of November 8, 2016, predictwise had his chances of winning at 7%, predictit at 22%

[29] FiveThirtyEight assigned a 29% probability to a Trump win.

[30] https://www.congress.gov/bill/115th-congress/house-joint-resolution/38/text

"waters of the US" rule;[31] Scott Pruitt, who is known for suing the EPA concerning the Clean Power Plan, was made Administrator of the Environmental Protection Agency. Further, Trump's budget plan proposes a 31% cut to the EPA's funding, which could further loosen restrictions on the coal industry.

Given all these changes - one would expect coal firms to have performed strongly since Trump took office. Table 2 shows the cumulative returns for coal firms from November 2016 - March 2017. Almost all of them underperformed the market, most by substantial amounts.

[Table 2 about here.]

One explanation for coal's poor performance, despite a favorable regulatory environment, is that the same concerns which led to earlier coal regulation, also provided the necessary incentives for developing more environmentally friendly alternatives. It is clear now that regulation alone was not to blame for the coal industry's general decline over the past several years. In 2015, Goldman Sachs was already calling peak coal. According to Bloomberg, coal is being out-competed on price by natural gas, which has expanded with the development of hydraulic fracturing and horizontal drilling[32]. Finally, countries like China are shutting down coal-fired electricity plants in response to the continued smog and toxic soil crises, affecting global demand for coal. This latter point underscores that even if some policies stand to deregulate environmentally damaging sectors in the short term, the longer term global trend is likely to favor more, not less, regulation over time.

For coal, Trump's election led to expectations of deregulation. Similarly large swings can occur in response to expectations of increased regulation. Bill Clinton's election as US President on November 3, 1991 created expectations of more stringent health care regulation. Consistent with this, pharmaceutical stocks declined sharply from October

[31] https://www.whitehouse.gov/the-press-office/2017/02/28/presidential-executive-order-restoring-rule-law-federalism-and-economic

[32] Even with deregulation, the lost coal mining jobs may not return. To reduce costs and increase safety, coal mines have increasingly switched to self-driving trucks and drills.

30, 1992 to February 26, 1993. An equally weighted portfolio of Bristol Myers Squibb, Pfizer, Merck & Co, and Eli Lilly & Co lost 15.2% while the S&P 500 index gained 5.35%.

4.2 Palm Oil

In a broad sense, the unpredictable regulatory changes that climate crises might provoke should generate wariness from investors and firms. But even without impending regulations, many private firms have taken the lead on reducing emissions and improving environmental practices, partly in anticipation of future regulations, and partly as a matter of corporate social responsibility in response to consumer pressure. Such firms may offer better risk return profile to long term investors, especially active portfolio managers with concentrated holdings. To illustrate, we examine the case of palm oil in Indonesia, and its connection to deforestation and global climate change.

Globally, between 10% and 30% of carbon emissions arise from deforestation and land use change, primarily in the tropics, where dense forests and organic soils store tremendous amounts of carbon in woody biomass.[33] When forests are cut, and usually burned, the majority of the carbon stored there is released into the atmosphere, exacerbating global warming, and removing the forests' crucial ability to recapture carbon from atmospheric carbon dioxide. The majority of such deforestation is caused by the expansion of agriculture.

Environmental groups and social justice advocates have set their sights on oil palm (Note: "oil palm" refers to the crop, while "palm oil" refers to the oil produced from the crop) in particular for its role in driving deforestation and climate change. Palm oil is a vegetable oil with many uses, ranging from cosmetics to foods and other consumer goods. Indonesia became the leading producer of palm oil in 2006, overtaking Malaysia. In 2016, Indonesia produced 34 million tons of palm oil.[34] While it is difficult to know with certainty the amount of land dedicated to oil palm production, the latest estimates

[33] Tubiello, Salvatore, Ferrara, House, Federici, Rossi, Biancalani, Condor Golec, et al. (2015)

[34] Indonesia-Investments, February 2, 2017

suggest that there are at least 8 million hectares in production.[35]

Despite its proliferation, oil palm plantations have produced tremendous deforestation in Indonesia, particularly in the carbon-rich peat forests of Kalimantan (Indonesian Borneo) and in Sumatra. Experts estimate that millions of hectares of peatlands have been deforested in the region, and that much, but not all, of this cleared peatland is now dedicated to palm oil production.[36] Cleared peatlands have resulted in roughly 500 million Mg of carbon dioxide emissions from the loss of above ground biomass, in addition to millions of Mg of annual emissions from the oxidation of subterranean peat.[37] Experts seem to be concerned about deforestation for oil palm for multiple reasons - all of which are likely to lead to more stringent regulations.

First, the emissions caused by deforestation are high, and the international community is invested in reducing deforestation in Indonesia as part of a broader climate change mitigation strategy. An emblematic moment in the history of the global North's efforts to curtail deforestation in Indonesia was the Norway-Indonesia memorandum of understanding signed in 2011.[38] The Norwegian government put $1 billion on the table as an incentive for Indonesia to halt deforestation in pristine forests, including the carbon-dense peatlands. Norway encouraged Indonesia to adopt a moratorium on new forestry and oil palm concessions as part of this arrangement, although results have been mixed.[39]

Second, there are regional effects associated with deforestation for oil palm trees. Peat soils in Kalimantan contain dense stores of organic matter up to 12 meters below the surface.[40] Fires on the surface of the land, sometimes caused by smallholders, but increasingly on oil palm plantations, can spread underground, where they cannot be controlled.[41] These fires have acute regional effects – smoke and haze blanketed Southe-

[35] USDA Foreign Agricultural Service, June 26, 2013

[36] Edwards, Koh, and Laurance (2012)

[37] ibid

[38] Edwards, Koh, and Laurance (2012)

[39] ibid

[40] Warren, Hergoualc'h, Kauffman, Murdiyarso, and Kolka (2017)

[41] According to data from the World Fire Emission Database of the World Resources Institute, Indo-

ast Asia in 2015 and 2016, halting air traffic and stalling significant economic activity.[42] Regional governments, including Singapore and Malaysia, are actively encouraging Indonesia to slow these fires, which are associated to a degree with oil palm plantations.[43] In addition, these fires generate extreme carbon emissions: according to data from the World Fire Emission Database of the World Resources Institute, Indonesian fires generated emissions during September and October 2015 that exceeded the average daily emission from all US economic activity.

[Figure 2 about here.]

As the Indonesian government has struggled to address unchecked oil palm proliferation for a variety of reasons,[44] the private sector has taken matters into its own hands. Companies like Unilever, Nestle, and McDonald's have committed to eliminating deforestation from their commodity chains, and pledged to cease buying palm oil from producers who cause deforestation. These firms buy a significant share of the world's palm oil – for example, Unilever alone buys 3% of global production.[45] Major global firms have demonstrated impressive leadership in responding to these issues. For example, Unilever has made the ambitious pledge to eliminate net deforestation from all of its value chains, including oil palm, by 2020[46].

nesian fires generated emissions during September and October 2015 that exceeded the average daily emission from all US economic activity

[42]Krol, Nechita, Van Leeuwen, Basu, Coheur, and Clerbaux (2016)

[43]Tacconi (2016)

[44]Myers, Larson, and Ravikumar (2016)

[45]Alonso-Fradejas, Liu, Salerno, and Xu (2016)

[46]https://www.unilever.com/sustainable-living/transformational-change/eliminating-deforestation/

While the success of their initiatives in reducing deforestation is still unclear, their commitment - and their continued success as a firm - showcases the potential synergies between sustainable production, long run risks and profitability.[47]

These pledges have teeth. According to a recent report, the unwillingness of major global palm oil buyers to purchase unsustainable palm oil, based on standards set by the Roundtable on Sustainable Palm Oil (RSPO), has stranded 6.1 million hectares, or 10 million football fields of oil palm assets in Indonesia.[48]. Not only are foreign governments like Norway and private companies like Unilever urging action, but growing coalitions within Indonesia are pressing for change. Such a change is required since India, China, Pakistan, Egypt, Bangladesh and Myanmar together account for nearly half of the palm oil imports, and consumers in those countries are much more sensitive to price than environmental issues. The coalescence of these local and global movements has already had unprecedented impacts on land use policy in Indonesia, and will likely have similar effects across the global South.

The indigenous peoples' (adat) movement has long lobbied for customary lands held by them to be recognized formally by the government. While Indonesia's constitution ostensibly recognizes indigenous rights, there had been no policies enacted to formally title communities on the basis of customary usage until 2012. The Constitutional Court of Indonesia, likely responding to growing indigenous discontent alongside international pressure, ruled that the government must recognize customary lands. This is a win for the environmental justice community and for indigenous rights advocates, but it also

[47]Unilever CEO Paul Polman discussed these at the UN COP 20 in Lima in 2014. As of 2017, 36% of its palm oil is certified by Roundtable on Sustainable Palm Oil, and Unilever has stated its refusal to buy additional palm oil from producers who are in violation of its Sustainable Living Plan, even though it may cost more. See Levin, Ng, Fortes, Garcia, Lacey, and Grubba (2012) for a rigorous assessment of the costs and benefits of sustainable palm oil production. This includes producers who generate net deforestation, grow oil palm on peatlands, or that the company deems to exploit local people. See Morel, Friedman, Tulloch, and Caldecott (2016)

[48]https://seekingalpha.com/article/4046193-indonesian-palm-oils-stranded-assets-10-million-football-fields

moves more land off the table for environmentally destructive oil palm production.[49]

5 Conclusion

While the principal fiduciary responsibility of professional money managers is to maximize returns, they must take their clients' ethical concerns into account while making investment decisions. We argue that even those who care only about risks and returns will benefit from incorporating ESG criteria into their investment process. To illustrate the issues and mechanisms involved, we focus on the environmental (E) part of ESG.

Given their increased severity and frequency, environmental crises are more likely to cause sudden changes in regulations, consumer tastes, and the emergence of disruptive new technologies. These rapid changes can cause large swings in asset prices, leaving investors with limited ability to react. By incorporating ESG criteria in their investment strategy, portfolio managers can proactively select firms which are well prepared to deal with these changes, and protect themselves from downside risk.

[49] Myers, Larson, and Ravikumar (2016)

References

Alonso-Fradejas, A., J. Liu, T. Salerno, and Y. Xu (2016): "Inquiring into the political economy of oil palm as a global flex crop," *The Journal of Peasant Studies*, 43(1), 141–165.

Bellard, C., C. Bertelsmeier, P. Leadley, W. Thuiller, and F. Courchamp (2012): "Impacts of climate change on the future of biodiversity," *Ecology letters*, 15(4), 365–377.

Daniel, K. D., R. B. Litterman, and G. Wagner (2016): "Applying asset pricing theory to calibrate the price of climate risk," Discussion paper, National Bureau of Economic Research.

Dilling, L., E. Pizzi, J. Berggren, A. Ravikumar, and K. Andersson (2017): "Drivers of adaptation: Responses to weather-and climate-related hazards in 60 local governments in the Intermountain Western US," *Environment and Planning A*, p. 0308518X16688686.

Edwards, D. P., L. P. Koh, and W. F. Laurance (2012): "Indonesia's REDD+ pact: Saving imperilled forests or business as usual?," *Biological Conservation*, 151(1), 41–44.

Frazzini, A., D. Kabiller, and L. H. Pedersen (2013): "Buffett's alpha," Discussion paper, National Bureau of Economic Research.

Friedman, M. (1970): "The Social Responsibility of Business is to Increase Its Profits," *New York Times, September*.

Hart, O., and L. Zingales (2016): "Should a Company Pursue Shareholder Value?,"
.

Knox, J., T. Hess, A. Daccache, and T. Wheeler (2012): "Climate change impacts on crop productivity in Africa and South Asia," *Environmental Research Letters*, 7(3), 034032.

Krol, M., N. Nechita, T. Van Leeuwen, S. Basu, P.-F. Coheur, and C. Clerbaux (2016): "Carbon Emissions from the 2015 Indonesian fires," in *Living Planet Symposium 2016*.

Lachapelle, E., and M. Paterson (2013): "Drivers of national climate policy," *Climate policy*, 13(5), 547–571.

Levin, J., G. Ng, D. Fortes, S. Garcia, S. Lacey, and D. Grubba (2012): "Profitability and sustainability in palm oil production," *Analysis of Incremental Financial Costs and Benefits of RSPO Compliance. WWF-US, FMO, CDC*.

London, J. K. (2016): "Environmental Justice and Regional Political Ecology converge in the other California," *Journal of Political Ecology*, 23(1), 147–158.

Mendelsohn, R., A. Dinar, and L. Williams (2006): "The distributional impact of climate change on rich and poor countries," *Environment and Development Economics*, 11(2), 159–178.

Morel, A., R. Friedman, D. J. Tulloch, and B. Caldecott (2016): "Stranded Assets in Palm Oil Production: A Case Study of Indonesia," .

Myers, R., A. Larson, and A. Ravikumar (2016): "Analyzing multilevel governance in Indonesia: lessons for REDD+ through land use change and benefit sharing in Central and West Kalimantan, Indonesia," *CIFOR Occasional Paper*.

Nordhaus, T., and J. Lovering (2016): "Does Climate Policy Matter?—Evaluating the Efficacy of Emissions Caps and Targets Around The World," *The Breakthrough Institute*, 28.

Olivier, J. G., G. Janssens-Maenhout, M. Muntean, and J. A. Peters (2016): "Trends in Global CO2 Emissions 2016 Report," *SSRN Working Paper*.

Pachauri, R. K., M. R. Allen, V. R. Barros, J. Broome, W. Cramer, R. Christ, J. A. Church, et al. (2014): *Climate change 2014: synthesis re-*

port. Contribution of Working Groups I, II and III to the fifth assessment report of the Intergovernmental Panel on Climate Change. IPCC.

Powers, C. W., and J. P. Gunnemann (1969): "Institutions, Investments and Integrity," *The Christian Century January*, 29, 144–148.

Saad, L., and J. M. Jones (2016): "U.S. Concern About Global Warming at Eight-Year High," *Gallup Poll, Mar 2-6*.

Simon, J. G., C. W. Powers, and J. P. Gunnemann (1972): "The ethical investor: Universities and corporate responsibility," .

Tacconi, L. (2016): "Preventing fires and haze in Southeast Asia," *Nature Climate Change*, 6(7), 640–643.

Tollefson, J. (2016): "2015 breaks heat record: Pacific Ocean warming helped to make last year the hottest in history," *Nature*, 529(7587), 450–451.

Tubiello, F. N., M. Salvatore, A. F. Ferrara, J. House, S. Federici, S. Rossi, R. Biancalani, R. D. Condor Golec, et al. (2015): "The contribution of agriculture, forestry and other land use activities to global warming, 1990–2012," *Global change biology*, 21(7), 2655–2660.

Warren, M., K. Hergoualc'h, J. B. Kauffman, D. Murdiyarso, and R. Kolka (2017): "An appraisal of Indonesia's immense peat carbon stock using national peatland maps: uncertainties and potential losses from conversion," *Carbon balance and management*, 12(1), 12.

Wheeler, T., and J. Von Braun (2013): "Climate change impacts on global food security," *Science*, 341(6145), 508–513.

Figure 1: Consider investing $1 in the S&P 500 index in 10-year rolling, overlapping windows from 1926-2016. Bars 1-9 represent the share of the total net present value of the investment, paid as dividends on that year after the initial investment. Bar 10 represents the net present value of dividends paid that year, plus the terminal value of the portfolio. Dividends are not reinvested. Present value is calculated with respect to the internal rate of return over the same 10-year period. Data is from Robert Shiller's Website.

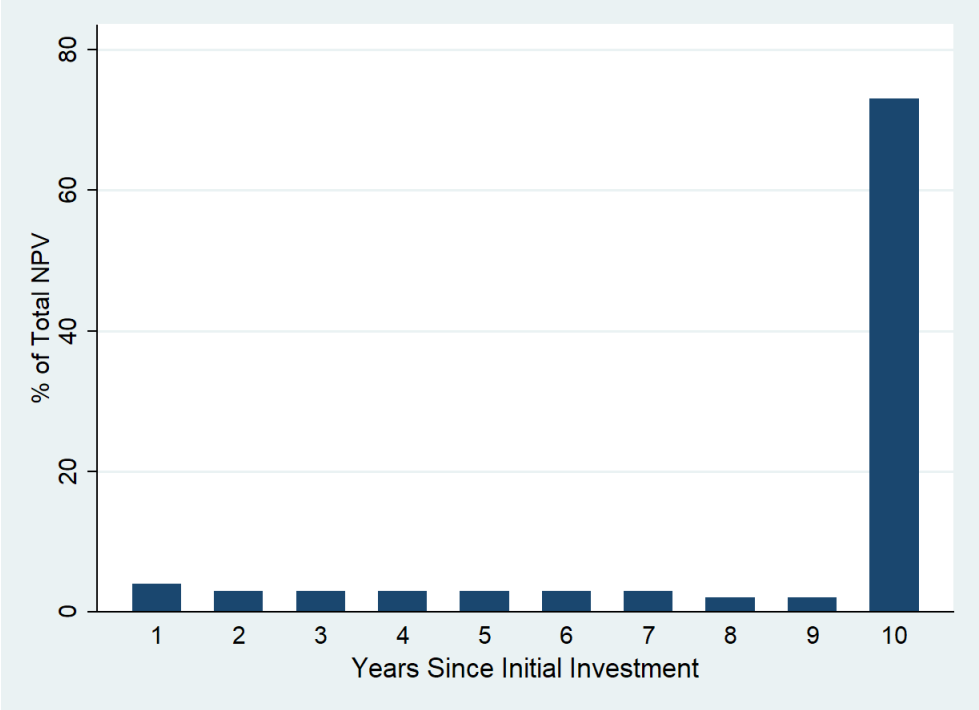

Figure 2: Source: Global Forest Watch and the Global Fire Emissions Database. See the World Resources Institute website for more information.

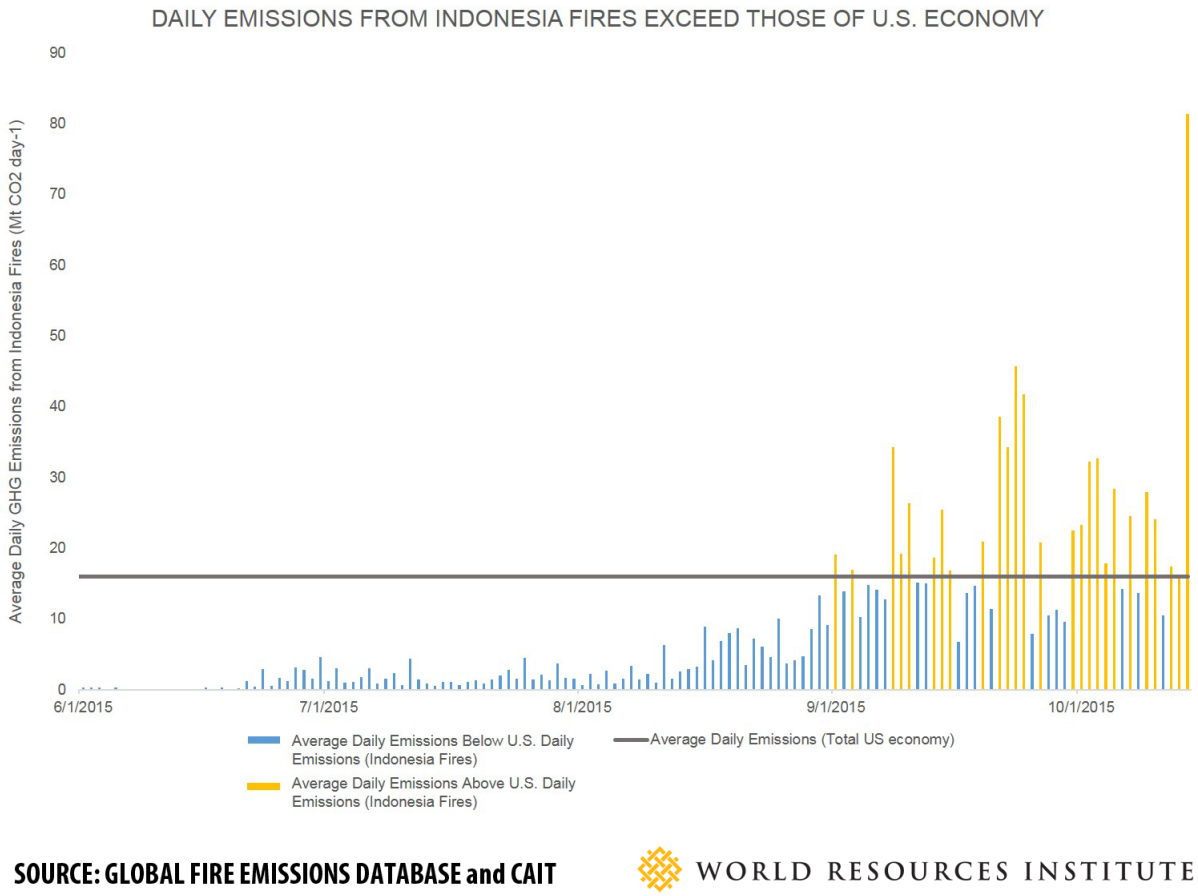

Table 1: Excess returns of publicly traded coal firms on the day after the 2016 US Presidential Election. This includes all firms in CRSP data with SIC codes 1200-1299 and/or NAICS codes 212111, 212112, 213113. Excess returns are calculated using the daily risk-free rate from Ken French.

Firm	11/9/2016 Return
Westmoreland Resource Partners LP	18.96%
Suncoke Energy Partners LP	6.93%
CNX Coal Resources LP	11.80%
Arch Coal Inc	10.44%
NACCO Industries Inc	2.79%
Westmoreland Coal Co	18.59%
Yanzhou Coal Mining Co Ltd	1.73%
CONSOL Energy Inc	9.02%
Alliance Resource Partners	17.21%
Hongli Clean Energy Tech Corp	12.81%
Natural Resource Partners LP	5.41%
Alliance Holdings GP LP	11.42%
Cloud Peak Energy Inc	13.35%
Average Return:	10.80%
Market Return:	1.46%

This list does not include every publicly traded coal-producing firm - for example, Hallador Energy (HNRG) is assigned a SIC code "9999" even though most of their revenue is from coal sales. This classification is likely the result of HNRG being a holding company with one coal subsidiary, one oil and gas exploration subsidiary, and one gas exploration subsidiary

Table 2: Cumulative excess returns of publicly traded coal firms from November 2016 - March 2017. This includes all firms in CRSP data with SIC codes 1200-1299 and/or NAICS codes 212111, 212112, 213113. Excess returns are calculated using the monthly risk-free rate from Ken French. Yanzhou Coal Mining Co Ltd went off exchange in February 17, 2017, so the return is calculated using the last available price.

Firm	11/16-3/17 Cumulative Return
Westmoreland Resource Partners LP	-21.31%
Suncoke Energy Partners LP	-22.47%
CNX Coal Resources LP	-10.55%
Arch Coal Inc	-11.65%
NACCO Industries Inc	-26.53%
Westmoreland Coal Co	-16.17%
Yanzhou Coal Mining Co Ltd	15.00%
Consol Energy Inc	-18.46%
Alliance Resource Partners	-8.65%
Hongli Clean Energy Tech Corp	-50.13%
Natural Resource Partners LP	9.21%
Alliance Holdings GP LP	-5.28%
Cloud Peak Energy Inc	-20.21%
Average	-14.40%
Market over Same Period	12.12%