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Abstract

As sustainability issues, also labelled environmental, social and governance (ESG) issues, become financially material, companies, investors and regulators are designing strategies and policies to improve sustainability disclosure and performance. In this paper, we outline a framework of how sustainability issues become financially material arguing that materiality is not a "state of being" but a "process of becoming." Our framework could assist companies and investors to make resource allocation decisions based on expectations about future materiality, social entrepreneurs and NGOs to develop their theories of social change, and policy makers to design disclosure regulations. Moreover, our framework generates predictions about the conditions under which sustainability issues become financially material that could be empirically tested in the future.

Keywords: sustainability disclosure, ESG, materiality, social impact, corporate valuation

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1. Introduction

In September of 2019, Purdue Pharma, one of the largest manufacturers of drugs and specifically of the narcotic Oxycotin, filed for bankruptcy under the burden of thousands of lawsuits accusing the company of fueling the opioid epidemic. The opioid epidemic has ravaged communities across the US. Since OxyContin came on the market in 1996, more than 400,000 Americans have died from opioid overdoses, including some 200,000 from prescription opioids.[1] In 2012, almost 81 opioid prescriptions were written for every 100 Americans.[2] The societal cost of such overuse and misuse was estimated to approach $80 billion annually (Florence, et al. 2016). A sustainability issue, in this case ethical marketing, that was traditionally not seen as financially material and thereby warranting disclosure was rapidly becoming of importance for profitability and valuation. With an increasing number of issues of growing societal interest, such as climate change, water, and employee diversity, all frequently now included in sustainability and corporate other reports, having noticeable valuation effects, the need for new disclosures and data has become apparent.

The example above is not an isolated case. In the past decade, great progress has been made in understanding the materiality of sustainability issues. During this time we have witnessed an exponential growth in the number of companies measuring and reporting environmental (i.e. carbon emissions, water consumption, waste generation, etc.), social (i.e. employee, product, customer related, etc.), and governance (i.e. political lobbying, anticorruption board diversity, etc.) data, collectively environmental, social or governance (ESG) data. Empirical analysis demonstrating the financial materiality of certain sustainability issues (Khan, Serafeim and Yoon 2016) and the release of industry-based standards by the Sustainability Accounting Standards

[1] https://www.cdc.gov/drugoverdose/epidemic/index.html
[2] https://www.cdc.gov/drugoverdose/data/prescribing/prescribing-practices.html

Board (SASB) in 2018 has accelerated mainstream acceptance that in order to properly integrate sustainability issues into a company or industry analysis, one must focus on material factors.

Most institutional investors now report that the primary reason why they use ESG data is because sustainability issues are or will become financially material (Amel-Zadeh and Serafeim 2018). The largest institutional investors, such as Blackrock and Vanguard, have released guidance for board of directors and senior management on expectations about corporate performance on ESG issues. Vanguard and State Street Global Advisors, in their proxy voting guidelines, explicitly state that they will vote considering the materiality of the sustainability issue in question.[3]

The proposition that sustainability issues can be financially material has gained general acceptance not only among investors but also among companies and increasingly among regulators. For example, thousands of companies now produce materiality assessments of sustainability issues leading to prioritization of certain issues based on their identified materiality to the company and society. A new European Union (EU) regulation explains how EU financial market participants must integrate ESG risks and opportunities in their processes as part of their fiduciary duty, and how they should keep beneficiaries informed elevating the importance of these issues within the investment industry. The US House Financial Services Committee has now held hearings on the use of ESG disclosures by market participants and the need to regulate and standardize such disclosures.

Conferring the status of "financially material" on any type of issue is significant in several ways. It elevates the discourse within corporate management, as companies are compelled to manage and disclose financially material issues to investors. Characterizing an issue as "material" focuses the attention of corporations, triggering the need for performance data, internal controls,

[3] Disclosure: George Serafeim is a partner at State Street Associates, a subsidiary of State Street Corporation.

disclosure to shareholders, acknowledgement by the CEO and CFO, and allocation of resources to manage the issue. But perhaps most importantly, it elevates the issue to one for consideration, diligence and integration into the governance processes and systems of the corporation by its ultimate governing body: its board of directors. Securities law provides an elegant definition of materiality that has stood the test of time: that which would cause a reasonable investor to think differently about whether to buy or sell the stock.

However, there is a misperception that there is a bright line between material issues and immaterial ones. Material issues are often seen as internalities to corporations and the purview of mainstream investors and the capital markets. Immaterial issues are viewed as externalities that are the purview of NGOs and impact investors. In reality, externalities can be internalized when subject to the pressure of stakeholders, regulators, or industry disruption. Therefore, the pathway by which an issue becomes material is important to understand, not only for corporations and their investors, but also for policy makers and NGOs.

In this paper, we provide a framework for how issues become financially material. We start by studying several ESG issues, how they evolved over time from financially immaterial to material (or not) and the conditions under which this evolution took place. Next, we develop a framework that describes the evolution of ESG issues to financial materiality.

Our approach provides a theory of change for actors that prioritize social progress (governments and regulators, NGOs, impact first investors) and a theory of action for actors that prioritize economics outcomes (companies and return first investors). For the former group, we advocate that understanding how issues become financially material can be a powerful framework for creating incentives for companies and investors to change their assessments of risks and opportunities thereby altering capital allocation and product development. Impact can be assessed

against an actor's success in elevating the issue to becoming financially material. This is because once an issue becomes financially material, decision makers focus attention and direct resources to the issue. For the latter group, we argue that the opportunity lies not only in actively managing issues that are already financially material but monitoring and proactively managing the issues that are becoming financially material. Our framework of action provides guidance on how to predict which issues are likely to become financially material by understanding the social context within which they are operating.

It is our hope that by illuminating these pathways, we can shift the perception of materiality as a "state of being" to a "process of becoming" material over time. The important question becomes not *whether* an issue is material, but *how* an issue becomes material. This question is important for:

- Companies, to develop future proof strategies and to be proactive rather than reactive to change.
- Investors, as they make decisions based on expectations about the future state of the world and the implications on their portfolio.
- Social entrepreneurs and NGOs, as they develop their theories of change.
- Policy makers and regulators, who address systemic issues and are concerned with the role of corporations in society.

2. Background to Sustainability Disclosure and Materiality

Thousands of publicly listed companies around the world are now measuring, managing and reporting on sustainability issues (Ioannou and Serafeim 2019). This is a relatively recent phenomenon with most of those companies having initiated their sustainability strategies in the last decade, appointing C-level executives to lead those efforts and setting public, ambitious targets

on issues ranging from carbon reductions, to diversity and employee or product safety (Li, Ioannou and Serafeim 2015). At the same time, the number of investors committed to integrating ESG issues in investment decisions and actively engaging with companies on ESG issues has grown exponentially. The Principles for Responsible Investment now has more than 2,300 signatories who have more than $89 trillion in assets under management.[4]

As both companies and investors are spending more resources on sustainability issues, a central question has become which sustainability issues are financially material and why. This is important in understanding whether companies are properly managing their resources and for investors that seek to optimize risk-adjusted returns. But it is also important for regulators in fulfilling their responsibilities. For example, the Securities and Exchange Commission (SEC) has a regulation requiring that companies disclose all information financially material to their business.

Many regulators and stock exchanges now require sustainability disclosure by companies. This includes emerging markets, such as China, Brazil and South Africa, but also developed markets, such as the EU and Australia. Studies have documented that these disclosure regulations have been effective at increasing levels of disclosure but also improving the comparability and credibility of reported information (Ioannou and Serafeim 2019). Moreover, stock prices react around the announcement of these regulations, suggesting that investors expect companies to reveal new information and/or take actions that will have implications for their valuation (Grewal, Rield and Serafeim 2019).

To report sustainability information, many companies have used guidelines for sustainability reporting, such as the ones provided by the Global Reporting Initiative (GRI). Companies identify their own set of issues that are material to the organization and to society based on stakeholder

[4] https://www.unpri.org/pri/about-the-pri

surveys and other instruments. The lack of a standard materiality framework made comparing firm performance on many of the issues deemed material by individual firms challenging for investors and other stakeholders. SASB addressed this issue by adopting a standard setting approach towards industry-specific materiality (SASB, 2017). Through a combination of a process that involves archival research for evidence of stakeholder interest and evidence of financial impact, expert industry working groups and the deliberations of a standards council, they defined which sustainability issues are material for each of 77 industries across 10 sectors.

Several studies have found that an industry-specific approach to materiality yields economically significant results. Using the SASB industry specific standards (SASB, 2018), studies have shown that firms improving their performance on material sustainability issues in the future outperform competitors with declining performance on material sustainability issues, and more disclosure on material sustainability issues is associated with more informative stock prices and other capital market proxies for capital formation and efficiency (Khan et al. 2016; Grewal et al. 2018). No such relationships were observed for sustainability issues not classified as material in each industry.

Against this backdrop, interest has been generated on understanding materiality and using that knowledge in the creation of corporate strategies, investment products and new regulations.

3. How do issues become financially material?

While the evidence is compelling that some issues are financially material and some issues are not, the question of how they become financially material is much less well understood. In this section, we seek to shed light on the pathways of materiality. We segment the materiality pathways

framework in five stages: the status quo, catalyst events, stakeholder reaction, company reaction, and regulatory reaction as well as innovation.

3.1. Status quo

Initially the industry is in equilibrium and the focal ESG issue is not financially material. Often there exists a degree of misalignment between the interests of business and the interests of society as a whole. In the pursuit of profits businesses may take actions which negatively impact society, either directly through their products (ex. the public health effects of tobacco use) or through their operations, often viewed as externalities (ex. the promotion of climate change through the production of greenhouse gases). This misalignment might not inherently malicious, and in some cases businesses may view this misalignment as a societal cost of doing business or insignificant relative to the societal good created through their operations. Moreover, in some cases businesses (and potential society as well) could be unaware this misalignment even exists.

Misalignment between business and societal interests is tolerated either because societal norms or lack of information about true level of misalignment. An example of the former case is society tolerating drug price increases and accepting them as legitimate compensation for high costs of innovation due to high risk of product failure during research and development. An example of the latter case is society not having information about the true extent of, for example, health damage or climate impact caused by carbon emissions and pollution. While it was known that burning fossil fuels polluted the environment resulting in environmental damage, the extent and longevity of the damage was not well understood by the general public.

Moreover, in this initial stage, an industry is in equilibrium when none of the players pursues more aggressive profits by imposing further negative externalities, even if they could successfully extract rents. Although companies could relax safety standards further and cut costs or pursue even

more aggressive price increases, they do not do so. Industry norms and/or enlightened self-interest constrain aggressive rent seeking.

An issue that is still in this stage in the pharmaceutical industry is drug pollution, pharmaceuticals present in the environment from human metabolytes and improperly disposed of drugs. While environmental data indicate widespread pharmaceutical contamination is affecting ecosystems, drinking water supplies and human health, companies have not yet been held responsible for this "externality" because society has not internalized the information regarding the magnitude of the misalignment. Many factors are exacerbating this issue, including increasing potency of drugs, a dramatic increase in the population taking prescription medication daily, and the inadequacy of wastewater treatment systems in most urban areas of the world. Investors are beginning to take note of this issue and to raise public awareness. For example, Nordea Asset Management is beginning to engage with pharmaceutical companies in Hyderabad, India over this issue. Conditions are ripe for a catalyst that can trigger the materiality of this issue.

3.2. Catalyst

We observe two distinct types of catalysts that start the materiality process. In the first case, company behavior moves away from what is currently considered socially acceptable. In the second case, it is societal norms about what is acceptable corporate behavior that move away from current practices. Therefore, in the first case it is companies that widen the misalignment while in the second case it is a revision of societal expectations that widen the gap.

In the first case, some companies deviate from the equilibrium seeking to capture rents, further misaligning business and societal interests. For some time, deviating companies can successfully capture these rents. However, the presence of additional uncaptured rents invites temptation. Some actors become enticed to aggressively pursuing rents and as a result drive misalignment to a new level. Drug pricing in the pharmaceutical industry is a case in point. In the past few years, there

have been several instances where drug companies have gotten extremely aggressive, so much so that they drew public attention to themselves. Drug companies' standard defense for increasing prices is the cost of innovation: only 1 out of every 12.5 potential drugs ever reach patients, the average drug takes 11-14 years to develop, and the costs of bringing a drug to market range from $1 to $2.6 billion.[5] However, the industry spends $30 billion annually on marketing in the US alone; $20 billion to reach doctors and $6 billion for advertisements directed at the public.[6] Therefore some argue that through high drug prices, companies are recouping both R&D and marketing costs.

Mylan, one of the largest drug manufacturers in the US, sells EpiPen, a patented self-injector that delivers epinephrine to people experiencing a severe allergic reaction. The drug epinephrine costs less than $1.00 per dose.[7] The patent covering the self-injector prevented competitors from developing a viable alternative, allowing Mylan to control 90% of the market. Mylan took advantage of its dominant position by increasing the price for a two-pack of EpiPens from $103.50 in 2009 to $608.61 in 2016. Valeant was another pharma company pursuing a similar pricing strategy. Valeant was growing by acquiring companies using large amounts of debt and then aggressively increasing the prices of the drugs sold by the acquired companies. Valeant's price increases made headlines beginning in 2015, when the company hiked prices on drugs for such diseases as diabetes, acid reflux and serious heart conditions, in some cases by more than 500%. Research found the price changes caused far fewer patients to get access to the heart drugs (Khot, Vogan and Militello 2017). Turing Pharma pursued a similar strategy. It purchased the rights to a

[5] https://thehill.com/opinion/healthcare/369727-us-drug-prices-higher-than-in-the-rest-of-the-world-heres-why
[6] https://arstechnica.com/science/2019/01/healthcare-industry-spends-30b-on-marketing-most-of-it-goes-to-doctors/
[7] http://money.com/money/4481786/how-much-epipen-costs-to-make/

drug called Daraprim which is a specialized treatment of a relatively uncommon illness and increased the price per pill to $750 from $13.50.

In the second case, societal expectations about corporate behavior change. This results from new information about companies' existing behavior or about the true state of negative externalities. For example, the #MeToo movement grew from the general public becoming aware of the systemic nature of sexual harassment in the workplace. Climate change is an interesting example because, like sexual harassment in the workplace, it has been a topic of public discourse for over half a century. Societal expectations changed due to the introduction of new information detailing the salience of climate change and the catastrophic consequences associated with failing to act now. Similarly, in the case of ethical marketing and the opioid crisis, ProPublica, an investigative journalist organization, provided data about the role of pharmaceutical companies.[8] Moreover, the public scrutiny of marketing practices was aided by sunshine laws enacted in the US in 2013, which compelled pharmaceutical companies to disclose the doctors and hospitals to which they made payments.

Table 1 shows the evolution of events in three high profile cases, Facebook, Massey and JUUL. We have categorized the evolution of those events tracing the status quo, the catalysts for responses from stakeholders, the company/industry and regulators. For example, the e-cigarette company JUUL received intense scrutiny for their marketing practices, which critics claimed were targeted at children. Despite the well documented health consequences of tobacco product use, society, in general, accepts that adults may undertake those risks if they choose. However, youth tobacco use is not accepted by society, and any perceived marketing to youths invokes a negative societal response. Moreover, according the U.S. Food and Drug Administration (FDA), JUUL

[8] https://www.propublica.org/datastore/dataset/dollars-for-docs

marketed their products as a safer alternative to cigarettes despite no scientific evidence supporting the claim).[9] Recent medical research has called JUUL's safety claim into question, and in August 2019, the CDC issued a health advisory on the "severe pulmonary disease associated with using e-cigarette products."[10]

[9] https://www.cnbc.com/2019/09/09/fda-says-juul-illegally-promoted-its-e-cigarettes-as-less-harmful-than-cigarettes.html
[10] https://emergency.cdc.gov/han/han00421.asp

Table 1: Product Safety in Three Industries

	Data Privacy: Facebook	Mining Safety: Massey Energy	Marketing Practices: JUUL
Status Quo	Cambridge Analytica harvested personal data from millions of Facebook profiles without knowledge or consent from users. These data were used for political advertising purposes. While some users consented to their personal information being collected through a survey, which stated was for academic use only, Facebook's design allowed personal information to be collected from all consenting users of the social network.	Mining companies were not required to disclose mining safety data, at times resulting in unsafe working conditions for miners. Between 1995 and 2010, the Mine Safety and Health Administration (MSHA) levied more than 3,000 safety violations against Massey.	No legislation existed regulating flavored e-cigarette production. Many stakeholders claimed e-cigarette companies used flavored products to market directly to children.
Catalysts	Despite reports of illicit personal data harvesting going back to 2015 (of which Facebook was aware per Attorney General for District of Columbia)[11], the scandal went mainstream in March 2018 following emergence of an ex-Cambridge Analytica employee whistle-blowers.	On April 5, 2010, a coal dust explosion occurred at Massey Energy's Upper Big Branch coal mine killing 29 out of the 31 on-site miners.	Reports of high school students' e-cigarettes use increases and increase flavored tobacco product appeal in youth affixed public attention on e-cigarette companies, particularly JUUL, the dominant player in the e-cigarette market.[12] Further drawing public scrutiny, JUUL's revenue increased sevenfold from 2016 to 2017, while a study showed teens are 16 times more likely to use JUUL than older age groups.[13]
Stakeholder Response	Outraged Facebook users claimed the company was consciously misusing personal data. In a matter of days more than $100 billion was lost from Facebook's market capitalization.	Massey Energy was condemned by politicians and local communities as stakeholders alleged the explosion occurred due to safety violations. Alpha Natural Resources purchased Massey Energy in 2011 and agreed to pay the fines associated with the mine explosion.	The U.S. Food and Drug Administration (FDA) labeled teen vaping an "epidemic".[14] JUUL received much of the backlash from families whose children had started using e-cigarettes. JUUL's valuation more than doubled from $16B to $38B from summer to December 2018.
Company Response	Facebook CEO Mark Zuckerberg publicly apologized and pledged to address the issues which led to the scandal by both limiting scope of and ease of access to user personal data for developers.	Massey claimed the explosion was not due to safety violations, but instead due to physical conditions leading to a sudden surge of natural gas.[15]	JUUL publicly apologized for its role in youth e-cigarette use. The company publicly supported increasing the legal age to smoke to 21 and deleted their Facebook and Instagram accounts to reduce advertising exposure to youths. In November 2018, JUUL announced they would stop selling flavored JUUL pods in stores. All flavored JUUL pod sales would be online to consumers at least 21 years old.

[11] https://www.theguardian.com/uk-news/2019/mar/21/facebook-knew-of-cambridge-analytica-data-misuse-earlier-than-reported-court-filing
[12] https://www.cdc.gov/tobacco/data_statistics/fact_sheets/youth_data/tobacco_use/index.htm
[13] https://truthinitiative.org/press/press-release/new-study-reveals-teens-16-times-more-likely-use-juul-older-age-groups
[14] https://www.fda.gov/news-events/press-announcements/statement-fda-commissioner-scott-gottlieb-md-new-steps-address-epidemic-youth-e-cigarette-use
[15] https://www.bdtonline.com/news/local_news/afternoon-update-massey-disputes-key-msha-findings-on-w-va/article_4b48624b-108a-565f-96ca-07f86b4faa01.html

Regulatory Response	Zuckerberg was called upon to testify before Congress in what became a highly publicized testimony. In 2019, the Federal Trade Commission approved fining Facebook $5 billion following an investigation of the scandal.	The MSHA concluded flagrant safety violations occurred issuing 369 citations and $10.8 million in civil fines and $209 million for Department of Justice settlement. In 2015, Massey CEO at the time of explosion, Don Blankenship, was sentenced to 1 year in prison for conspiring to willfully violate safety standards.	In November 2018, the FDA introduced new restrictions on flavored e-cigarette sales and proposed a ban on menthol cigarettes and flavored cigars. 17 states raised the age for purchasing tobacco products and e-cigarettes to 21. In Jun 2019, San Francisco banned the sale and distribution of e-cigarettes.

3.3. Stakeholder reaction

NGOs, media and other stakeholders react to the furthering of the misalignment between business and societal interests. This in turn initiates reaction within political circles. However, in most cases no legislation or regulatory action is taken. For example, on the issue of drug pricing, the pharmaceutical companies in question received condemnation by politicians across the political spectrum. Both Bernie Sanders and Donald Trump denounced pharmaceutical pricing practices, citing evidence of price gouging by drawing comparisons to drug prices in European and Canadian markets. However, no regulatory action was taken by Congress. But the threat of investigations, future regulatory action and bad publicity that damages reputations and brands cause valuation changes. Here is where we find the first evidence that this issue could be financially material but frequently for specific companies only, rather than the whole industry. At that point, sometimes but not always, stock prices are reacting to stakeholder pressure, and investors recalibrate expectations about risk and future growth.

Target companies are usually those that are performing significantly worse than the industry average for the focal issue. For example, Valeant raised drug prices significantly more than the industry norm, and this differential was observable in advance of the material effects for Valeant. Had Valeant not been so aggressive and kept drug price increases within the range of (still misaligned) industry pricing practices, it would have been harder to isolate their behavior. When a single company increases their own degree of societal misalignment, such that their actions can be isolated from industry norms, the issue will likely first become material to the deviating firm. The issue could subsequently become material for the entire industry, but that is driven more by the results of stakeholder action. For example, the actions of a single firm could result in regulatory changes or draw attention to industry norms resulting in a reassessment of societal expectation. In

the case where changes in societal expectations drive increased misalignment, if a company's performance is close to its peers, the whole industry could be indicted by stakeholders. But if a company's performance on the issue in question can be meaningfully differentiated, the issue may become material only for low performers.

Activism from stakeholders can push targeted firms to converge or diverge on certain practices deemed positive or negative by activists. A divergence of practices in an industry could result if the activism is directed towards one or a few firms that can be isolated from peers with respect to their performance. If the offending firm is clearly misaligned with industry norms and its performance on the focal sustainability issue can be identified as an outlier, then usually the company is singled out and the issue can become material for the focal company and not for the whole industry. Divergence is accentuated if competitor firms can deflect activism or defect during attempted industry self-regulation. If activism can successfully influence an entire industry, potentially through shaming the whole industry or inspiring successful self-regulation, a convergence of practices could occur. Furthermore, if the activism results in a convergence of practices, the issue becomes an industry norm and stakeholders may assume a certain standard of compliance/performance on the issue in question. Conversely, a divergence of practices can create an issue by which "best in class" performance can be measured.

Many of the issues championed by activists are not new issues, some having been discussed by proponents of the issue for decades. The timeframe of stakeholder pressure as a materiality pathway can vary vastly across a set of issues. For example, over the past couple of years climate activism has made large, highly publicized, strides in engaging with oil and gas companies. However, climate activists have been engaging with oil and gas companies for decades, with little to no success. In 2018, ExxonMobil management was defeated in a proxy vote asking management

to report on how climate change scenarios would impact business operations. The passing shareholder proposal had been submitted for proxy voting in previous years, but 2018 marked an inflection point – the growing group of climate conscious investors were joined by large institutional investors, such as BlackRock, resulting in a majority vote for the proposal.

On the other hand, enough stakeholder pressure on an issue can accumulate seemingly overnight. In response to a few high profile women coming forward with their stories of sexual assault, the #MeToo movement rapidly took shape, changing the dynamic around how firms were expected to deal with sexual assault and harassment allegations in the work place and leading firms to attempt to actively curtail the culture which was propagating sexual assault and harassment.

Another movement which rapidly gained widespread support was the rejection of plastic straws due to environmental pollution. Public attention to the issue can, in part, be traced backed to an estimation that 500 million straws are used in the U.S. everyday. While the accuracy of this number has been called into question by experts, scientists estimate there are approximately 7.5 million straws laying on beaches across the U.S. and between 437 million and 8.3 billion plastics straws on beaches across the globe.[16] The dissemination of these figures throughout the media led to a public backlash against single-use plastic straws and support for campaigns advocating a ban of their use. Responding to public opinion, Seattle became the first U.S. city to ban plastic straws in July 2018. Other cities have followed Seattle's example, include Washington D.C. Companies have also joined in, announcing voluntary bans on plastic straws. For example, McDonald's is banning plastic straws across their U.K. and Ireland stores and Starbucks will phase out plastic straws by 2020. However, some companies have pushed back against the movement. For example, packing giant Tetra Pak, despite announcing they will begin production of paper straw alternatives,

[16] https://phys.org/news/2018-04-science-amount-straws-plastic-pollution.html

is lobbying politicians and regulators against banning plastic straws, claiming "from an environmental perspective, their [plastic straws] impact is significantly lower than most liquid food packaging alternatives."[17] Nonetheless, plastic straws have become the symbol of the wider push to reduce consumption of all single-use plastics.

3.4. Company reaction

In the face of stakeholder reaction, companies attempt to respond and regain public trust. Some of those responses are company-specific while others involve broader industry efforts to self-regulate. All of them share a common characteristic: initiatives with small cost increases to assuage stakeholders and win back public trust. Mylan did offer some insured patients a $300 discount card and promised to introduce a generic version of the EpiPen. However, the discount cards only brought the price down to $300, weren't available to everyone, and simply shifted the costs to the insurance companies who would recoup those losses by increasing their premiums the following year. A major motive in many cases is stopping future regulatory efforts. Companies are willing to incur some additional costs as an act of good faith in order to mitigate regulatory action and shape the public discourse regarding the development of new industry norms. Intense negotiation between actors about how to appropriately respond occurs, resulting in new norms and beliefs for industry behavior.

The debate around tech companies and individual data privacy provides an example. Numerous reports of how tech companies collect, sell or use consumer data have become public knowledge over recent years, leading to numerous high-profile scandals. For example, the Facebook-Cambridge Analytica scandal during the 2016 U.S. President elections, perhaps the most publicized of such events, led to public outrage and a congressional hearing for CEO Mark

[17] https://www.ft.com/content/ee6b50d8-5f6a-11e8-9334-2218e7146b04

Zuckerberg (Table 1). Tech companies have attempted to respond to demands of accountability by stakeholders and to preempt possible legislation by improving data privacy and security. It should be noted, the threat of regulation is particularly salient, as the European Union has already taken regulatory steps beyond what currently exists in the U.S. to ensure tech companies improve data privacy standards.[18] Many tech companies have generated significant revenues by collecting and selling user data, making the practice core to their business strategy. As the public becomes more conscious of data privacy it may become harder for firms to continue collecting and selling data as is currently commonplace, forcing tech firms to come up with innovative strategies for protecting user's privacy and data while still capitalizing on data collection.

3.5. Regulation and innovation

A new equilibrium is formed at this degree of misalignment unless one of two things happen. The first is regulation that changes business practices, cost structures etc. resulting in a new equilibrium. The second, is industry disruption through innovation from one of the companies. In both cases, the change in industry dynamics is no longer incremental and the changes in stock prices and business fundamentals are much more substantial. Furthermore, the misalignment between societal and business interests shrinks in both scenarios.

In some cases, when company reaction is not seen as legitimate and satisfactory and where stakeholders have enough power to mobilize political reaction, we see new regulation that forces a new equilibrium in which misalignment is lessened. Issues which may not have been material in absence of regulation can become material when regulation is introduced. Specifically, increased regulation on an issue increases the materiality of an issue. For example, after the 2010 Upper Big Branch Mine disaster involving Massey Energy, the Securities and Exchange

[18] https://edps.europa.eu/data-protection/data-protection_en

Committee (SEC) introduced new required mine safety disclosures, part of the Dodd-Frank Act (Table 1). The introduction of new regulation increased the materiality of mine safety, despite the importance of mine safety by no means being a new issue.

Similarly, as part of the "conflict mineral" provision of the Dodd-Frank Act, publicly traded U.S. companies became required to check their supply chains for tin, tungsten, tantalum and gold that might originate from the Democratic Republic of the Congo (DRC) or one of its neighbors. Over concerns that minerals from these regions were being used to finance conflict "characterized by extreme violence", companies must report annually on the measures taken to "exercise due diligence on the source and chain of custody of such minerals" and provide "a description of the products manufactured or contracted to be manufactured that are not DRC conflict free".[19] The first law of its kind, the law helped change material sourcing materiality by requiring firms to take ownership of the impact of their supply chains.

While increased regulation can increase the materiality of an issue, relaxing or the lack of regulation can decrease the materiality of an issue. Carbon emissions are a material issue for many industries and global agreements to cut carbon emissions to fight climate change have been almost universally agreed upon. However, the lack of carbon pricing legislation has lessened the materiality of carbon emissions. The materiality of drug price increases has been similarly lessened due to the lack of action by congress to limit drug pricing or to address the inability of the government to negotiate prices. Similarly, there has been little legislative action regarding the role pharmaceutical companies played in the opioid crisis. However, overwhelming legal action against opioid manufactures appears to be driving the materiality of the issue, as Purdue Pharma filed for bankruptcy in September 2019.[20]

[19] https://www.sec.gov/opa/Article/2012-2012-163htm---related-materials.html
[20] https://www.nytimes.com/2019/09/15/health/purdue-pharma-bankruptcy-opioids-settlement.html

Regulation is clearly a powerful force in increasing the materiality of an issue (or stymieing materiality when lacking regulation), however regulation is, in general, slow moving and reactive. Regulation often is enacted in response to an event which potentially could have been prevented (or predicted) if legislation was implemented. However, the reactive legislation is still important as it helps cement the adapted practices as industry norms and acts as a mechanism to prevent firms from slowly reverting to their prior practices after media focus wanes.

In other cases, we observe company innovation disrupting the industry and leading to new equilibrium. Innovation can also be the impetus which makes an issue material. A firm can disrupt an industry through innovating and developing a competitive advantage, forcing firms to improve their performance on certain issues or develop new capabilities in order to compete with the innovating firm.

Given innovation requires a firm to develop novel capabilities which result in a competitive advantage for the innovating firm over competitors, innovation usually results in an initial divergence of practices. This is most notably the case during the first few years as the leader is pursuing a differentiated strategy. Eventually some competitors will attempt to adopt, while other will not. After a period of time, idiosyncratic to the specific innovation and conditional on competitors attempting to adapt in response to innovation, consumer preferences changing or regulation catching up to innovation, a convergence of practices may occur and firms will compete on the issue which drove innovation.

Take for example the introduction of electric vehicles as a viable alternative to internal combustion engine vehicles to lower carbon emissions in the transportation industry and mitigate the effects of climate change. Prior to Tesla, electric vehicles were rarely, if ever, discussed by automobile manufacturers. Despite beginning in the luxury vehicle market and slowly progressing

to economy vehicle markets (ex. Tesla Model 3), as Tesla was able to lower their battery production costs they were able to attract an excited customer base and substantial amounts of capital. Tesla's actions shifted industry demand towards electric vehicles, forcing automobile manufactures to respond. Over the course of few years, automobile manufacturers went from treating electric as a niche product to almost every major manufacturer promising to electrify a significant portion of their fleet within the next 5-10 years. Automobile manufacturers now compete over the material issue of their electric vehicle (and hybrid vehicles) offerings.

An important element of the innovation pathway is the speed at which it can occur. Relative to other forces changing industry dynamics, innovation moves quickly. Innovating firms may spend years developing the technology or capabilities necessary for the innovation in question, however once an innovative product, technology, etc. goes to market the divergence of practices occur rapidly.

4. Hypotheses Generated from the Framework

Table 2 includes a description of the state of affairs in each stage, a hypothesis generated from the framework, an evaluation of the degree of misalignment between business and societal interests and predictions about pricing and valuation effects. The framework described above generates a few hypotheses that could be empirically tested in the future about the pathways to materiality. Specifically, one would expect that sustainability issues are more likely to become financially material:

- in industries and countries with weaker norms and beliefs that societal and business interests should be aligned (norms and beliefs)

- when it is easier for stakeholders to receive information about the true alignment between societal and business interests (actionable information)
- when media and NGOs have more power and when politicians are more responsive to this power (media and NGO power and responsiveness of politicians)
- when companies lack ability to self-regulate and truly address the issues of misalignment (effective self-regulation)
- when new regulations are effectively enforced (regulatory enforcement)
- when companies have a higher capacity for innovation that addresses the misalignment by offering a differentiated service/product (innovation to disrupt the competitive landscape).

Table 2: Pathways to Materiality

	Status Quo	Catalyst	Stakeholder Pressure	Company Response	Regulatory Response and Innovation
	Issue financially immaterial	**Issue still financially immaterial**	**Issue becoming financially material for some companies**	**First sign issue could become financially material for entire industry**	**Issue financially material for entire industry**
Description of state	Degree of misalignment between business and societal interests is tolerated and no industry players pursue increased profits by increasing negative externalities. Misalignment is either accepted by societal norms or due to a lack of information about true state of affairs.	Some companies deviate from equilibrium seeking to capture more rents, increasing business and social misalignment. Some companies are successful in capturing rents. Alternatively, societal expectations can change due to information about companies' existing behavior and about true state of negative externalities.	NGOs, media and other stakeholders react to the furthering of the misalignment between business and societal interests. Political stirring may occur, but action is unlikely at this point. Public ire is generally focused on the offending companies and not on the practices of the industry as a whole.	Companies attempt to regain trust through company-specific or industry self-regulation, aiming to minimize the cost of reaction while successfully deterring stakeholder pressure and regulation. Politicians or regulators threaten action in response to misalignment. New norms and beliefs are set for industry behavior.	New regulation forces firms to decrease misalignment, creating a new equilibrium. Alternatively, innovation disruptions the industry leading to a new equilibrium. Either through regulation or innovation, the issue is integrated into the competitive landscape of the industry.
Hypothesis	Issues are more likely to become financially material in industries and countries with weaker norms and beliefs that societal and business interests should be aligned.	Issues are more likely to become financially material when it is easier for stakeholders to receive information about the true alignment between societal and business interests.	Issues are more likely to become financially material when media and NGOs have more power and when politicians are more responsive to this power. Issues will remain material for one (or several) companies if performance on the issue can be isolated from the rest of the industry or if it deviates significantly from industry norms.	Issues are more likely to become financially material when companies lack ability to self-regulate and truly address the issues of misalignment.	Issues more likely to become financially material when new regulations are enforced or when some companies develop an innovation that addresses the misalignment offering a differentiated service/product.
Misalignment	Misalignment is minimal or within a margin accepted by society. Moreover, misalignment is static.	Misalignment is increasing, either due to corporate actions or changing societal expectations.	Misalignment peaks. Diverging companies cease further misalignment increases and see if the negative public response continues or gains regulator attention.	Misalignment shrinks as companies, to a degree, walk back actions which drove misalignment. Degree of misalignment is still greater than what would exist in the presence of new regulation or disruptive innovation.	Regulation or disruptive innovation drives misalignment to a new equilibrium level. Misalignment again becomes static.

Price reaction and valuation effects	None	Diverging companies capturing rents may outperform other industry players.	Diverging companies specifically targeted by public response likely to experience negative price reaction.	Other companies in industry may also begin to experience negative stock reactions. Companies with relatively better performance on the issue in question may escape negative or could experience positive price reactions.	Performance on issue affects all industry firm's market valuation. Firms compete on relative performance of issue.

5. Conclusion

There are a few issues that we want to highlight in the conclusion of this article. First, understanding which sustainability issues are material and how they become so is increasingly important for corporate management, governance, investment management and regulatory effectiveness. Second, materiality is a dynamic concept evolving over time and as a result scenario analysis, forward looking assessments, alternative, industry specific data sets and new ways of measuring impacts are all helpful tools in identifying emerging issues. Third, because of its dynamic nature we feel that sustainability disclosure will be more difficult to regulate compared to financial disclosure. Regulators will need to be ready for a new more flexible, principles-based approach to regulating sustainability disclosure and measurement. Comparability might be more difficult to achieve as the dynamic nature of materiality will manifest at different points in time and with different intensity across companies and industries.

However, as this article illustrates there are some predictable pathways and an emerging framework that could guide our thinking on how sustainability issues become financially material for companies and their investors. Misalignment of corporate behavior with societal needs is a critical initial condition for materiality. With early attention to certain catalysts, it is possible that emerging issues can be addressed before they become financially material, which is the best possible outcome for all stakeholders.

References

Florence, C., Luo, F., Xu, L. and Zhou, C., 2016. The economic burden of prescription opioid overdose, abuse and dependence in the United States, 2013. *Medical care*, *54*(10), p.901.

Grewal, J., Hauptmann, C. and Serafeim, G., 2018. Material sustainability information and stock price informativeness. Harvard Business School Working Paper.

Grewal, J, Riedl, E. and Serafeim, G. 2019. Market reaction to mandatory nonfinancial disclosure. *Management Science* 65(7), pp.3061–3084.

Ioannou, I., Li, S.X. and Serafeim, G., 2015. The effect of target difficulty on target completion: The case of reducing carbon emissions. *The Accounting Review*, 91(5), pp.1467-1492.

Ioannou, I. and Serafeim, G. 2019. The consequences of mandatory corporate sustainability reporting. In The *Oxford Handbook of Corporate Social Responsibility*. 2nd ed. Oxford University Press.

Khan, M., Serafeim, G. and Yoon, A., 2016. Corporate sustainability: First evidence on materiality. *The Accounting Review*, 91(6), pp.1697-1724.

Khot, U.N., Vogan, E.D. and Militello, M.A., 2017. Nitroprusside and isoproterenol use after major price increases. *New England Journal of Medicine*, *377*(6), pp.594-595.

Sustainability Accounting Standards Board (SASB), 2017. Staff Bulletin SB002-07062017 SASB's Approach to Materiality for the Purpose of Standards Development, www.sasb.org

Sustainability Accounting Standards Board (SASB), 2018. Sustainability Accounting Standards for 77 Industries, www.sasb.org