ASIA GLOBAL INSTITUTE
THE UNIVERSITY OF HONG KONG

Asian Perspectives Global Issues

ASIAGLOBAL PAPERS NO. 5 | JANUARY 2022

Unifying ESG and Supply Chain Thinking: An Urgent Call to Action in the Post-Pandemic Era

Tinglong Dai
Professor of Operations Management and Business Analytics, Carey Business School, Johns Hopkins University

Christopher S Tang
UCLA Distinguished Professor and Edward W. Carter Chair in Business Administration, Anderson School of Management, University of California, Los Angeles

ABSTRACT

The COVID-19 pandemic has highlighted the instrumental role of supply chains in delivering economic, human, and societal value. At the same time, the pandemic has heightened interest among academics, businesses, and governments in environmental, social, and governance (ESG) issues. In this paper, we argue that in today's hyper-globalized economy, ESG measures are of little value if they do not explicitly incorporate a firm's operations across its entire supply chain. On the other hand, well-calibrated ESG measures should play a central role in firms' day-to-day supply chain management. We present three cases from the COVID-19 pandemic—online platforms, public health supply chains, and vaccine manufacturers—to illustrate the relevance and value of unifying ESG and supply chain thinking. Finally, we spotlight key challenges and opportunities for practitioners and scholars in both ESG and supply chain management.

Keywords

Supply chain management, Environmental, Social and Governance (ESG), COVID-19 pandemic, operations management

Acknowledgments

With permission from the Asia Global Institute, a condensed academic version of this *AsiaGlobal Paper* has been accepted for publication by *Service Science*.

CONTENTS

1. INTRODUCTION

Since its inception in a United Nations report in 2006, ESG—the acronym for environmental, social, and governance—issues have garnered significant attention from academics, businesses, and governments (Atkins 2020). To understand the impact of ESG, one need only look at the rapidly growing ESG-themed investment funds, which had amassed a total of $40 trillion in assets by 2021 (Bloomberg Intelligence 2021). Today, ESG is arguably the most widely accepted metric for assessing a company's sustainability and social impact: the US Securities and Exchange Commission (SEC) established an ESG subcommittee, which recommended in 2020 that all publicly traded companies disclose material ESG information (SEC 2020a). Similarly, the European Commission unveiled an action plan in 2018 to increase ESG disclosures (European Commission 2018).

ESG issues are not merely a matter of "sustainable finance," but may also have a direct impact on how businesses operate on a daily basis, including how they manage their supply chains. According to a McKinsey survey of CEOs (Committee Encouraging Corporate and CECP 2010, p. 10), 94% of the respondents agreed they are "being held responsible for their entire supply chain on social issues." Such a broad consensus means the importance of ESG in managing supply chains is unequivocal. However, few, if any, of the commonly used ESG measures adequately account for activities occurring throughout a firm's supply chain (Silk, Niles, and Lu 2020). Without mapping and evaluating a firm's global supply chains, ESG metrics are unlikely to be truly reflective of a firm's sustainability and social impact in today's hyper-globalized economy. In other words, for both ESG and supply chain management to thrive in the post-pandemic era, they must be unified (Dai and Tang 2021).

Throughout the COVID-19 pandemic, ESG issues received widespread coverage in the popular media. According to Muckrack, an online service that tracks how a topic is covered in the press in the United States, ESG was the subject of over 183,000 articles between September 1, 2020 and June 30, 2021 (see Figure 1). In comparison, academic research on ESG issues in supply chain management is sparse. Even within a vibrant subfield that studies sustainable supply chains (see Atasu et al. (2020) for a review of this literature), research explicitly addressing ESG issues remains rare. A search of INFORMS Pubs Online (https://pubsonline.informs.org), a database of papers published across 17 INFORMS journals, returns only 26 articles (as of December 30, 2021) containing the phrase "environmental, social, and governance," the majority of which were published within the last three years (see Figure 2).

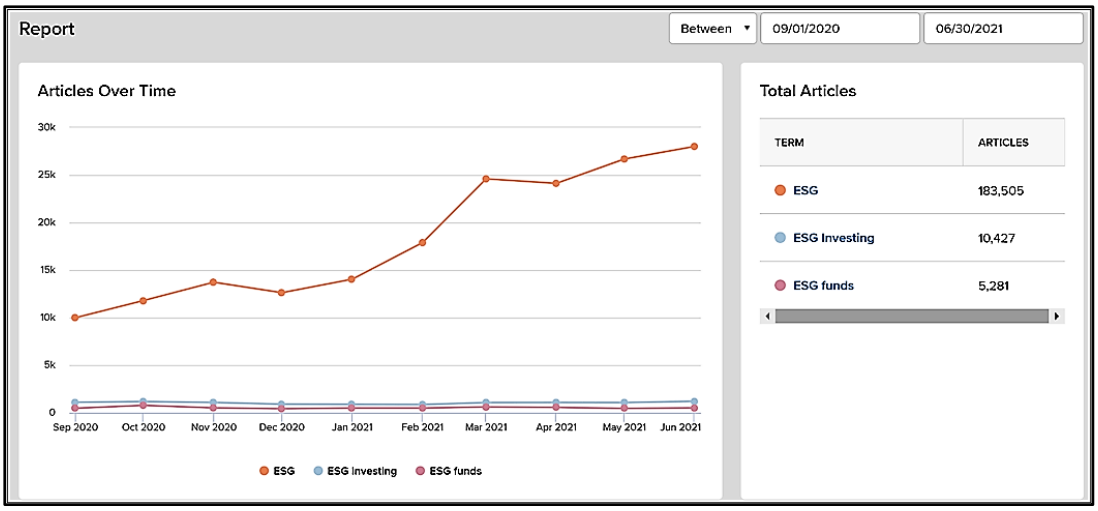

Figure 1: Number of ESG-related articles as tracked by Muckrack

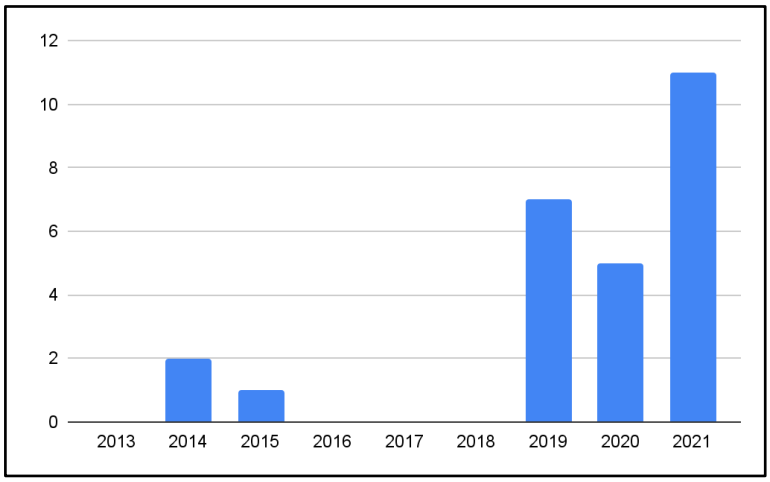

Figure 2: The number of INFORMS journal papers containing "environmental, social, and governance" (in any part of each paper)

Needless to say, the COVID-19 pandemic has revealed the value of supply chain thinking for firms to deliver business and human value. At the same time, the importance of ESG issues in managing supply chains has been spotlighted. The pandemic serves as an urgent call to action to connect ESG and supply chain thinking: for ESG measures to be truly effective, rating agencies must look beyond firm boundaries and gain visibility into a corporation's supply chain partners' sustainability and social impact (Dai and Tang 2021). Likewise, for corporations to be able to develop resilient supply chains, ESG risks can no longer be overlooked or downplayed.

From a practical standpoint, although ESG investing continues to gain traction, the complexity and variability of ESG criteria and reporting standards have created substantial obstacles for investment companies in developing various ESG index

funds. For example, the DWS Group, the asset management arm of Deutsche Bank AG, claimed $540 billion (more than half of its assets under management) has been run through a process (ESG integration) that can ensure the investment would face lower ESG risks than the industry average. However, Kowsmann and Brown (2021) report that no quantifiable or verifiable ESG integration for key asset classes exists at DWS. This scandal heightened the need to streamline various ESG measures and reporting standards.

In the rest of the paper, we first argue post-pandemic supply chain management must incorporate ESG considerations and contribute to ESG performance. We note that whereas the "E" (environmental) and "G" (governance) pillars are relatively well defined and well understood, the "S" (social) pillar is ambiguous. Thus, our focus in this paper is on how the "S" (social) pillar of ESG considerations interacts with supply chain management. Next, we present three cases from the COVID-19 pandemic to illustrate the importance and value of unifying ESG and supply chain thinking. We conclude our paper by spotlighting key challenges and opportunities for practitioners and researchers in both ESG and supply chain management.

2. FROM CSR TO ESG

The COVID-19 pandemic, social unrest, hate crimes, and economic downturn in 2020 compelled business executives to rethink the role of business in society. Friedman (1970) argued a firm's goal is to serve the shareholders' interests by engaging in profitable activities as long as the firm stays within the rules of the game. This shareholder paradigm incentivized firms to focus on profit without paying close attention to the well-being of the planet and the people. Since the Reagan era, the "trickle down economy" has generated windfalls for big corporations and wealthy individuals through outsourcing and offshoring many operations to lower-cost countries such as China (Ingraham 2020). The value created for shareholders and corporate leaders, on the other hand, has not "trickled down" to have a meaningful effect on unemployment or economic growth. Indeed, between 1980 and 2019, CEO compensation increased by 1,167%, while the average worker's compensation increased by 13.7% (Mishel and Kandra 2020).[1]

In 2020, the total market capitalization of the top 50 global companies (e.g., Apple, Amazon, Alphabet, Nestle, P&G, and Walmart) increased by $4.5 trillion, and their combined worth is equivalent to 28% of the global gross domestic product.[2] This remarkable statistic has two ramifications. To begin, these leading multinational corporations wield more economic clout than many national governments. Second, their worldwide supply chain activities have a substantial influence on environmental sustainability and social responsibility across borders.

Whereas the concept of corporate social responsibility (CSR) dates all the way back to the 1800s in the US when industrialist Andrew Carnegie and then John D. Rockefeller donated large sums of money to education and scientific research, the term was coined in 1953 by economist Howard Bowen (Thomas 2019). However, defining CSR has proven difficult; the reader is referred to Dahlsrud (2008) for a study of 37 CSR definitions and to Moura-Leite and Padgett (2011) for a review of the historical background of CSR. Because CSR is not well defined, Henderson (2009) argues it will result in increased costs and diminished corporate performance. Ward and Smith (2006) comment that CSR is "now breaking up into a distinct series of sub-agendas" and "a variety of alternative characteristics emerged." Specifically, some businesses perceive CSR as philanthropic giving, while others consider it as a synthesis of the "business case" and the "moral case" without quantifiable outcomes.

Even without a precise definition, it is heartening to note that nearly 200 CEOs from the Business Roundtable, including the heads of Apple, Pepsi, and Walmart, issued

[1] The fact that the world's 26 richest people owned as much as the poorest half of the world's population in 2019 was a clear indication that corporations must change (Elliott 2019).

[2] By contrast, the total market capitalization of the top 50 global companies was approximately 5% of global gross domestic product in 1990 (Orlik, Jimenez, and Sam 2021).

a statement in 2019 declaring that businesses must shift their focus from shareholders to stakeholders by investing in their employees, protecting the environment, and conducting business fairly and ethically with their suppliers (Gelles and Yaffe-Bellany 2019). However, by 2020, this pledge had not resulted in any tangible, measurable changes, even though many corporate leaders believe capitalism is undergoing a fundamental transformation (Toussaint 2020).

The intent of CSR was to make companies accountable for their actions that affect health, safety, and the environment. Several examples of such actions include China's milk formula scandal, which resulted in kidney damage to 54,000 infants (Yardley 2008), Mattel's toys tainted with lead paint in 2007 (Story and Barboza 2007), the extreme air and water pollution in China caused by unethical manufacturers (Buckley 2015), the collapse of Rana Plaza in Bangladesh in 2013 with a death toll of over 1,000 factory workers (Dai 2020), and counterfeit and unsafe products sold by Amazon's third-party sellers (Dai and Tang 2020f). On the surface, one could argue that these disasters were caused by contract manufacturers' unethical behavior, while their customers (major multinational corporations) can claim ignorance. However, the public believes that even if these multinational corporations did not commit these acts directly, they are indirectly responsible because they could have been avoided with proper supply chain management.

Along with public pressure, investment strategies are evolving as millennials reach the age of 40 in 2021. The millennial generation is, on average, more concerned with environmental sustainability and social responsibility than the baby boomer generation. In 2020, millennial investors contributed $51 billion to sustainable funds, up from $5 billion in 2015 (Adamczyk 2021). These sustainable funds are based on ESG investing, an investment strategy in which shareholders invest in firms with good environmental, social, and governance performance measures.

Globally, ESG investment has grown at a breakneck pace in recent years. By 2025, global ESG assets are projected to reach $53 trillion, accounting for more than a third of the estimated $140.5 trillion in total assets under management (Bloomberg Intelligence 2021). Larry Fink, Chairman and CEO of Blackrock, the world's largest asset manager, issued a letter to CEOs in 2021, stating that ESG investing has nearly doubled since 2019 and arguing that executives must adapt to address issues ranging from public health to climate change to social justice, rather than just quarterly earnings. (Fink 2021).

Unlike CSR, which pressures a company to be "accountable" for its actions, ESG is intended to make a company's actions and their outcomes "measurable" so that investors can make their investment decisions and the public can form judgment. The ESG movement is creating a new incentive for companies to collect and disclose information about their financial, environmental sustainability, and social responsibility performance. However, a significant obstacle exists—a lack of

agreement on what to measure and report, as ESG is extremely broad and its definition is still being debated. The first set of ESG standards were developed in the early 1990s by Amy Domini, one of the founders of KLD Research & Analytics, who created the Domini 400 Social Index, which is a stock market index selected according to a set of *social and environmental* standards.[3]

With stronger recommendations from analysts and an increasing interest in ESG investing (an investment strategy that seeks to effect positive changes in society), there are many rating agencies that measure and rank the ESG performance of different companies, including (i) Bloomberg ESG Data Services, (ii) Dow Jones Sustainability Index, (iii) MSCI ESG Research, (iv) Sustainalytics, (v) Thomson Reuters ESG Research Data, (vi) S&P Global, (vii) ISS ESG, (viii) Vigeo/EIRIS, (ix) Fitch Ratings, and (x) Moody's Investors Service. For example, the MSCI ESG Rating Index rates a company based on the following criteria: (1) data that the company voluntarily discloses in accordance with various reporting standards established by GRI (Global Reporting Institute), SASB (Sustainability Accounting Standards Board), and TCFD (Task Force on Climate-retailed Financial Disclosures), and (2) data collected from independent sources (news media, governmental databases, NGO reports, etc.).[4]

Currently, no uniform ESG reporting standard exists, and the sheer number of measurements is overwhelming. For example, MSCI ESG Metrics provides institutional investors with 56 ESG comparable metrics[5] of 8,500 (large, mid, and small cap) companies across 23 developing-markets and 27 emerging-markets countries. As of this writing, no agreement exists on what to measure and what to report, and the SEC opined that ESG disclosures are likely to be adaptive and innovative (Coates 2021).

Will increased disclosure of ESG performance in annual reports eventually generate incentives for businesses to do good? With a history of poor CSR performance and ambiguous ESG metrics in the present, how can firms manage their supply chains in the post-COVID-19 era to create future stakeholder value?

---

[3] Through a series of acquisitions by MSCI, a global provider of equity, fixed income, hedge fund stock market indexes, multi-asset portfolio analysis tools, and ESG products, the FTSE KLD 400 Social Index was renamed the MSCI KLD 400 Social Index in 2010.

[4] For details, see: https://www.msci.com/what-if-esg-disclosures-become-standardized, accessed on July 30. 2021.

[5] The MSCI ESG metrics (https://www.msci.com/esg-metrics) measure a firm's risk exposure to climate change, pollution, waste, worker health and safety, discrimination and diversity, supply-chain risks, data breaches, corruption, instability, business ethics, and human rights protection, among others.

3. THE IMPORTANCE OF UNIFYING ESG AND SUPPLY CHAIN THINKING

As previously noted, despite increased interest in ESG investment, the specific definition and measurement of ESG remain vague, hampering attempts to hold corporate executives responsible for the sustainability and social obligations of their enterprises. Specifically, ESG's three pillars have widely accepted measures for the "E" (environmental) and "G" (governance) pillars, but the "S" (social) pillar does not. According to the *ESG Global Survey 2019* (BNP Paribas 2019, p. 24), conducted a year prior to the pandemic, a "middle-child predicament" is associated with the "S" pillar of ESG:

> While experts are getting to grips with the "E" in ESG, the "S" remains elusive. This year's survey found the "S" the most difficult element to incorporate into investment analysis. Nearly half (46%) of respondents feel that this is the case… Investors are grappling with the complexity of integrating social factors into their investment analysis and decision-making. A lack of consensus in the industry surrounding what constitutes the "S" makes it harder to incorporate into investment strategies compared to both the "E" and "G". As such, it often acts as an interaction point between these two elements.

The "S" pillar is ambiguous in part due to a lack of agreement about the scope of social issues it touches upon. For example, the CFA Institute (2015, p. 4) lists the following as examples of social issues: customer satisfaction, data protection and privacy, gender and diversity, employee engagement, community relations, human rights, and labor standards. By contrast, the SEC's ESG subcommittee proposes that the "S" pillar cover issues such as weapons, alcohol, gambling, support for organized labor, human rights practices, supply chain labor standards, consumer protection, and animal welfare (SEC 2020b). Even with its ambiguous scope, the scope of "S" continues to expand. In the case of the COVID-19 pandemic, major shortages of personal protection equipment (PPE) have triggered a call for adding public health and national security to the list (Bai, Dai, and Shivaram 2020).

Another, and frequently overlooked, reason the "S" pillar is difficult to quantify is the extensive supply chain networks on which almost every business relies and operates. Supply chains are a component of the "S" pillar in several major ESG index providers. Nonetheless, they frequently treat supply chains in isolation from the other components. For example, in the "S" pillar of Bloomberg's ESG index, supply chains are treated independently of discrimination, human rights, and community relations (Boffo and Patalano 2020). In reality, however, it is unthinkable to measure discrimination, human rights, and community relations without taking into account a firm's extensive supply chain networks (Dai 2020).

In today's hyper-globalized economy, ESG measures are of little value if they do not incorporate a firm's operations throughout its entire supply chain. For example, related to the relatively well-defined "E" pillar, ExxonMobil indicated it was reducing greenhouse gas emissions while it was actually increasing them, shifting dirty operations to its supply chain partners (Henn 2016). In addition, the current ESG measures (especially those related to the "S" pillar) do not properly incorporate how a focal firm deals with the downstream (e.g., customers) and upstream (i.e., suppliers) of its supply chain. For example, "customer protection" may sound like an issue between a company and its customers. Yet, today's ubiquitous platform economy means customers frequently interact with third-party sellers and service providers with little, if any, legal protection from the platform. In many cases, customers who purchase unsafe products from foreign sellers have difficulty getting compensated despite several injuries (Dai and Tang 2020f). Thus, accounting for the entire supply chain is necessary for investors and regulators to gauge a firm's consumer protection effort, an important component of the "S" pillar.

On the flip side, incorporating ESG risk is essential to managing supply chains. To sustain its supply chain operations and to improve its performance pertaining to the "S" pillar in 2021, Unilever announced its plan to pay a living wage to "all of its supply-chain workers" by 2030 (Bowman 2021). Although appreciated, the implementation of this plan is challenging because Unilever's global supply chain operations entail over 400 brands of consumer goods[6] in 190 countries. ESG is not merely about moral values; it measures real risks that threaten the functioning of firms' supply chains, especially in times of crises. For example, the US medical supply chains were severely disrupted during the COVID-19 pandemic, in large part because few medical-supply manufacturers and distributors have incorporated public health and national security risks into their design of supply chain networks, leading to over-reliance on foreign suppliers for essential medical supplies and hence the inability to ramp up production during the initial months of the COVID-19 pandemic (Bai, Dai, and Shivaram 2020; Dai and Tang 2020b, 2020c).

The significance of ESG risks (particularly in the context of ESG investing) and the dearth of consistent and adequate ESG supply chain measurements (particularly in the context of supply chain risks) prompt us to structure the remainder of this paper as follows. We provide three distinct supply chain case studies that happened during the COVID-19 pandemic in sections 4, 5, and 6. The purpose of these case studies is to illustrate the need of developing proper ESG metrics that include a firm's activities throughout its entire supply chain. We propose several research topics for further examination in section 7 based on the definition and measurement concerns

[6] According to Unilever's website (https://www.unilever.com/brands/), its product categories include food, ice cream, tea, coffee, cleaning agents, pet food, beauty products, and personal care, among others.

discussed in section 3 and the three case studies given in sections 4, 5, and 6. Section 8 concludes.

4. CASE 1: ONLINE MARKETPLACE PLATFORMS: CONSUMER PROTECTION

Since the start of the COVID-19 pandemic in 2020, many brick-and-mortar stores have been closed for extended periods of time, and safety protocols have changed consumer shopping habits. Many consumers have shifted to online retail platforms around the world, and these platforms, such as Amazon in the US, have become even more important to consumers in the wake of the COVID-19 pandemic. Amazon's US sales increased by 44% to $318.41 billion in 2020, accounting for nearly 40% of the US ecommerce market (Droesch 2021). Such changes in how consumers shop appear to be long-lasting, as evidenced by a 220% increase in Amazon's profitability in the first three months of 2021 compared to the same period in 2020 (Weise 2021).

To meet consumer demand with supply, online retail platforms need to expand their global supply chain operations. However, due to the sheer nature of its role as an online platform facilitating cross-border transactions, getting more merchants to sell on these online platforms exposes consumers to increased risks with little protection. Using Amazon as an example, we now describe two aspects in which firms' ESG risk is not well defined and cannot be easily measured unless it incorporates supply chain thinking.

4.1 THIRD-PARTY PRODUCTS

Behind Amazon's rapid increase in profitability during the pandemic is the rise of its third-party sales. Specifically, as an online retail platform, Amazon sells some products from its inventory that it owns. It also facilitates sales transactions between independent third-party merchants and consumers conducted through its online marketplace platform, and charges a sales commission average of 15% (Brophy 2020). By 2020, Amazon's third-party sales accounted for nearly 60% of the company's physical sales (Dai and Tang 2020a). Due to Amazon's aggressive efforts in recruiting China-based third-party sellers starting in 2013, the majority of these third-party sellers are now based in China.

While foreign-made products are ubiquitous in the United States, until the rise of third-party sales on Amazon, Americans had never been exposed to large-scale direct (online) sales from foreign sellers. More importantly, the opacity of Amazon's product pages frequently made differentiating between domestic and foreign third-party sellers nearly impossible. Beginning in September 2020, however, after significant media attention about Amazon's business model (Berzon, Shifflett, and Scheck 2019), the company's third-party sellers are now required to disclose their names and addresses (Greene 2020).

The proliferation of unidentified foreign third-party sellers exposes American consumers to never-before-seen risks of purchasing counterfeit, pirated, or even dangerous goods. As the US Department of Homeland Security finds in a report to the President of the United States (DHS 2020), "While the expansion of e-commerce has led to greater trade facilitation, its overall growth—especially the growth of certain related business models—has facilitated online trafficking in counterfeit and pirated goods. American consumers shopping on e-commerce platforms and online third-party marketplaces now face a significant risk of purchasing counterfeit or pirated goods." The same report points out that online marketplaces such as Amazon heighten such a risk for two reasons. First, third-party sellers "can quickly and easily establish attractive 'store-fronts' to compete with legitimate businesses" often without the need to provide identifying information. Second, a counterfeiter typically sets up multiple accounts and "the ability to rapidly proliferate third-party online marketplaces" complicates enforcement efforts because it "allows counterfeiters to hop from one profile to the next even if the original site is taken down or blocked." Without properly managing its third-party sellers, Amazon risks losing consumer trust. Such risks should be incorporated in its ESG ratings.

Fake reviews are another major source of concern, as they increase the friction between buyers and sellers on these platforms, eroding buyers' trust (Chen et al. 2020; Xiao, Chen, and Tang 2021). Foreign sellers have been linked to blatant manipulation via a practice known as "brushing" (Ovide 2020), which involves fabricated orders that make a listing appear more popular than it actually is and lead to fake reviews that appear to be from verified purchases.

Third-party listings clearly impact consumer welfare and satisfaction, which means that a comprehensive assessment of Amazon's ESG risk must include how it manages a significant portion of its supply chain, namely its massive network of third-party sellers and suppliers, the majority of whom are based outside the US. Amazon's supply chain ESG metric should specifically include the extent to which Amazon collects and verifies the identities and track records of third-party sellers (in terms of genuine and safe products, sales records, quality assurance records, and customer satisfaction), as well as the extent to which Amazon discloses this information transparently on its product page.

4.2 CONSUMER LIABILITY

When millions of consumers shop on online platforms such as Amazon, hail a ride with Uber, or stay with various hosts listed on Airbnb, few consider the possibility of injury or more serious damage as a result of the goods and services purchased on these platforms. Uber has received complaints from female passengers alleging sexual harassment at the hands of male drivers (Feeney 2015). Airbnb has been

embroiled in a series of embarrassing safety incidents, including prostitution, theft, and voyeuristic hosts monitoring guests via cameras (Grind and Shifflett 2019). Nonetheless, when such incidents occur, online platforms frequently assert that they are not sellers of goods or services and thus are not liable (Dai and Tang 2020f).

On August 13, 2020, the San Diego Superior Court issued a landmark decision highlighting the lack of consumer protection on online platforms (Bolger v. Amazon.com, LLC 2020). The decision involved Angela Bolger, who purchased a replacement laptop battery from Amazon and sustained severe burns when the battery burst. Amazon contended that it should be held harmless for the damage since it facilitated the transaction between Bolger and Lenoge, a China-based third-party seller who did not respond to the court. The decision, in a break from previous court rulings, states:

As a factual and legal matter, Amazon placed itself between Lenoge and Bolger in the chain of distribution of the product at issue here. Amazon accepted possession of the product from Lenoge, stored it in an Amazon warehouse, attracted Bolger to the Amazon website, provided her with a product listing for Lenoge's product, received her payment for the product, and shipped the product in Amazon packaging to her. Amazon set the terms of its relationship with Lenoge, controlled the conditions of Lenoge's offer for sale on Amazon, limited Lenoge's access to Amazon's customer information, forced Lenoge to communicate with customers through Amazon, and demanded indemnification as well as substantial fees on each purchase. Whatever term we use to describe Amazon's role, be it "retailer," "distributor," or merely "facilitator," it was pivotal in bringing the product here to the consumer.

As encouraging as the Bolger v. Amazon ruling may seem, consumer protection on online platforms was long overdue and its broad impact remains to be seen.

Legal actions aimed at enforcing accountability on online platforms may have unforeseen repercussions. For instance, the California State Assembly introduced AB-3262 with the title "Product Liability: Electronic Retail Marketplaces" (Stone 2020). Under this law, all online marketplaces will be "held strictly liable" for harm caused to consumers due to defective products sold through them. Whereas Amazon issued a statement voicing its "conditional support" of AB-3262, arguing that "this legislation aimed at protecting consumers should apply equally to all stores, including all online marketplaces," others warned such legislations can kill off smaller competitors so that Amazon can gain a bigger market share. More targeted efforts, such as pressure from ESG investors, can be more effective.

Online marketplaces have emerged as a key development engine in both developed and emerging economies over the last decade. According to the *Wall Street Journal* (Austin, Canipe, and Slobin 2019), by February 2019, of the 10 most valuable

venture-backed private companies in the world, six (including Uber, Airbnb, WeWork, and Lyft) were online marketplaces. These platforms have been lauded for their innovative business models, which have resulted in the creation of new marketplaces and job opportunities. Nonetheless, their disrespect for consumer safety (in terms of financial and bodily harm) while relying on a vast supply chain network to produce products and services must be factored into their ESG risk assessment. Specifically, besides supply chain transparency as a measure for ESG risk (Sodhi and Tang 2019), we believe supply-chain-wide ESG measures should assess the safeguards put in place by the platform to protect consumers.

5. CASE 2: PUBLIC HEALTH SUPPLY CHAINS: SUPPLY CHAIN RESILIENCE

The COVID-19 pandemic brought to light the vulnerabilities in public health supply chains. In October 2019, just five months before the pandemic, the Nuclear Threat Initiative, a policy and strategy think tank based in the US, published the Global Health Security Index, in collaboration with the Johns Hopkins Center for Health Security and the Economist Intelligence Unit, which ranked 195 countries around the world for their pandemic readiness (NTI 2019a). According to this index, the US ranked first in the world for its ability to prevent, detect, and respond to pandemics. Notably, the index evaluates each country's "infection control practices and equipment availability," for which the US received a perfect (100 out of 100) score.

Nonetheless, the reality in 2020 was diametrically opposed to the top ranking in 2019. Throughout the initial months of the COVID-19 pandemic, hospitals, nursing homes, and other critical facilities throughout the US faced severe shortages of PPE, particularly specialized PPE such as N95 respirators (Artenstein 2020). Such severe shortages have been linked to unnecessary infections and mortality, particularly among healthcare workers and residents of nursing homes (Dai, Bai, and Anderson 2020). In comparison, countries and regions with an adequate supply of PPE, such as Hong Kong, Taiwan, New Zealand, and Singapore, experienced almost no COVID-19-related deaths in nursing homes and healthcare facilities during the same time period (Dai et al. 2021).

To make sense of the stark contrast between the top ranking and reality in the US, we notice that the index does not account for the supply chain. Specifically, the component relating to PPE accessibility (NTI 2019b, p. 101, sec. 4.5.1: Infection control equipment availability) employs a single documentation-based criterion (rather than a metric of PPE supply chain resilience), as described below:

> Has the country published a publicly available plan, strategy, or similar document to address personal protective equipment (PPE) supply issues for both routine national use and during a public health emergency?
>
> Yes = 1
>
> No = 0

As simplistic as the above criterion may look, the Global Health Security Index was actually "a massive undertaking involving millions of dollars and hundreds of researchers" (Lewis 2021, p. xiv). To our best knowledge, ESG indexes have not formally incorporated public health risk as a consideration when evaluating a firm. Even if they do, one has reason to believe they would not be able to deliver a more

comprehensive assessment of public health risks than the Global Health Security Index does unless they specifically incorporate supply chain risks that affect public health.

The majority of the essential medical supplies such as PPE used in the US are provided by multinational manufacturers such as 3M Company, Honeywell International Inc., and MSA Safety Inc. (Dai, Bai, and Anderson 2020). Yet, these companies are only required to report the locations of their manufacturing plants to the Food and Drug Administration. Whereas the fact that the US imports the vast majority of its specialized PPE from China is common knowledge (Fok 2020), the exact PPE production capacity in domestic versus overseas facilities of these US-based manufacturers is less clear. To gain a competitive edge, most global firms are secretive about their supply chain operations so that they can keep those low-cost suppliers to themselves. By treating basic supply chain data as trade secrets, regulators, public health agencies, healthcare providers, and researchers cannot assess the vulnerabilities of the public health supply chains caused by these essential medical-supply manufacturers (Fiore 2020).

An over-reliance on PPE supply sources from China, Malaysia, and other distant locations creates supply chain risks, as an ancient Chinese proverb teaches: "Distant water will not quench a nearby fire" ("遠水不救近火"). In addition to the risk associated with excessive dependence on foreign suppliers, what is even more concerning is a lack of information about the extent of such dependence.

Amid calls to include public health and national security implications as part of ESG considerations (Bai, Dai, and Shivaram 2020), ESG rating agencies must ensure that they use reliable and up-to-date supply chain data when assessing various companies' ESG risk, particularly in the medical supply sector. Otherwise, they risk repeating the Global Health Security Index's costly error.

On the other hand, when the ESG index truly captures the public health implications of the manufacturers' supply chain decisions, those manufacturers will be rewarded or penalized by investors, depending on whether they contribute to pandemic readiness. Accordingly, they will be incentivized to take public health seriously and strive to win the trust of their investors, customers, and society. For example, consider the case in which ESG rating agencies include a "supply chain resilient" measure based on the simulated performance associated with some standardized "stress tests" of a company's supply chain (Dai, Bai, and Anderson 2020; Simchi-Levi and Simchi-Levi 2020). In this case, this resilient measure can be ranked across different firms within the same sector, creating incentives for companies to develop plans to mitigate potential supply chain disruptions.

6. CASE 3: COVID-19 VACCINE DEVELOPMENT, MANUFACTURING, AND DISTRIBUTION: SOCIAL WELFARE

During the COVID-19 pandemic, perhaps nothing demonstrates the "S" pillar of the private sector better than the record-breaking pace of vaccine development and manufacturing by companies such as AstraZeneca, Johnson & Johnson, Moderna, and Pfizer, which marked the beginning of the end of the COVID-19 pandemic that has infected nearly 200 million people and killed more than five million as of December 2021.[7] Clearly, rapid vaccine development and manufacturing create social welfare in terms of significantly reducing the number of infections, hospitalizations, and deaths (Mak, Dai, and Tang 2021). Yet, the instrumental role these manufacturers played has not been reflected in their ESG ratings. Pfizer, for example, was the first vaccine manufacturer to receive an emergency-use authorization from the Food and Drug Administration for its mRNA vaccine. However, according to Morningstar's Sustainalytics ratings,[8] Pfizer has an ESG score of 24.1 (medium risk) and a ranking of No. 96 among pharmaceutical companies.

From the public health perspective, simply recognizing those manufacturers for successfully developing and manufacturing vaccines does not provide adequate incentives to the pharmaceutical industry as a whole. The reason is that the endgame of the COVID-19 pandemic is not the vaccines per se, but the efficient and equitable vaccination of people around the globe. The crucial "link" between vaccines and vaccination is a staggeringly complex vaccine supply chain that depends on collaboration and coordination among a large number of companies (Dai and Tang 2020g; Dai and Song 2021). In addition, how a firm designs its randomized controlled trials can have a significant impact on the way (e.g., dosage and regimen) vaccines are delivered and hence the pace of the ensuing distribution effort (Strohbehn et al. 2021).

First, developing new vaccines is a risky business due to uncertainty in efficacy, yield, and demand for vaccines (Dai and Tang 2020e). Among the 145 vaccine candidates under development by July 2020 (Dai and Tang 2020d), only 20 were authorized for use by August 2021 (Zimmer, Corum, and Wee 2021). Even for the lucky few manufacturers whose vaccines were authorized—most notably, AstraZeneca, Johnson & Johnson, Moderna, and Pfizer—producing billions of doses based on novel technologies requires significant investments and does not guarantee profitability. As a case in point, the AstraZeneca vaccine has been distributed in more than 170 countries, yet is expected to deliver a $13 million loss to the manufacturer in the second quarter of 2021 (Strasburg and Butini 2021). In view

[7] https://coronavirus.jhu.edu/. Accessed December 30, 2021.

[8] https://www.sustainalytics.com/esg-rating/pfizer-inc/1008040516. Accessed December 30, 2021.

of the risk in developing and producing vaccines, manufacturers can benefit from horizontal co-opetition schemes through which pharmaceutical manufacturers compete for the development of COVID-19 vaccines while cooperating by building shared production capacity (Dai and Tang 2020d). Such co-opetition schemes help reduce the risks associated with vaccine development and help incentivize companies to expand their production capacity. ESG ratings must accurately and properly incorporate manufacturers' participation in such efforts. For instance, in the "S" pillar, ESG measures should measure the extent to which a firm is willing to cooperate and coordinate with other firms to create societal value.

Second, one often thinks of randomized controlled trials for vaccines as a way to establish their safety and efficacy. Yet how such clinical trials are designed can have an oversized impact on the pace of vaccinations. For example, each dose of the Moderna vaccine in use contains 100 µg, although half a dose (50 µg) can provide nearly the same level of protection (Chu et al. 2021). Given the same raw-material constraints, producing half-dose vaccines can double the vaccine coverage. The challenge, however, is that vaccines are authorized based on the way randomized controlled trials were designed in the first place. This issue has prompted researchers to highlight the "disconnect between individually and socially optimal doses" (Strohbehn et al. 2021, e1049) especially because the private sector often focuses on increasing efficacy without fully incorporating the impact of dose design on vaccination efficiency and equity. To maximize population benefits, incentivizing vaccine manufacturers to choose "socially optimal pandemic drug dosing" is essential (Strohbehn et al. 2021, e1049). This incentivizing is where ESG agencies can play a role—they can measure a vaccine manufacturer's social impact in terms of the population benefits delivered by the entire vaccine supply chain instead of the benefits delivered by the manufacturer alone.

Related to the second aspect, an important logistics constraint in COVID-19 vaccination is that most of the authorized vaccines require two (and potentially more) doses, and the interval between doses can vary across vaccines. As Mak, Dai, and Tang (2021, p. 28) observe,

> [T]he logistics parameters of vaccine regimens (i.e., one or two doses, recommended lead time) depend on the design of trials and the data presented for regulatory approvals. For instance, the fact that Pfizer requires two doses but Johnson & Johnson only requires one is primarily due to how the respective trials were designed and thus how the specific regimens were approved, but is not necessarily reflective of the differences in the science of the vaccines.

Measuring manufacturers' "S" pillar according to their supply chain impacts, therefore, can provide a strong incentive for them to design their vaccine regimens with population benefits in mind.

7. CHALLENGES AND OPPORTUNITIES IN UNIFYING ESG AND SUPPLY CHAIN THINKING

Through our discussion of the three cases presented in sections 4, 5, and 6, we have argued about the importance of ESG rating agencies' incorporating various supply-chain ESG measures to encourage more firms to solidify their commitments to the "S" pillar. However, a variety of challenges exist for unifying ESG and supply chain thinking. Below, we briefly outline several challenges and potential opportunities to address them.

1. **Lack of supply chain visibility and transparency.** As noted in section 4, supply chain operations are opaque, and companies often do not have visibility beyond their immediate suppliers (Dai and Tang 2020c; Fiore 2020; Dai, Bai, and Anderson 2020). Sodhi and Tang (2019) argue that supply-chain visibility and transparency can enable firms to reduce supply chain risks and improve supply chain efficiency. For example, Boeing would have managed its supply chain differently to reduce the delay of its 787 development had the company known about the true capabilities of its tier-1 suppliers (Tang, Zimmerman, and Nelson 2009). Additionally, by making its supply chain transparent to the public, a company can enlist consumers, NGOs, and even suppliers' own employees to expose suppliers' unethical activities (Tang and Babich 2014). Conducting research to examine whether supply chain visibility and transparency can indeed reduce supply chain risks and improve supply chain efficiency is certainly of interest.

   Beyond these potential benefits, ESG rating agencies should consider establishing a supply chain transparency index that can be ranked in a similar way as the Fashion Transparency Index for the fashion industry (Dai 2020).[9] Doing so can create a new research opportunity to examine the impact of this supply chain transparency ranking on financial and other ESG performances. In addition, rating agencies have the responsibility to independently collect supply chain information so that they can verify companies' self-reported information.

2. **Unclear relationship between supply chain ESG measures and a firm's performance.** Currently, ESG measures do not incorporate a firm's supply chain operations. Before executives invest more money and effort in gathering, verifying, and reporting supply chain ESG data, one wonders about the value of ESG reporting itself. From the perspective of stock returns, ESG

[9] The Fashion Transparency Index is developed by an independent organization Fashion Revolution https://www.fashionrevolution.org/about/transparency/

ratings offer mixed results (Shifflett 2021). Specifically, top-ranked ESG stocks (rated by MSCI ESG rating, Sustainalytics ESG rating,[10] and Refinitiv ESG rating[11] agencies) can beat or lag the S&P 500 index or the Dow Index. Likewise, the relationship between a listed company's ESG rating and stock-market performance is unclear.

In the absence of a clear association between ESG rankings and stock performance, the need to examine the market response to firms with strong supply chain ESG measures is even greater.

3. **Supply chain ESG measurement complexity.** Because the supply chain structure and operations are often highly complex for many multinational firms, the number of measures can be overwhelming. Putting supply chain issues aside, the lack of a common ESG reporting standard has allowed companies to use different ways to measure and report their data. For example, Kotsantonis and Serafeim (2019) illustrate 20 different ways for companies to report their employee health and safety data. In addition, when many ESG rating agencies are using the reported data to compute different ESG metrics using their proprietary systems, the finding that these ESG ratings can be inconsistent and unreliable is not surprising.

   Fink (2021) advocates for a uniform ESG disclosure standard for all companies in order to quantify and rank their ESG performance.[12] Having a common standard with a limited number of ESG metrics can be beneficial. Li and Wu (2020) argue, however, that one-size-fits-all ESG mandates may not result in improved societal outcomes. Thus, rather than being overwhelmed by various reporting requirements, perhaps each industry sector should take proactive control of ESG metrics.[13] For example, food companies (e.g., Nestle, Mondelez, Mars, etc.) source their ingredients (e.g., cocoa, coffee, etc.) from all over the world, and paying farmers a "fair price" would be considered socially responsible. Numerous businesses have historically viewed Fair Trade Certification as a marketing campaign aimed at ensuring fair trade between producers and industry partners according to the fair price

[10] Sustainalytics was acquired by Morningstar Inc in 2020.

[11] Refinitiv is a data provider owned by the London Stock Exchange Group.

[12] Currently, many Environmental, Social, and Governance (ESG) measurements are established by GRI (Global Reporting Institute), SASB (Sustainability Accounting Standards Board), and TCFD (Task Force on Climate-retailed Financial Disclosures), among others.

[13] Business schools missed the opportunity to take control of metrics, and they are now overwhelmed by many survey requests in order to participate in numerous business school rankings.

established by Fair Trade International (Chen, Lee, and Tang 2021). Indeed, by fairly compensating farmers, food companies earn increased consumer support. Kaplan and McMillan (2021) report that FairTrade certified products contributed significantly to the growth of CPG sales between 2013 and 2018. To build supply chain ESG metrics, creating a small number of relevant supply chain metrics and assessing which metrics result in improved overall ESG performance is a potential route.

4. **Unbiased supply chain ESG measures and reporting.** When left to their own devices, firms within an industrial sector may collude by cherry-picking supply chain ESG metrics or by agreeing to report on just a subset of supply chain ESG metrics collectively. To minimize possible conflicts of interest, it is worthwhile to investigate the role of an industry-based consortium with an independent board of directors in governing the process of selecting supply chain ESG metrics for a certain business sector.

   Once a set of ESG measures for an industry sector is established, a potential issue of "selective reporting" arises. For example, Shi, Wu, and Zhang (2021) find empirical evidence that firms tend to greenwash their supply chain ESG image by reporting environmentally responsible suppliers and concealing "bad" suppliers. As a result, it is necessary to establish an impartial audit process to eliminate selective reporting biases.

8. CONCLUDING REMARKS

While ESG investing is gaining traction, complex and inconsistent ESG measurement and reporting standards have posed significant challenges for even the most sophisticated investment firms when developing various ESG index funds (Dai and Tang 2021). At the same time, we recognize supply chain measures are blatantly omitted in ESG measures, which can induce unethical behavior for firms to shift various dirty and unethical operations to their supply chain partners overseas to boost their ESG ratings.

In this paper, we have argued the importance of incorporating supply chain processes and operations into ESG measures to capture the performance of all three "E," "S," and "G" pillars along a firm's supply chain. Specifically, we have presented three cases from the COVID-19 pandemic to illustrate how the "S" pillar of ESG considerations interacts with supply chain management and why establishing supply chain ESG measures is important. We have also proposed various research questions to address some of the on-going challenges for establishing supply chain ESG measures.

Once a set of meaningful supply chain ESG measures has been developed for each sector, ESG rating agencies can then develop a new methodology to rate a firm's entire supply chain operations in a more transparent manner.[14] With transparent supply chain ESG reporting and transparent ESG rating methodologies, companies are more likely to conduct their supply chain operations more carefully in an environmentally sustainable and socially responsible manner.

[14] Currently, many ESG rating agencies use data reported by the firm to compute different ESG metrics using their proprietary systems without disclosing their underlying methodologies. This fact may explain why various ESG ratings can be inconsistent and unreliable (Mackintosh 2021). Moreover, when institutional investors face so many inconsistent ESG metrics across firms and so many ratings across agencies, analysts/investors may suffer from "metrics and ratings fatigue" (Thompson, Hamilton, and Rust 2005) and end up with inconsistent recommendation/investment decisions.

BIBLIOGRAPHY

Adamczyk, Alicia. 2021. "Millennials Spurred Growth in Sustainable Investing for Years. Now, All Generations Are Interested in ESG Options." CNBC. May 21, 2021. https://www.cnbc.com/2021/05/21/millennials-spurred-growth-in-esg-investing-now-all-ages-are-on-board.html

Artenstein, Andrew W. 2020. "In Pursuit of PPE." *New England Journal of Medicine* 382 (18): e46. https://doi.org/10.1056/NEJMc2010025

Atasu, Atalay, Charles J. Corbett, Ximin (Natalie) Huang, and L. Beril Toktay. 2020. "Sustainable Operations Management Through the Perspective of Manufacturing & Service Operations Management." *Manufacturing & Service Operations Management* 22 (1): 146–57. https://doi.org/10.1287/msom.2019.0804

Atkins, Betsy. 2020. "ESG History & Status." Baja Corporation. https://insights.diligent.com/wp-content/uploads/2020/06/ESG-History-Status.pdf

Austin, Scott, Chris Canipe, and Sarah Slobin. 2019. "The Billion Dollar Startup Club." *Wall Street Journal*, 2019. https://www.wsj.com/graphics/billion-dollar-club/

Bai, Ge, Tinglong Dai, and Rajgopal Shivaram. 2020. "The PPE Supply Chain Is a Black Box—That Needs to Change." *Fortune*, 2020. https://fortune.com/2020/07/25/ppe-supply-chain-national-security/

Berzon, Alexandra, Shane Shifflett, and Justin Scheck. 2019. "Amazon Has Ceded Control of Its Site. The Result: Thousands of Banned, Unsafe or Mislabeled Products." *Wall Street Journal*, August 23, 2019. https://www.wsj.com/articles/amazon-has-ceded-control-of-its-site-the-result-thousands-of-banned-unsafe-or-mislabeled-products-11566564990

Bloomberg Intelligence. 2021. "ESG Assets May Hit $53 Trillion by 2025, a Third of Global AUM." *Bloomberg Professional Services*, February 23, 2021. https://www.bloomberg.com/professional/blog/esg-assets-may-hit-53-trillion-by-2025-a-third-of-global-aum/

BNP Paribas. 2019. "The ESG Global Survey 2019." BNP Paribas. https://securities.cib.bnpparibas/the-esg-global-survey-2019/

Boffo, Riccardo, and Robert Patalano. 2020. "ESG Investing: Practices, Progress and Challenges." OECD. https://www.oecd.org/finance/ESG-Investing-Practices-Progress-Challenges.pdf

Bolger v. Amazon.com, LLC. 2020, 53 Cal. App. 5th 431. Court of Appeal, 4th Appellate Dist., 1st Div.

Bowman, Robert. 2021. "Unilever Pledges a 'Living Wage' for Its Global Supply Chain." Supply Chain Brain. April 30, 2021. https://www.supplychainbrain.com/articles/32998-podcast-unilever-pledges-a-living-wage-for-its-global-supply-chain

Brophy, Meaghan. 2020. "Amazon Seller Fees: Cost of Selling on Amazon." Fit Small Business. September 1, 2020. https://fitsmallbusiness.com/amazon-seller-fees/

Buckley, Chris. 2015. "Documentary on Air Pollution Grips China." *New York Times*, March 1, 2015, sec. World. https://sinosphere.blogs.nytimes.com/2015/03/01/documentary-on-air-pollution-in-china-grips-a-nation/

CECP. 2010. "Shaping the Future: Solving Social Problems Through Business Strategy." Committee Encouraging Corporate Philanthropy and McKinsey & Company. https://www.mckinsey.com/~/media/mckinsey/dotcom/client_service/high%20tech/pdfs/shaping_the_future1.ashx

CFA Institute. 2015. "Environmental, Social, and Governance Issues in Investing: A Guide for Investment Professionals." CFA Institute.

Chen, Li, Hau Lee, and Christopher S. Tang. 2021. "Fair Price, Fair Trade, and Fair Pay in Supply Chains." Working paper.

Chen, Ying-Ju, Tinglong Dai, C. Gizem Korpeoglu, Ersin Körpeoğlu, Ozge Sahin, Christopher S. Tang, and Shihong Xiao. 2020. "OM Forum—Innovative Online Platforms: Research Opportunities." *Manufacturing & Service Operations Management* 22 (3): 430–45. https://doi.org/10.1287/msom.2018.0757

Chu, Laurence, Roderick McPhee, Wenmei Huang, Hamilton Bennett, Rolando Pajon, Biliana Nestorova, and Brett Leav. 2021. "A Preliminary Report of a Randomized Controlled Phase 2 Trial of the Safety and Immunogenicity of MRNA-1273 SARS-CoV-2 Vaccine." *Vaccine* 39 (20): 2791–99. https://doi.org/10.1016/j.vaccine.2021.02.007

Coates, John. 2021. "ESG Disclosure – Keeping Pace with Developments Affecting Investors, Public Companies and the Capital Markets." U.S. Securities and Exchange Commission. March 11, 2021. https://www.sec.gov/news/public-statement/coates-esg-disclosure-keeping-pace-031121

Dahlsrud, Alexander. 2008. "How Corporate Social Responsibility Is Defined: An Analysis of 37 Definitions." *Corporate Social Responsibility and Environmental Management* 15 (1): 1–13. https://doi.org/10.1002/csr.132

Dai, Tinglong. 2020. "Where Does Your PPE Come from? A Lack of Transparency Is Hurting Americans." *Fast Company*, July 15, 2020. https://www.fastcompany.com/90527227/where-does-your-ppe-come-from-a-lack-of-transparency-is-hurting-americans

Dai, Tinglong, Ge Bai, and Gerard F. Anderson. 2020. "PPE Supply Chain Needs Data Transparency and Stress Testing." *Journal of General Internal Medicine* 35 (9): 2748–49. https://doi.org/10.1007/s11606-020-05987-9

Dai, Tinglong, and Jing-Sheng Song. 2021. "Transforming COVID-19 Vaccines into Vaccination." *Health Care Management Science*, June. https://doi.org/10.1007/s10729-021-09563-3

Dai, Tinglong, and Christopher S. Tang. 2020a. "Amazon Has a Trust Problem." *Barron's*, April 7, 2020. https://www.barrons.com/articles/amazon-has-a-trust-problem-51596825474

———. 2020b. "Needed: A PPE Industrial Commons." *EE Times*, May 27, 2020. https://www.eetimes.com/needed-a-ppe-industrial-commons/

———. 2020c. “The U.S. Medical Supply Chain Isn’t Ready for a Second Wave.” *Barron’s*, June 23, 2020. https://www.barrons.com/amp/articles/the-u-s-medical-supply-chain-isnt-ready-for-a-second-wave-51592953230

———. 2020d. “How to Build a Coronavirus Vaccine Supply Chain.” *Bloomberg Law*, July 21, 2020. https://www.bloomberglaw.com/product/health/document/X5TJQ4LG000000

———. 2020e. “Influenza Vaccine Supply Chain Lessons for Coronavirus.” *Bloomberg Law*, July 21, 2020. https://www.bloomberglaw.com/product/health/document/XT3U3Q4000000

———. 2020f. “Safety First for Online Markets, or Customers May Shop Elsewhere.” *Barron’s*, August 25, 2020. https://www.barrons.com/amp/articles/safety-first-for-online-markets-or-customers-may-shop-elsewhere-51598370480

———. 2020g. “How to Distribute the COVID-19 Vaccine: Lessons from Amazon and Walmart.” *Fast Company*, December 16, 2020. https://www.fastcompany.com/90586746/how-to-distribute-the-covid-19-vaccine-lessons-from-amazon-and-walmart

———. 2021. “ESG Investing Has a Sustainability Blind Spot: Supply Chains.” *Fast Company*, November 23, 2021. https://www.fastcompany.com/90698724/esg-investing-has-a-sustainability-blind-spot-supply-chains

Dai, Tinglong, Muhammad H. Zaman, William V. Padula, and Patricia M. Davidson. 2021. “Supply Chain Failures amid Covid-19 Signal a New Pillar for Global Health Preparedness.” *Journal of Clinical Nursing* 30 (1–2): e1–3. https://doi.org/10.1111/jocn.15400

DHS. 2020. “Combating Trafficking in Counterfeit and Pirated Goods: Report to the President of the United States.” Department of Homeland Security. January 24, 2020. https://www.dhs.gov/sites/default/files/publications/20_0124_plcy_counterfeit-pirated-goods-report_01.pdf

Droesch, Blake. 2021. “Amazon Dominates US Ecommerce, Though Its Market Share Varies by Category.” Insider Intelligence. April 27, 2021. https://www.emarketer.com/content/amazon-dominates-us-ecommerce-though-its-market-share-varies-by-category

Elliott, Larry. 2019. “World’s 26 Richest People Own as Much as Poorest 50%, Says Oxfam.” *The Guardian*, 2019, sec. News. http://www.theguardian.com/business/2019/jan/21/world-26-richest-people-own-as-much-as-poorest-50-per-cent-oxfam-report

European Commission. 2018. “Renewed Sustainable Finance Strategy and Implementation of the Action Plan on Financing Sustainable Growth.” Text. European Commission - European Commission. 2018. https://ec.europa.eu/info/publications/sustainable-finance-renewed-strategy_en

Feeney, Matthew. 2015. “Is Ridesharing Safe?” Policy Analysis 767. Cato Institute. https://www.cato.org/policy-analysis/ridesharing-safe

Fink, Larry. 2021. “Larry Fink’s 2021 Letter to CEOs.” BlackRock. 2021. https://www.blackrock.com/corporate/investor-relations/larry-fink-ceo-letter

Fiore, Kristina. 2020. "Not Much Progress on PPE 'Reshoring.'" September 25, 2020. https://www.medpagetoday.com/special-reports/exclusives/88815

Fok, Patrick. 2020. "China Dominates the Pandemic PPE Market. What Does That Mean for U.S. as Virus Surges?" PBS NewsHour. October 27, 2020. https://www.pbs.org/newshour/show/china-dominates-the-pandemic-ppe-market-what-does-that-mean-for-u-s-as-virus-surges

Friedman, M. 1970. "The Social Responsibility of Business Is to Maximise Its Profits." *New York Times Magazine*, 1970.

Gelles, David, and David Yaffe-Bellany. 2019. "Shareholder Value Is No Longer Everything, Top C.E.O.s Say." *The New York Times*, August 19, 2019, sec. Business. https://www.nytimes.com/2019/08/19/business/business-roundtable-ceos-corporations.html

Greene, Jay. 2020. "Amazon Will Disclose Merchant Names to Discourage Rogue Sales." *Washington Post*, July 8, 2020. https://www.washingtonpost.com/technology/2020/07/08/amazon-will-disclose-merchant-names-discourage-rogue-sales/

Grind, Kirsten, and Shane Shifflett. 2019. "Shooting, Sex Crime and Theft: Airbnb Takes Halting Steps to Protect Its Users." *Wall Street Journal*, December 26, 2019, sec. Tech. https://www.wsj.com/articles/shooting-sex-crime-and-theft-airbnb-takes-halting-steps-to-police-its-platform-11577374845

Henderson, David. 2009. "Misguided Corporate Virtue: The Case Against CSR, and the True Role of Business Today." *Economic Affairs* 29 (4): 11–15. https://doi.org/10.1111/j.1468-0270.2009.01941.x

Henn, Jamie. 2016. "ExxonMobil Takes The Olympic Gold In Deceitful Advertising." Common Dreams. August 11, 2016. https://www.commondreams.org/views/2016/08/11/exxonmobil-takes-olympic-gold-deceitful-advertising

Ingraham, Christopher. 2020. "'Trickle-down' Tax Cuts Make the Rich Richer but Are of No Value to Overall Economy, Study Finds." *Washington Post*, 2020. https://www.washingtonpost.com/business/2020/12/23/tax-cuts-rich-trickle-down/

Kaplan, Robert S., and David McMillan. 2021. "Reimagining the Balanced Scorecard for the ESG Era." *Harvard Business Review*, February 3, 2021. https://hbr.org/2021/02/reimagining-the-balanced-scorecard-for-the-esg-era

Kotsantonis, Sakis, and George Serafeim. 2019. "Four Things No One Will Tell You About ESG Data." *Journal of Applied Corporate Finance* 31 (2): 50–58. https://doi.org/10.1111/jacf.12346

Kowsmann, Patricia, and Ken Brown. 2021. "Fired Executive Says Deutsche Bank's DWS Overstated Sustainable-Investing Efforts." *Wall Street Journal*, August 1, 2021. https://www.wsj.com/articles/fired-executive-says-deutsche-banks-dws-overstated-sustainable-investing-efforts-11627810380

Lewis, Michael. 2021. *The Premonition: A Pandemic Story*. W. W. Norton & Company.

Li, Jun, and Di (Andrew) Wu. 2020. "Do Corporate Social Responsibility Engagements Lead to Real Environmental, Social, and Governance Impact?" *Management Science* 66 (6): 2564–88. https://doi.org/10.1287/mnsc.2019.3324

Mackintosh, James. 2021. "ESG Is All the Rage. Big Investors Can't Agree on Why." *Wall Street Journal*, March 4, 2021. https://www.wsj.com/articles/everyone-sees-esg-investing-differently-but-they-all-want-to-buy-11614866558

Mak, Ho-Yin, Tinglong Dai, and Christopher S. Tang. 2021. "Managing Two-Dose COVID-19 Vaccine Rollouts with Limited Supply." Working paper. https://doi.org/10.2139/ssrn.3790836

Mishel, Lawrence, and Jori Kandra. 2020. "CEO Compensation Surged 14% in 2019 to $21.3 Million: CEOs Now Earn 320 Times as Much as a Typical Worker." Economic Policy Institute. August 18, 2020. https://www.epi.org/publication/ceo-compensation-surged-14-in-2019-to-21-3-million-ceos-now-earn-320-times-as-much-as-a-typical-worker/

Moura-Leite, Rosamaria C., and Robert C. Padgett. 2011. "Historical Background of Corporate Social Responsibility." *Social Responsibility Journal* 7 (4): 528–39. https://doi.org/10.1108/17471111111117511

NTI. 2019a. "The Global Health Security Index." Nuclear Threat Initiative. https://www.ghsindex.org/

———. 2019b. "Global Health Security Index: Building Collective Action and Accountability." Nuclear Threat Initiative. https://www.ghsindex.org/wp-content/uploads/2019/10/2019-Global-Health-Security-Index.pdf

Orlik, Tom, Justin Jimenez, and Cedric Sam. 2021. "World-Dominating Superstar Firms Get Bigger, Techier, and More Chinese." Bloomberg Businessweek. May 21, 2021. https://www.bloomberg.com/graphics/2021-biggest-global-companies-growth-trends/

Ovide, Shira. 2020. "Online Shopping Is Amazing. Or Is It?" *The New York Times*, December 15, 2020. https://www.nytimes.com/2020/12/15/technology/online-shopping.html

SEC. 2020a. "Recommendation from the Investor-as-Owner Subcommittee of the SEC Investor Advisory Committee Relating to ESG Disclosure." U.S. Securities and Exchange Commission. https://www.sec.gov/spotlight/investor-advisory-committee-2012/recommendation-of-the-investor-as-owner-subcommittee-on-esg-disclosure.pdf

———. 2020b. "ESG Subcommittee Update: Report to the SEC Asset Management Advisory Committee." U.S. Securities and Exchange Commission. https://www.sec.gov/files/ESGSubcommitteeUpdate.pdf

Shi, Yilin, Jing Wu, and Yu Zhang. 2021. "Corporate Social Responsibility in Supply Chain: Green or Greenwashing?" Working paper. The Chinese University of Hong Kong. https://doi.org/10.2139/ssrn.3700310

Shifflett, Shane. 2021. "How ESG Stocks Perform Depends on Who Ranks Them." *Wall Street Journal*, June 11, 2021. https://www.wsj.com/articles/how-esg-stocks-perform-depends-on-who-ranks-them-11623403803

Silk, David M., Sabastian V. Niles, and Carmen X. W. Lu. 2020. "The Other 'S' in ESG: Building a Sustainable and Resilient Supply Chain." *The Harvard Law School Forum on Corporate Governance* (blog). August 14, 2020. https://corpgov.law.harvard.edu/2020/08/14/the-other-s-in-esg-building-a-sustainable-and-resilient-supply-chain/

Simchi-Levi, David, and Edith Simchi-Levi. 2020. "We Need a Stress Test for Critical Supply Chains." *Harvard Business Review*, April 28, 2020. https://hbr.org/2020/04/we-need-a-stress-test-for-critical-supply-chains

Sodhi, ManMohan S., and Christopher S. Tang. 2019. "Research Opportunities in Supply Chain Transparency." *Production and Operations Management* 28 (12): 2946–59. https://doi.org/10.1111/poms.13115

Stone, Mark. 2020. *Product Liability: Electronic Retail Marketplaces*. *AB-3262*. https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201920200AB3262

Story, Louise, and David Barboza. 2007. "Mattel Recalls 19 Million Toys Sent From China." *The New York Times*, August 15, 2007. https://www.nytimes.com/2007/08/15/business/worldbusiness/15imports.html

Strasburg, Jenny, and Cecilia Butini. 2021. "AstraZeneca Loses Money on Covid-19 Vaccine for Second Straight Quarter." *Wall Street Journal*, July 29, 2021. https://www.wsj.com/articles/astrazeneca-loses-money-on-covid-19-vaccine-for-second-straight-quarter-11627547543

Strohbehn, Garth W., William F. Parker, Pankti D. Reid, and Walid F. Gellad. 2021. "Socially Optimal Pandemic Drug Dosing." *The Lancet Global Health* 9 (8): e1049–50. https://doi.org/10.1016/S2214-109X(21)00251-5

Tang, Christopher S., and Volodymyr Babich. 2014. "Using Social and Economic Incentives to Discourage Chinese Suppliers from Product Adulteration." *Business Horizons* 57 (4): 497–508. https://doi.org/10.1016/j.bushor.2014.03.009

Tang, Christopher S., Joshua D. Zimmerman, and James I. Nelson. 2009. "Managing New Product Development and Supply Chain Risks: The Boeing 787 Case." *Supply Chain Forum: An International Journal* 10 (2): 74–86. https://doi.org/10.1080/16258312.2009.11517219

Thomas. 2019. "A Brief History of Corporate Social Responsibility (CSR)." Thomas. September 25, 2019. https://www.thomasnet.com/insights/history-of-corporate-social-responsibility/

Thompson, Debora Viana, Rebecca W. Hamilton, and Roland T. Rust. 2005. "Feature Fatigue: When Product Capabilities Become Too Much of a Good Thing." *Journal of Marketing Research* 42 (4): 431–42. https://doi.org/10.1509/jmkr.2005.42.4.431

Toussaint, Kristin. 2020. “One Year Ago, the Business Roundtable Pledged to Reshape the Culture of Business. Has Anything Changed?” *Fast Company*, August 19, 2020. https://www.fastcompany.com/90540844/one-year-ago-the-business-roundtable-pledged-to-change-the-culture-of-business-how-did-they-do

Ward, Halina, and N. Craig Smith. 2006. *Corporate Social Responsibility at a Crossroads: Futures for CSR in the UK to 2015*. London: IIED. http://www.iied.org/pubs/pdfs/16019IIED.pdf

Weise, Karen. 2021. “Amazon’s Profit Soars 220 Percent as Pandemic Drives Shopping Online.” *The New York Times*, April 29, 2021. https://www.nytimes.com/2021/04/29/technology/amazons-profits-triple.html

Xiao, Shihong, Ying-Ju Chen, and Christopher S. Tang. 2021. “Customer Review Provision Policies with Heterogeneous Regional Preferences.” *Management Science*. https://doi.org/10.2139/ssrn.3403322

Yardley, Jim. 2008. “Baby Formula Sickened Many More, China Says.” *The New York Times*, September 17, 2008. https://www.nytimes.com/2008/09/17/world/asia/17milk.html

Zimmer, Carl, Jonathan Corum, and Sui-Lee Wee. 2021. “Coronavirus Vaccine Tracker.” *The New York Times*, 2021. https://www.nytimes.com/interactive/2020/science/coronavirus-vaccine-tracker.html

ABOUT THE AUTHORS

Tinglong Dai is a Professor of Operations Management and Business Analytics at Johns Hopkins University. He serves on the leadership team of the Hopkins Business of Health Initiative and the executive committee of the Institute for Data Intensive Engineering and Science. As a leading expert in healthcare analytics, Dr. Dai has been quoted hundreds of times in the media, including the Associated Press, *Bloomberg*, *CNBC*, CNN, *Fortune*, *Harvard Business Review*, *New York Times*, NPR, PBS, *USA Today*, *Wall Street Journal*, and *Washington Post*. In 2021, *Poets & Quants* named him one of the World's Best 40 Under 40 Business School Professors. Dr. Dai's research interests span across healthcare, marketing-operations interfaces, and human-AI interaction. His work has been published in leading journals such as *Management Science*, *M&SOM*, *Marketing Science*, and *Operations Research*, and has been recognized by Johns Hopkins Discovery Award, INFORMS Public Sector Operations Research Best Paper Award, POMS Best Healthcare Paper Award, and Wickham Skinner Early Career Award. He currently serves as an Associate Editor for *M&SOM*, *Naval Research Logistics*, and *Health Care Management Science,* and as a Senior Editor for *Production and Operations Management*. He graduated from Carnegie Mellon University with a PhD in Operations Management and Robotics in 2013.

Christopher Tang is a UCLA Distinguished Professor and the holder of the Edward W. Carter Chair in Business Administration. In addition to his academic activities at UCLA, he serves as President of the Production and Operations Management Society (2013-2104) and as Chairman of the Advisory Board of the Hong Kong Polytechnic University Business School (2012-2015). He has also served as a member of the International Advisory Board of the Hong Kong City Univeristy Business School (2009 - 2012), and as an external reviewer of the Columbia-London Business School-Hong Kong University Executive MBA program (2009) as well as the Chinese Univeristy of Hong Kong Executive MBA program (2009-2012). His research spans across different areas including: global supply chain management, retail operations, and social business operations. He has co-edited 4 books, co-written 1 book, and published over 100 academic articles in research journals and management articles in Wall Street Journal, Financial Times, and The Guardian. He served on editorial boards for over 15 international journals and research boards for startup companies. He has advised companies such as Abbott Laboratories, Accenture, Amgen, Andersen Consulting, Bay Networks, Emerson Electric (Hong Kong), Federal Reserve Bank, GKN (United Kingdom), Hewlett Packard Company (world-wide locations), Honda America, Hughes Aircraft Company, Nestlé USA, IBM (world-wide locations), ICL International, Intertek Testing Services (England), Information Technology Institute (Singapore), Johnson and Johnson, Kleiner Perkins Caufield & Byers, Kurokabe (Japan), Northrop-Grumman, and Orient Overseas

Container Limited (Hong Kong). Currently, he serves as a board member of Asia Pacific Health Ventures (California).

ABOUT ASIA GLOBAL INSTITUTE

Inaugurated on July 1, 2015, the Asia Global Institute is a multidisciplinary think tank co-established by The University of Hong Kong and the Fung Global Institute. Its mission is to generate and disseminate research and ideas on global issues from Asian perspectives.

ISSN: 2706-8554 (print); 2706-8552 (online)

Draft submitted in August 2021
Published in January 2022

ASIA GLOBAL INSTITUTE
Room 326-348, 3/F, Main Building
The University of Hong Kong, Pokfulam, Hong Kong
agimail@hku.hk I +852 3917 1297
www.asiaglobalinstitute.hku.hk

ASIA
GLOBAL
INSTITUTE

MIX
Paper from
responsible sources
FSC™ C006398