Companies’ contribution to sustainability through global supply chains

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Global supply chains play a critical role in many of the most pressing environmental stresses and social struggles identified by the United Nations’ Sustainable Development Goals (SDGs). Responding to calls from the global community, companies are adopting a variety of voluntary practices to improve the environmental and/or social management of their suppliers’ activities. We develop a global survey of 449 publicly listed companies in the food, textile, and wood-products sectors with annual reports in English to provide insight into how the private sector contributes to advancing the SDGs via such sustainable-sourcing practices. We find that while 52% of companies use at least one sustainable-sourcing practice, these practices are limited in scope; 71% relates to only one or a few input materials and 60.5% apply to only first-tier suppliers. We also find that sustainable-sourcing practices typically address a small subset of the sustainability challenges laid out by the SDGs, primarily focusing on labor rights and compliance with national laws. Consistent with existing hypotheses, companies that face consumer and civil society pressure are associated with a significantly higher probability of adopting sustainable-sourcing practices. Our findings highlight the opportunities and limitations of corporate sustainable-sourcing practices in addressing the myriad sustainability challenges facing our world today.

Significance

Supply chains tied to multinational corporations represent over 80% of global trade and engage over one in five workers. Supply-chain management therefore has a significant impact on key social and environmental challenges. Despite this importance, there is currently no comprehensive, empirically grounded understanding of how companies address sustainability in their supply chains. We develop a global database based on a random sample of publicly listed companies with annual reports in English to provide insight into how the private sector contributes to advancing global sustainability via their supply chains. This study provides a large-scale empirical analysis of corporate sustainable-sourcing practices across multiple sectors and geographies.

For decades, the global community has urged companies to contribute to the advancement of a sustainable global economy (1). Companies initially responded through corporate social responsibility (CSR) initiatives to address social or environmental challenges in their own operations or in neighboring communities (2). As globalization has spread the production of goods around the world, the social and environmental impacts of consumption in rich and emerging economies has increasingly been displaced to distant locations via global supply chains. With 80% of global trade flowing through multinational corporations (3), one in five jobs tied to global supply chains (4), and over 95% of environmental impacts of food and retail companies stemming from their supply chains (5), supply chains play an outsized role in many of the most pressing social and environmental challenges (6).

The United Nations’ Sustainable Development Goals (SDGs) explicitly highlight the role of corporate supply chains for a sustainable global economy (7). Supply-chain sustainability is becoming an integral part of companies’ strategies to contribute to sustainable development (8–11). A 2008 KPMG survey reports that over 90% of the world’s top 250 businesses employ some form of standard to regulate their suppliers’ social and/or environmental behaviors (12). Similarly, sustainable certification or eco-labels have grown in popularity, with over 90% of sustainable-sourcing certifications having been created in the last two decades (8). Empirical evidence suggests that at least some companies’ supply-chain initiatives have contributed to tackling sticky problems from Amazonian deforestation to improving factory workers’ rights (13–15).

Despite the recent growth in companies’ commitments to sustainable supply chains, we lack a comprehensive understanding of how companies are advancing supply-chain sustainability. There have been no large-scale empirical evaluations of what sustainable development topics companies address, what practices companies commonly use, or what types of companies are implementing practices to advance sustainability in their supply chain. To address this gap, we study companies’ sustainable-sourcing practices (SSPs), defined as voluntary practices companies pursue to improve the social and/or environmental management of their suppliers’ activities. Such SSPs are distinct from a company’s approach to addressing social and environmental impacts within their own operations and from general philanthropic initiatives that are not tied to the company’s supply chain.

Our current understanding of companies’ SSPs is restricted to case studies of individual companies (16–18), conceptual frameworks (9, 19), and theoretical models (20–22). The few empirical evaluations of SSPs are limited by small and nonrepresentative samples that substantially bias their results (23, 24). Scholars have suggested that SSPs will be used primarily by large companies facing consumer, civil society, investor, or government pressures (18, 21, 25–28). Other research has suggested that corporate sustainability approaches will deal only with practices relevant to companies’ self-interest (25, 29). These hypotheses have not yet been tested in a representative sample (SI Materials and Methods).

We address the following questions: What SSPs currently exist, and which practices do companies most commonly use? How do these SSPs contribute to the United Nations’ SDGs? What factors influence the adoption of SSPs by companies? We develop an
original dataset of SSPs in a random, global sample of 449 companies with annual reports in English in the food, wood-products, and textile sectors that are listed on the 12 largest organizations for Economic Co-Operation and Development (OECD) stock exchanges. We use content analysis of corporate sustainability reports, annual reports, and company websites to identify SSPs reported by the sampled companies. (For an example of how iconic companies perform in our content analysis, see SI Materials and Methods.) This study provides a large-scale analysis of sustainable sourcing across multiple sectors and geographies.

Results

Our main findings are as follows:

i) Fifty-two percent of companies have adopted at least 1 of 16 distinct SSPs, with the most common SSP being a supplier code of conduct.

Overall, 235 of 449 companies sampled (52%) use some form of SSP within their supply chain (Fig. 1 and SI Materials and Methods). We identified 16 distinct practices, which range from third-party certification of production standards defined by nongovernmental organizations (NGOs) to training suppliers related to social or environmental criteria (Table 1). These practices can be classified based on (i) who defines the practice and (ii) whether social and/or environmental production standards are defined. External standards have production standards defined by entities external to the company. Internal standards have production standards defined internally by a company for its supply chain. Internal interventions apply to a company’s supply chain but do not have defined production standards. Thirty-one percent of companies use external standards, 45% of companies use internal standards, and 28% of companies use internal interventions. A single company can use multiple SSPs. By far the most common approach is a supplier code of conduct, with over 40% of companies having a code of conduct related to social and/or environmental issues in their supply chain. Other SSPs often build on a code of conduct: 82% of companies who adopt any other SSP also have a code of conduct.

Companies may also conduct research to better understand social and/or environmental issues in their supply chain, convey aspirational goals and commitments, or donate to projects or civil society groups in regions from which they supply. While such practices may signal a company’s interest in impacting their suppliers’ production practices, they are not tools that companies use to change the social and/or environmental management of their suppliers’ activities. Hence, we do not consider such efforts SSPs. These other activities include risk screening of a supply chain, life-cycle assessments, donations, and pledges to address key issues in the supply chain (SI Materials and Methods).

ii) Seventy-one percent of SSPs are tied to specific input materials. SSPs often cover only a single input of a company’s product(s). For example, a company might use recycled materials for the packaging of a product but leave the remainder of a product’s upstream impact unaddressed. Seventy-one percent of SSPs relate to either a single input or a subset of a company’s input materials, covering 1.3 materials on average. Companies who use SSPs cover a total of four input materials on average. The most common input materials addressed through SSPs are wood and palm oil.

In addition, 27% of input-specific SSPs apply only to a single product line or are being implemented at a pilot scale rather than being implemented systematically across all purchases of the input. For example, a company may use fair trade certification for only one line of coffee that it sells or may provide training to only a small subset of its suppliers.

iii) Thirty-seven percent of SSPs use external verification (third-party audits).

For external and internal standards, where verification of environmental and/or social standards is possible, we examined whether the company reported verification and, if so, the type of audit used. We find that 96% of external standards are third-party audited (verification by an independent body), with only sector standards relying somewhat on second-party audits (conducted by the buying company) or first-party audits (conducted by the supplier) (Fig. 2 and SI Materials and Methods). In contrast, many internal standards do not provide information on whether audits are conducted. For example, if companies require that a supplier change its production practices, they do not disclose whether the supplier is audited to ensure such a change has in fact occurred. Overall, 37% of all SSPs are third-party audited, 15% are second-party audited, 5% use first-party audits, and 18% disclose no information on their audit approach. The remaining 25% of SSPs are internal interventions.

iv) The vast majority of SSPs apply only to a single tier in the supply chain, with 60.5% of SSPs applying only to first-tier suppliers.
A company operating in a multitiered supply chain can enforce an SSP with its direct suppliers (first tier), intermediate-tier suppliers (subsuppliers), raw material producers (at the farm, fishery, or forest level), or via traceability through the whole supply chain. A company that sources directly from the raw material producer only has a single tier to which to apply the SSP (first tier, raw material). Forty-eight percent of SSPs address only first-tier suppliers. An additional 12.5% of SSPs focus on first-tier, raw material producers. Thirty-five percent of SSPs address a company’s raw material producers that are not direct suppliers of the company. SSPs rarely address the intermediate tiers of a supply chain (1.5%). SSPs that trace a product from raw material producer to final product are used in just 3% of the cases. Most raw material producers are covered by external standards, while internal standards primarily address first-tier suppliers (Fig. 3 and SI Materials and Methods).

v) SSPs rarely address the broad social and environmental challenges outlined in the SDGs, focusing primarily on SDGs related to working conditions and compliance with national laws.

When relating SSPs to the SDGs, we first note that, by definition, all SSPs relate to SDG 12: Responsible Production and Consumption. In addition, SSPs primarily address SDG 8: Decent Work and Economic Growth (via labor rights) and SDG 16: Peace, Justice, and Strong Institutions (via compliance with national law requirements), with almost 50% of all companies addressing each of these topics in their supply chain (SI Materials and Methods). In contrast, only 15% of companies address health, energy, infrastructure, climate change, education, gender, or poverty in the supply chain directly. External standards focused the most on SDG 2: Zero Hunger (via sustainable agriculture) and SDG 15: Life on Land (mostly via land use), while internal standards focused primarily on SDGs 8 and 16. Internal interventions dealt with topics that were largely missing from the standards, including SDGs related to health, education, gender, and inequality. The focus of SDGs was largely consistent across sectors.

vi) Large, branded companies exposed to consumer and civil society pressure are significantly more likely to adopt SSPs.

We used a logistic regression (logit) model to identify which variables significantly predict SSP adoption in our sample, using Lasso estimation. We find that high brand value, large revenues, serving European markets, not serving markets in...
Second, companies are often using SSPs for only a small subset of their input materials or product lines. On one hand, a focus on key input materials, like palm oil and wood products allows companies to address the most critical inputs in their supply chains, as these commodities can have significant negative impacts (31). On the other hand, the lack of comprehensive coverage across suppliers and input materials highlights an important limitation of the reach and impact of SSPs that is rarely acknowledged in the discourse on sustainable sourcing. Companies may be unlikely to use SSPs for 100% of a product’s input materials, as consumers rarely differentiate between fully and partially sustainable products (32). Furthermore, consistent with our finding that consumer and civil society pressure significantly drives SSP adoption, companies may target their sustainable-sourcing efforts only at input materials that have been the topic of visible campaigns (33).

We also find significant diversity in the audit stringency by which SSPs are enforced, and a large number of companies provide no information on SSP audit requirements. This might reflect the lack of consensus on how best to verify compliance or the challenges that companies face with trying to ensure compliance. Previous studies have questioned the ability of third-party (34–36), second-party (37), and first-party verification (38) to effectively identify and remediate issues in supply chains. Theoretical studies have suggested that the inability to effectively monitor and punish actors based on adherence to requirements makes compliance unlikely (39, 40). There is a critical need to better understand how different types of verification, or lack thereof, influence the effectiveness of SSPs.

The United Nations’ SDGs define the global agenda for sustainability for years to come. However, we find that companies’ sustainability efforts in global supply chains are largely focused on workers’ rights and compliance with national laws. Important social (e.g., health, education, gender, inequality) and environmental (e.g., climate change, energy) issues are rarely the primary focus of SSPs. This raises concern, as companies are expected to be a major player in achieving the SDGs via their global supply chains (7). However, we also see a few leading companies finding

Fig. 3. How far down the supply chain each SSP applies for each SSP group.
innovative ways to address these more challenging topics, which suggests that there are opportunities for supply-chain initiatives to contribute to a more comprehensive range of SDGs. Companies also address the SDGs through internal or philanthropic activities, which is outside the scope of this paper.

Our results also illuminate the influence of external pressures on SSP adoption. Companies that face consumer pressures, either by having a consumer-facing product, a high brand value, or by serving European markets, are associated with a significant increase in uptake of SSPs. These findings support the hypotheses that companies facing consumer pressure are most likely to adopt sustainability initiatives (21, 25, 26, 41). We also find that civil society pressure, as measured by HQ NGO density, is associated with an uptake of SSPs. This supports hypotheses that external stakeholders are able to pressure companies into action around sustainability (42, 43). In contrast, there was no association between the strength of environmental regulations in the country where the company is headquartered and the uptake of SSPs. Research should further explore how company pressure on sustainability initiatives. Future research should explore how company-reported actions align with actual implementation of SSPs, as some scholars have questioned whether companies actually punish suppliers for failing to comply with sustainability criteria (48, 49). We are also limited to English-only corporate reports to avoid the potential translation bias of defining sustainable-sourcing terms across languages. This sampling decision led to some bias in our sample, with excluded companies being smaller, less likely to be leaders in their sector, and more likely to be serving Asian markets (SI Materials and Methods). Our results are thus likely to be an upper estimate of the prevalence of SSPs among global publicly listed companies.

Conclusion

This study is a large-scale survey of how companies across multiple sectors and geographies contribute to global sustainability via their supply chains. Companies address environmental and social challenges in their supply chain by relying on a portfolio of 16 distinct practices, which is much more diverse than commonly assumed and studied. Supplier codes of conduct and NGO-led certifications are just some of the mechanisms used by companies to promote sustainability in their supply chain. Disciplinary blinders have tended to focus different fields on only a subset of SSPs. Our study combines these separate streams of literature through a comprehensive analysis of the range of strategies companies use in practice to address social and environmental issues in their supply chains.

Although there are positive indications of SSP uptake, the reach of these practices is limited by the types of companies that adopt them, the products and supply-chain tiers they cover, the strength by which they are enforced, and the SDGs they address. Consumer and civil society pressure among branded firms appears to be an effective tool to encourage SSP uptake. For non–consumer-facing firms, encouraging uptake of SSPs is more difficult. Identifying key social and environmental risks may be an effective tool to encourage change among these companies. For supply-chain interventions to effectively drive social and environmental change at a global scale, private-sector actors need to more widely adopt SSPs that are stringent, verifiable, address a broad set of sustainability issues, and reach all tiers of global supply chains.

Materials and Methods

Sample. We took a random sample of 1,000 publicly listed companies on the 12 largest OECD stock exchanges in the food, textile, and wood-product sectors. We oversampled companies because, at the time of sampling, it was not possible to know which companies would have annual reports available in English or would have missing documents. During the coding process, we excluded companies that had documents missing or did not have an annual report in English. This led to some bias, as excluded companies differed from our sample on a number of variables, likely resulting in an overreporting of SSP presence (SI Materials and Methods).

Data Sources. We use information published by companies relating to sustainability and sourcing in the 2015 fiscal year. We examined the company’s sustainability report (if any), annual report, and relevant website pages (“corporate sustainability documents”), using a digital archive of websites from December 31, 2015 (50).

Content Analysis. We use content analysis to extract information on SSPs mentioned by firms in their corporate sustainability documents. Content analysis is a qualitative method to categorize text into groups based on clear selection criteria (51). Following best practices, we developed a detailed codebook with definitions for each item and calibrated our codebook on over 70 preliminary companies. Four research assistants received 2 wk of intensive training before coding documents in NVivo 11 (QSR International). Cross-coder reliability of over 90% was achieved in the sample of 15 documents.

Our primary outcomes of interest are corporate SSPs. We categorized SSPs based on common sustainable-sourcing typologies used in the literature and expanded this framework based on practices that emerged from the coding process (9, 17, 18). We also select additional characteristics that have been suggested to influence the effectiveness of sourcing practices (18, 52).

We also categorized each SSP to the primary SDGs it addressed. We developed a codebook defining how each of the 17 SDGs relates to companies’ practices by consulting the official definitions and objectives for each SDG and the SDG Compass explanations developed by the United Nations to translate the SDGs into relevant business practices (53, 54). We constrained our analysis of SDGs to the primary focus of each SSP, typically resulting in two or three SDGs being coded to each SSP.

Statistical Analysis. We use a logistic regression to explore what company characteristics are associated with the uptake of any SSP. Our model consists of 11 independent variables and seven control variables, with 136 interaction terms. We use Lasso (55), well-suited for high-dimensional regressions, to perform model selection and estimation of regression parameters simultaneously.

Table 3. Independent variables used in logit model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measurement</th>
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<tbody>
<tr>
<td>High brand value</td>
<td>Company in the Interbrand or Reputation Institute list of companies with high brand value (56, 57)</td>
</tr>
<tr>
<td>Top-10 market share</td>
<td>Whether firm is one of top 10 companies by revenue in their sector</td>
</tr>
<tr>
<td>Size of company Markets served</td>
<td>Logged average company revenues over last 5 y if company derives 10%-+ of revenues from Europe, North America, Asia-Oceania, and rest of world</td>
</tr>
<tr>
<td>Serves multiple regions</td>
<td>Company derives revenue from more than two continents</td>
</tr>
<tr>
<td>HQ environmental stringency</td>
<td>An equally weighted index of the World Economic Forum’s 2015 Executive Opinion Survey questions on perceived stringency and enforcement of environmental regulations and number of ratified international environmental treaties (58)</td>
</tr>
<tr>
<td>HQ NGO density</td>
<td>Logged number of international NGOs per 1,000 citizens (59) (International NGOs per country from the Yearbook of International Organizations; population data from the US Census Bureau’s International Database 2016).</td>
</tr>
<tr>
<td>Operational risk</td>
<td>Company mentions environmental, social, reputation, or regulatory risk of supply in corporate sustainability documents</td>
</tr>
<tr>
<td>Consumer-facing</td>
<td>Company has a brand visible to end consumers</td>
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To determine the Lasso penalty term, we used 10-fold cross-validation. We then computed the first differences of each independent and control variable (ROA), the presence of a sustainability report, adherence to the GRI CSR reporting standards, and membership in the Consumer Goods Forum (CGF), a major food, wood-products, and textile industry network that makes sustainability commitments. For robustness checks, we also ran models with the 2015 ROA, the 3-y ROA average, and adding in gross domestic product per capita in the country of the company headquarters (Hdq GDP), with similar results.

Several omitted variables may influence results. We expect that other companies are doing in an industry impacts decisions by companies to adopt certain SSPs. We account for this using an industry-level Top 10 variable to identify leaders in each sector. We also expect that media attention to individual companies influence the adoption of SSPs. (10), we account for this using (i) a proxy for brand value and (ii) whether the firm is consumer-facing. Strong management commitment to sustainability may also play a role in encouraging SSP adoption (17). Given the cross-sectional nature of our dataset, we are unable to fully account for these influences. Time-series approaches would be required to isolate these potential effects.

Data from this project are available on the Stanford Digital Repository at https://purl.stanford.edu/hv344k7076.

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