The Gap-Filling Role of Private Environmental Governance: A Case Study of Semiconductor Supply Chain Contracting

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The Gap-Filling Role of Private Environmental Governance: A Case Study of Semiconductor Supply Chain Contracting

ABSTRACT

Three of the principal international agreements that govern various aspects of hazardous substances or wastes are not legally binding on American companies because the US Congress has not passed the requisite implementing legislation. The failure of American companies to meet or exceed the standards set forth in these agreements, although not legally mandated, could be detrimental to American businesses operating on the global stage. The American semiconductor industry responded to this potential disconnect by developing internal firm-specific standards that bind suppliers through supply chain agreements. This Note explores the phenomenon of private standard setting in the semiconductor industry, a prime example of private environmental governance. It seeks to explain how, if at all, private standard setting in the semiconductor industry reflects, undercuts, or fills gaps inherent in the law governing this area in the United States. After looking closely at these standards, this Note recommends two general approaches that will improve upon the current firm-specific toxics standards.

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Companies must conform to various standards of conduct, stemming from domestic legal requirements, foreign laws and the norms of the countries in which they operate, and rules and regulations promulgated by a wide array of influential non-governmental organizations. To the extent those norms and laws are reflected in international environmental agreements that have not been implemented in the United States, American companies are vulnerable to legal challenge or decreased business opportunities if they comply only with domestic legal requirements.

Enter private environmental governance, which interacts with public environmental governance in a variety of ways, including supplementing, superseding, undermining, or simply filling in gaps inherent in many public efforts. Instead of merely reacting to
continually evolving global environmental standards, semiconductor firms have embraced private environmental governance by proactively implementing self-regulating standards to minimize any adverse impact external intervention might have on their supply chains and manufacturing operations more generally. These self-regulating standards are not uniform across the semiconductor industry; instead, individual manufacturers develop their own standards with which they then require their suppliers to comply.

The objective of this Note is to determine the role supply chain contracting plays in private environmental governance, primarily by analyzing the documents governing toxic chemicals that accompany supply chain agreements. In addition, this Note relies on sustainability reports, annual reports, and other publicly available information provided by American semiconductor firms that illuminate how these firms communicate the presence of toxics in their supply chains to the public and how they attempt to regulate those toxics. This Note details the primary mechanism several key firms in the semiconductor industry use to regulate toxics through their supply chains, examines possible reasons these firms might be policing the toxic chemicals in their supply chains, and concludes that the private regulation of toxics through supply chain contracts fills gaps created by the US government's failure to implement international toxics agreements, at least at the federal level. Additionally, this Note highlights the firm-specific nature of these standards and recommends a uniform approach across the semiconductor industry, or a broader approach across manufacturers more generally. As an alternative to uniform standards, this Note proposes the creation of a database to compile the various firm-specific requirements, which would eliminate some of the burden individualized firm standards put on suppliers serving multiple firms or even multiple industries.

II. FOCUSING IN ON THE SEMICONDUCTOR INDUSTRY

A. Introduction to the Semiconductor Industry

The semiconductor industry majorly impacts the everyday lives of citizens spanning most of the globe. Semiconductors are the microchips that control all modern electronics. Although these microchips are safe in their manufactured, useful form, large

amounts of high-grade chemicals are used to produce them, including: highly corrosive hydrochloric acid; volatile solvents like toluene, benzene, methyl chloroform, and acetone; toxic gases including arsine; and metals including arsenic, cadmium, and lead. Unsurprisingly, many of the chemicals utilized, including those listed above, and the waste they ultimately produce, are hazardous. As a result, these chemicals are regulated under a number of international agreements, domestic laws, and increasingly by manufacturers themselves through supply chain agreements with the companies that supply their raw materials and component parts.

B. Why Does This Industry Serve as a Fitting Case Study?

The American semiconductor industry may serve as an instructive case study in private environmental governance because it generates tremendous profits and has achieved great success in producing more efficient, better-performing electronic components while simultaneously developing more sustainable manufacturing processes. In 2015, the global semiconductor industry generated USD 335 billion in sales. The American semiconductor industry has the largest market share in the global semiconductor industry,


4. For example, the NIOSH Pocket Guide to Chemical Hazards lists the following as symptoms that can occur following toluene exposure: “irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage.” NAT’L INST. FOR OCCUPATIONAL SAFETY AND HEALTH, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS (2016), https://www.cdc.gov/niosh/npg/npgd0619.html (last visited Jan. 14, 2018) [https://perma.cc/JY2G-YTCH] (archived Feb. 19, 2018).


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controlling over 50 percent of the market. Further, electronics constitute the single largest American export category, worth more than USD 120 billion per year, and semiconductors are a key component of almost all electronic products. Exports of semiconductor components themselves, worth USD 43 billion, were second only to the export value of automobiles and aircraft. United States-based semiconductor industry global sales have seen an average annual rate of increase of 14.6 percent over the twenty-year period from 1994 to 2014.

Of particular relevance to supply chain contracting, the US semiconductor industry conducts about 52 percent of its manufacturing in the United States. Since not every raw material needed in semiconductor manufacturing is readily available in the United States, American semiconductor companies are importing raw materials (and, in some cases, pre-manufactured components or component parts) into the United States.

III. GOVERNING INTERNATIONAL ENVIRONMENTAL AGREEMENTS

This Note explores three international agreements that govern aspects of hazardous substances or wastes: the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes of 1989 (the Basel Convention), the Rotterdam Convention on Prior Informed Consent of 1998 (the Rotterdam Convention), and the Stockholm Convention on Persistent Organic Pollutants of 2001 (the Stockholm Convention). These Conventions differ from each other in a number of ways, but for this analysis, the key difference is the way in which they choose which substances to regulate and, consequently, the substances they ultimately cover. These agreements—and the US Congress’s failure to implement them—illustrate the gap between international law and domestic law that creates a challenge for American companies that operate on the international stage.

8. Id. at 8.
9. Id.
10. Id. at 4.
11. Id. at 7.
12. See, e.g., Alexander C. Kaufman, How Intel Eliminated War from Its Supply Chain, HUFFINGTON POST (Jan. 12, 2016, 3:56 PM ET), http://www.huffingtonpost.com/entry/intel-conflict-free-minerals_usa_569520e5e4b065b3245da6ea7 [https://perma.cc/GD36-6NUP] (archived Jan. 31, 2018) (discussing the steps Intel took to find alternative sources of materials when it learned it may have been inadvertently funding the conflict in the Democratic Republic of Congo through its purchase of minerals and metals).
A. The Basel Convention

On March 22, 1989, the Basel Convention was adopted in response to public outcry following the discovery that developed countries were depositing toxic wastes in Africa and other parts of the developing world. The Basel Convention seeks to "protect human health and the environment against the adverse effects of hazardous wastes" by prohibiting trade in such wastes when (1) the importing country fails to provide written consent; or (2) the exporting country has reason to believe that the particular wastes will not be handled in an environmentally sound manner. The Basel Convention covers an array of "hazardous wastes" that were selected by the drafters based on their source, composition, and characteristics, plus "other wastes," a category that includes household waste and incinerator ash. These "other wastes" are not generated by the semiconductor industry, and are included in this description of the Basel Convention solely for the sake of completeness. Wastes may be deemed "hazardous wastes" for the purpose of the Basel Convention if they (1) are both listed in Annex I and possess any of the hazardous characteristics contained in Annex III, or (2) are considered to be hazardous wastes by the domestic legislation of the exporting, importing, or transit party. The Basel Convention prohibits the export of any hazardous or other waste until the importing and transit nations have authorized the transport in writing. The authorization process requires the participant countries, the disposer, and the exporter to share information regarding the waste itself, including the nature and amount, and the contract specifications governing waste management. Under the Basel Convention, the parties themselves independently choose whether to prohibit the import of hazardous or other wastes into their respective counties.

14. Id.
17. Put differently, under the Basel Convention, it is not enough to be listed in Annex I to be deemed a "hazardous waste"; wastes listed in Annex I must also possess a hazardous characteristic listed in Annex III to be subject to regulation. Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, supra note 15, art. 1.
18. Id.
19. Id. art. 6.
20. Id.
21. Id. art. 4, ¶1.
prohibit such imports, it is then prohibited from exporting said waste. Since the parties themselves ultimately decide whether to prohibit the import of a particular hazardous waste, scientific considerations play, at most, an indirect role and are subject to the individual country’s values, resources, and priorities.

**B. The Rotterdam Convention**

The Rotterdam Convention, adopted on September 10, 1998, seeks to protect human health and the environment by encouraging cooperation and facilitating information-sharing between parties in the international trade of certain hazardous materials. A party in each of two separate “Prior Informed Consent regions” must ban or severely restrict a chemical and notify the Secretariat of the ban or restriction before the chemical can be evaluated for addition to the Convention. The seven “Prior Informed Consent regions” were adopted solely to effect the purposes of paragraph 5 of Article 5 of the Convention, which describes the procedures for listing chemicals to the Convention, and are arranged logically by geographic region. By requiring notification from two separate regions, the Convention aims to target widely used chemicals; otherwise, the list could be filled with chemicals of concern to a particular region that are not used elsewhere.

The notification must include (1) the chemical’s common name, according to an internationally recognized nomenclature, and trade names; (2) information on the hazard classification if the chemical is subject to such classification requirements; (3) use of the chemical; and (4) physico-chemical, toxicological, and ecotoxicological properties. The notifications are then sent to the Chemical Review...

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22. *Id.* art. 4, ¶1(b).
26. Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, *supra* note 23, art. 5. Pesticides are evaluated under a different procedure, which will not be discussed here since pesticides are not involved in semiconductor manufacturing. See *id.* art. 6.
Committee for consideration. Paragraph 6 of Article 18 of the Convention specifies, "Membership of the Committee shall consist of a limited number of government-designated experts in chemicals management." The Committee evaluates the notifications in accordance with the criteria set out in Annex II of the Convention, which ensures both the integrity of the data and that the Committee has considered the effect of the final regulatory action chosen. The Committee then makes a recommendation regarding whether the chemical should be made subject to the Prior Informed Consent Procedure. The Chemical Review Committee does not have the final word on whether a particular chemical will be listed in Annex III, the repository of chemicals that are regulated under the Convention. Instead, the Committee generates a draft decision that is forwarded to the Conference of the parties where the final decision is made. Here, too, science is considered in conjunction with other factors that countries weigh differently depending on their particular values and priorities.

C. The Stockholm Convention

The Stockholm Convention seeks to regulate persistent organic pollutants in a way that protects human health and the environment. The precautionary approach set forth in the 1992 Rio Declaration on Environment and Development, which sought to guide signatories in future sustainable development, significantly influenced this goal. Persistent organic pollutants, commonly referred to as "POPs," are carbon-based chemical substances that, by virtue of their chemical and physical properties, remain in the environment for significant periods of time, gradually spreading throughout the environment. These chemicals accumulate in fatty tissues, biomagnify—or increase in concentration—as they move through the food chain, and are toxic to both humans and wildlife. Due to their

28. Id. art. 5.
29. Id. art. 18.
30. Id. at annex II.
31. Id. art. 5.
32. Id. art. 7.
33. Id.
37. Id.
long lifespans, toxicity, and mobility, POPs are of particular interest to regulators.

A party seeking listing or targeting of a particular chemical by the Stockholm Convention must submit a proposal to the Secretariat containing the information specified in Annex D.\textsuperscript{38} Annex D requires that the requesting party include the following items in the proposal: (1) chemical identity, which includes names and structure; (2) persistence, which includes evidence that the chemical is "sufficiently persistent to justify its consideration within the scope of this Convention"; (3) bio-accumulation, which includes the bio-concentration factor, monitoring data, or other data showing the chemical "presents other reasons for concern"; (4) potential for long-range environmental transport, which may include monitoring data or modeling data; and (5) evidence of adverse effects or toxicity data that shows listing of the chemical is appropriate under the Convention.\textsuperscript{39} The three separate annexes where chemicals are listed require different mitigating actions from the parties. Parties must take steps to eliminate the production and use of chemicals listed in Annex A, to restrict the production and use of chemicals listed in Annex B, and to reduce the unintentional releases of chemicals listed in Annex C.\textsuperscript{40}

The Persistent Organic Pollutant Review Committee, composed of chemical assessment or management experts, evaluates an initial proposal to determine whether it provides all of the information required by Annex D.\textsuperscript{41} If the Committee finds that the threshold criteria has been met, it then creates a draft risk proposal in accordance with Annex E.\textsuperscript{42} If the Committee finds that the proposed chemical falls within the objective of the Convention, it then requests information on socio-economic considerations, provided for in Annex F.\textsuperscript{43} Only after all three phases are complete can the Committee recommend whether the chemical should be considered for listing in Annex A, B, and/or C.\textsuperscript{44} The Conference of the parties then makes the final decision regarding listing.\textsuperscript{45} The Stockholm Convention differs from the Basel and Rotterdam Conventions because the reviewing committee evaluates both the scientific and socio-economic information, following a process more closely aligned with the analysis the parties themselves will conduct.

\textsuperscript{38} Stockholm Convention on Persistent Organic Pollutants, supra note 34, art. 8.
\textsuperscript{39} Id. at annex D.
\textsuperscript{40} Id. arts. 3, 5, 6.
\textsuperscript{41} Id. art. 8.
\textsuperscript{42} Id.
\textsuperscript{43} Id.
\textsuperscript{44} Id.
\textsuperscript{45} Id.
D. Where These Conventions Stand in the United States

The United States signed all three conventions—the Basel Convention in 1990, the Rotterdam Convention in 1998, and the Stockholm Convention in 2001.46 However, the US Congress has not yet passed implementing legislation for any of the conventions, which is required before the President can ratify them.47 As such, none of the conventions discussed above are binding on US companies as a matter of domestic law.

The US position with respect to these Conventions stands in stark contrast to that of the rest of the world. One hundred and eighty-six countries ratified the Basel Convention.48 While fewer countries ratified the Rotterdam Convention and the Stockholm Convention, 160 and 182, respectively,49 they, too, received overwhelming support from countries spanning the globe.

E. Summary of the Governing International Environmental Agreements

The three agreements described above together represent international efforts to control the movement of hazardous wastes, to facilitate information sharing about hazardous characteristics of certain chemicals, and to eliminate production or limit unintentional releases of persistent toxic chemicals. But none of the three


agreements has been fully implemented in the United States, which means they are not binding on US companies as a matter of domestic law. This creates a problem for global industries like the semiconductor industry because companies that are located in countries that have signed on to these three Conventions are required to manage their supply chains in compliance with the three agreements, but American companies need not comply with the requirements set forth in any of the agreements. This could make it difficult to reach agreed upon terms when the companies governed by the Conventions enter into contracts with American companies.

A simple hypothetical illustrates the disconnect: Company X is contracting with Company Y to supply Company Y with its required supply of titanium. Company X is located in a country with highly protective environmental laws; Company Y is located in a country with only minimally protective environmental laws. If Company X individually drafted its ideal supply chain agreement and Company Y did the same, the two agreements would look very different. Presumably, the agreement drafted by Company X would include much more stringent environmental requirements than the agreement drafted by Company Y because Company X is subject to stricter environmental requirements. This disagreement over applicable environmental standards might disqualify Company Y as one of Company X’s suppliers or, at the very least, it will add another dimension to negotiations, potentially requiring Company Y to enact costly improvements in order to make doing business with Company X a possibility.

How have the companies that make up the American semiconductor industry responded to this disconnect? They have begun to establish internal toxics standards that govern supply chain contracts with their suppliers. This Note will address these internal standards in the latter section of Part IV.

IV. Private Environmental Governance in the Electronics Industry

A. What Function Does Private Environmental Governance Serve?

In the absence of new environmental statutes, private entities, including nongovernmental organizations (NGOs) and corporations, have developed mechanisms that drive environmental improvement, a function formerly typical of government regulators. Private environmental governance, the term for these efforts by nongovernmental entities, is “a new model of legal and extralegal influences on the environmentally significant behavior of corporations

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and households." In other words, private environmental governance is a phenomenon wherein interactions between private entities create environmental requirements that govern corporate and household behavior, ultimately influencing environmental quality. Private entities have adopted a variety of mechanisms geared toward reducing environmental degradation, including collective standard setting, certifications, and supply-chain agreements.

Private approaches to environmental improvement are a response to a variety of social, economic, and legal incentives; one of the most significant driving forces is consumer preference for sustainable practices. Professor Michael Vandenbergh has described the process by which consumer preferences influence corporate behavior as follows:

> Individuals act on [their] preferences through their private market behavior . . . or through their behavior as employees and managers of firms. These preferences are both reflected by and stimulated by NGOs, which also facilitate the application of pressure on private firms. Private firms respond by participating in collective standard setting with other private parties . . . and by unilaterally adopting internal firm standards . . . . The private standards then affect the firms' decisions about which products or services to buy, and in many cases are included as express provisions in contracts.

Companies also adopt private approaches to environmental improvement for economic reasons. Many realize that "greener" technology is actually more cost effective due to factors such as lower regulatory burdens, fewer control requirements, reduced waste costs and positive market differentiation. Further, some companies are embracing more sustainable practices in response to events over which they have no control but that directly impact their bottom line. For example, Coca Cola began to accept the idea that climate change threatened its economic livelihood when the company lost a lucrative

51. Id.
52. Id.
53. Deborah P. Majoras, A Summit on Private Environmental Governance: Facing the Challenges of Voluntary Standards, Supply Chains, and Green Marketing, 44 ENVT'L. L. REP. NEWS & ANALYSIS 10120, 10120 (2014); see also Lesley K. McAllister, Harnessing Private Regulation, 3 MICH. J. ENVT'L & ADMIN. L. 291, 293 (2014) (providing examples of private regulation, including the establishment of codes of conduct in supply chain agreements, voluntary programs that certify and label products meeting specified social and environmental criteria, and the use of private auditors to assess corporate compliance with private and public standards).
55. Id. at 921–22.
57. Id.

Internal factors may also encourage companies to adopt private environmental controls. Corporate sustainability goals, which more companies set for themselves each year,\footnote{See VELISLAVA IVANOVA, \textit{SUSTAINABILITY GOALS THAT MAKE AN IMPACT 2} (2013) (noting the increase in the number of corporations setting and publicly disclosing sustainability goals in the preceding five years).} increasingly require that companies make deliberate, significant strides toward more environmentally and socially responsible activities, including commitments to safer alternatives for toxic chemicals.\footnote{Eliason, supra note 56.} Whatever motivates a particular company or organization, efforts in the realm of private environmental governance have grown significantly in recent years.\footnote{Private Environmental Governance, supra note 50, at 140–41.}

The recent emergence of private governance generally—not only as it relates to environmental concerns—was in large part a response to the evolution of the global economy in two principle regards.\footnote{Gary Gereffi & Frederick Mayer, \textit{Regulation and Economic Globalization: Prospects and Limits of Private Governance}, 12 Bus. \& Pol., no. 3, 2010, at 3.} First, global production has largely shifted from the developed world to the developing world.\footnote{Id. at 3–4.} This evolution has forced international companies to take note of the working conditions and business practices in the developing world. Second, the organization of global production has changed significantly.\footnote{Id.} Historically, manufacturers were largely domestic enterprises or multinational corporations based in developed countries that generally owned all or most of their foreign factories.\footnote{Id. at 3–4.} Now, international production networks consisting of lead firms—often located in developed countries—control many aspects of their suppliers’ operations—often located in developing countries.\footnote{Id.} Much like the shift of manufacturing from the developed to the developing world, this web of global production requires companies headquartered in the developed world but operating globally to ensure they understand practices in the developing world.
Consumer demand, however, often compels companies to go one step further. Consumers want more socially responsible products and brands—those sourced without conflict minerals and child labor—and are increasingly willing to pay more for those products. This leads companies to actively seek to improve various aspects of their suppliers’ businesses, in addition to their own.

Although the term “regulation” is traditionally understood as referring to requirements put in place by government, a much broader view of regulation—one that includes a role for private standard-setting, coalition-building, and other private efforts—is emerging in current academic parlance. This emerging view defines regulation as “any process or set of processes by which norms are established, the behavior of those subject to the norms monitored or fed back into the regime, and for which there are mechanisms for holding the behavior of regulated actors within the acceptable limits of the regime.” Private standards, therefore, are filling areas that were overlooked, either intentionally (as is the case with standards that limit their scopes, usually for reasons of feasibility) or by virtue of a country’s failure to adopt relevant standards (as is the case with international agreements that regulate toxic chemicals but, as yet, unimplemented in the United States). Therefore, private standards are playing the role traditionally reserved for governmental regulation.


B. The Growing Role of Private Environmental Governance in Supply Chain Contracting

Supply chain agreements offer environmentally conscious companies an ideal opportunity to prescribe conduct and standards with which their suppliers must comply. Since these are contractual agreements, their terms are binding on the parties. Additionally, both parties can benefit from the establishment of a long-lasting relationship, so the manufacturer has an incentive to set clear expectations and suppliers want to perform to the manufacturers' expectations. These features—the binding nature of contractual agreements and the suppliers' desire to supply materials or components long-term—make supply chain contracting an ideal area for companies to exercise private environmental governance.

One reason why semiconductor industry supply chain agreements are particularly suited for analysis in this context is that highly successful brand-name merchandisers—for instance, Apple and Google, whose products all rely on semiconductors—play a powerful role in dictating the way supply chains operate by requiring suppliers to meet certain standards. Some successful brands wield so much power that they are able to transform entire industries.

One timely example of such an effort is the partnership between Google and the Healthy Building Network (HBN), who have collaborated to develop Portico, a green materials database and a decision-making tool through which they hope to transform the building industry. HBN's predecessor to Portico began "as a database of materials and [what is] in them [and] eventually evolved into an information-gathering tool to help systematize chemical disclosure requests from manufacturers." Although advocates for greener building have been calling for changes in the industry for years, HBN hopes that Google's strong purchasing power—and its role in creating Portico—will persuade manufacturers to make healthier building products.

The phenomenon of private environmental governance in supply chains and as a broader effort to influence environmentally friendly behavior is not exclusive to the semiconductor industry or highly successful brands. It appears in other forms, ranging from initiatives...
to combat climate change to efforts to sustainably manage world fisheries. A few examples that highlight the various roles private environmental governance can play and prospects for success follow.78

1. The Greenhouse Gas Protocol’s Scope 3 Standard

The Greenhouse Gas Protocol developed the Corporate Value Chain Accounting and Reporting Standard, also referred to as the Scope 3 Standard, to provide a standardized step-by-step approach that would help companies and other organizations prepare a greenhouse gas (GHG) emissions inventory that includes indirect emissions resulting from “value chain activities.”79 The inclusion of upstream and downstream activities that emit GHGs builds on the Greenhouse Gas Protocol’s existing standards to help companies better understand their Scope 3 emissions, which sometimes represent a company’s largest source of emissions.80

Kraft Foods, a company that participated in the Scope 3 Standard pilot project,81 offers an interesting example. Kraft conducted its first Scope 3 inventory using relevant average industry data from various public and commercial sources, an approach that kept costs low while providing the company with a baseline of Scope 3 emissions that it can improve upon as information becomes available from its own suppliers.82 Kraft found that Scope 3 emissions account for more than 90 percent of the company’s total emissions.83 At an even more granular level, the company found that the subcategory, purchased goods and services, which includes raw materials,
accounted for 70 percent of its total Scope 3 emissions; transportation and distribution, energy-related activities, and the use of sold products accounted for most of the remaining 30 percent.\(^\text{84}\)

Should Kraft and other companies decide to pursue a complete Scope 3 emissions analysis, they will need to collect emissions data from their suppliers, because that data forms the basis for a particular company’s Scope 3 emissions. Companies can use the Scope 3 inventory to encourage supplier GHG measurement and reduction. Further, since the company reporting the Scope 3 emissions has an interest in reducing those emissions, the development of the inventory will likely encourage the company to engage the supplier, and potentially even consumers through product retailers, in talks about how to reduce emissions.\(^\text{85}\)

After quantifying and evaluating the sources of Scope 3 emissions, companies have the information necessary to achieve cost savings, improve overall supply chain efficiency, reduce regulatory risks, and strengthen supplier and consumer relationships.\(^\text{86}\) Companies that sign on to the Scope 3 Standard are choosing to take responsibility for their emissions at all levels of business, not because the government mandates it, but because, as discussed above, they have determined that doing so makes smart business sense for their own unique reasons.\(^\text{87}\)

The Scope 3 Standard accounts for indirect GHG emissions, which are not covered by the existing federal GHG reporting rule.\(^\text{88}\) Because these can account for a substantial amount of a company’s emissions, current federal standards leave a significant gap; the Scope 3 Standard can fill this gap via private environmental governance. Since the Standard is voluntary, it may seem tenuous to argue that it serves a gap-filling function as opposed to a supplementary one. However, a more in-depth analysis reveals that the Standard’s voluntary nature does not automatically preclude its classification as a gap-filler. The Standard seeks to influence the behavior of companies and their suppliers through the disclosure of information much like some existing public regulations, including the

\(^{84}\) Id.  
\(^{85}\) Id. at 14.  
\(^{86}\) Id. at 15.  
\(^{87}\) See id. at 13–15 (discussing the various that motivate companies to initiate private efforts to improve environmental quality).  
National Environmental Protection Act (NEPA)\textsuperscript{89} and, more pointedly, the Emergency Planning and Community Right to Know Act (EPCRA).\textsuperscript{90} To be clear, the Scope 3 Standard's reliance on voluntary participation distinguishes it significantly from these legally binding governmental regulations. However, the operation of the standard, which drives company behavior through the disclosure of information, makes the Scope 3 Standard function more like a gap-filler than a supplementary mechanism.

2. The Marine Stewardship Council's Blue Label Sustainable Seafood Initiative

The Marine Stewardship Council (MSC), which has been in existence for almost twenty years, offers an additional example of a highly successful private supply chain initiative.\textsuperscript{91} The MSC publishes standards for sustainable fishing and seafood traceability. Products that conform to these standards are recognized with a blue MSC label, which communicates to consumers that the seafood was caught according to the MSC's strict specifications.\textsuperscript{92} A fishery must adhere to three core principles to receive MSC certification: (1) maintenance of sustainable fish stocks; (2) minimization of environmental impact; and (3) utilization of a management system that is responsive to changing circumstances.\textsuperscript{93}

Once a fishery is certified as sustainable, the MSC Chain of Custody Standard ensures that each company in the supply chain that handles or sells an MSC certified product has a valid MSC Chain of Custody certificate.\textsuperscript{94} Five core principles must be met for a company to achieve Chain of Custody Certification: (1) the company must purchase from a certified supplier; (2) the certified products must be identifiable; (3) the certified products must be segregated; (4) the certified products must be traceable, and the product volumes must be recorded; and (5) the organization must have a management

\begin{itemize}
\item \textsuperscript{89} National Environmental Policy Act of 1969, 42 U.S.C.A. § 4321 et seq. (West).
\item \textsuperscript{90} Emergency Planning and Community Right-To-Know Act of 1986 (EPCRA), 42 U.S.C.A. § 11001 et seq. (West).
\end{itemize}
system in place. This start-to-finish supply chain tracking assures consumers that MSC-labelled products actually come from certified sustainable fisheries. DNA testing reveals that over 99 percent of MSC-labelled products are correctly labelled, which demonstrates the effectiveness of the Chain of Custody Standard.

Certification to the MSC Fisheries Standard is voluntary, yet the program enjoys wide participation; in this area, wide participation equates to wide success. Two hundred eighty-one fisheries in thirty-three countries have been certified as sustainable according to the MSC Standard, and the total number of Chain of Custody certificate holders almost tripled from 1,099 in 2010 to 2,898 in 2015. As with all voluntary programs, it is important to consider what is driving participation. According to the MSC, "there is evidence that fishers have gained a number of socioeconomic benefits as a result of MSC certification, from higher revenues, to beneficial partnerships and greater influence with governing institutions." Various studies found that MSC certification creates price premiums in markets where the seafood is sold. Also, as discussed in the context of personal electronics containing semiconductor devices, consumer demand for "greener" products further supports the MSC's sustainability efforts.

In the context of sustainable fisheries, the MSC standards are taking on a gap filling role for public environmental governance. The MSC's standards are not the only ones that govern sustainable fisheries, but the other standards are much more limited in scope, leaving overall deficiencies. For instance, the European Union has entered Sustainable Fisheries Partnership Agreements (SFPAs) with over twenty nations worldwide, but the nations with the busiest

95. Id.
96. Id.
98. MSC Fisheries Standard, supra note 93.
100. See id. at 6 ("Today, almost 10% of the world’s wild-caught fish is MSC certified.").
101. Id. at 52.
102. See id. (citing a study indicating an estimated 10% price premium for MSC certified haddock in UK supermarkets and another indicating an estimated 14.2% price premium for MSC certified Alaskan pollock in the U.K.).
103. See Our Approach, supra note 92 (showing a diagram depicting the role market demand plays in driving more fisheries to adopt sustainable practices).
ports—Peru, Indonesia, Korea, and Chile—are noticeably absent from those agreements. The United Nations has passed a resolution on sustainable fisheries, but, as Gereffi and Mayer note, the United Nations' enforcement bodies have extremely limited powers. As a result, the MSC continues to play a vital role in filling gaps left by public governance.

3. How is Private Environmental Governance Making an Appearance in Semiconductor Industry Supply Agreements?

This analysis focuses on supply chain agreements, corporate responsibility (or sustainability) reports, annual reports, and other materials indicative of a company's position on supply sourcing for the fourteen charter members of the Semiconductor Industry Association. Eight of the fourteen charter members are also members of the Electronic Industry Citizenship Coalition (EICC), an industry group dedicated to electronics supply chain responsibility.

105. Tim Huntington et al., Fishing Landings at the World's Commercial Fishing Ports, J. OF OCEAN & COASTAL ECON., October 2015, at 6 tbl.1 (compiling a global ranking of major fishing ports). Note that Russia had two fleets ranked in the top ten but the country's landings were all attributed to domestic fleet and so it was excluded from the list of countries that do not have agreements with the EU. Id. One shortcoming of this metric is that it does not determine which of these countries actually trade fish with the EU. The point, regardless, is that these major fishing countries are not part of agreements requiring they utilize sustainable fishing methods.


108. Gereffi & Mayer, supra note 63, at 5.


These eight members are also signatories to the EICC Code of Conduct, a set of voluntary standards governing social, environmental, and ethical issues in the electronics industry supply chain that references a variety of international norms and standards.111

The EICC Code of Conduct has a substantial impact on semiconductor supply chain agreements, which is not surprising when one considers what—according to the text of the Code—a company must do to adopt the code: "[A] business shall declare its support for the Code and actively pursue conformance to the Code and its standards in accordance with a management system as herein."112

Companies that have adopted the Code have taken a similar approach to declaring their support for the Code and their efforts to conform to the Code. For example, in the "Stakeholder Engagement" section of its Corporate Responsibility Report, IBM first notes that it is a founding member of the EICC; the company then says that it "encourages its suppliers of products and services to join the group and participate in the development and deployment of resources aimed at driving improvements in social responsibility." It closes by stating that the EICC Code of Conduct was recently updated and that IBM has updated its standards to reflect any changes.113 Similarly, Intel Corporation declared its support for the Code in the "Management Approach" section of its Corporate Responsibility Report, noting that it not only expects its suppliers to comply with the EICC Code of Conduct, but that it also expects its suppliers to ensure their suppliers abide by the Code.114

In addition to adhering to the EICC Code of Conduct (or perhaps in pursuit of adhering to the EICC Code of Conduct), some of these companies have developed their own internal standards and goals that they in turn require their suppliers to observe. Research into semiconductor firms’ approaches to supply chain contracting for toxics revealed restricted material lists or equivalent documents for


112. Id.


four companies. A fifth company, Qualcomm, listed banned materials on the “Product Responsibility” section of its website. This is mentioned separately because the intended audience for the restricted materials documents were the companies’ suppliers as opposed to the interested public, the expected audience of a public website.

Texas Instruments created a list of restricted chemicals and materials that applies to all suppliers “who provide a chemical or material that becomes part of [Texas Instruments]’s final product, or packing materials used to ship [Texas Instruments]’s products.” This list includes the chemical or material name, relevant thresholds (i.e., whether a material may contain a concentration of mercury less than or equal to a pre-determined value or mercury is prohibited in any concentration), and industry and regulatory references.

Like the three Annexes used to set specific goals for different chemicals in the Stockholm Convention, Texas Instruments uses separate tables to designate the categories and the specific chemicals within them that are banned for any use or banned when the chemical will become part of the Texas Instruments product. The list includes a number of pesticides and herbicides in Table N, which is somewhat surprising because the semiconductor industry does not rely on any such materials in its manufacturing processes. The list makes no reference to wastes of any sort, precluding comparisons to the wastes listed in the Basel Convention.

While Texas Instruments’ restricted chemicals and material list contains some chemicals listed in both the Stockholm and Rotterdam Conventions, it also includes many additional chemicals. The
partial overlap suggests that neither the Stockholm Convention nor the Rotterdam Convention influenced Texas Instruments' list of restricted chemicals and materials. Additionally, the restricted chemicals and materials list is part of a larger document called “Texas Instruments General Quality Guidelines for SUPPLIERS,” which suggests that it is merely advisory.\footnote{124} However, the Guidelines, excerpted below, state otherwise:

Suppliers must provide updates to their certificates of compliance to the latest [Texas Instruments Restricted Chemicals and Materials] list, including yearly 3rd party test reports for the [Restriction of Hazardous Substances] 6 substances of [lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyl, and polybrominated diphenyl ethers]. TI also requires testing for [chlorine] and [bromine] for non-metal material sets to check for [certain contaminants]. All other restricted chemicals are verified through material declarations and/or compliance statements from these suppliers.\footnote{125}

The various mechanisms that Texas Instruments uses to hold suppliers accountable—ongoing updates to ensure compliance with the most recent company standards, testing for contaminants, and verification through other means—demonstrate that the guidelines, and, more specifically, the list of restricted materials and chemicals are, in fact, binding.

Intel Corporation, another semiconductor industry giant, has a similar list called the “Environmental Product Content Specification for Suppliers & Outsourced Manufacturers.”\footnote{126} In the “Purpose & Scope” section, Intel describes the document as follows: “[the Environmental Product Content Specification for Suppliers & Outsourced Manufacturers] is intended to define environmental requirements for Intel suppliers and outsourced manufacturers.”\footnote{127} The scope of the document’s application is simple: “[t]he . . . material declaration will be required from suppliers for all components, piece parts, assemblies and final products.”\footnote{128}

Much like Texas Instruments’ Restricted Chemicals and Materials List and the three annexes used to set specific goals for different chemicals in the Stockholm Convention, Intel’s document breaks down the restrictions on chemical usage in manufacturing into separate tiers: materials that are outright prohibited for use in manufacturing (Table 1 of the document); and materials that are

\footnote{124. See Texas Instruments General Quality Guidelines for SUPPLIERS, supra note 118.}
\footnote{125. Id. at 8.}
\footnote{127. Id. at 2 (emphasis added).}
\footnote{128. Id. (emphasis added).}
prohibited for use in the manufacturing of parts or products on behalf of Intel (i.e., outsourced manufacturing) (Table 2 of the document).\textsuperscript{129} Intel's list also includes "Intel-Specific Requirements."\textsuperscript{130} The categories include: (1) reportable, under which chemicals that are not currently banned or controlled but are likely to become banned or voluntarily phased out or chemicals that have an impact on the end-of-life management of the finished product must be communicated to Intel; (2) controlled, under which chemicals may only be used for limited, specified purposes; and (3) prohibited, under which substances "shall not be intentionally added to materials used in Intel products and equipment in the restricted application," among other more specific categories.\textsuperscript{131} Unsurprisingly, Intel's list does not contain wastes of any sort; thus, like Texas Instruments' Guideline, it cannot be compared to the wastes listed in the Basel Convention.

There is no question that Intel's standard is obligatory. The use of the terms "requirements" and "require" alone indicate that compliance with the document is non-negotiable. The requirement that the document be referenced in a supplier's contract and purchasing agreement documents confirms this presumption.\textsuperscript{132}

IBM Corporation presents similar information regarding materials and substances that are prohibited from or restricted in its products. IBM's Baseline Environmental Requirements for Supplier Deliverables to IBM "establishes baseline environmental requirements for all Deliverables where this specification is referenced in a Statement of Work, print, contract or other procurements documents."\textsuperscript{133} As with Intel, IBM's requirements apply when referenced in contractual materials.\textsuperscript{134} In addition, IBM's Baseline Environmental Requirements clearly states that the company maintains additional requirements in other documents.\textsuperscript{135} It further provides that when multiple documents provide different restrictions on one chemical or substance in the same application, the most restrictive requirements apply.\textsuperscript{136} While some of this may seem self-evident, by clearly laying out terms that apply any time this document is referenced in procurement materials, IBM is eliminating opportunities for suppliers to plead ignorance and is, therefore,

\begin{thebibliography}{99}
\bibitem{129} See id. at 4.
\bibitem{130} See id. at 6.
\bibitem{131} See id.
\bibitem{132} See id. Under the subheading "Documentation," it reads: "This document shall be referenced in the contract & the purchasing agreement document." Id.
\bibitem{134} See id. at 7.
\bibitem{135} See id. at 4 (noting that "IBM maintains environmental and/or related requirements in other specifications, contracts, or procurement documents").
\bibitem{136} See id.
\end{thebibliography}
increasing the likelihood that suppliers will comply with its standards.

The actual requirements listed in IBM's standard are similar to those prescribed by the corresponding Texas Instruments and Intel documents. Table 1 of IBM's standard describes chemicals that are "[p]rohibited from use in hardware deliverables, parts, products, chemicals, mixtures, substances, and preparations." The specific prohibition for each chemical is listed in Table 1, which again mimics the tiered approach used in the Stockholm Convention and in the two aforementioned agreements. To illustrate, polybrominated diphenyl ethers (PBDEs), commonly found in flame retardants, are prohibited in deliverables, including chemicals. The column next to hexachlorobutadiene simply reads "[p]rohibited." Table 2 of the IBM's standard provides further prohibitions. As with Texas Instruments' and Intel's documents, hazardous wastes are not specifically mentioned.

Two substances, or more generally, classes of substances, that are regulated under the Rotterdam Convention and restricted under all four of the internal standards—those discussed above and Qorvo's—are asbestos and perfluorooctane sulfonic acid (PFOS) and its derivatives. Yet, the language describing the actual restrictions on the use of these substances differs between the four companies, though they all produce the same end result. To illustrate, in Texas Instrument's Restricted Chemicals and Material List, asbestos appears in a table titled, "Manufacturers threshold based on customer requirements" with the notation, "No exceptions." The exact meaning of this language is unclear, and it is not further explained elsewhere.

Intel and IBM both use the term "prohibited" to describe their restrictions on asbestos use, which seems to unambiguously ban the use of asbestos. Intel, however, defines the term "prohibited," to mean that asbestos should not be "intentionally added." The adjacent column in the Intel table confirms the interpretation, noting

137. See id. at 9–15.
138. See id.
139. See id. at 14.
140. See id. at 11.
141. See id. at 17–20 (listing substances that are "prohibited in Substances, Mixtures, Preparations, Field Use Materials, and Chemical Product Supplies" and providing "example legal citations").
142. See id.
143. See TI Restricted Chemicals and Materials List, supra note 119, at 2.
144. See Environmental Product Content Specification for Suppliers & Outsourced Manufacturers, supra note 126, at 6; see also Baseline Environmental Requirements for Supplier Deliverables to IBM, supra note 133, at 9.
145. See Environmental Product Content Specification for Suppliers & Outsourced Manufacturers, supra note 126, at 6.
the reporting threshold for asbestos is "[i]ntentionally added."

Qorvo—whose standard was not discussed above—describes its restriction on asbestos with the phrase, "No intentional use," which appears to mimic Intel's restriction, at least as the term "prohibited" is defined. This variation in language between standards demonstrates how small deviations between company standards might create confusion for suppliers.

The failure of the aforementioned standards to address hazardous waste is not surprising. Companies utilize these standards to police the materials and components sent to them for use in the manufacture of their products. Wastes are not utilized in semiconductor manufacturing and so the standards do not govern them. As such, it is difficult to say how, or if, the Basel Convention is relevant to the semiconductor industry. Semiconductor manufacturing processes certainly generate hazardous wastes that must be disposed of, but it seems highly unlikely that firms that flaunt their commitment to socially and environmentally responsible behavior would ship their waste internationally to dispose of it. Many firms self-regulate their disposal of hazardous waste by setting standards that govern the allowable disposal or treatment methods for these wastes, likely in an effort to ensure compliance with applicable waste disposal laws and to continue their pursuit of sustainable practices. For instance, Intel Corporation developed a set of environmental goals with a deadline of the year 2020, including to "[a]chieve zero chemical waste to landfill." While this does not reveal how the Basel Convention might come into play in the semiconductor industry, it does tee up a question that could be explored in greater detail in a separate Note.

In addition to creating goals for themselves, these companies, as shown above, dedicate ample resources to generating and

146. See id.

147. See Supplier Requirements, supra note 115.

148. See supra Part II (describing the chemicals used in semiconductor manufacturing).

149. See supra Part II (noting generation of hazardous wastes during semiconductor manufacturing).

150. See, e.g., Pollution Prevention, IBM, https://www.ibm.com/ibm/environment/pollution/ (last visited Jan. 9, 2018) [https://perma.cc/N4VU-R83A] (archived Jan. 15, 2018) ("Of the total 1,360 metric tons of hazardous waste IBM generated worldwide in 2016, 65 percent (by weight) was recycled, 18 percent was sent directly to IBM to suitably regulated landfills, 14 percent was sent for incineration, and 3 percent was sent off-site for treatment."); Sustainability: Environmental Responsibility: Materials Management, TEX. INSTRUMENTS, http://www.ti.com/corp/docs/csr/materials_management.html (last visited Jan. 9, 2018) [https://perma.cc/R8WB-PH4C] (archived Jan. 15, 2018). ("We [] do not ship hazardous waste, as defined in the Basel Convention, across international boundaries.")

maintaining restrictions on the chemicals used in their manufacturing processes. It is no surprise that they hold their suppliers accountable through audits and reviews, company-funded consulting, and increased engagement between the company’s management and the supplier’s management.\textsuperscript{152} In addition to the accountability tools Texas Instruments details in its Restricted Materials and Chemicals List,\textsuperscript{153} other companies have developed additional ways to hold their suppliers accountable. For example, Intel set a goal to “[c]omplete or review an on-site audit for each of [the company’s] Top 75 suppliers by the end of 2016.”\textsuperscript{154} The company, which met this goal for 2016, identified the suppliers that are not meeting its requirements in its Corporate Responsibility Report.\textsuperscript{155} Though it can hardly be said that a corporate social responsibility report is widely read, the topic is often newsworthy—when companies’ suppliers exceed expectations and even more so when they come up significantly short—so poorly performing suppliers may feel pressure to improve performance when their names appear on a list of “at risk” suppliers.\textsuperscript{156}

Even firms that produce internal toxics standards above and beyond existing regulatory requirements remain concerned about the potential impact future regulations may have on their companies. Texas Instruments expressed concern to its shareholders in its most recent publicly available annual report.\textsuperscript{157} If they have notice before such requirements are implemented, companies could preemptively address some of this apprehension by creating a category similar to Intel’s “reportable” classification, which requires suppliers to notify Intel if they use chemicals that are likely to become banned.\textsuperscript{158}

\textsuperscript{152.} See, e.g., Intel Corporate Responsibility Report, supra note 114, at 65.

\textsuperscript{153.} See supra note 125.

\textsuperscript{154.} See Intel Corporate Responsibility Report, supra note 114, at 52 (noting that its “supplier audits are based on EICC Code of Conduct requirements for third-party audits and internal criteria defined by Intel management”).

\textsuperscript{155.} See id. at 65.


\textsuperscript{157.} See 2015 Annual Report, TEX. INSTRUMENTS 11 (2015), http://www.ti.com/corp/docs/investor_relations/annual_reports.html [https://perma.cc/A6H4-DN7W] (archived Jan. 15, 2018) [hereinafter TI Annual Report] (select “2015 (PDF, 1.0 MB)” hyperlink) cautioning that legal developments may significantly impact it “if such laws and regulations . . . require the addition or elimination of a raw material or process to or from our current manufacturing processes”).

\textsuperscript{158.} See supra note 126, at 6 (describing the function of Intel Corporation’s “Reportable” category).
4. Summary of Private Environmental Governance in the Semiconductor Industry

Private environmental governance plays a significant role in semiconductor supply chains. Many firms create binding standards for their suppliers that are more restrictive than existing governmental regulations. Additionally, firms take steps to ensure their suppliers are actually conforming to these standards. It is unknown how companies formulate their lists of restricted and banned substances. It is clear, however, that companies are—at least in part—building upon the restrictions in the environmental agreements introduced above.

V. METHODOLOGY & FINDINGS

The rather simple methodology used to generate this analysis was ultimately sufficient;\textsuperscript{159} as it turns out, companies impose standards governing the conduct of their suppliers with regard to toxics through restricted materials lists and other roughly equivalent documents separate from the actual agreements.\textsuperscript{160} Company websites served as valuable resources for this analysis because they often provided copies of annual reports and corporate responsibility (or sustainability) reports—especially as company filings were not available.\textsuperscript{161} Supplier documents, such as Texas Instruments' Restricted Chemicals & Materials list and IBM's Baseline Environmental Requirements for Supplier Deliverables to IBM, provided comprehensive and understandable information regarding company expectations of suppliers.\textsuperscript{162} Table 1, shown below, summarizes how companies are communicating their efforts to regulate their supply chains to the public and their shareholders.

The table uses Yes (Y), No (N), or Not Found (NF) to indicate whether relevant supply chain topics appear in a particular document or report. More specifically, Yes does not reflect merely that one of the search terms or phrases appeared in the text; Yes indicates that a word or phrase that is relevant to the appearance of toxics appears in

\textsuperscript{159} Originally, I intended for this analysis to focus on the supply chain agreements themselves; however, I ran multiple searches for supply agreements using the "SEC EDGAR Filings, Combined" filter on LexisAdvance, but my attempts were not fruitful. I attempted to replicate the methodology described by Professor Vandenbergh in \textit{The New Wal-Mart Effect}, supra note 54, at 936 n.109.

\textsuperscript{160} See, e.g., Baseline Environmental Requirements for Supplier Deliverables to IBM, supra note 133.

\textsuperscript{161} The methodology for acquiring information from company websites was rather simple: I performed a series of Google searches where I entered [company name] annual report, [company name] sustainability report, and lastly [company name] toxic supply chain.

\textsuperscript{162} See TI Restricted Chemicals and Materials List, supra note 119.
supply chain agreements. The corresponding footnotes provide both the source of the information and, where appropriate, an excerpt or summary of the text from the company's annual report or corporate responsibility (or in some cases, sustainability) report explaining the relevant or noteworthy information.

Table 1. Summarizing how companies are communicating their efforts to regulate their supply chains to the public and to their shareholders

<table>
<thead>
<tr>
<th>EICC Member</th>
<th>Suppliers/ Countries</th>
<th>Annual Report</th>
<th>Corporate Social Responsibility/ Sustainability Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMD</td>
<td>Y</td>
<td>NF</td>
<td>N Y</td>
</tr>
<tr>
<td>Analog Devices</td>
<td>Y</td>
<td>&gt; 2,000 / NF</td>
<td>N N</td>
</tr>
<tr>
<td>Global Foundries</td>
<td>Y</td>
<td>NF</td>
<td>NF N</td>
</tr>
<tr>
<td>IBM Corporation</td>
<td>Y</td>
<td>14,000 / 100</td>
<td>N Y</td>
</tr>
</tbody>
</table>

163. Note that a general discussion of supply chain logistics or finances in an annual report would not be sufficient to warrant crediting the document or report with declaring support for regulating toxics in the supply chain.

164. Members, supra note 110.


<table>
<thead>
<tr>
<th>Corporation</th>
<th>Y</th>
<th>19,000 / 100</th>
<th>N</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intersil</td>
<td>NF</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Lansdale Semiconductor Inc.</td>
<td>NF</td>
<td>NF</td>
<td>NF</td>
<td></td>
</tr>
<tr>
<td>Maxim Integrated</td>
<td>See FN</td>
<td>NF</td>
<td>N</td>
<td>NF</td>
</tr>
<tr>
<td>Micron Technology, Inc.</td>
<td>Y</td>
<td>NF / 30</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>ON Semiconductors</td>
<td>Y</td>
<td>NF</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Qorvo</td>
<td>Y</td>
<td>NF</td>
<td>N</td>
<td>NF</td>
</tr>
</tbody>
</table>

Report, supra note 113, at 12 (describing a tool that allows it to identify in real time which parts are impacted by expiring exemptions for the E.U. RoHS Directive).


Although a systematic analysis is not possible based on the available data, the publicly available supply chain contracting information from Texas Instruments, Intel Corporation, and IBM Corporation suggests that American semiconductor manufacturers are creating internal standards to fill gaps left by the United States' failure to implement international standards governing toxic chemicals. Company documents intended for suppliers provided the most substantive information for this Note. While it is impossible to say what specific provisions American semiconductor firm supply chain agreements include based on this analysis, these documents that purport to bind suppliers appear to function as addenda to supply chain agreements. Thus, it was possible to reach substantive conclusions for the purposes of this Note without access to the supply chain agreements themselves. These documents definitively demonstrate that American semiconductor firms are taking steps to internally regulate their supply chains.

A careful reading of Texas Instruments', Intel's, and IBM's restricted chemicals lists reveals some consistency with regard to chemicals listed and the specific restrictions on them. However, the lists are far from identical. For example, Texas Instruments' list is much more comprehensive than those of Intel and IBM. While comprehensiveness is generally a point of strength, it does not necessarily make Texas Instruments' list more useful for its suppliers. For instance, Texas Instruments' list includes pesticides, which are not used in semiconductor manufacturing. Perhaps this list is given to every supplier that contracts with Texas Instruments.

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178. See TI Restricted Chemicals and Materials List, supra note 119; Environmental Product Content Specification for Suppliers & Outsourced Manufacturers, supra note 126; Baseline Environmental Requirements for Supplier Deliverables to IBM, supra note 133.
including those providing landscaping or extermination services, which could explain its overbreadth. However, such a comprehensive list is certainly more cumbersome for suppliers of specific materials than would be a list containing only materials used in the manufacturing process.

VI. WHAT ARE THE IMPLICATIONS FOR FUTURE REGULATION OF HAZARDOUS WASTES AND SUBSTANCES IN THE SEMICONDUCTOR INDUSTRY?

As this semiconductor case study demonstrates, individual companies in at least one industry have used private governance to create uniform standards for their particular suppliers across international regimes. This has perhaps been motivated by a desire to reduce the risk of noncompliance with foreign laws, tort liability, reputational harm, and the time each firm's compliance department spends tracking developments in environmental regulations across the globe. However, by adopting these firm-specific standards, individual semiconductor firms are essentially passing the problem they endeavored to solve for themselves on to their suppliers. Suppliers that contract with multiple semiconductor companies must meet the requirements imposed on them by each individual company. While some of these standards are uniform, minute variations in language, which may be amplified in translation, and significant differences in the restrictions placed on certain chemicals mean that suppliers must now either track the differences in requirements or modify their practices to consistently comply with the most stringent requirements. Such requirements will, of course, trickle down to the suppliers' suppliers, requiring them to make the same choice.

Developing uniform industry standards to govern chemicals in supply chain contracting, perhaps coordinated by the EEIC,179 would lessen the burden on semiconductor industry suppliers.180 Uniform industry standards would not completely eliminate the problem, since some companies might elect to regulate certain chemicals that others do not in anticipation of future regulatory developments or based on


180. For a discussion of the potential chilling effect of antitrust laws on companies collaborating on social responsibility issues, see Inara Scott, Antitrust and Socially Responsible Collaboration: A Chilling Combination?, 53 AM. BUS. L. J. 97 (2016). This Note did not specifically explore the suppliers each semiconductor firm utilizes. If a particular supplier works with only one firm, the burden of all of these unique standards will be nonexistent. If, however, a supplier works with all fourteen charter members of the SEMICONDUCTOR IND. ASS'N, then the burden will be significant.
company policy. Further, variations in manufacturing processes naturally lead to some difference in chemical usage between semiconductor manufacturers. These minor differences could be addressed in appendices to any uniform standards the industry adopts. Such appendices may need to be kept confidential to prevent violation of antitrust laws.

Further, instead of generating uniform standards specific to the semiconductor industry, semiconductor firms could work across multiple industries to develop uniform standards applicable to all American companies or organizations. The Sustainability Consortium, an existing organization with sustainability-driven members representing an array of industries, is in a prime position to coordinate such an endeavor. A national set of standards would certainly make a statement, but the approach has limitations as well. For instance, many substances that would be covered would only be relevant to one or a few industries.

Uniform standards are ideal from the supplier perspective because they limit the amount of information suppliers will need to sort through, understand, and comply with. Alternatively, if the industry is unable to reach such a solution, a database of information detailing firm-specific standards could be another viable, though perhaps less favorable, choice. Google and HBN's Portico database could serve as a model for such an approach. This type of database would certainly be complex, but, at a minimum, it would compile all of the information in one place. This would obviate the need for individual suppliers to create their own repositories for the information and eliminate small variations in terminology, thus simplifying the standards for suppliers.

VII. CONCLUSION

The multitude of supply chain contracting requirements on toxics across the semiconductor industry seems to indicate that they are filling a gap created—at least in part—by the United States’ failure to implement international environmental agreements. The industry's present approach is, however, filling the gap with a mosaic of standards, and both manufacturers and suppliers would be better served by a uniform approach. A uniform set of semiconductor industry standards, or even broader American manufacturer or company standards, would alleviate much of the burden currently imposed on suppliers; these approaches do not, however, come without complications. One potential alternative, the development of

182. See supra note 75.
a database detailing each semiconductor firm's standards, would decrease the burden of individual firms' standards on suppliers, but would likely be a less effective solution for burdened suppliers.

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