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MADE IN EVERYWHERE

Transformative Technologies and the (Re)codification of CSR in Global Supply Chains

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Global supply chains, rather than individual corporations alone, are in many ways the true locus of corporate social responsibility (CSR) for multinational enterprises (MNEs). Yet the companies that form these supply chains can often escape state regulatory oversight. A race to the bottom, reinforced by regulatory entrepreneurship and the willingness of poorer states to benefit from hosting various parts of the chain without themselves having significant regulatory capacity, together limit the possibility of assuring the accountability and transparency of companies' activities throughout global supply chains.[1]

1 Larry Catá Backer, "Regulating Multinational Corporations: Trends, Challenges, and Opportunities" (2015) 22:1 Brown J World Affairs 153.

The intersection between two ideas — global supply chain governance and CSR — has been the subject of much discussion.[2] Indeed, some would argue that supply chains should be understood holistically and that CSR standards must be applied at the level of supply chains.[3] This chapter addresses the link between these two ideas and a third current trend: the rise of new information and communication technologies, and in particular the Internet of Things (IoT), blockchain and artificial intelligence (AI). We will illustrate how these technologies are already being used to strengthen the capacity of companies to monitor their CSR performance in global supply chains and will argue that they can and should be further exploited to this end.

In the first part of the chapter, we will map and identify current issues in assessing and implementing CSR in global supply chains. Second, we will discuss the potential impact of the IoT, blockchain and AI in helping MNEs address those technical and conceptual issues. Third, we will discuss the existing incentives for both MNEs and other actors to implement these technologies in supply chains. Finally, we will acknowledge that these positive developments are not without their own new set of risks.

Issues in the Assessment and Implementation of CSR within Global Supply Chains

First Challenge: The Need for Cross-level and Cross-scale Assessment of CSR

CSR can appear to be a diffuse, even impracticable concept, given the multiplicity of actors, norms and goals that underpin it. Yet the polysemous quality of the term corresponds to the true difficulty of rendering transnational firms accountable for the claims of the large array of stakeholders subject to the impacts of their activities. There is no single way to measure CSR. By way of analogy, one might recall the conclusions of the Stiglitz-Sen-Fitoussi Report, ordered by then French President Nicolas Sarkozy, which put into question the validity of GDP as the single, central unit of economic measurement, and which called for the adoption of a "dashboard" of indicators, including those relating to quality of life and sustainable development.[4] In short, CSR is vulnerable to a risk of illegitimacy if it becomes prone to what Bruno Latour has called an "oligopticon" effect — one produced by a device for seeing some, but not all, human activity — where the metrics used for assessment allow for the traceability of only a subset of the relevant claims and needs.[5]

2 See Mette Andersen & Tage Skjoett-Larsen, "Corporate social responsibility in global supply chains" (2009) 14:2 Supply Chain Management Intl J 75; Organisation for Economic Co-operation and Development (OECD), *OECD Guidelines for Multinational Enterprises* (Paris: OECD, 2011); Kish Parella, "Improving Social Compliance in Supply Chains" (2019) 8:22 Notre Dame L Rev 729; Julia Patrizia Rotter, Peppi-Emilia Airike & Cecilia Mark-Herber, "Exploring Political Corporate Social Responsibility in Global Supply Chains" (2014) 125:4 J Business Ethics 581; Stefan Ulstrup Hoejmose, Johanne Grosvold & Andrew Millington, "Socially responsible supply chains: power asymmetries and joint dependence" (2013) 18:3 Supply Chain Management Intl J 277.

3 Backer, *supra* note 1 at 156.

4 Joseph Stiglitz, Jean-Paul Fitoussi & Amartya Sen, *Report by the Commission on the Measurement of Economic Performance and Social Progress* (2008), online: <https://ec.europa.eu/eurostat/documents/118025/118123/Fitoussi+Commission+report>.

5 Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory* (Oxford: Oxford University Press, 2005) at 181.

Consequently, it can be argued that there is a need for diverse CSR measurement tools in line with the pluralist approach often favoured by ecological economics and conceptions of sustainable development.[6] Among the tenets of ecological economics is that an integrated, holistic approach should be taken to socio-ecological systems, both as regards the deployment of disciplines in the sciences, social sciences and humanities,[7] and as regards multiple scales ("the spatial, temporal, quantitative, or analytical dimensions used to measure and study any phenomenon") and levels (the "units of analysis that are located in the same position on a scale") of analysis.[8]

CSR has itself been conceptualized as flowing from sustainable development,[9] thus a cross-scale and cross-level framework would help to avoid the blind spots of an oligopticon. The challenge for the assessment of CSR is to integrate multiple dimensions and levels of accountability for the social and environmental impact of companies.[10]

If a cross-scale and cross-level approach is needed for CSR generally, that is even more obviously so as regards global supply chains. The assessment of CSR across a global supply chain cannot be limited, on the spatial scale, to responsibility in the domicile of any single company, or indeed to the state level on the jurisdictional scale. Thus, for example, Loblaws, a Canadian grocery chain, in the end acknowledged responsibility for having its source of supply for clothing items in the collapsed Rana Plaza factory in Bangladesh.[11] In an oligopticon view of its responsibility, the Canadian company was distinct from the Bangladesh supplier, and the grocery chain with ancillary clothing products did not need to take on standards for the textile sector. Yet Loblaws apparently understood, as did its consumers, that such partial views of responsibility were inadequate.

In sum, the assessment of CSR in global supply chains will inevitably draw upon the various jurisdictional and normative frameworks at every relevant scale and level, from extraction to production to distribution to consumption, with reciprocal responsibility for all actors throughout.

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6 See Robert Costanza, "What is Ecological Economics?" (1989) 1 Ecological Economics 1 at 2. See also Bert de Vries, *Sustainability Science* (New York: Cambridge University Press, 2013) at 142.

7 Peter Brown & Peter Timmerman, eds, *Ecological Economics for the Anthropocene: An Emerging Paradigm* (New York: Columbia University Press, 2015).

8 Hsing-Sheng Tai, "Cross-Scale and Cross-Level Dynamics: Governance and Capacity for Resilience in a Social-Ecological System in Taiwan" (2015) 7:2 Sustainability 2045 at 2047, citing Clark C Gibson, Elinor Ostrom & TK Ahn, "The concept of scale and the human dimensions of global change: A survey" (2000) 32:2 Ecological Economics 217. See also David W Cash et al, "Scale and Cross-Scale Dynamics: Governance and Information in a Multilevel World" (2006) 11(2): Ecology & Society 8.

9 Michael Kerr, Richard Janda & Chip Pitts, *Corporate Social Responsibility: A Legal Analysis* (Toronto: LexisNexis, 2009).

10 See Alain Supiot, *Governance by Numbers: The Making of a Legal Model of Allegiance*, Hart Studies in Comparative Public Law, vol 20, translated by Saskia Brown (Portland, OR: Hart, 2017).

11 See Loblaws media statements; see especially 24 October 2013, online: <https://media.loblaw.ca/English/media-centre/company-statements/company-statements-details/2013/Loblaw-Update-to-Rana-Plaza-Compensation/default.aspx>. However, note the subsequent Canadian litigation; see also David J Doorey, "Rana Plaza, Loblaw, and the Disconnect Between Legal Formality and Corporate Social Responsibility" (13 September 2018), doi:10.2139/ssrn.3265826.

Second Challenge: The Lack of Transparency and Accountability for CSR in Global Supply Chains

Two main impediments to the implementation of CSR in global supply should be underlined. The first is raised by the view that CSR is purely voluntary, i.e., that companies are responsible solely to shareholders for financial performance and take on any other responsibilities *ex gratia* in order to build goodwill. The second is raised by the structure of global supply chains, which have technical impediments to accountability and transparency.

The Voluntary Nature of CSR

While the exact status of CSR may vary from country to country,[12] the dominant shareholder model still relies on Milton Friedman's idea that the only true responsibility of a company is to generate profit.[13] Although it may be possible to make the case for CSR from within the dominant shareholder model by arguing that CSR contributes to profit,[14] since both the public and investors give consideration to company ethics and sustainability, CSR is nevertheless often still understood as a matter of public relations rather than an essential element of the company's business.

The consequence of this weak status for CSR is that although CSR can be linked to the general fiduciary obligations of corporate directors and officers, it tends to be viewed as corporate behaviour that will emerge as a response to appropriate incentives rather than as flowing from "hard law."[15] Even if CSR can be rooted in formal legal obligations, it remains relevant and necessary to find the right set of incentives as well. This is especially true as regards obligations stemming from the operation of global supply chains, as illustrated by the Loblaws litigation alluded to above.[16]

Accountability and Traceability in Global Supply Chains

Incentives should be designed to overcome the gaps in monitoring and oversight of global supply chains produced by the patchwork of national legal regimes.[17] After all, regulation of global supply chains appears to be outside the traditional power of the nation state.[18] Indeed,

12 Canada, *People's Department Store v Wise (Trustee of)* 2004 SCC 68, and *BCE Inc v 1976 Debentureholders* 2008 SCC 69 laid the ground for a legal notion of good corporate citizenship, countering the shareholder-centric Delaware model. In China, the government has incorporated CSR into article 5 of its Company Law. See *Company Law of the People's Republic of China* (revised 2013), online: *Invest in China* <www.fdi.gov.cn/1800000121_39_4814_0_7.html>. In 2017, France adopted the *Loi relative au devoir de vigilance des sociétés mères et des entreprises donneuses d'ordre* (online: *LegiFrance* <www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000034290626&categorieLien=id>), which requires parent corporations and corporations that direct subsidiaries or sub-contractors in supply chains to exercise vigilance with respect to human rights and environmental abuses. Corporations that fail to exercise proper oversight of their supply chains can be subject to significant fines. See also Pauline Abadie, "Le juge et la responsabilité sociale de l'entreprise" (2018) Recueil Dalloz 302, for the argument that this law will further the role and power of judges regarding CSR cases in France.

13 Milton Friedman, "The Social Responsibility of Business is to Increase its Profits", *The New York Times Magazine* (13 September 1970). It should be noted here that this shareholder model may differ in the European context. See Klaus J Hopt, "Comparative Corporate Governance: The State of the Art and International Regulation" (2011) 59:1 Am J Comp L 1.

14 Philipp Schreck, *The Business Case for Corporate Social Responsibility: Understanding and Measuring Economic Impacts of Corporate Social Responsibility* (Heidelberg: Physica-Verlag Heidelberg, 2009).

15 For a review of the legal foundations of CSR in Canada, see Richard Janda & Juan C Pinto, "National Report on Human Rights, Due Diligence and Reporting: Canada Country Report" in Lukas Heckendorn & Johanna Fournier, eds, *Regulating Human Rights Due Diligence for Corporations: A Comparative View* (Zurich: Edition Schulthess, 2017).

16 See Doorey, *supra* note 11.

17 See generally Backer, *supra* note 1.

18 See Andreas Georg Scherer & Guido Palazzo, "The New Political Role of Business in a Globalized World: A Review of a New Perspective on CSR and its Implications for the Firm, Governance, and Democracy" (2011) 48:4 J Management Studies 899.

the basic unit that is the object of state regulation is typically the company rather than the polycorporate supply chain.[19]

The global reach of supply chains allows MNEs to limit their legal and fiscal obligations by engaging in forum shopping and lobbying.[20] This permits them to escape accountability for the actions of their suppliers while having considerable influence on the governance of lower levels of the supply chain.[21] Yet companies are rarely held liable for the actions and decisions of their suppliers, sometimes even if these are linked to blatant human rights abuses.[22] There are thus significant gaps in the legal structure of corporate accountability for the social and environmental impact of suppliers whom they strongly influence.

Global supply chains also raise issues of traceability.[23] Traceability is defined by Petter Olsen and Melania Borit as "the ability to access any or all information relating to that which is under consideration, throughout its entire life cycle, by means of recorded identifications."[24] Even sophisticated organizations can lack ready access to product traceability. In December 2016, Walmart's vice president of food safety, Frank Yiannas, picked up a package of sliced mangoes at a store near company headquarters and ordered his team to find out how quickly they could determine where it came from. It took them an entire week.[25] All in all, the capacity to trace the origin and impact of goods throughout the chain, both for managerial and ethical purposes, is a major challenge in global supply chains characterized by a multiplicity of actors, markets and jurisdictions.

Technical and Conceptual Challenges: Potential Solutions Drawing on New Information and Communication Technologies

The first part of this chapter identified several challenges, summarized here for convenience:

- producing a holistic approach to CSR conceptualization and evaluation methodology that takes into account the multiple scales and levels of global supply chains;
- incentivizing companies across supply chains to adopt CSR policies; and
- fostering accountability and traceability throughout supply chains.

19 Backer, *supra* note 1 at 6–7. See also Darren Rosenblum, "Traveling Corporations and the Futility of Walls" (2019) 93 Tul L Rev 645. For an earlier analysis, see José Engrácia Antunes, *Liability of Corporate Groups: Autonomy and Control in Parent-subsidiary Relationships in US, German and EU Law: An International and Comparative Perspective* (Deventer: Kluwer, 1994).

20 Backer, *supra* note 1; Elizabeth Pollman & Jordan M Barry, "Regulatory Entrepreneurship" (2017) 90 S Cal L Rev 383.

21 See Ulstrup Hoejmose, Grosvold & Millington, *supra* note 2 (on the power asymmetry between different levels of global supply chains).

22 See *Kiobel v Royal Dutch & Co*, 569 US 108 (2013).

23 See generally Yong H Kim & Gerald F Davis, "Challenges for Global Supply Chain Sustainability: Evidence from Conflict Minerals Reports" (2016) 59:6 Academy Management J 1896.

24 Petter Olsen & Melania Borit, "How to define traceability" (2013) 29:2 Trends Food Science & Technology 142 at 148.

25 Alec Guzov, "Walmart: From supply chain to blockchain", Harvard Business School Digital Initiative (10 November 2017), online: <https://rctom.hbs.org/submission/walmart-from-supply-chain-to-blockchain/>.

This part will explore various ways in which the IoT, blockchain and AI could help address these challenges. First, we will survey how these new technologies can help respond to the challenges for CSR posed by global supply chains. Next, we will offer examples of developments made possible by use of blockchain and the IoT for supply chain traceability and transparency. Finally, we will explore how AI can enable companies to use the data accumulated through the IoT to minimize the supply chain's environmental and social impact.

New Digital Technologies and Supply Chain Sustainability

The IoT, blockchain and AI have the potential to transform the conceptualization, evaluation and implementation of CSR in global supply chains. By their nature, they enable the cross-scale and cross-level holistic approach to CSR that was discussed in the first part of this chapter. They provide the means to recodify CSR throughout global supply chains.

The IoT allows for a continuous stream of data from physical objects that are connected to the internet. It thus enables exactly what a cross-level and cross-scale approach requires: a way to link, in a holistic way, the different levels of geographical scale, and to work simultaneously in physical, digital and jurisdictional dimensions. Put less abstractly, the IoT simplifies the analysis of a supply chain's entire social and environmental impact by connecting its actors and tracking the physical movement of its parts. Although the integration of the IoT within global supply chains is still limited at a technical level,[26] it could, in principle, respond to the challenge raised by ecological economics that we understand supply chains as socio-ecological (and technological) systems.

Blockchain technology also contributes to answering this challenge. By creating secured and public transaction traceability, blockchain technology offers the potential for a platform shared by all the members of the global supply chain and open to outside scrutiny. It can create incentives for companies to respect their CSR engagements and offer logistical help for decentralized governance at the level of the supply chain. Linked to the IoT, blockchain represents a way to safeguard and share the data accumulated across the supply chain.

Finally, AI (and machine learning algorithms in particular), can also enter this holistic approach to sustainable supply chain management by adding sophisticated tools to analyze the large quantities of data available to companies throughout the chain. AI may not only allow the identification of patterns of environmental and social impact in supply chains, but might also eventually help engineer ways through which companies could reduce the risk of generating social and environmental impacts in supply chains.

We turn now to practical illustrations of corporate initiatives using these technologies that could pave the way for more robust CSR across global supply chains.

See-through Supply Chains: The Impact of the IoT and Blockchain Technology on CSR and Self-regulation

The IoT and blockchain raise the prospect of business accountability and transparency in "see-through" supply chains. We will first offer two examples of supply chains reorganized around

26 See World Economic Forum System Initiative on Shaping the Future of Environment and Natural Resource Security, *Building Block(chain)s for a Better Planet* (2018), Fourth Industrial Revolution for the Earth Series at 15.

these two technologies and then explain how these changes have the potential to incentivize CSR through accrued transparency and accountability.

In 2016, Provenance, a UK company, sought to respond to many issues raised by labour and environmental concerns about the fishing of yellowfin and skipjack tuna in Indonesia.[27] The fishing industry is plagued by instances of forced labour and illegal fishing, giving rise to problems of sustainable resource management and protection of the environment.[28] Facing a growing demand for traceability through the tuna supply chain, Provenance acknowledged that its existing supply chain lacked transparency and began using blockchain technology to record the trajectory of each fish, from fisher to consumer. Provenance stated publicly that it sought to "share the same truth between all stakeholders — fishermen, factories, certifiers and consumers, without giving any of them a backdoor to the system."[29] To do so, Provenance established a system in which an external non-governmental organization (NGO) verified the efficiency of Indonesian fishers' fair trade practices. The fishers were then equipped with cellphones, which allowed the registration on the blockchain of each transaction through which individual items would change hands: from the producer to the supplier, supplier to the factory, and factory to consumers. Provenance also created a public access portal to the blockchain to allow consumers to track the origin of each item, down to the very fishers who introduced them in the chain.[30]

In a similar gesture, retail giants Walmart and Carrefour both recently introduced blockchain- and IoT-based food supply chain management programs, hoping to resolve issues of water management, traceability and food poisoning that had arisen in the past.[31] In an experiment, the Walmart team created a physical identification tag for mangoes harvested in Mexico. The tag allowed the tracking of mangoes throughout decontamination, transport, customs and storage, as well as identification for customers in Walmart stores.[32] John Keogh reports that whereas "it took almost 7 days to execute a mock recall [on the basis of existing formal regulatory requirements]... [it took] 2.2 seconds using their specific Blockchain configuration."[33] Carrefour, a European counterpart to Walmart, introduced a similar project in 2018 for its own food supply chain.[34] Both programs bring together the IoT (through near field communications technology,

27 Provenance, *From shore to plate: Tracking tuna on the blockchain* (16 July 2016), online: <www.provenance.org/tracking-tuna-on-the-blockchain#blockchains>.

28 *Ibid*, s II ("A broken system: When your fish supper supports slavery"). See also MSC Fisheries Standards, online: <www.msc.org/standards-and-certification/fisheries-standard>.

29 Provenance, *supra* note 27, s III ("Blockchains present a global, inclusive solution for traceability").

30 See *ibid*, s II for two graphs illustrating the blockchain-enabled control of the supply chain by consumers.

31 See Olga Rharif, "Walmart tackles food safety with test of blockchain technology", *Bloomberg* (18 November 2016), online: <www.bloomberg.com/news/articles/2016-11-18/wal-mart-tackles-food-safety-with-test-of-blockchain-technology>. See also Guzov, *supra* note 25.

32 See Robert Hackett, "Why Big Business Is Racing to Build Blockchains", *Fortune* (22 August 2018), online: <http://fortune.com/2017/08/22/bitcoin-ethereum-blockchain-cryptocurrency/>.

33 For a critical analysis of blockchain's potential to guarantee food authenticity and quality, see John G Keogh, "Blockchain, Provenance, Traceability & Chain of Custody" (17 August 2018), online: *My Food Trust* <www.myfoodtrust.com/2018/08/17/blockchain-provenance-traceability-chain-of-custody/>.

34 See "Carrefour lauches Europe first food blockchain", online: *Carrefour* <www.carrefour.com/current-news/carrefour-launches-europes-first-food-blockchain>. Provenance later supported a similar project for Unilever and the growing of tea plants; see Supply Chain Movement, "Unilever trials blockchain to improve supply chain sustainability" (11 January 2018), online: <www.supplychainmovement.com/unilever-trials-blockchain-improve-supply-chain-sustainability/>.

that is, the "tagging" of real-life items for radio identification)[35] and blockchain as a way to secure the registration of food items in a uniform system throughout the food supply chain.[36]

These examples demonstrate the possibility for blockchain and the IoT to be used as instruments in the development of traceability and sustainability in global supply chains. The Provenance project on the management of the tuna supply chain showed how proper use of blockchain could allow effective communication from every actor in the chain, as well as the democratization of the information relative to the goods transferred throughout the chain. Furthermore, the Provenance supply chain clearly works as a cross-scale and cross-level holistic system: it links the different levels of the supply chain by location and numerically.[37] By doing so, it offers a platform to produce more effective CSR monitoring of the presence of human trafficking, unsustainable fishing practices and the general lack of accountability on the part of suppliers.

Finally, by giving companies access to considerable amounts of additional data on the entire supply chain, the IoT and blockchain offer the beginnings of the response to the difficulty inherent in evaluating the impact of company practices. Provided companies are willing to give access to this data, it can provide rich sources of information for sustainability indexes to achieve more compelling assessments of the environmental and social impact of companies throughout the supply chain. The (meta)data encoded in the bar code, QR code [the full name is the Quick Response code] or RFID [radio frequency identification] of the final product is no longer limited to stating "Made in Country X" to convey its origin. A t-shirt can now tell the user of every place and every process through which it took its final form and thus how it was "Made in Everywhere."

Figure 1: Metadata of a product embedded in a QR code that is itself embedded in the product.

35 See Danny Pigini & Massimo Conti, "NFC-Based Traceability in the Food Chain" (2017) 9:10 Sustainability 1910.

36 See also a pilot project to use blockchain technology to certify the verification of a textile supply chain and to link the certificate to T-shirt QR codes: Anja Wilde, "CSR In The Supply Chain — Traceability Of Clothing@Kik", online: *More Than Digital* <https://morethandigital.info/en/csr-in-the-supply-chain-traceability-of-clothingkik/>.

37 Tai, *supra* note 8.

Better Social and Environmental Management of International Supply Chains through the Use of AI

In this section, we discuss the potential for AI to allow for better social and environmental engineering of supply chains. We then touch upon its potential to offer partial solutions to what we had characterized as the oligopticon problem: the existing surveillance of only some of the relevant sources of responsibility.

AI as a Tool to Minimize the Social and Environmental Impact of Companies

The IoT and blockchain, when used in conjunction with machine learning, can allow socially minded companies to better identify and predict their environmental and social impacts. To quote from IBM: "AI can rapidly and comprehensively read, understand and correlate data from disparate sources, silos and systems. It can then provide real-time analysis based on interpretation of that data."[38]

This is especially interesting because it suggests that AI could help not only to identify better social and environmental practices for companies, but also be used to modify the structure of supply chains themselves. By allowing for their optimization — notably in order to participate in a circular economy — AI could, in principle, offer tools to design supply chains that are more socially and environmentally responsible.

Some companies have begun to gain a better grasp of their social and environmental impact through the use of machine learning. A 2018 report from the Ellen MacArthur Foundation in the United Kingdom gave several examples in which AI was able to "help build and improve the reverse logistics infrastructure required to 'close the loop' on products and materials by improving the processes to sort and disassemble products, remanufacture components, and recycle materials"[39] in a circular economy. In one example drawn from the report, a company used AI to identify plant-based substitutes for animal products.[40] In another, AI was used to find new metal materials with low levels of toxicity in order to respect circular economy principles.[41] These examples suggest a promising direction for AI: the analysis of data from across the entirety of the supply chain, independent of the geographical or even cultural differences among its different levels, with a view to reducing or eliminating negative externalities.

AI as a Tool to Avoid the Risks of an Oligopticon

The emerging power of AI also suggests answers to the problem of CSR as an oligopticon. By having access to vast amounts of data on the physical characteristics and performance of a supply chain, machine learning opens the prospect of accounting for all of its levels and scales at once, in real time.

To go even further, companies may be able to identify the potential impact of their activities — and that of their supply chains — in fields or spheres that were not even part of their initial commitment to CSR. For example, IBM has marketed its Watson AI as able to "predict"

38 IBM, "Supply Chain Analytics", online: <www.ibm.com/dk-en/supply-chain/supply-chain-analytics>.

39 Ellen MacArthur Foundation & Google, with McKinsey & Company, "Artificial intelligence and the circular economy: AI as a tool to accelerate the transition."

40 *Ibid* at 25.

41 *Ibid* at 12.

disruptions in supply chains by monitoring "all aspects of the supply base including…relevant news, events, and raw material shortages, as well as suppliers and route integrity."[42] Similarly, AI company TransVoyant makes the following claim: "From sensors, satellites, radar, video cameras, smartphones and other devices that make up the Internet of Things (IoT), we collect over one trillion events each day, giving us one of the largest repositories of real-time big data in the world. Our proprietary machine learning algorithms analyze these massive big data streams in real-time to produce live and predictive insights that help companies to achieve competitive advantage and government agencies to save lives."[43]

Of course, machine learning should not be understood as a "magic wand."[44] It is still at its inception and faces many technical obstacles.[45] However, it seems to offer the possibility not only to help companies minimize the social and environmental impact of supply chains, but also to allow them to "mine the universe" to predict the future impacts they might have. Without overstating the power of machine learning, this could be understood as part of the answer to some of the conceptual issues raised by the complexity of defining CSR and engaging in multivariate evaluation of firm performance. Indeed, the power of AI to identify and predict disruption in the supply chain suggests that it could help trace impacts at scales and levels that were not previously anticipated, thus potentially confining the risks of producing an oligopticon in the conceptualization and evaluation of CSR.

Incentives Provided by New Technologies to Enhance CSR Disclosure Standards

Previously, we looked at new technologies as tools that could help companies develop better conceptions and implementation of CSR throughout supply chains. Technology, however, does not implement itself — and as noted in the first part of this chapter, the challenges to CSR in supply chains are not only technical, but relate as well to the significant incentives companies can have to resist increasing transparency. This third part discusses the ways in which companies can be incentivized to develop technology-driven CSR strategies.

New Incentives for the Development of CSR through the Knowledge-as-Service Model

The use of the IoT and blockchain could work to close the "structural hole"[46] between consumers and their sellers. By involving consumers in the supply chain and allowing them to track the origin of and processes giving rise to goods, see-through supply chains can do more than offer companies better opportunities to manage traceability. They also represent an opening

42 IBM, "IBM Supply Chain Insights with Watson: Leverage artificial intelligence to mitigate supply chain disprupti ons", Solution Brief at 5, online: <www.ibm.com/downloads/cas/YLEKOE53>.

43 TransVoyant, online: <transvoyant.com/predictive-analytics-space/>. This example and the specific case uses advertised by the company (online: <www.transvoyant.com/hello-world-2/>) are premised on supply chain optimization for profit, but could, by way of analogy, be exported to optimize the environmental or social impact of the supply chain.

44 Steve Banker, "Things to know about artificial intelligence of supply chain management", *Forbes* (1 January 2019) at para 15, online: <www.forbes.com/sites/stevebanker/2019/01/01/20-things-to-know-about-artificial-intelligence-for-supply-chain-management/#7e81e6a35371>.

45 *Ibid* at 9.

46 Robert A Phillips, "Ethics and Network Organizations" (2010) 20:3 Business Ethics Q 533 at 538, quoted in Provenance, *supra* note 27, s VII ("Pilot phase 3: The consumer experience and building an interface for trust").

for consumers as citizens to make sustainable choices, consumers who, in turn, represent an "external pressure factor"[47] for the adoption of CSR.

As a general matter, since the price of products does not reflect the externalities generated through the production process, there is what Ronald Coase identified as a problem of social cost, one that is specifically linked to all the transactions involved in connecting impacts to use.[48] According to Coase, consumers will purchase products that generate harm for others without bearing those consequences in mind because of the costs associated with identifying and managing all of those transactions. In principle, if transaction costs associated with identifying externalities could be brought to close to zero, this would mean that harmful impacts could be assessed and aligned with the price mechanism, at least to the degree that consumers would be willing to pay to avoid harms that are attributable to their purchases.

Consumers are not the only actors that can face new incentives if externalities can be traced throughout supply chains. If, in addition, harmful impacts crystallize into risk factors for investors (for example, single-use plastics become understood as a business risk for the plastics industry),[49] the traceability of supply chains can increase investor incentives to reduce the impacts of their portfolios.

Traceability can lead companies to respond to such shifting incentives by creating entire business models based on knowledge-as-service. Deloitte developed this idea in a 2015 report.[50] According to the report, the integration of the IoT within the supply chain could be turned into a business model — consumers may be willing to pay more to benefit from the knowledge inherent in the real-time information provided by the IoT.[51] The knowledge-as-service model could be the marketing incentive for CSR.[52] The example from the Provenance tuna supply chain is telling: if citizens/consumers find value in being able to discriminate their consuming choices according to the impacts products generate, then the use of the IoT and blockchain as tracking devices for management purposes could create a virtuous circle that generates further incentives for companies to adopt sustainable practices throughout their supply chains, promote traceability and transparency, and work toward enhanced evaluation and implementation of CSR policies.

47 See David Eriksson & Göran Svensson, "Elements affecting social responsibility in supply chains" (2015) 20:5 Supply Chain Management Intl J 561.

48 Ronald Coase, "The Problem of Social Cost" (1960) 3 JL & Econ 1.

49 See Justin Trudeau, Prime Minister of Canada, News Release, "Canada to ban harmful single-use plastics and hold companies responsible for plastic waste" (10 June 2019), online: <https://pm.gc.ca/en/news/news-releases/2019/06/10/canada-ban-harmful-single-use-plastics-and-hold-companies-responsible>; Pauline Skypala, "Investors must look hard at the future of plastics", *Financial Times* (15 July 2019), online: <www.ft.com/content/0a21d8b6-42af-3b99-b320-c6131b07be86>.

50 Joe Mariani, Evan Quasney & Michael E Raynor, "Forging links into loops: The Internet of Things' potential to recast supply chain management" (2015) 17 Deloitte Rev 122.

51 *Ibid* at 126.

52 See Zaheer Khan, Yong Kyu Lew & Byung Il Park, "Institutional legitimacy and norms-based CSR marketing practices: Insights from MNCs operating in a developing economy" (2015) 32:5 Intl Marketing Rev 463. See also Rojanasak Chomvilailuk & Ken Butcher, "The impact of strategic CSR marketing communications on customer engagement" (2018) 36:7 Marketing Intelligence & Planning 764.

Code-embedded CSR as a Way to Bridge the Trust Gap with Consumers

Traceability and transparency can also feed into an ambitious possibility enabled by the IoT and blockchain, namely to put into place "smart contracts" governing CSR undertakings.[53] In a blog post, Phil Gomes, CEO of a smart contracts company, presents the following algorithm structure:

> By way of example, consider the following contract logic:
> If the profitability of the firm is> [X]%, AND
> IF the firm's supply chain is certified by [insert reliable NGO here] as at least [Y]% fair trade, AND
> IF you are a holder of preferred stock as of [date], THEN
> Said shareholders will receive [$Z] per share in their electronic wallets within a day of the firm's quarterly earnings announcement.[54]

The logic underlying this algorithm is that blockchain technology, by automating contracts, could enforce CSR by incorporating it within the methodology for effectuating transactions. This idea has already given rise to an entire business model. Companies have started to create smart contract protocols as a way to improve branding for socially minded companies. For example, Medium is a company that offers to build a range of undertakings, such as charitable donations, into smart contracts.[55] Identifying the fact that many consumers lack trust in the businesses they interact with, Medium offers to build that trust by creating smart contracts that force companies to execute their CSR obligations, thus reassuring their clients.[56]

This forced accountability is different from the general transparency brought about by blockchain. Smart contracts offer the possibility of going further than creating additional and accessible data on companies: they can render CSR undertakings executable, taking accountability to another level.

Moreover, the possibilities raised by smart contracts are not limited to company-consumer relationships. Accountability is also possible among companies seeking to engage in socially responsible behaviour with their suppliers. If blockchain allows for secure and efficient tracking of goods, then companies could more easily enforce their own CSR policies by incorporating their codes of conduct into blockchain-enforced traceability and transparency.[57]

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53 For a definition and explanation of smart contracts, see Lauren Henry Scholz, "Algorithmic Contracts" (2017) 20 Standford Tech L Rev.

54 Phil Gomes, "Using the Blockchain and Smart Contracts for CSR: The Social Purpose Case for Using Bitcoin's Core Technology", *LinkedIn* (15 October 2015), online: <www.linkedin.com/pulse/using-blockchain-smart-contracts-csr-phil-gomes/>.

55 Massimo Lomuscio, "Smart Social Contracts, unstoppable promises on the Blockchain" (4 February 2018), online: *Medium* <https://medium.com/reason/what-are-smart-social-contracts-the-new-business-model-for-the-blockchain-d3a27025fc4b>.

56 *Ibid.*

57 Nick Heinzmann & Pierre Mitchell, "Icertis Blockchain Framework: A Glimpse of CLM's Expanding Footprint into the Supply Chain" (4 March 2019), online: *Spend Matters* <https://spendmatters.com/2019/03/04/icertis-blockchain-framework-a-glimpse-of-clms-expanding-footprint-into-the-supply-chain/>.

Mercedes Benz recently put into place a project of this sort. The company sought to ensure that every actor in Mercedes's supply chain signed and acknowledged the Mercedes supplier code of conduct. At the same time, some suppliers in the chain sought to preserve anonymity and Mercedes was willing to keep its contractual information limited to its first-tier manufacturers. It thus put into place a smart contract allowing for the signature and certification of the Mercedes code of conduct at each level of the supply chain, while preserving anonymity throughout the supply chain.[58] This allowed key relevant terms — such as code of conduct undertakings and, in some circumstances, the identity of suppliers — to move up the chain while protecting other terms requiring more anonymity, such as price points.[59]

Industry and State Norms Governing Traceability and Transparency

The increasing capacity to trace provenance and impacts is already beginning to manifest itself in the evolution of industry standards. In 2014, the United Nations Global Compact, together with Business for Social Responsibility, released *A Guide to Traceability: A Practical Approach to Advance Sustainability in Global Supply Chains*, which identifies 25 collaborative standards across 35 business sectors that have developed traceability certification.[60] Industry traceability standards are also beginning to incorporate use of blockchain.[61]

Governments are already involved in seeking to promote the development of AI for supply chain traceability.[62] They have also begun to issue general traceability standards. For example, in 2002, the European Union implemented the General Food Law, which requires food and feed businesses to trace the provenance and destination of their products and to provide this information to regulators in close to real time.[63] This kind of regulation can function in tandem with industry standards. For example, the GS1 industry standard originated in an effort to standardize the use of barcodes in the retail industry as a whole.[64] GS1 has developed a Global Traceability Standard for various food products, which allows food regulators to send a "GS1-centric message" to retailers that can result in a stop-sale protocol being implemented at cash registers across the country within 30 minutes, when necessary.[65]

Government traceability requirements, which are in the nature of disclosure rules, do not prescribe specific practices for businesses and correspond to efforts those businesses are already making to oversee their supply chains. In principle, therefore, they do not encounter the kind of industry pushback that command-and-control regulation typically encounters. The "light touch"

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58 *Ibid.*

59 *Ibid* at "Icertis Blockchain Framework: What it does."

60 See UN Global Compact and Business for Social Responsibility, *A Guide to Traceability: A Practical Approach to Advance Sustainability in Global Supply Chains* (2014), online: <www.unglobalcompact.org/docs/issues_doc/supply_chain/Traceability/Guide_to_Traceability.pdf>.

61 See e.g. OriginTrail, "an ecosystem dedicated to making supply chains work — through championing standards supporting a universal data exchange…and ensuring data immutability by utilizing the blockchain technology", online: <https://origintrail.io/about-us>.

62 In December 2018, the Government of Canada launched Scale AI, whose stated mission is to "boost productivity across industries in Canada through the integration of AI with supply chains." Online: <https://scaleai.ca/about-us/>.

63 EC, *Commission Regulation 178/2002 of 28 January 2002, laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety*, [2002] OJ, L 31/1.

64 GS1, "Mission and History", online: <www.gs1us.org/what-we-do/about-gs1-us/mission-history>.

65 See Keogh, *supra* note 33.

provided by a traceability requirement can nevertheless lead to stronger legal accountability of suppliers of goods at the transnational level. Since goods can be tracked through physical identification and an inherently public and unalterable blockchain database, states can regain a degree of supervision over MNEs by requiring them to give access to their supply chain management data.[66] The use of blockchain by companies to maximize the efficiency of their supply chain — as in the Walmart example — exerts additional pressure to adopt tougher CSR standards, since companies are, in effect, stopped from "looking the other way" at their suppliers' unsustainable practices. After all, they are able to track whether such practices have entered their supply chains.[67]

The legislation adopted by France to ensure vigilance over human rights and environmental standards in supply chains goes beyond simply mandating traceability. It also requires upstream companies in the chain to: map out human rights and environmental risks in the chain; implement procedures for regular verification of their subsidiaries, sub-contractors and suppliers; take steps to mitigate risks and prevent grave harm; create a system for signalling and receiving alerts when harmful impacts take place; and have a follow-up mechanism to evaluate the effectiveness of measures taken.[68] As the French legislation gets tested, it could become a bellwether for regulation elsewhere.

CSR Risks of New Technologies

In this last part, we explore the changes that AI, blockchain and the IoT will make to our conception of CSR itself. We suggest that the challenges linked to new technologies (such as data protection and cybersecurity) have already become one more field of CSR. We conclude with a brief discussion of the risks posed by incommensurability in CSR evaluation.

CSR Issues Spawned by the New Technologies of Information and Communication

Of all the main categories of CSR recognized in the literature — the environment, fair labour practices, human rights, Indigenous justice, consumer issues, and community involvement and development[69] — none fully contains the issues raised by the use of digital technologies. The first and most obvious of these issues is the privacy of the actors involved in collecting the massive quantities of data necessary for optimal use of the IoT and AI. The fiduciary role of corporations extends to protecting the vulnerability of those who share data through the

66 See Russ Stoddard, "How the blockchain could transform sustainability reporting" (24 April 2018), online: *GreenBiz* <www.greenbiz.com/article/how-blockchain-could-transform-sustainability-reporting>.

67 Julia Rotter, Peppi-Emilia Airike & Cecilia Mark-Herbert, "Exploring Political Corporate Social Responsibility in Global Supply Chains" (2014) 125:4 J Business Ethics 581 at 584.

68 See *Loi relative au devoir de vigilance des sociétés mères et des entreprises donneuses d'ordre, supra* note 12. The first case testing the legislation was brought forward on December 12, 2019. See Camille Bauer, "Justice première utilisation de la loi sur le devoir de vigilance des entreprises" (12 December 2019), online: *l'Humanité* <www.humanite.fr/justice-premiere-utilisation-de-la-loi-sur-le-devoir-de-vigilance-des-entreprises-681738>. See also Les Amis de la Terre France & Survie, "Les manquements graves à la Loi sur le devoir de vigilance des entreprises : le cas Total en Ouganda" (June 2019), online: *Survie* <https://survie.org/IMG/pdf/rapport_totalouganda_at_survie2019>.

69 International Organization for Standardization, "Guidance on social responsibility" (2010), ISO 26000:2010(en), online: <www.iso.org/obp/ui/#iso:std:iso:26000:ed-1:v1:en>.

supply chain, including ultimate consumers.[70] Data privacy and protection have thus become an increasingly important part of CSR, and indeed have become the main issue area to which executives expect to increase the allocation of resources over the next two years, according to the State of Corporate Citizenship Report.[71] Of course, the concern is particularly pressing in the case of global supply chains, through which data is, by its nature, readily transferable and can be moved through different jurisdictions having different legal standards, which in turn might allow companies to minimize their legal obligations through forum shopping and regulatory lobbying.

The second related issue arises out of the cybersecurity risks posed by algorithmic norms. The disastrous end of the Decentralized Autonomous Organization in 2016,[72] or the hacking of the Ethereum blockchain in 2017 following a human error in the creation of hash keys for some user accounts,[73] gave rise to the loss of several million dollars enabled by the algorithmic "laws" that had been put in place on the platform. It follows that the democratization of blockchain — and by extension, of the IoT and AI — throughout everyday activities, at all levels of global supply chains, creates an additional responsibility for businesses to address the cybersecurity concerns associated with the use of technologies. Although cybersecurity could be understood as implicit in broader categories of CSR, such as consumer protection or human rights, it may become its own separate category for oversight.[74]

Real-time Law Confronts Incommensurability

The traceable assessment of CSR social and environmental impacts in supply chains also brings to the fore the question of whether such impacts are inherently unmeasurable. Is it possible to give a measurable value to a visually pleasing landscape, access to a resilient climate, or even a feeling of job security? True, there are "willingness to pay" proxies, and life cycle analyses can be expanded to include multifactorial approaches.[75] Yet any attempt to define a common measure of value and thus compare all factors on a single scale or index could give rise to potential injustice, as each of the goods or claims has an inherent value defended by a different normative and social sphere.[76] One could argue, for example, that the failure to monitor labour practices in

70 See Horace McPherson, "Data privacy — Protecting This Asset Is a Priority" (1 May 2014), online: *ISACA* <www.isaca.org/resources/isaca-journal/past-issues/2014/data-privacy-protecting-this-asset-is-a-priority>.

71 Susan McPherson, "8 Corporate Social Responsibility (CSR) Trends To Look For In 2018", *Forbes* (12 January 2018), online: <www.forbes.com/sites/susanmcpherson/2018/01/12/8-corporate-social-responsibility-csr-trends-to-look-for-in-2018/>.

72 See Nathaniel Popper, "A Hacking of More than $50 Million Dashes Hopes in the World of Virtual Currency", *The New York Times* (18 June 2016), online: <www.nytimes.com/2016/06/18/business/dealbook/hacker-may-have-removed-more-than-50-million-from-experimental-cybercurrency-project.html>. For an explanation of decentralized autonomous organizations in general (as opposed to the Decentralized Autonomous Organization that named itself after the concept and is referred to in the previous article), see David Olarinoye, "What is a decentralized autonomous organization (DAO)?" (3 July 2018), online: *Invest In Blockchain* <www.investinblockchain.com/decentralized-autonomous-organization-dao/>.

73 Andy Greenberg, "A 'Blockchain Bandit' Is Guessing Private Keys and Scoring Millions", *Wired* (23 April 2019), online: <www.wired.com/story/blockchain-bandit-ethereum-weak-private-keys/>.

74 See Scott Shackelford, "Cybersecurity as Social Responsibility: Business, Music, and the Symphony of Cyber Peace" (2017) Indiana University Kelley School of Business Research Paper Series No 17-69.

75 See Cécile Bulle et al, "IMPACT World+: a globally regionalized life cycle impact assessment method" (2019) 24 Intl J Life Cycle Assessment.

76 See *Stanford Encyclopedia of Philosophy*, online: <https://plato.stanford.edu/entries/value-incommensurable/>; see especially *ibid*, "Social choices and institutions" and discussion of the work of Michael Walzer, notably *Spheres of Justice* (New York: Basic Books, 1983).

a supply chain cannot be compensated by good environmental practices: a company that relies on child labour cannot redeem itself through recycling.

Thus, the technological possibilities brought forward by the Fourth Industrial Revolution may accentuate the question as to whether CSR should attempt to integrate, through the use of common metrics, notions that are, by definition, incommensurable.[77] If common metrics are used as diagnostic tools that assist in a more differentiated analysis (the dashboard of indicators we referred to earlier), they could be deployed responsibly. Indeed, a second-order assessment of CSR should pay attention to whether metrics are treated as ends or means: do companies simply report on and satisfy themselves with numerical rankings, without probing the claims that arise from incommensurable impacts? Furthermore, does the transparency they provide to users of data allow third parties to engage in differentiated analysis?

Conclusion: Conceptualizing CSR in Globalized Supply Chains

Globalized supply chains all but escape the control of state law. On their own, states can barely track supply chains that are polycentric and transnational, and if expectations for oversight are centred on the state, that creates space for the neglect of companies' social and environmental obligations. At the same time, it is a considerable challenge simply to define and evaluate precisely how to measure social and environmental impacts. The discourse on CSR is shared by a multiplicity of actors, including international organizations, states, academia and, of course, companies, and its boundaries remain uncertain. New information and communications technologies — the IoT, blockchain and AI — offer emerging avenues for addressing the problems inherent in measuring CSR, such as how best to assemble data from complex systems involving an array of environmental, economic and social impacts. They also hold the promise of better traceability and accountability among actors at all levels of global supply chains.

However, any technology is only a tool — it does not autonomously generate social norms. Although we have sought to show how these technologies could be and, indeed, are being arrayed so as to allow companies to expand their accountability for CSR throughout supply chains, they will still need to be implemented universally by the multiplicity of actors that form supply chains today. Even if that were accomplished, formal and informal norms to govern the use of data and the response to real-time signals of impact will have to emerge and evolve. CSR in global supply chains will become the constellation of such norms, enabled by traceability in real time.

Although we have attempted to identify ways in which CSR can take shape in this new setting, how MNEs are exercising and will exercise agency in shaping norms of corporate behaviour is a broader issue that would require a separate investigation.[78] Furthermore, the implementation of these new technologies will give rise to additional CSR issues, from data privacy and cyber security to normative questions concerning incommensurabilities among the various metrics

77 On incommensurability, see generally Supiot, *supra* note 10.

78 See e.g. Business Roundtable, "Statement of Purpose of a Corporation" (2019), online: <https://opportunity.businessroundtable.org/wp-content/uploads/2019/08/BRT-Statement-on-the-Purpose-of-a-Corporation-with-Signatures.pdf>.

being used to assess the data gathered. These issues boil down to problems of data and technology governance. How MNEs exercise agency in forming norms, and how data and technology are governed, will together open further questions concerning the nature and transformation of the law in this realm. Real-time traceability of social and environmental impacts is beginning to generate a new normative architecture that will recodify the very process of seeking sources of law.[79]

79 See Lawrence Lessig's initial, famous and subsequently revised effort to conceptualize how cyberspace transforms law. Lawrence Lessig, *Code version 2.0* (New York: Basic Books, 2006), online: <http://codev2.cc/download+remix/Lessig-Codev2.pdf>.