

## **ESG DISCLOSURES IN THE TECHNOLOGY SECTOR**

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### **ABSTRACT**

The technology sector is exposed to ESG risks associated with direct and indirect operations, internal and external stakeholders, and legal and regulatory constraints. The recent trend in supply chain diversification also brings new challenges. Mitigating ESG risk could help improve brand value and avoid unnecessary cost increases stemming from supply chain disruptions, reputation damage, regulatory fines, or litigation. However, a review of Bloomberg ESG disclosure data shows that technology firms do not have a high ESG disclosure in contrast to other industries. This study analyzes ESG disclosure effects on ESG risks, the firm's profitability, and supply chain agility.

**Keywords:** ESG, Sustainability, Technology sector

## WDSI Abstract:

### The Effects of ESG Disclosures in the Technology Sector

The technology sector is exposed to ESG risks associated with direct and indirect operations, internal and external stakeholders, and legal and regulatory constraints. In addition, the recent trend in supply chain diversification may bring new challenges to this sector. Mitigating ESG risk could help improve brand value and avoid unnecessary cost increases stemming from supply chain disruptions, reputation damage, regulatory fines, or litigation. However, a review of Bloomberg ESG disclosure data shows that technology firms do not have a high ESG disclosure in contrast to other industries. This study analyzes ESG disclosure effects on ESG risks for technology companies in the United States. The study also analyzes ESG disclosure effects on the firm's supply chain agility and profitability. Detailed results will be presented at the conference.

This study analyzes ESG risk rating data from Sustainalytics, ESG disclosure data from Bloomberg, and firms' performance data from WRDS. A total of 40 IT hardware companies and 125 IT software and service companies are included. Descriptive statistics show that the IT hardware industry has a lower ESG risk rating and higher ESG disclosures than the IT software and service industry. Detailed analyses and hypotheses testing will be provided at the conference.

#### Sustainalytics risk rating data

Sustainalytics risk rating 2020	n	Mean	StdDev
Hardware	40	15.33	4.62
Software & Services	141	21.09	4.28
Semiconductor	24	21.27	5.38

IT Hardware			
	n	Mean	StdDev
US	40	15.33	4.62
ROW	125	19.91	5.38

IT Software & Services			
	n	Mean	StdDev
US	141	21.09	4.28
ROW	173	19.95	5.23

Semiconductor	n	Mean	StdDev
US	24	21.27	5.38
ROW	58	26.17	8.04

Bloomberg 2020	n	ESG	E	S	G
HW	40	34.54	28.56	29.65	57.77
SW	125	26.09	21.20	25.60	57.07
Semiconductor	23	43.28	36.80	39.89	61.18

Hypothesis: high disclosures, lower risk rating? S is significant?

Hypothesis: higher disclosures, better C2C and profit margin? (Agility and profitability)

Dependent variable Risk rating or ROA and C2C

Independent variables: Industry (SW, HW), E, S, G, ESG. Company size, NAICS

Consider other independent variables such as SC policy and audit, internal and external (customer also) policy, and auditors in governance.

## IT companies ESG components risks and opportunities

### Ecological component

The technology sector is exposed to direct and indirect environmental risks associated with manufacturing operations, manufactured products and the use of the physical infrastructure of the Internet. Their environmental impact is primarily related to their indirect operations, as the vast majority of their manufacturing operations are outsourced to suppliers. Working with supply chains, when properly managed, makes it possible to operate more efficiently and environmentally. This can, over time, reduce the impact of environmental risks on equipment and semiconductor companies

### Social component

The main social risks are associated with supply chain management, information privacy and security, and people and diversity. Many tech companies collect, manage, and monetize sensitive information that can be misused. Any theft of corporate or individual information can damage a company's reputation and profit prospects, as well as increase the risk of oversight and regulatory restrictions. Given the environmental and social risks and tighter regulatory and industry focus, it is imperative for equipment and semiconductor companies to effectively manage their complex global supply chains to promote environmental and social best practices.

### Governance component

At the industry level, some tech companies have a two-tier ownership structure that favors founders with super-voting and antitrust disputes. Litigation, especially antitrust disputes, are common in IP-focused segments of the tech sector such as software applications, hardware devices, and semiconductor designs. Legal violations can disrupt and jeopardize the long-term survival

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Sustainalytics data: Sustainalytics classifies a company as a part of its comprehensive universe or core universe primarily by its market capitalization as well as its inclusion in major global and regional indexes. Sustainalytics' Core Framework covers 20-30 management indicators, whereas its Comprehensive Framework covers over 70 management indicators.

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## Multilevel and Longitudinal Modeling with IBM SPSS

<https://www.youtube.com/watch?v=8wWhP1YPJHc>

“Because the data are not strictly hierarchically nested, this investigation used an extension of multilevel modeling, hierarchical cross-classified modeling (HCM). HCM fits both fixed and random effects and accounts for the structure of the data by including random intercepts in the model for the two cross-classified identifiers (Singer, 1998), in this case, firm and year.”

Singer, J.D. (1998), “Using SAS PROC MIXED to fit multilevel models, hierarchical models, and individual growth models”, *Journal of Educational and Behavioral Statistics*, Vol. 23 No. 4, pp. 323-355.

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Brand Directory <https://brandirectory.com/>

## S&P Global Rating

ESG Industry Report Card:  
Technology

<https://www.spglobal.com/ratings/en/research/articles/200211-esg-industry-report-card-technology-10992765>

- We view the global technology sector as having above-average exposure to social risks in the hardware and semiconductor sectors, as well as in software and services.
- Privacy and data security concerns are key for software and services since many technology companies collect, manage, and monetize sensitive information for corporations and individuals at risk of misuse.
- The hardware and semiconductor subsectors are more exposed to social risks, such as criticism over labor management, poor working conditions, and lax occupational safety standards, particularly in Asia.
- Environmental risk to credit ratings is below average for software and services, but above average for hardware sectors, in our view. In particular, data centers face environmental concerns because of their large energy consumption, mitigated by efforts to improve energy efficiency.
- Hardware and semiconductor companies' supply chains require mining of precious metals and rare earth elements to produce electronic components. Production also requires large volumes of ultrapure water; wastewater contains high amounts of heavy metals and toxic chemicals.

## Qualitative Sector Listing Of Relative Environmental Exposure: Technology

Greenhouse gas emissions, waste, pollution, and land use



Source: S&P Global Ratings.

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### Analytic Approach

Environmental, social, and governance (ESG) risks and opportunities can affect an entity's capacity to meet its financial commitments in many ways. S&P Global Ratings incorporates these considerations into its ratings methodology and analytics, which enables analysts to factor in short-, medium-, and long-term impacts--both qualitative and quantitative--to multiple steps of their credit analysis. Strong ESG credentials do not necessarily indicate strong creditworthiness ("The Role Of Environmental, Social, And Governance Credit Factors In Our Ratings Analysis," published Sept. 12, 2019).

Our ESG report cards qualitatively explore the relative exposures (average, below, above average) of sectors to environmental and social credit factors over the short, medium, and long term. For environmental exposures, Chart 1 shows a more granular listing of key sectors and (in some cases) subsectors reflecting

the qualitative views of our analytical rating teams. This sector comparison is not an input to our credit ratings and not a component of our credit rating methodologies; it is based on our current qualitative, forward-looking opinion of credit risks across sectors.

In addition to our sector views, this report card lists ESG insights for individual companies, including how and why ESG factors may have had a more positive or negative influence on an entity's credit quality compared to sector peers or the broader sector. These comparative views of environmental and social risks are qualitative and established by analysts during industry portfolio discussions, with the goal of providing more insight and transparency.

Environmental risks we considered include greenhouse gas (GHG) emissions, including carbon dioxide, pollution, and waste, water and land usage, and natural conditions (physical climate, including extreme and changing weather conditions, though these tend to be more geographic/entity-specific than a sector feature). Social risks include human capital management, safety management, community impacts, and consumer-related impacts from customer service and changing behavior to the extent influenced by environmental, health, human rights, and privacy (but excluding changes resulting from broader demographic, technological, or other disruptive industry trends). Our views on governance are directly embedded in our rating methodology as part of the management and governance assessment score.

## **Software And Services**

### **Environmental exposure**

Companies in the software and services industry have limited use of physical infrastructure or facilities, and most do not have manufacturing operations. Overall, they produce lower GHG emissions, pollution, or environmental waste, and have low land and water use. However, companies that operate data centers or provide hosting services carry more significant risk exposure to GHG emissions. As companies increasingly rely on cloud computing to offload the data and services consumers use, in social media and gaming in particular, they have an exponentially increasing need for computing and data storage. Data centers consume large amounts of energy. Mitigating factors include greater environmental risk awareness, leading data center companies to improve their



energy efficiency, use environmentally friendly Leadership in Energy and Environmental Design (LEED)-certified buildings, and increase renewables in their energy mix.

## **Social exposure**

In our view, the most relevant social risks in this sector are privacy and data security because many technology companies collect, manage, and monetize sensitive information for corporations and individuals at risk of misuse. Data security breaches can cause significant reputational and monetary damage to companies, weakening their credit risk profile because their competitive position could be harmed and, in turn, hurt revenue and profitability. Moreover, these concerns could invite increased regulatory scrutiny, which could lead to a more restrictive business environment and additional operational costs to comply.

Other important social risk factors include gender inequality, lack of workforce diversity as it affects employee turnover, and talent retention critical to tech firms' intellectual property (IP).

## **Hardware And Semiconductors**

### **Environmental exposure**

Environmental risk is more relevant for hardware and semiconductor companies in the broader technology sector because of significant exposure to water and waste management. Manufacturing semiconductors requires large volumes of ultrapure water. As water becomes scarcer around the globe, robust management of water usage is key to avoiding higher supply costs and potential loss of access to water-scarce areas. This could disrupt production and affect revenues.

Wastewater generated in the production process contains high amounts of heavy metals and toxic chemicals, often requiring high clean-up costs. Higher operating costs and capital expenditures to deal with hazardous waste, as well as poor management of waste disposal can also put companies at higher risk of regulatory fines.

Given the outsourcing of manufacturing activities by most tech hardware and semiconductor companies in recent decades, GHG emission, waste disposal, and other hazardous waste concerns transfer to their vast supply chain partners. However, as hardware original equipment manufacturers (OEMs) and

semiconductor design firms have significant influence over the manufacturing process, regulatory and industry emphasis has increased on these companies' efforts to establish, implement, and enforce best practices to mitigate their scope 1 (direct emissions from owned or controlled sources), scope 2 (indirect emissions from generation of purchased energy), and scope 3 (all indirect emissions not included in scope 2) impact in their supply chain networks. Furthermore, because many manufacturing operations are outsourced to Asia-Pacific, the tech hardware and semiconductor global supply chain is more exposed to chronic or acute natural events such as floods and earthquakes. For example, severe flooding across Thailand in November 2011 significantly disrupted the manufacturing of hard disk drives, a crucial component for personal computers, causing global industry supply shortages and elevated component costs for almost two years. Not only did it hurt vendors' financial performance, it lowered unit sales of PC and storage systems, weakening those vendors' credit profiles.

While it's often difficult to assess the associated costs that pressure hardware and semiconductor companies' operating margins and operating cash flow generation, [we believe their efforts to mitigate environmental risk exposure should help protect brand value and avoid unnecessary cost increases stemming from supply chain disruptions, brand damage, regulatory fines, or litigation.](#)

Another important issue for the industry is product lifecycle management and e-waste. The high turnover rate for electronic equipment fueled by innovation and fashion trends has created an ever growing challenge for dealing with the end-of-life product disposal. Robust product life cycle management programs can help companies mitigate increased regulatory costs and realize cost savings by recovering precious and rare earth metals by recycling electronic equipment.

## **Social exposure**

Electronics manufacturers face high scrutiny and criticism over human capital management. Long hours, poor working conditions, and lax occupational safety standards are major areas of concern, particularly in Asia. Improving working conditions and labor relations can help increase productivity and avoid production disruptions and work stoppages, which could affect sales volumes and revenues. It can also prevent reputational damage and fines linked to labor-related scandals.

There is also social risk exposure in the supply chain. Precious metals and rare earth elements such as tin, tantalum, tungsten, gold, and cobalt are mined, often

in geopolitically unstable areas. Cobalt, for instance, a crucial component for lithium-ion batteries, is mostly mined in the Democratic Republic of Congo, where child and forced labor are common. Robust management of labor risks and adherence to international covenants on human rights throughout the supply chain can help mitigate production disruptions and avoid costly scandals, which can cost companies their social licenses to operate.

## Governance

Overall, governance is company-specific because it usually reflects corporate culture, strategy, and ownership structure. At the sector level, certain technology companies have a dual-class ownership structure that favors founders with super-voting power and antitrust disputes.

Founder-led companies with super-voting power can reduce the board's effectiveness; however, it isn't necessarily a weakness because in many instances founder-led companies can pursue longer-term growth objectives by prioritizing corporate culture and product innovations rather than short-term shareholder remuneration. Companies must take steps to manage their key-person risk when the founder's presence, absence, or behavior hinders performance. Some technology companies also have excessive executive compensation practices to ensure that incentives are well aligned with corporate strategy and do not encourage unnecessary risk-taking.

Litigation, specifically antitrust disputes, are common in IP-centric segments of the technology sector, such as software applications, hardware devices, and semiconductor designs. Legal infractions can disrupt and threaten an organization's long-term survival, so they're an important factor in our credit rating assessment.

**Supply chain diversification** is gaining momentum. The technology supply chain, long dominated by China, is likely to undergo gradual diversification due to the confluence of the ongoing pandemic and the resulting component and assembly capacity shortage, rising geopolitical concerns and lower cost in other regions. Such a transition could have far-reaching implications for technology companies, including increasing resiliency of their manufacturing supply chain, increasing diversification of their supplier and customer base, and potentially strengthening competitive barriers from managing an

increasingly complex supply chain. However, such benefits do not come without risks as these companies face issues such as adjusting manufacturing processes to local customs and culture, incremental startup costs, and finding suitable labor supply. We see major electronics manufacturing services (EMS) providers and component makers increasing capacity mainly in Vietnam, Thailand, Malaysia, and India driven by demand from their OEM customers. To minimize geopolitical and event risks such as from the COVID-19 pandemic, large OEMs such as Apple are encouraging Taiwanese EMS suppliers to build new capacity in southeastern Asia and India. Increasing nationalistic sentiment are also resulting in more government policies that favor local supply chains, which could add to reasons for evaluation of supply chain diversification. India, for example, has prohibitive import taxes to encourage local production, speeding up the need for EMS companies to expand their domestic capacity in India. And many semiconductor companies, such as TSMC and Samsung, are increasing investments in U.S. and European manufacturing facilities driven by customer demand, as well as subsidies from local governments. Still, there are many challenges faced by technology companies when diversifying their supply chain. Cultural conflicts and infrastructure constraints have emerged for companies like Hon Hai Precision Industry Co. Ltd. Inc. and Wistron Corp., which caused delays in production ramp and damage to their reputations due to labor disputes. Moreover, building capacity outside of China can be costly given China's well-developed infrastructure and supply chain capabilities. Additionally, some countries, especially those in Southeast Asia, lack a large pool of skilled labor or have much higher labor costs, such as in the U.S. In the near term these issues may be minimized given the tightness of supply and better pricing resulting from component shortages; however, we believe these conditions are temporary.

Despite the reasons explained, and our expectation for some diversification of supply chain in the tech sector, we believe China will remain the largest global manufacturing hub given its highly efficient manufacturing capabilities, well-developed infrastructure, and large domestic market. Nonetheless, these headwinds are unlikely to deter the broad trends supporting supply chain diversification over the longer term. The recent pandemic-related surge in demand was unanticipated and caught the industry off guard. But the trends supporting supply chain diversification is not only to meet the recent surge of demand but rather based on longer-term business strategies around risk management and improving the company's competitive positioning. Surging demand and improving profitability have helped the tech Industry Top Trends 2022: Technology S&P Global Ratings January 25, 2022 16 supply chain carry out its capacity expansion with limited impact to most companies' credit profiles. We expect capacity shortage and relatively strong profitability in combination with significant subsidies by hosting nations could facilitate such a transition, but any meaningful diversification will take time in our view.

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