Analysis on the Disclosure Integrity of Industry-specific Material ESG Information Disclosures of KOSPI Top 10 Firms*
KOSPI 상위 10개 기업의 산업별 중요성을 반영한 ESG 공시 충실성 연구

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Voluntary ESG disclosure practices are on the rise, oftentimes not fully embracing material ESG information which is in increasing demand in the capital market. This calls for the adoption of financially material ESG disclosure standards. The SASB standards, with their clear industry-specific material disclosure guidelines, are gaining legitimacy in Korean and global markets. This study examines the disclosure integrity of ESG disclosures of the Top 10 companies listed on the KOSPI in terms of industry-specific financial materiality. We construct a coverage-ratio-scoring-mechanism by mapping Bloomberg ESG Disclosure datasets and sustainability reports to the SASB standards. The results show that 1) during 2018-2020, KOSPI Top 10 firms showed advanced industry-specific material ESG disclosure both in quantity and quality and 2) readily-available Bloomberg ESG Disclosure datasets did not fully capture the scope of the SASB-related disclosure practices of the sample firms.

Key Words: ESG disclosures, ESG investment, ESG ratings, the SASB, Sustainability reports

I. Introduction

With global cultural shifts towards corporate responsibility, the integration of Environmental, Social, and Governance (ESG) issues lies at the heart of investing. Accordingly, sustain- able investment assets are constantly growing. As of early 2020, sustainable investment has reached up to $35.5 trillion in five major markets (GSIA, 2021). As investors ask for more transparency, demand for ESG disclosure and ESG data services follows the same trend. It is expected that ESG data and analytics

will grow to a $5 billion global market by 2025 (GSIA, 2021). With increased attention to ESG investment, the capital market is requesting advanced disclosure of ESG information. Governments throughout the world are starting to mandate ESG disclosure practices (IPSF, 2021). In Korea alone, 135 firms published sustainable reports in 2020 (Kim, 2021b). Starting in 2025, KOSPI-listed large-cap companies are expected to be subject to mandatory sustainability reporting (FSC, 2021), and 52% of those firms will be required to report are already disclosing ESG-related information voluntarily (Lee & Lee, 2021).

As in the traditional financial disclosure arena, capital market participants utilize the concept of materiality to capture the essence of ESG disclosure and ESG data. However, financial materiality concepts in terms of ESG are still at their inception (Grewal et al., 2021; Soehner & Boujoukos, 2021). The Sustainability Accounting Standards Board (SASB) is an organization that leads the discussion on sustainability materiality disclosure standards. Founded in 2011, the SASB has progressively constructed industry-specific material ESG disclosure standards. It has created detailed guidelines focusing on ESG factors linked to financial performance and is quickly being accepted by capital market participants (CSES, 2021). According to a Morrow Sodali survey from 2020, 81% of institutional investors recommended firms to use the SASB standards

to communicate ESG information (Clarkin et al, 2020; Vasantham & Shammai, 2020). It is the second most widely used ESG disclosure initiative in Korea as of 2021 after GRI (Lee & Lee, 2021).

In late 2021, The International Financial Reporting Standards (IFRS) Foundation formed the International Sustainability Standards Board (ISSB). The ISSB, whose goal is to provide the global baseline of sustainability disclosures, has guided firms to identify and disclose industry-specific sustainability-related material information based on the SASB standards in its two exposure drafts published in March, 2022. (ISSB, 2022a; ISSB, 2022b). Around the world, the IFRS Standards are the most widely used universal financial reporting standards with 87% of jurisdictions – one of which is Korea – mandating the standards for most of their companies (IFRS, 2018b). Based on this overwhelming rate of adoption of the IFRS standards, expectation is high for the ISSB as an affiliated arm of the IFRS Foundation to develop universally binding sustainability reporting metrics. It is for this reason that foundation of the Korea Sustainability Standards Boards (KSSB) is being proposed to prepare for the adoption of the ISSB reporting standards in Korea (Jeon & Cheung, 2022). Therefore, even though the development of ISSB sustainability disclosure standards is still in progress, disclosure of industry-specific material ESG information according

to the SASB standards is expected to have a significant impact on sustainability disclosure practices in both global and Korean markets.

Previous research showed the significance of the disclosure practices of industry-specific material ESG information in terms of ESG investment. Grewal et al. (2021) and Khan et al. (2016) showed that when the SASB standards were mapped to pre-existing ESG datasets, financial metrics such as stock price informativeness and index performance significantly increased. Previous research also showed that the level of ESG disclosure was different between firms even when they implemented the same standards. Eccles et al. (2012) showed divergence in disclosure quality as the U.S. firms disclosed climate-related information. Busco et al. (2020) showed differences in quantity when it comes to the SASB-related ESG disclosure practices of the U.S. companies. However, only a small number of studies examine the general level of ESG disclosure practices of Korean companies (Han et al., 2016; Lee & Lee, 2021), and previous literature tends to cover specific topics such as climate-related disclosure (Eccles et al., 2012; Han et al., 2019). To this end, this research conducts a case study to assess the level of KOSPI Top 10 firms' ESG disclosure practices in terms of industry-specific mate-

rial ESG topics, which are suggested by the SASB standards.

The purpose of this research is to analyze the disclosure integrity[1] of ESG disclosures of listed Korean firms in terms of industry-specific financial materiality. This research intends to analyze the implementation status for and readiness to the SASB standards – which is expected to play the role as comparable international ESG disclosure standards in the future, in line with mandatory ESG disclosures of large corporations in 2025 – of the largest listed Korean companies. Practically, this research limits sample range to KOSPI Top 10 companies since it aims to analyze the level of SASB-readiness of the largest KOPSI-listed companies in each year since the SASB standards were first introduced in 2018. Bloomberg ESG Disclosure dataset is a widely used proxy database for research regarding ESG disclosure (Baldini et al., 2018; Christensen et al., 2022; Li et al., 2018). Therefore, we use Bloomberg ESG Disclosure dataset as a proxy for ESG disclosure data. Comparatively, sustainability reports are also collected and reviewed as these are the original source of communication regarding firms' sustainability-related datasets. We use Bloomberg ESG Disclosure score as the benchmark to compare our scoring results. Industry-

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1) This research defines disclosure integrity as how completely firm's ESG disclosure practices are reflecting the SASB disclosure standards. Similarly, Busco et al. (2020) calculated "the degree of compliance to the SASB standard at the topic level" by analyzing the ratio of disclosure topics for which companies reported.

specific material ESG disclosure standards are attained from the SASB.

This research studies the breadth and depth – quantity and quality – of industry-specific material ESG disclosure practices of large-cap Korean firms. We conducted a case study of KOSPI Top 10 firms during the sample period of three years, from 2018 to 2020. The integrity of firms' industry-specific material ESG disclosure is assessed by analyzing the coverage ratio of the SASB disclosure standards. First, BloomSA score calculates the ratio of the number of Bloomberg ESG Disclosure dataset items that correspond to the SASB metrics against the total number of the SASB metrics. According to BloomSA score results, the quantity of the SASB disclosure of KOSPI Top 10 firms is low, indicating that not much of the SASB disclosure metrics are covered – i.e., low disclosure integrity. Second, SusSA score calculates the ratio of the number of the SASB metrics disclosed on sustainability reports divided by the total number of the SASB metrics. According to SusSA score results, the quantity of the SASB disclosure of KOSPI Top 10 firms is generally high. Unlike BloomSA results, SusSA results, which directly mapped the sustainability reports of the sample firms, indicate that the sample firms are indeed quantitatively well disclosing industry-specific material ESG information

– i.e., high disclosure integrity. Comparatively, SusSA scores are higher than BloomSA scores and the proxy Bloomberg ESG Disclosure scores particularly in 2019-2020. This coincides with the period that most of the sample companies started to adopt the SASB standards. Especially, the difference between Bloomberg ESG Disclosure scores and SusSA scores can be due to the fact that even though the sample firms are disclosing according to the SASB metrics, Bloomberg ESG Disclosure scores may not fully reflect these firms' disclosure performance.

Even when firms are covering much scope of the SASB standards, users cannot expect usefulness if ESG disclosures are mostly made of generic statements (Eccles et al., 2012). That is why this research conducts an additional quality analysis. Whereas BloomSA and SusSA study quantitative ESG disclosure coverage ratio against the SASB standards, the additional study assesses the quality of ESG disclosure content of the sample firms. Among the disclosure contents of the sustainability reports, ESG disclosure items that follow the descriptive SASB disclosure standards are identified and their disclosure contents are evaluated according to the four disclosure categories (Eccles et al., 2012); 1) No disclosure, 2) Boilerplate statements,[2] 3) Industry specific, and 4) Quantitative metrics.

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2) Boilerplate statements: "Generic language about potential risks from future regulation and the inability to quantify financial impacts." It is concerning when such statements prevail since they add little value to the users of a

Such qualitative evaluation is significant, along with quantitative assessments, since firms' ESG disclosures must include practical information in content to become useful and relevant to the main users. The result of our additional study shows that, during 2018-2020, sample firms prevalently disclose industry specific and quantitative metrics in their sustainability reports, which are more advanced forms of ESG information. This shows that large-cap Korean firms have been disclosing industry-specific material ESG information not only in a quantitatively, but also in a qualitatively advanced manner in recent years.

This research makes contributions in mainly two ways. First, it contributes to various users of industry-specific material ESG information disclosure. The results show that the sample firms are disclosing industry-specific material ESG-related information in detail both quantitatively and qualitatively. Capital market participants may expect usefulness of ESG disclosure practices from large-cap listed Korean firms and, therefore, safely refer to firms' ESG disclosures as the fundamental source of industry-specific financial ESG information. Although it is important to note that our samples are limited to KOSPI Top 10 firms, we find that firms in the pharmaceutical industry underperformed both quantitatively and qualitatively in industry-specific material ESG

report (Eccles et al., 2012).

disclosure. Our results may inform policy makers the need to tailor sector-specific ESG disclosure regulations so that no industry gets neglected. As it is known that medium and small firms show a low level of ESG disclosure (Lee, 2021c), our findings also suggest a managerial implication in that the ESG disclosure materials of the highly-scored sample firms of this research can serve as good benchmarks to the firms which aim to advance their ESG disclosures.

Second, it contributes to the end-users of readily-available ESG datasets. Importantly, this research indicates that Bloomberg ESG Disclosure datasets fail to fully reflect the SASB-related ESG information of individual firms we analyzed. In other words, although KOSPI Top 10 companies' ESG disclosure practices have been advancing quantitatively and qualitatively according to the SASB standards, widely-used Bloomberg ESG Disclosure database does not fully capture such progress. Therefore, in order to increase the usefulness of disclosed ESG information, users should validate retrieved ESG disclosure data thoroughly. This research also finds that Bloomberg ESG Disclosure scores from the past years are not fixed, but rather, continuously get updated over time. This means that the users of Bloomberg ESG Disclosure datasets and Bloomberg ESG Disclosure scores should be cautious when they design their research or interpret the

data in their decision-making processes.

The rest of this paper goes as follows. Section 2 sets out literature review and motivation of this research. Section 3 describes the methodology in detail. Section 4 discusses the results. Lastly, the paper concludes with Section 5.

II. Literature Review and Motivation

2.1 ESG Investing and ESG Disclosure Regulations

Although the practice of ethical investments dates back to the Quakers in the eighteenth century, the dawn of responsible investment of today – ESG investment – began with the foundation of the UN Principles for Responsible Investment (UNPRI) in 2005 (Gifford, 2015; Hawley, 2015). Thus, this research adopts the definition of ESG-related investment suggested by the UNPRI as investing with regards to the incorporation of ESG-related factors (UNPRI, 2021). An exponentially growing level of attention has been given globally to ESG strategy and ESG investing in recent years. Global assets under management which integrate ESG issues amount to $40.5 trillion in 2020. It has doubled in the past four years, and more than tripled in the past eight years (Baker, 2020; Chang, 2021; Kim, 2021a). According to Bloomberg, global

ESG assets are expected to be even larger, to exceed $53 trillion by 2025, which would surpass more than a third of the total global assets under management (Bloomberg Intelligence, 2021). The Korean asset management market, as well, is reacting accordingly. Articles suggest that for Korean pension funds, ESG issues are highlighted as must-to-consider issues (Hong, 2021). Rightly so, ESG-related assets are continuously increasing in Korea (Koo, 2021).

Such a strong market drive has put ESG into the mainstream. ESG investment is now referred to as a global "paradigm shift" (Benz & Ptak, 2020). Major investors specifically require industry-specific material ESG information that are useful to their decision-making processes. The importance of the disclosures on ESG-related information is being reaffirmed globally. In 2021, the European Union has announced that it would tighten the ESG disclosure rules with the introduction of Corporate Sustainability Reporting Directive proposal (European Commission, 2021b). The EU proposal expands subject firms of ESG disclosure dramatically from 11,600 to 49,000 (European Commission, 2021a). Although it is also being actively pursued, the regulatory framework on ESG disclosure is less definitive in the U.S. (Katz et al., 2021), with the U.S. Securities and Exchange Commission (SEC) focusing on implementing an ESG disclosure framework (Lee, 2021a). The U.S.

Congress takes a stronger stance, calling for the SEC to require disclosures of ESG metrics in the "ESG Disclosure Simplification Act of 2021" (U.S. Congress, 2021). Korea is following suit, although relatively slowly, by mandating large KOSPI-listed firms to disclose ESG-related issues by 2025 and all the KOSPI-listed by 2030 (Lee, 2021b). Despite such regulatory trends, firms' disclosures on ESG issues fail to keep up with the growing attention and amount of ESG-related investment assets. ESG disclosures today lack both in quantity and quality, creating potential problems such as greenwashing (Soehner & Boujoukos, 2021) and capital misallocation (TCFD, 2017).

The quick transition of market atmosphere also brought about concerns about ESG reporting. The issues of how much and which ESG-related information to be disclosed is at the forefront of on-going conversations in the realm of ESG investing. At the heart of this practice, there is the principle of financially material ESG disclosures. Questions such as 1) What "financially material" means when it comes to ESG disclosures? (Coates, 2021; SASB, 2020), 2) How to measure such information? (SASB, 2018), and 3) Where to disclose? (Coates, 2021) have been raised, reviewed, and answered. The existence of multiple ESG disclosure frameworks – popularly referred to as "alphabet soup" – also pose a concern (Sætra, 2021). Companies which dis-

close ESG information consider to implement various ESG disclosure frameworks such as GRI, TCFD, SASB, IIRC, CDP, etc. Different ESG disclosure frameworks address disparate ESG issues. Investors worry that the value of ESG disclosures would be reduced without a standardized set of ESG disclosure frameworks which can enhance comparability (Clarkin et al., 2020). In order to eliminate the root of such confusion, the International Financial Reporting Standards (IFRS) Foundation is leading the way to establish a "universal" global ESG disclosure framework. They have started the process by launching the International Sustainability Standards Board (ISSB) and endorsing a majority of existing ESG disclosure frameworks such as TCFD, SASB, IIRC, CDSB, etc. (ISSB, 2021). Still, questions remain whether and how the ISSB would incorporate with other existing frameworks such as GRI, the EU CSRD, and the regulations from the U.S. SEC (Carter et al., 2022).

2.2 Financially Material ESG Disclosures and the SASB Standards

Financial materiality guides traditional financial accounting standards (Eccles et al., 2012; Grewal et al., 2021). In the traditional sense of financial accounting, information is considered "material" if omitting or misstating such information would or could alter decisions made by general users of the information. The

U.S. Supreme Court set forth the definition of materiality as "an omitted fact is material if there is a substantial likelihood that a reasonable shareholder would consider it important in deciding…(TSC Industries, Inc v. Northway, Inc., 1976)." Similarly, materiality is defined by the SEC as "The omission or misstatement of an item in a financial report is material if, in the light of surrounding circumstances, the magnitude of the item is such that it is probable that the judgment of a reasonable person relying upon the report would have been changed or influenced by the inclusion or correction of the item (SEC, 1999)." The Financial Accounting Standards Board (FASB) aligns its definition of materiality with the U.S. Supreme Court and the SEC (Santay, 2018). In Korea, the Korea Accounting Standards Board (KASB) directly adopts the definition of materiality from the International Accounting Standards Board (IASB), which states "Information is material if omitting, misstating or obscuring it could reasonably be expected to influence the decisions that the primary users of general purpose financial statements make on the basis of those financial statements, which provide financial information about a specific reporting entity (IFRS, 2018a; KASB, 2019)."

In the ESG domain, the sense of financial materiality is also of significance. However, things are not as well defined. Material factors can be broadly seen as impactful factors such as revenue growth, cash flow generation capability, as well as risks and opportunities that are "significant to companies' business model and value drivers" (Robeco, n.a.). The application of financial materiality in terms of ESG disclosure is convoluted. First, ESG issues are extremely broad (Katz et al., 2021). The industry-specific nature of ESG issues adds yet another degree of complexity (Eccles et al., 2012). Additionally, some of these issues are even firm-specific (Coates, 2021). To this end, the SASB is leading the conversation on defining financial materiality on ESG disclosures. The SASB directly adopts the definition set forth in the financial domain as stated above (SASB, 2020), and interprets financial materiality as meeting the needs of "investors and other providers of financial capital" (Guillot, 2021). With the goal of helping companies and investors better communicate about financially material and decision-useful sustainability information (SASB, 2020), the SASB has developed a map of industry-specific financially material sustainability topics and metrics. The SASB standards are a set of Industry Standards by which companies voluntarily choose to disclose financially material ESG information. It is thanks to such clear focus on industry-specific material sustainability information which has made investors and ESG rating agencies embrace the SASB standards (CSES, 2021).

2.3 Research Motivation and Development

Previous literature studied the effects of material ESG disclosures and the significance they have in the capital market. Grewal et al. (2021) showed a positive correlation between the SASB's materiality disclosure guidelines and stock price informativeness. Khan et al. (2016) reported positive relations between high ratings of firms on SASB-identified material sustainability issues and long-term stock returns. They also showed that the SASB materiality-adjusted index outperformed the KLD-ESG index. Lee et al. (2018) showed that there was no significant correlation between the airline industry's material CSR initiatives and firm performance. These studies commonly utilize readily-available ESG ratings and/or ESG disclosure standards – specifically the SASB standards which guide materiality – to capture the level of ESG disclosures.

Previous literature also reports that ESG disclosures and ESG ratings are not free of caveat. For instance, although Bloomberg bestows higher scores to the companies that disclose more ESG information, not all relevant scopes of ESG disclosures may be captured (Christensen et al., 2022). Additionally, "transparency around data sourcing and methodologies" is also seen as one of the major issues regarding ESG ratings (European Commission, 2022). This means that data users may be blind to the processes and assumptions behind the readily-available ESG datasets and ESG scores. Likewise, it is sometimes unclear whether industry-specific material information is included in the scoring process and to what degree. This is of concern as previous studies showed polarizing levels of ESG disclosures between companies both in quantitative and qualitative perspectives. Intensity assessments on the SASB-driven ESG materiality disclosure practices, while generally good, varied by industry (Busco et al., 2020). The quality of climate change-related disclosures within 10-K filings of firms varied, although "boilerplate statements" proliferated (Eccles et al., 2012).

As described above, existing papers reported the significance of material ESG disclosure in financial markets (Grewal et al., 2021; Khan et al., 2016) and level of sustainability-related disclosure practices of firms (Busco et al., 2020; Eccles et al., 2012). While companies are widely adopting ESG disclosure frameworks and guidelines in Korea, there is little research that has analyzed the overall scope of ESG disclosures of Korean companies (Han et al., 2016; Lee & Lee, 2021). Other previous literature which studied firms' sustainability disclosure practices focuses on specific topics such as climate-related information (Eccles et al., 2012; Han et al., 2019). Existing studies do not analyze the integrity of industry-specific financial ESG disclosure practices of

Korean companies. This is not surprising, as the adoption of standards on material ESG issues, such as the SASB standards, is a very recent occurrence. Although sustainability report assurance services can guarantee basic reliability of sustainability information disclosed by firms (European Commission, 2021a), questions still remain on the integrity of financially material ESG disclosure practices of Korean firms. We hypothesize that the disclosure extent of industry-specific material ESG information between Korean firms would be disparate. Hence, we aim to assess the integrity of ESG disclosures of Korean companies in terms of industry-specific material ESG topics. We evaluate ESG disclosure practices of KOSPI Top 10 firms over the sample period of three years – 2018-2020 – both quantitatively and qualitatively.

III. Methodology and Data

3.1 Methodology

We calculate and analyze the coverage ratio of the industry-specific material ESG disclosure topics in ESG disclosure practices of KOSPI Top 10 companies. Data are collected from the following sources: 1) KRX, which provides KOSPI datasets, 2) the SASB, which provides industry-specific material ESG dis-

closure standards, 3) Bloomberg, which provides Bloomberg ESG Disclosure datasets and Bloomberg ESG Disclosure scores, and 4) sustainability reports from the websites of each firm.

Previous literature developed methodologies utilizing the SASB standards as an ESG disclosure proxy. State Street Global Advisors has developed the R-Factor ESG rating by mapping Sustainalytics, ISS-ESG, Vigeo-EIRIS, and ISS-Governance to the SASB Industry Standards (Kumar, 2019). Khan et al. (2016) maps the KLD Standards to the SASB Industry Standards. Each KLD items are classified material or immaterial following the SASB guidance. Grewal et al. (2021) utilizes Bloomberg's SASB-mapped "XLTP XESG" dataset. The SASB material sustainability score is calculated as "the ratio of number of disclosed SASB ESG metrics to total number of metrics identified by SASB and available in Bloomberg." Following Grewal et al. (2021), this research constructs a scoring methodology by mapping Bloomberg ESG Disclosure datasets and sustainability reports against the SASB standards to calculate the coverage ratio of number of disclosed SASB metrics.

First, KOSPI Top 10 companies during the research period of 2018-2020 are identified from the KRX dataset platform. Companies are then listed and categorized following the SASB Industry Classification. Second, industry-specific material ESG information that each

firm has to report is collected from the SASB guidelines. Third, two sets of scores – BloomSA and SusSA – are calculated against the SASB standards; 1) BloomSA captures the coverage ratio of Bloomberg ESG disclosure dataset against the SASB disclosure metrics (*See Appendix A-1*). BloomSA scores are compared with Bloomberg ESG Disclosure scores. 2) SusSA captures the coverage ratio of information on sustainability reports against the SASB disclosure metrics (*See Appendix A-2*). SusSA scores are compared with Bloomberg ESG Dislcosure Scores and BloomSA scores.

Our methodologies bear a caveat. Although the sample firms have disclosed industry-specific material ESG information, our methodologies can miss some data. Our main evaluation methodologies rely on a single set of ESG disclosure source – Bloomberg ESG Disclosure datasets for BloomSA and sustainability reports for SusSA. Considering that Bloomberg may not include all ESG disclosures (Christensen et al., 2022) and that companies disclose ESG information through various channels other than sustainability reports, our scores may not wholly reflect every ESG-related disclosure made by firms.

3.2 Company Samples

Our sample selection for assessing the ESG materiality disclosure scoring (BloomSA and SusSA) is Top 10 companies by market capitalization listed on the KOSPI index between 2018-2020. Top 10 companies are chosen based on the rankings on the market closing date – December 28th in 2018 and December 30th in 2019 and 2020 – of each year. It is suggested that high-cap S&P 500 companies scored higher on ESG disclosure than mid-cap S&P 500 companies (Tamimi & Sebastianelli, 2017). In the same vein, we select the highest-cap Korean companies, KOSPI Top 10 companies, as sample firms since they are more likely to disclose fuller ESG information. This study is based on firms' disclosures content. We reason that fuller disclosures mean more objects to be analyzed, which can increase the credibility of our case analysis results.

KOSPI Top 10 firms by market capitalization between 2018-2020 are retrieved from the KRX database. In practice, top eleven firms were included for each year in order to avoid double-counting between "Samsung Electronics (005930)" and "Samsung Electronics Preferred (005935)." In total, thirty-three equity datasets are retrieved from the KRX database over the period of three years. Then three datasets of "Samsung Electronics Preferred (005935)" are ignored to make the final KOSPI Top 10 company sample lists over the sample period. As a result, a total of fourteen individual firms make our research sample.

3.3 The SASB Standards

Industry-specific materiality ESG standards are retrieved from the SASB guidelines. The SASB is a nonprofit standard-setter whose mission is "to establish industry-specific disclosure standards across ESG topics that facilitate communication between companies and investors about financially material, decision-useful information (SASB, 2020)." Established in 2011, the SASB has developed the disclosure standards for 77 industries, which were first published in 2018. Although the SASB materiality metrics are voluntarily adopted, not mandated (SASB, 2018), they have been establishing importance in ESG disclosure domain. Many ESG investors, one of the major end-users of ESG disclosures, endorse and require companies to follow the SASB guidelines. Major global investing institutions such as BlackRock, Vanguard, and State Street are pressuring their clients to disclose sustainability information in line with industry-specific SASB standards (BlackRock, Inc., 2021; Clarkin et al, 2020; Jessop & Kerber, 2020). Major ESG rating agencies such as Moody's and S&P also endorse and support the SASB standards (Clarkin et al., 2020).

The SASB standards consist of five layers of structure (SASB, 2020). From the top of the structure is constructed as; 1) Sectors and Industries, which are "based on SASB's Sustainable Industry Classification System (SICS).", 2) Sustainability Dimensions, which are "broad sustainability themes.", 3) General Issue Categories, which are "industry-agnostic and cross-cutting themes.", 4) Disclosure Topics, which are "the industry-specific.", and 5) Accounting Metrics, which are "quantitative and qualitative indicators." The SASB Materiality Map shows a comparative snapshot of the forementioned structure across different sectors and industries *(See Appendix B)*. Individual SASB Industry Standards list materiality metrics for each industry. For this research, corresponding business sectors and industries are identified for each sample firm, according to the SASB's SICS. The SASB Sustainability Dimensions of each set of Industry Standards are observed from the Materiality Map, and these dimensions are rearranged as Environment (E), Social (S), and Governance (G) so that Bloomberg ESG datasets can be mapped accordingly. In detail, "Environment" under the SASB Materiality Map is sorted as E. "Social Capital and Human capital" are sorted as S. "Leadership & Governance" are sorted as G. Under "Business Model & Innovation", each Disclosure Topic is sorted as E, S, or G by the nature of the industry-specific Accounting Metrics. Accordingly, the SASB Disclosure Topics and Accounting Metrics under each Sustainability Dimension are also rearranged.

Although the SASB Accounting Metrics for an industry are given by the organization itself, it is important to note that a couple of

adjustments are made for this research. First, U.S. country-specific metrics are either altered or omitted. For example, in "Electric Utilities & Power Generators" under the Disclosure Topic "Nuclear Safety & Emergency Management", firms are required to disclose "Total number of nuclear power units, broken down by U.S. Nuclear Regulatory Commission (NRC) Action Matrix Column." This metric is changed as "Total percentage of nuclear power units" to cater to more relevant disclosure practices of Korean companies. Additionally, some metrics are broken down further. For example, in "Iron & Steel Producers" under the Disclosure Topic "Energy Management", firms are required to disclose "1) Total energy consumed, 2) percentage grid electricity, 3) percentage renewable." This metric is divided into three individual metrics, and calculated as such.

3.4 Bloomberg ESG Disclosure Dataset and Bloomberg ESG Disclosure Score

As a proxy ESG disclosure data, we utilize Bloomberg ESG Disclosure dataset.[3] Bloomberg gathers, assures, and publishes ESG information of over 11,700 companies from 102 countries – referred to as "Bloomberg ESG Disclosure dataset". Bloomberg ESG Disclosure datasets are widely used in decision-making processes of capital market participants and researchers.

(Baldini et al. 2018; Christensen et al. 2022; Eccles et al, 2011; Li et al. 2018). For this research, ESG datasets are manually collected for each sample company from the Bloomberg terminal database. Bloomberg ESG Disclosure datasets are available over multiple scopes. The scopes of ESG Disclosure data considered for this research are 1) overview, 2) environmental, 3) social, 4) governance, 5) executive and director compensation, and 6) ESG ratios. *(See Appendix C)*

Bloomberg also offers ESG ratings based on its datasets – referred to as "Bloomberg ESG Disclosure score" (CSES, 2021; Kim, 2014; Lee & Lee, 2021). We use Bloomberg ESG Disclosure score as a benchmark score to compare with our analyses results. Bloomberg has significance as it offers ESG dataset of companies more than 80% of global equity market capitalization (Bloomberg, n.a.). Not only quantity, but also quality is significant when it comes to Bloomberg ESG data, since as-reported ESG disclosures of companies are standardized by the analysts for its users (Bloomberg, n.a.). It is for this reason that Bloomberg ESG Scores are widely used by a number of academic research (Bermejo Climent et al., 2021; Buallay, 2018; Chen and Xie, 2022; Han et al., 2016; Kim, 2020; Pyles, 2020). These papers analyze the effect of ESG disclosures on various corporate finance

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3) Bloomberg ESG Disclosure datasets and Bloomberg ESG Disclosure scores were accessed on March 22, 2022.

indicators. Commonly, they utilize Bloomberg ESG scores as proxy for firms' ESG disclosure practices. Bloomberg ESG Disclosure score ranges from 0.1 to 100. The score becomes higher as a company discloses more ESG information. These scores are known as industry-specific (Baldini et al. 2018; Christensen et al. 2022; Kim, 2014; Li et al. 2018).

3.5 Sustainability Reports

We also review sustainability reports of the sample companies for our analyses. Sustainability reports have significance in terms of ESG rating and investing, since ESG-related raters and investors acquire the primary ESG-related information of a company from its sustainability report (BlackRock, Inc., 2021; KCGS, n.a.). An issue regarding the sustainability reporting data collection is that during the research period – 2018-2020[4] –, several sample companies did not publish sustainability reports. This comes from the fact that sustainability reporting is still a voluntary practice in Korea

(FSC, 2021). In case of no sustainability report published, SASB-aligned disclosure score for the company automatically becomes zero.

Ⅳ. Results

4.1 BloomSA: A systematic re-evaluation of Bloomberg ESG Disclosure datasets against the SASB standards

First, the proxy ESG disclosure datasets, Bloomberg ESG Disclosure datasets, are compared against the SASB standards. BloomSA score systematically re-evaluates Bloomberg ESG Disclosure datasets according to the SASB standards. We collect Bloomberg ESG Disclosure datasets per each sample firm and calculate the coverage ratio of such datasets conforming to the SASB standards. BloomSA scores are then compared with the proxy ESG disclosure score, Bloomberg ESG Disclosure score. Table 1 shows the average scores per each sample

〈Table 1〉 BloomSA average score during 2018-2020

	BloomSA Score	Bloomberg ESG Disclosure Score	Difference
2020 Average	23.84	48.05	24.21
2019 Average	26.70	49.16	22.46
2018 Average	21.14	45.42	24.28

4) The sample period of this research begins from 2018, when the SASB standards were published. At the time of this research, sustainability reports which were published in 2021 were the latest. These reports contain ESG disclosures for FY2020. Hence, we analyzed sustainability reports from FY2018, FY2019, and FY2020.

year. In 2020, 2019, and 2018, the average BloomSA scores of the sample firms were 23.84, 26.70, and 21.14, respectively. Over the sample period, BloomSA scores are consistently low and lower than Bloomberg ESG Disclosure scores. We can speculate that this is because the SASB standards are not fully reflected on Bloomberg ESG Disclosure database. We also speculate that this gap probably happens as Bloomberg ESG Disclosure score would account for multiple scopes of ESG disclosure such as CDP, TCFD, etc. other than just the SASB standards.

Table 2 presents the BloomSA materiality scores of each of KOSPI Top 10 sample firms. In 2018-2020, SK Hynix, a semiconductor manufacturer, received the highest scores, whereas pharmaceutical manufacturers such as Samsung Biologis Co., Ltd. and Celltrion Inc. received the lowest scores. Notably, Celltrion Inc. received 0.00 in 2018. This is because there was no disclosure item which met the SASB standards in the Bloomberg ESG Disclosure datasets of Celltrion Inc in 2018. Over 2018-2020, the company that showed the biggest difference between Bloomberg ESG Disclosure score and BloomSA is Samsung Biologis Co. This means that the coverage ratio of industry-specific material ESG information of Samsung Biologics Co. available from the proxy ESG disclosure data is low.

Looking at individual firms, the scores remain stagnant throughout the sample period,

2018-2020 (*See Figure 1 and Appendix E*). Over the three-year sample period, the result shows a stark difference between the outperforming companies and the underperforming ones with extremely low scores. This may indicate that some companies, the low scorers, are off-track from disclosing industry-specific and firm-specific material sustainability issues, which capital market participants, mainly investors, require.
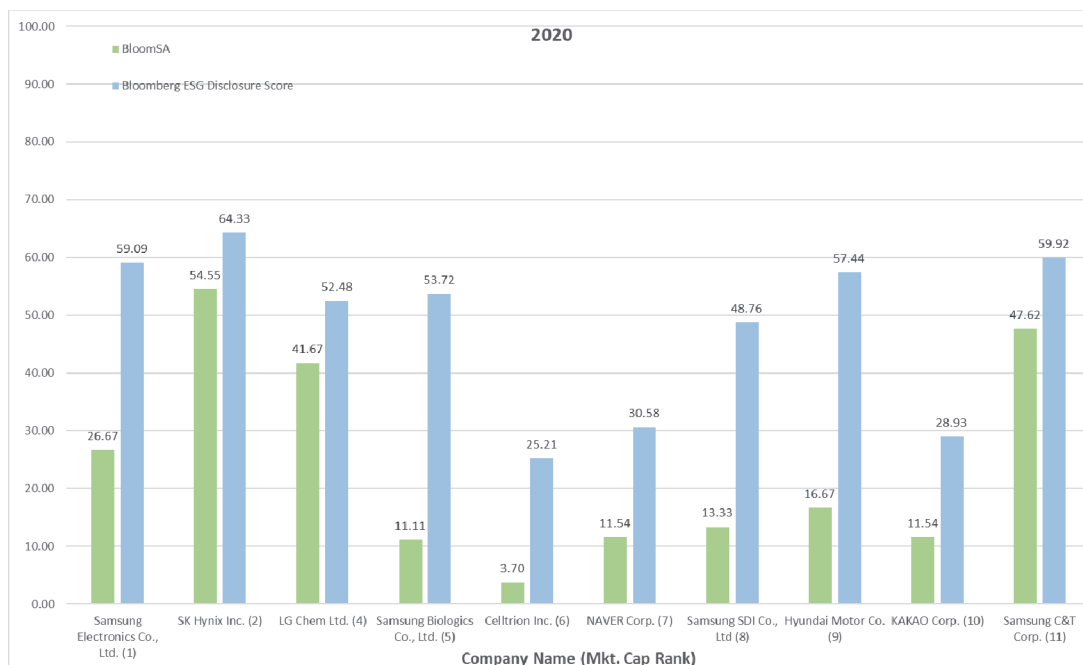
We suspect that Bloomberg ESG Disclosure datasets and BloomSA results may not accurately reflect actual disclosure practices of the sample firms. The BloomSA method mechanically maps the Bloomberg ESG disclosure datasets to the SASB standards without looking at individual sustainability reports of the sample firms. However, the analysis of BloomSA score has a possible problem in that although our proxy datasets – Bloomberg ESG Disclosure datasets – are widely used by researchers and investors, they may fail to fully include ESG information disclosed by firms (Christensen et al., 2022; Grewal et al., 2021). By looking at the scoresheets and the results, we found evidence to such concern. That is, the SASB standards require descriptive disclosures in some cases. The SASB requires firms to disclose based on a diverse set of specific organizational and/or third-party standards. However, Bloomberg data only state "Yes" or "No" when it comes to policy descriptions. From here, we feel the need to review the original sets of

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〈Table 2〉 BloomSA scores of KOSPI Top 10 firms during 2018-2020

Year	Company Name (Mkt. Cap Rank)	SICS Category	SASB Adoption (Y/N)	BloomSA Score	Bloomberg ESG Disclosure Score	Difference
	Samsung Electronics Co., Ltd. (1)	Hardware	Y	26.67	59.09	32.42
	SK Hynix Inc. (2)	Semiconductors	Y	54.55	64.33	9.78
	LG Chem Ltd. (4)	Chemicals	Y	41.67	52.48	10.81
	Samsung Biologics Co., Ltd. (5)	Biotechnology & Pharmaceuticals	Y	11.11	53.72	42.61
	Celltrion Inc. (6)	Biotechnology & Pharmaceuticals	N/A	3.70	25.21	21.51
2020	NAVER Corp. (7)	Internet Media & Services	Y	11.54	30.58	19.04
	Samsung SDI Co., Ltd (8)	Hardware	Y	13.33	48.76	35.43
	Hyundai Motor Co. (9)	Automobiles	Y	16.67	57.44	40.77
	KAKAO Corp. (10)	Internet Media & Services	Y	11.54	28.93	17.39
	Samsung C&T Corp. (11)	Engineering & Construction Services	Y	47.62	59.92	12.30
	2020 Average			**23.84**	**48.05**	**24.21**
	Samsung Electronics Co., Ltd. (1)	Hardware	Y	26.67	59.09	32.42
	SK Hynix Inc. (2)	Semiconductors	Y	54.55	61.42	6.87
	NAVER Corp. (4)	Internet Media & Services	N/A	11.54	28.93	17.39
	Samsung Biologics Co., Ltd. (5)	Biotechnology & Pharmaceuticals	N/A	3.70	39.67	35.97
	Hyundai Motor Co. (6)	Automobiles	N	22.22	57.02	34.8
2019	Hyundai Mobis Co., Ltd. (7)	Auto Parts	N	23.08	45.04	21.96
	Celltrion Inc. (8)	Biotechnology & Pharmaceuticals	N/A	3.70	23.97	20.27
	LG Chem Ltd. (9)	Chemicals	Y	41.67	63.22	21.55
	POSCO (10)	Iron & Steel Producers	Y	32.26	53.31	21.05
	Samsung C&T Corp. (11)	Engineering & Construction Services	Y	47.62	59.92	12.30
	2019 Average			**26.70**	**49.16**	**22.46**
	Samsung Electronics Co., Ltd. (1)	Hardware	N	26.67	63.64	36.97
	SK Hynix Inc. (2)	Semiconductors	N	50.00	60.08	10.08
	Celltrion Inc. (3)	Biotechnology & Pharmaceuticals	N/A	0.00	20.66	20.66
	Samsung Biologics Co., Ltd. (5)	Biotechnology & Pharmaceuticals	N/A	3.70	41.32	37.62
	Hyundai Motor Co. (6)	Automobiles	N	22.22	60.74	38.52
2018	LG Chem Ltd. (7)	Chemicals	N	41.67	59.92	18.25
	SK Telecom Co., Ltd. (8)	Telecommunication Services	Y	4.17	32.92	28.75
	Korea Electric Power Corp. (9)	Electric Utilities & Power Gene	N	19.15	38.84	19.69
	POSCO (10)	Iron & Steel Producers	N	32.26	52.07	19.81
	NAVER Corp. (11)	Internet Media & Services	N/A	11.54	23.97	12.43
	2018 Average			**21.14**	**45.42**	**24.28**

SICS: Sustainable Industry Classification System

N/A: Sustainability report not published

〈Figure 1〉 BloomSA and Bloomberg ESG Disclosure Score of KOSPI Top 10 firms in 2020

disclosure documents, such as sustainability reports, rather than solely relying on the Bloomberg ESG Disclosure datasets as a disclosure proxy dataset and to verify BloomSA scores of the sample firms, which are generally very low. By doing so, we expect to more fully assess the integrity of ESG disclosure practices of the sample firms against the SASB standards.

4.2 SusSA: A systematic evaluation of sustainability report content against the SASB standards

As we have stated above, the scope of Bloomberg ESG Disclosure datasets does not appear to be exhaustive. Christensen et al. (2022) state that not all relevant ESG information disclosed by firms are considered by Bloomberg. Grewal et al. (2021) note that Bloomberg datasets do not cover all SASB disclosure items, although "it is unlikely that firms are disclosing a significant amount of SASB metrics that are not available on Bloomberg." Therefore, they devise an alternative measure of SASB-related disclosures which does not depend on Bloomberg datasets to check the robustness of their research results. The BloomSA score analysis results are consistently lower than the Bloomberg ESG Disclosure score for all of the sample firms over the sample period,

2018-2020. And following Christensen et al. (2022) and Grewal et al. (2021), we suspect that some information could be missing on Bloomberg ESG Disclosure datasets in the case of our sample companies. We reviewed individual firms' sustainability reports against the SASB standards in order to assess their ESG disclosure in detail. The new coverage ratio of the SASB standards calculated from the analysis of original sustainability reports is called SusSA score. SusSA score is then compared with the BloomSA score and the benchmark score, Bloomberg ESG Disclosure score.

Table 3 shows the average scores of Bloomberg SusSA, BloomSA, and ESG Disclosure score by each year. Over the sample period, SusSA scores were significantly higher than BloomSA scores. The average SusSA scores of the sample firms were 84.76 in 2020, 72.39 in 2019, and 47.85 in 2018. SusSA scores were not significantly different from Bloomberg ESG Disclosure scores in 2018, but there was a big difference in 2019 and 2020 when firms started to disclose according to the SASB standards (*See Appendix D*). In other words, SusSA scores reflect the SASB adoption trends

of the sample firms. Conversely, this implies that BloomSA score, which is based on the Bloomberg ESG Disclosure proxy data, does not wholly capture the extent of SASB-related disclosures of the sample firms. This indicates that Bloomberg ESG Disclosure score may underscore industry-specific material ESG disclosure practices of firms.

Table 4 presents the SusSA scores of KOSPI Top 10 firms over 2018-2020. Over 2018-2020, Samsung Electronics Co., Ltd., a hardware manufacturer, and SK Hynix, a semiconductor manufacturer, earned high scorers. On the contrary, Samsung Biologis Co., Ltd. and Celltrion Inc., pharmaceutical manufacturers, earned low scorers. Over the sample period, SusSA results indicate underperforming companies. NAVER Corp. and Samsung Biologics Co., Ltd. did not publish sustainability reports until 2020. Celltrion Inc. did not publish sustainability reports in 2018-2020. These findings confirm our initial assumption that the level of industry-specific material ESG information in the Korean market would be disparate between individual companies. Markedly, sample firms received very high SusSA scores in 2020, although Celltrion Inc. scored 0.00 over the

〈Table 3〉 SusSA average score during 2018-2020

	SusSA Score	BloomSA Score	Bloomberg ESG Disclosure Score
2020 Average	**84.76**	23.84	48.05
2019 Average	**72.39**	26.70	49.16
2018 Average	**47.85**	21.14	45.42

〈Table 4〉 SusSA score of KOSPI Top 10 firms during 2018-2020

| Year	Company Name (Mkt. Cap Rank)	SICS Category	SASB Adoption (Y/N)	SusSA Score	BloomSA Score	Bloomberg ESG Disclosure Score
	Samsung Electronics Co., Ltd. (1)	Hardware	Y	100.00	26.67	59.09
	SK Hynix Inc. (2)	Semiconductors	Y	100.00	54.55	64.33
	LG Chem Ltd. (4)	Chemicals	Y	66.67	41.67	52.48
	Samsung Biologics Co., Ltd. (5)	Biotechnology & Pharmaceuticals	Y	25.93	11.11	53.72
	Celltrion Inc. (6)	Biotechnology & Pharmaceuticals	N/A	0.00 (N/A)	3.70	25.21
2020	NAVER Corp. (7)	Internet Media & Services	Y	92.31	11.54	30.58
	Samsung SDI Co., Ltd (8)	Hardware	Y	93.33	13.33	48.76
	Hyundai Motor Co. (9)	Automobiles	Y	100.00	16.67	57.44
	KAKAO Corp. (10)	Internet Media & Services	Y	84.62	11.54	28.93
	Samsung C&T Corp. (11)	Engineering & Construction Services	Y	100.00	47.62	59.92
	2020 Average			**84.76**	**23.84**	**48.05**
	Samsung Electronics Co., Ltd. (1)	Hardware	Y	86.67	26.67	59.09
	SK Hynix Inc. (2)	Semiconductors	Y	77.27	54.55	61.42
	NAVER Corp. (4)	Internet Media & Services	N/A	0.00 (N/A)	11.54	28.93
	Samsung Biologics Co., Ltd. (5)	Biotechnology & Pharmaceuticals	N/A	0.00 (N/A)	3.70	39.67
	Hyundai Motor Co. (6)	Automobiles	N	38.89	22.22	57.02
2019	Hyundai Mobis Co., Ltd. (7)	Auto Parts	N	61.54	23.08	45.04
	Celltrion Inc. (8)	Biotechnology & Pharmaceuticals	N/A	0.00 (N/A)	3.70	23.97
	LG Chem Ltd. (9)	Chemicals	Y	91.67	41.67	63.22
	POSCO (10)	Iron & Steel Producers	Y	93.55	32.26	53.31
	Samsung C&T Corp. (11)	Engineering & Construction Services	Y	57.14	47.62	59.92
	2019 Average			**72.39**	**26.70**	**49.16**
	Samsung Electronics Co., Ltd. (1)	Hardware	N	66.67	26.67	63.64
	SK Hynix Inc. (2)	Semiconductors	N	72.73	50.00	60.08
	Celltrion Inc. (3)	Biotechnology & Pharmaceuticals	N/A	0.00 (N/A)	0.00	20.66
	Samsung Biologics Co., Ltd. (5)	Biotechnology & Pharmaceuticals	N/A	0.00 (N/A)	3.70	41.32
	Hyundai Motor Co. (6)	Automobiles	N	27.78	22.22	60.74
2018	LG Chem Ltd. (7)	Chemicals	N	30.56	41.67	59.92
	SK Telecom Co., Ltd. (8)	Telecommunication Services	Y	70.83	4.17	32.92
	Korea Electric Power Corp. (9)	Electric Utilities & Power Gene	N	27.66	19.15	38.84
	POSCO (10)	Iron & Steel Producers	N	38.71	32.26	52.07
	NAVER Corp. (11)	Internet Media & Services	N/A	0.00 (N/A)	11.54	23.97
	2018 Average			**47.85**	**21.14**	**45.42**

SICS: Sustainable Industry Classification System

N/A: Sustainability report not published

sample period as it did not publish a sustainability report. In the case of SK Telecom Co., Ltd., it was the only company which implemented the SASB standards in 2018. Its SusSA score was accordingly high in 2018, however, BloomSA and Bloomberg ESG Disclosure score were significantly low. In the case of NAVER Corp., the company only published its first sustainability report in 2020, with the adoption of the SASB standards. Accordingly, its SusSA score in 2020 increased dramatically compared to 2018-2029. However, BloomSA and Bloomberg ESG Disclosure score dwelt around the same low level. Again, these results show

that Bloomberg ESG Disclosure score may fail to reflect the firms' disclosure of SASB required information and undervalue the coverage ratio of industry-specific material information provided by KOSPI Top 10 firms.

SusSA scores of individual firms *(See Figure 2 and Appendix E)* reflect the fact that many of the Top 10 KOSPI firms have started to adopt the SASB standards as of 2019-2020 (*See Appendix D*). However, although some firms have shown much progress in disclosing SASB-related ESG disclosures in 2019-2020, it appears their Bloomberg ESG Disclosure scores are very low. BloomSA scores were con-
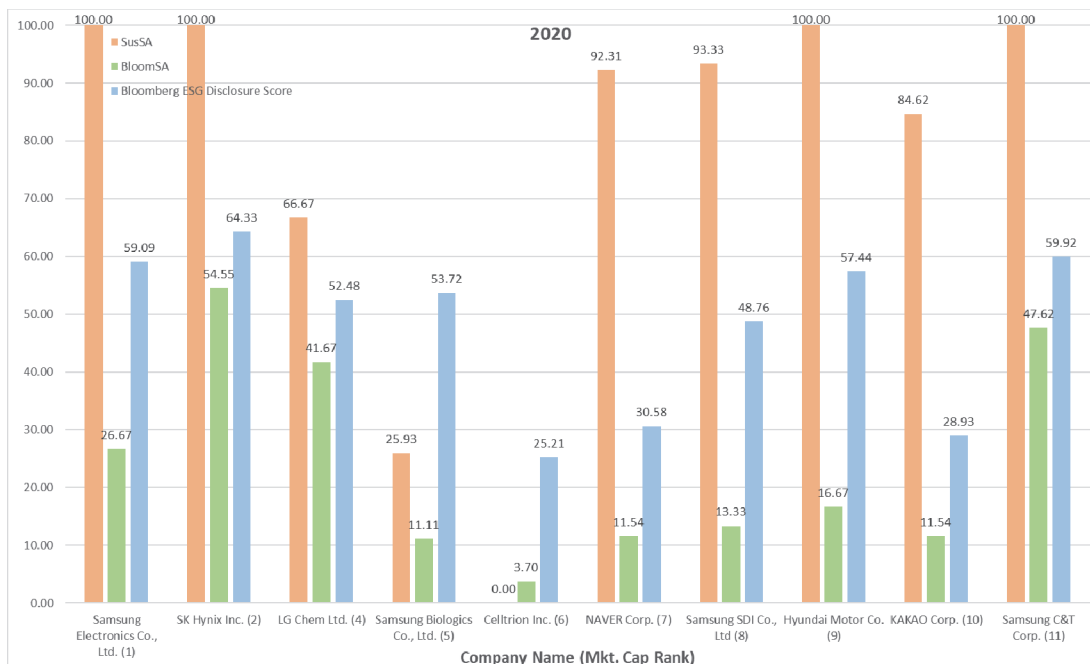
〈Figure 2〉 SusSA, BloomSA, and Bloomberg ESG Disclosure Score of KOSPI Top 10 firms in 2020

sistently and significantly low when compared to SusSA scores, and BloomSA scores stayed unchanged even after each sample firm introduced the SASB standards. We can infer that this is because Bloomberg ESG Disclosure datasets, used as proxy in BloomSA scoring methodology, do not seem to fully cover SASB-related disclosure practices of the sample companies. Therefore, sample companies may reason that their advanced industry-specific material disclosure practices are not fully reflected on Bloomberg ESG Disclosure datasets. As such, we conclude that investors and researchers need to be cautious when evaluating Bloomberg ESG Disclosure datasets and scores, as they can be misleading if investors are specifically looking for SASB-relevant metrics.

It is important to note that low or high BloomSA and SusSA scores do not demonstrate the overall level of firms' ESG disclosure practices. Nor do we assert that Bloomberg ESG Disclosure datasets are inaccurate. Our research delves into the specific subject of the industry-specific material ESG information disclosures represented by the SASB standards. We analyze how well the largest KOSPI-listed firms are disclosing ESG information according to the SASB standards and how ready they are to adopt such standards. Hence, our results only show SASB-related disclosure integrity of the sample firms.

4.3 Comparison of BloomSA and SusSA Scores of 2020 KOSPI Top 10 Companies over 2018-2020

In order to expand comparability of the results of our analysis, we conducted an additional comparison of BloomSA and SusSA Scores of 2020 KOSPI Top 10 companies over the sample period, 2018-2020. The results *(See Appendix F)* show that the number of companies implementing the SASB standards has increased every year during 2018-2020. SASB adoption rate of 2020 KOSPI Top 10 companies from 0% in 2018 (0 out of 10 companies) to 90% (9 out of 10 companies) in 2020. As a result, SusSA scores also steadily increased every year. Compared to the average SusSA score of 46.45 in 2018, the average SusSA score in 2020 has increased to 84.76.

The results also show that two of the largest KOSPI-listed companies, Samsung Electronics Co., Ltd. and SK Hynix Inc., disclosed SASB-related information in high integrity in 2018, even though they did not adopt the SASB standards at that point. Their SusSA scores in 2018 are as high as SK Telecom Co., Ltd., which is the only company among the sample firms that endorsed the SASB standards in 2018 *(See Appendix D)*. Although limited to two-firm cases, it can mean that even without disclosing according to the SASB standards, some Korean firms were already meeting the market participants' needs for industry-specific

material sustainability information, albeit only to a certain extent.

4.4 Additional Analysis: Quality assessment of descriptive ESG disclosure practices

When describing climate-related information, U.S. firms tend to use boilerplate statements. (Eccles at el., 2012). Boilerplate statements are generic descriptions which lack detailed information compared to more advanced forms of disclosure such as industry-specific information and quantitative metrics. This research hypothesizes that Korean firms would also disclose ESG-related information using general words which do not specify industry-specific, quantitative metrics. To this end, this research further analyzes the depth of the sample firms' industry-specific material ESG disclosure practices by qualitatively studying sustainability reports. The SASB disclosure standards consist of quantitative and descriptive metrics. For this analysis, only the descriptive metrics are considered since firms already have to disclose quantitative information

for the quantitative metrics. For descriptive metrics, firms have a choice whether to disclose in the most general form of information or in more detail.

For each industry, descriptive disclosure metrics are identified. Then, the actual disclosure practice of the sample firms is examined according to the four categories (Eccles et al., 2012) - 1) No Disclosure, 2) Boilerplate Statements, 3) Industry-specific, and 4) Quantitative Metrics (*See Appendix G*)., For example, in 2020, 11% is boilerplate statements among the total SASB-related descriptive information disclosed by KOSPI Top 10 firms. On the other hand, industry specific information and qualitative metrics are prevalent, recording 25% and 47%, respectively. The results also show that these advanced types of disclosures have increased over 2019-2020. This means that the sample firms started to care for more than just the coverage of disclosure but also for the qualitative detail of disclosed information.

Boilerplate statements, or generic information, are far from what the capital market requires.

〈Table 5〉 Quality assessment of the descriptive accounting metrics during 2018-2020

	2018	2019	2020
No Disclosure	8 (27%)	3 (10%)	8 (17%)
Boilerplate Statements	4 (13%)	6 (20%)	5 (11%)
Industry Specific	6 (20%)	5 (17%)	12 (25%)
Quantitative Metrics	12 (40%)	16 (53%)	22 (47%)
Total	30 (100%)	30 (100%)	47 (100%)

The ISSB states that ESG disclosure shall be material to financial valuation of the firms (ISSB, 2022a). However, boilerplate statements fail to include such valuable information. Contrary to the previous research in the U.S. (Eccles et al., 2012) and our initial belief, this research shows that Korean sample firms focus more on industry specific information and quantitative metrics in their ESG reporting. The results show that the big Korean firms are on the fast track when it comes to industry-specific material ESG disclosures, and investors can reliably refer to firms' ESG-related disclosures.

Ⅴ. Discussion and Conclusion

With growing attention to ESG in capital markets, many firms are starting to adopt ESG disclosure guidelines. Among these guidelines, the SASB standards are preferred by key stakeholders such as major investors thanks to their focus on industry-specific material ESG issues. However, since the introduction of SASB guidelines is rather new in financial markets, their application practices by firms are yet to be better studied, especially in the Korean financial market. Our study assesses the integrity of ESG disclosures of Korean firms according to the SASB standards.

This paper analyzes the Top 10 companies

on KOSPI over the sample period of 2018-2020. We find that the sample companies are well disclosing industry-specific material ESG information, and in particular, the quantitative proportion of SASB disclosure items has increased in 2019-2020. However, results can vary depending on the source of the ESG disclosure data. Bloomberg ESG Disclosure datasets and Bloomberg ESG Disclosure scores seem to lack industry-specific material ESG disclosure coverage when compared to the sustainability reports. We also find that the sample companies disclose qualitatively relevant and useful material ESG information. The sample companies have a high disclosure rate of industry specific ESG information and quantitative ESG metrics. These disclosures can contain particularly useful information for investors. It is important to note that although our results show the KOSPI Top 10 firms are faithfully disclosing industry-specific material ESG information, Bloomberg ESG Disclosure datasets are not reflective of this. As Bloomberg terminal is one of the most widely used source of ESG disclosure datasets, data users such as investors, researchers and managers should be aware of this concern and always validate the retrieved data. It is also important to note that our sample only consists of large-cap Korean companies. Hence, our results do not represent ESG disclosure practices of all Korean firms.

Specifically, the first analysis of BloomSA

score, a systematic re-evaluation of Bloomberg ESG Disclosure datasets against the SASB standards, shows that KOSPI Top 10 firms result in consistently low industry-specific material ESG disclosure scores. We speculate that this is because Bloomberg ESG datasets do not reflect SASB-related disclosures. Further analysis of SusSA score, calculating SASB-related disclosure integrity based on firms' original ESG information sources, i.e. sustainability reports, supports this speculation. SusSA scores of all sample firms result in higher scores than BloomSA scores and Bloomberg ESG Disclosure scores. This signifies that firms are actually making good efforts to disclose industry-specific material ESG information. In particular, the disclosure score has increased sharply in 2019-2020. Our results show that the coverage level of the disclosure practices of industry-specific material ESG information of the sample firms is high. In other words, the quantitative integrity of industry-specific material ESG disclosures of the sample firms is high. Additionally, the sample firms show high integrity scores when it comes to qualitatively meaningful ESG disclosure performance. Our results show that the sample firms have a high rate of industry specific and quantitative ESG disclosure metrics. These forms of ESG disclosures are expected to deliver more advanced financially material ESG information. Therefore, our results show that recent ESG disclosure practices of KOSPI Top 10 firms

are superb not only in terms of quantity but also in terms of quality.

The results from this study have some implications for the business world. As stated above, it is clear that large-cap Korean firms are making efforts to disclose industry-specific material ESG information according to the SASB standards. In quantity, the sample firms' disclosure scores have increased significantly especially in 2019-2020. This research also shows notable results in terms of ESG disclosure quality. These results illustrate that the sample firms are practicing advanced ESG disclosures in terms of industry-specific materiality. As global standard-setters and regulators such as the ISSB and the SEC require more detailed disclosure of ESG information which is necessary for enterprise valuation, more and more firms are expected to practice in accordance. The results from this study serve as evidence that large-cap Korean firms are on the right track when it comes to industry-specific material ESG information disclosure practices. Furthermore, the sample firms with advanced ESG disclosure practices on their industry-specific materiality ESG issues can serve as benchmarks to the firms that aim to reap ESG disclosure. Our research also has implications for policymaking. Although the overall level of industry-specific material ESG information disclosure performance of KOSPI Top 10 firms is high during 2018-2020, certain industries, such as pharmaceutical

manufacturers, fall behind. As Korean regulators are planning to establish policies to mandate ESG disclosure to KOSPI-listed firms, our results show that policy makers should take industry-specific ESG factors into consideration along with other crucial issues such as global ESG disclosure guidelines, firm-sizes etc.

Additionally, this paper contributes as a notice of caution to the users of Bloomberg ESG Disclosure datasets and Bloomberg ESG Disclosure scores. This research shows that Bloomberg ESG Disclosure datasets may not fully include or properly weight industry-specific material ESG information disclosed by firms. This is of concern since it adds confusion to the main users of ESG disclosure data. Investors require industry-specific material ESG data with which they can utilize on financial decision-making processes. Therefore, when Bloomberg ESG Disclosure dataset fails to fully capture such information, it also fails to fully cater to the end-users' needs. An additional concern arises from the fact that Bloomberg ESG Disclosure score gets updated continuously. For example, 2018 ESG Disclosure score of Samsung Electronics still gets updated in 2022. This may be due to the continually added data and disclosure frameworks. However, constantly changing scores are not quite representative of a specific past period. Especially from researchers' point of view, a reliability issue may occur since their results

can vary according to the time of data collection.

This research is not free of limitations. First, this research looks at how faithfully Korean firms are disclosing industry-specific material ESG information based on Bloomberg ESG Disclosure datasets as a proxy dataset. However, Bloomberg ESG Disclosure datasets encompass various disclosure frameworks and standards other than the SASB. For future research, multiple ESG disclosure proxy datasets can be utilized. Second, KOSPI Top 10 firms can be deemed as homogenous in that most of these firms are conglomerates where affluent sources for more advanced ESG disclosure are available. Future research could compare companies of different sizes whose resources and motivation behind ESG disclosure would diverge.

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〈Appendix〉

Appendix A-1. BloomSA Methodology

〈BloomSA Materiality Score〉
1) Gather ESG disclosure datasets of each firm from Bloomberg ESG Disclosure datasets.
2) Construct an industry-specific scoresheet by mapping the SASB Industry Standards accounting metrics. Adjust the SASB Sustainability Dimensions into Environment (E), Social (S), and Governance (G), according to the nature of the Disclosure Topics and Accounting Metrics.
3) From 1), identify disclosure metrics which correspond to 2). Check whether disclosed (O) or not (X).
4) Compute O as 1 and X as 0 and calculate scores by each Disclosure Topic.
5) Compute the BloomSA Score as (Number of SASB-identified Bloomberg firm disclosure metrics) / (Total number of SASB Disclosure Accounting Metrics).

Appendix A-2. SusSA Methodology

〈SusSA Materiality Score〉
1) Gather the original sustainability reports of each firm.
2) Construct a scoresheet by mapping the SASB Industry Standards accounting metrics.
3) From 1), identify disclosure metrics which correspond to 2). Retrieve and paste the disclosure content that are SASB-identified.
4) Compute the total SusSA Score as (Number of SASB-identified firm disclosure metrics on sustainability report)/(Total number of SASB Disclosure Accounting Metrics).

Appendix B. The Sustainable Accounting Standards Board (SASB)

- The SASB is a nonprofit organization which sets disclosure standards of financially material sustainability information. Its mission is "to establish industry-specific disclosure standards across ESG topics that facilitate communication between companies and investors about financially material, decision-useful information."
- The SASB was established in 2011, and has developed the disclosure standards over 77 industries, which were first published in 2018. Firms voluntarily adopt the SASB standards.
- The SASB standards are industry-specific, decision-useful, cost-effective, and evidence-based and market-informed. In order to guarantee these qualities, the SASB's standard-setting actives go through public comments periods, where drafts are open to industry experts and relevant stakeholders.
- As of late 2019, the SASB is endorsed by 243 institutions investors globally, which represents $72T AUM.
- As of 2021, nearly 600 companies worldwide are reporting using the SASB standards.
  (Source: https://www.sasb.org/)

〈SASB Materiality Map〉

(Source: https://materiality.sasb.org/)
Note: On the website, Industries are shown under each Sectors, which are marked in black here.

Appendix C. Bloomberg ESG Data

- Bloomberg terminal offers a vast amount of corporate financial data. It is globally used by a variety of institutions. Over 11,500 companies worldwide are covered by Bloomberg's ESG datasets, which offer ESG metrics and ESG disclosure scores. Bloomberg offers historical data since 2006.
- For this paper, Bloomberg ESG Disclosure datasets and Bloomberg ESG Disclosure scores are retrieved by entering "Ticker/Code KS+ Equity+ FA ESG" on Bloomberg terminal.
- It is important to note that Bloomberg ESG Disclosure datasets and Bloomberg ESG Disclosure scores for this research were accessed on March 22, 2022.
  (Source: https://www.bloomberg.com/professional/dataset/global-environmental-social-governance-data/)

〈 e.g. Bloomberg ESG Disclosure datasets & scores – Samsung Electronics Co Ltd 〉

Bloomberg　　　　　　　　　　　　　　　　　　　　　　　Financial Statement Analysis

Ticker: 005930 KS Equity	Periodicity: Annuals	Currency: KRW	Note: Years shown on the report are Fiscal Years			Company: Samsung Electronics Co Ltd
Filing: Most Recent						Consolidation Basis: Consolidated Data

	Original:2014 A	Original:2015 A	Original:2016 A	Original:2017 A	Original:2018 A	Original:2019 A	Original:2020 A
For the period ending	2014-12-31	2015-12-31	2016-12-31	2017-12-31	2018-12-31	2019-12-31	2020-12-31
ESG Disclosure Score	61.98	61.98	61.98	63.22	63.64	59.09	59.09
Environmental							
Environmental Disclosure Score	72.87	72.87	72.87	73.64	73.64	66.67	65.12
Total GHG Emissions	9,290.00	10,192.00	11,600.00	13,585.00	15,173.00	16,065.00	17,579.00
Total CO2 Emissions	7,366.00	8,524.00	9,909.00	10,889.00	11,439.00		
CO2 Intensity per Energy	0.45	0.45	0.47	0.46	0.44		
NOx Emissions	0.62	0.64	0.64	0.69	0.62	0.66	0.65
Total Energy Consumption	16,484.70	19,005.50	21,073.00	23,420.00	26,028.00	26,900.00	29,025.00
Total Water Use	112,278.00	138,614.00	152,855.00	176,773.00	196,601.00	203,035.00	212,475.00
Hazardous Waste	171.93	256.73	349.40	386.35	396.69	321.63	345.87
Total Waste	778.43	937.34	1,078.31	1,146.81	1,210.52	1,099.20	1,181.74
Environmental Fines #	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Environmental Fines $	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Social							
Social Disclosure Score	42.11	42.11	42.11	42.11	38.60	38.60	38.60
Number of Employees	319,208.00	325,677.00	308,745.00	320,671.00	309,630.00	287,439.00	267,937.00
Employee Turnover Pct	13.94	13.06	13.24	12.91	12.68	12.99	11.36
Pct Women in Workforce	42.00	45.60	44.00	45.00	43.00	40.20	37.30
% Women in Mgt							
Community Spending	523.11	523.00	444.79	385.57	409.64	357.75	311.42
Governance							
Governance Disclosure Score	57.14	57.14	57.14	60.71	66.07	62.50	66.07
Size of the Board	9.00	9.00	9.00	9.00	11.00	10.00	11.00
Indep Directors	5.00	5.00	5.00	5.00	6.00	6.00	6.00
% Indep Directors	55.56	55.56	55.56	55.56	54.55	60.00	54.55
Board Duration (Years)	3.00	3.00	3.00	3.00	3.00	3.00	3.00
# Board Meetings	7.00	8.00	11.00	8.00	8.00	7.00	10.00
Board Mtg Attendance						91.93	91.21	91.67

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(Source: Bloomberg terminal; "Ticker/Code KS+ Equity+ FA ESG")

Appendix D. SASB Adoption of the Sample Companies

- Our sample companies of KOSPI Top 10 firms during 2018-2020 amount to total fourteen individual firms.
- Sample companies began to adopt the SASB standards from 2019, and in 2020, most of the sample companies adopted the SASB standards.

〈SASB Adoption Trend of the Sample Companies during 2018-2020〉

	Y	N	N/A	Total
2020	12 (86%)	1 (7%)	1 (7%)	14 (100%)
2019	7 (50%)	3 (21%)	4 (29%)	14 (100%)
2018	1 (7%)	9 (64%)	4 (29%)	14 (100%)

〈SASB Adoption Status of the Sample Companies during 2018-2020〉

Company Name	2018	2019	2020
Celltrion Inc.	N/A	N/A	N/A
Hyundai Mobis Co., Ltd.	N	N	N
Hyundai Motor Co.	N	N	Y
KAKAO Corp.	N/A	N/A	Y
Korea Electric Power Corp.	N	Y	Y
LG Chem Ltd.	N	Y	Y
NAVER Corp.	N/A	N/A	Y
POSCO	N	Y	Y
Samsung Biologics Co., Ltd.	N/A	N/A	Y
Samsung C&T Corp.	N	Y	Y
Samsung Electronics Co., Ltd.	N	Y	Y
Samsung SDI Co., Ltd	N	N	Y
SK Hynix Inc.	N	Y	Y
SK Telecom Co., Ltd.	Y	Y	Y

N/A: Sustainability report not published

Appendix E. SusSA vs. BloomSA vs. Bloomberg ESG Disclosure Score

〈2020 SusSA vs. BloomSA vs. Bloomberg ESG Disclosure Score 〉
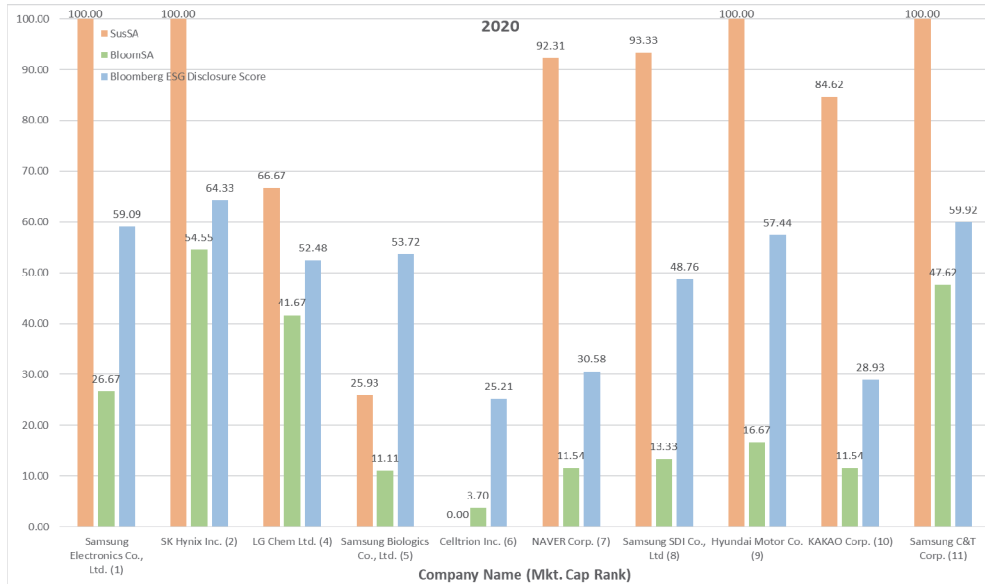
〈2019 SusSA vs. BloomSA vs. Bloomberg ESG Disclosure Score 〉
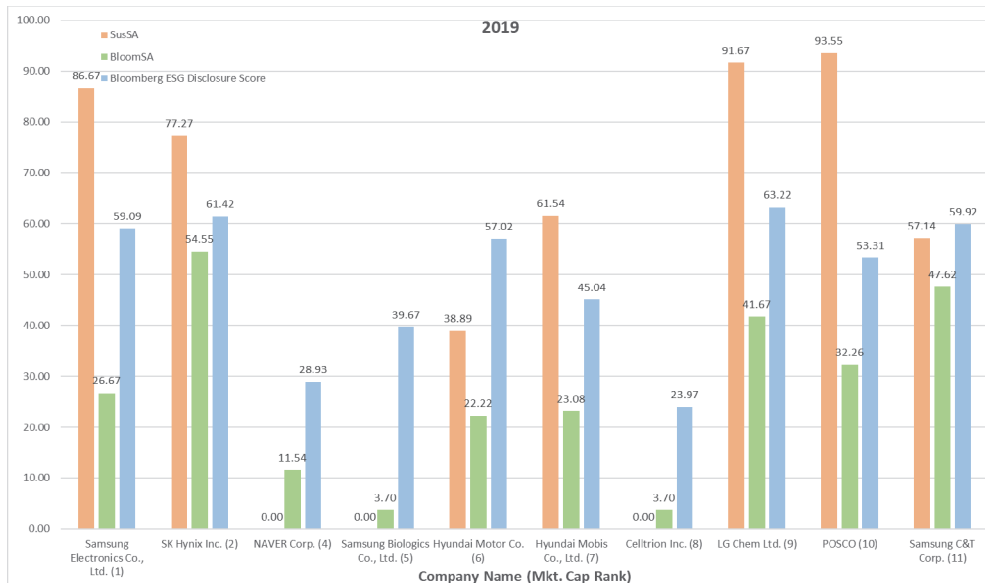
〈2018 SusSA vs. BloomSA vs. Bloomberg ESG Disclosure Score 〉

2018

- SusSA
- BloomSA
- Bloomberg ESG Disclosure Score

Company Name (Mkt. Cap Rank)	SusSA	BloomSA	Bloomberg ESG Disclosure Score
Samsung Electronics Co., Ltd. (1)	66.67	26.67	63.64
SK Hynix Inc. (2)	72.73	50.00	60.08
Celltrion Inc. (3)	0.00	0.00	20.66
Samsung Biologics Co., Ltd. (5)		3.70	41.32
Hyundai Motor Co. (6)	27.78	22.22	60.74
LG Chem Ltd. (7)	30.56	41.67	59.92
SK Telecom Co., Ltd. (8)	70.83	4.17	32.92
Korea Electric Power Corp. (9)	27.66	19.15	38.84
POSCO (10)	38.71	32.26	52.07
NAVER Corp. (11)		11.54	23.97

Appendix F. Comparison of 2020 KOSPI Top 10 Companies over 2018–2020

Year	Company Name (2020 Mkt. Cap Rank)	SICS Category	SASB Adoption (Y/N)	SusSA Score	BloomSA Score	Bloomberg ESG Disclosure Score
2020	Samsung Electronics Co., Ltd. (1)	Hardware	Y	100.00	26.67	59.09
	SK Hynix Inc. (2)	Semiconductors	Y	100.00	54.55	64.33
	LG Chem Ltd. (4)	Chemicals	Y	66.67	41.67	52.48
	Samsung Biologics Co., Ltd. (5)	Biotechnology & Pharmaceuticals	Y	25.93	11.11	53.72
	Celltrion Inc. (6)	Biotechnology & Pharmaceuticals	N/A	0.00 (N/A)	3.70	25.21
	NAVER Corp. (7)	Internet Media & Services	Y	92.31	11.54	30.58
	Samsung SDI Co., Ltd (8)	Hardware	Y	93.33	13.33	48.76
	Hyundai Motor Co. (9)	Automobiles	Y	100.00	16.67	57.44
	KAKAO Corp. (10)	Internet Media & Services	Y	84.62	11.54	28.93
	Samsung C&T Corp. (11)	Engineering & Construction Services	Y	100.00	47.62	59.92
	2020 Average			**84.76**	**23.84**	**48.05**
2019	Samsung Electronics Co., Ltd. (1)	Hardware	Y	86.67	26.67	59.09
	SK Hynix Inc. (2)	Semiconductors	Y	77.27	54.55	61.42
	LG Chem Ltd. (4)	Chemicals	Y	91.67	41.67	63.22
	Samsung Biologics Co., Ltd. (5)	Biotechnology & Pharmaceuticals	N/A	0.00 (N/A)	3.70	39.67
	Celltrion Inc. (6)	Biotechnology & Pharmaceuticals	N/A	0.00 (N/A)	3.70	23.97
	NAVER Corp. (7)	Internet Media & Services	N/A	0.00 (N/A)	11.54	28.93
	Samsung SDI Co., Ltd (8)	Hardware	N	33.33	13.33	49.17
	Hyundai Motor Co. (9)	Automobiles	N	38.89	22.22	57.02
	KAKAO Corp. (10)	Internet Media & Services	N/A	0.00 (N/A)	11.54	24.79
	Samsung C&T Corp. (11)	Engineering & Construction Services	Y	57.14	47.62	59.92
	2019 Average			**64.16**	**23.65**	**46.72**
2018	Samsung Electronics Co., Ltd. (1)	Hardware	N	66.67	26.67	63.64
	SK Hynix Inc. (2)	Semiconductors	N	72.73	50.00	60.08
	LG Chem Ltd. (4)	Chemicals	N	30.56	41.67	59.92
	Samsung Biologics Co., Ltd. (5)	Biotechnology & Pharmaceuticals	N/A	0.00 (N/A)	3.70	41.32
	Celltrion Inc. (6)	Biotechnology & Pharmaceuticals	N/A	0.00 (N/A)	0.00	20.66
	NAVER Corp. (7)	Internet Media & Services	N/A	0.00 (N/A)	11.54	23.97
	Samsung SDI Co., Ltd (8)	Hardware	N	33.33	13.33	47.52
	Hyundai Motor Co. (9)	Automobiles	N	27.78	22.22	60.74
	KAKAO Corp. (10)	Internet Media & Services	N/A	0.00 (N/A)	11.54	25.21
	Samsung C&T Corp. (11)	Engineering & Construction Services	N	47.62	47.62	59.92
	2018 Average			**46.45**	**22.83**	**46.30**

SICS: Sustainable Industry Classification System
N/A: Sustainability report not published

Appendix G. Types of climate change-related disclosures (Eccles et al., 2012) and the methodology of quality assessment of descriptive ESG disclosure practices

- Categorizing the quality of disclosure for each company as "No Disclosure", "Boilerplate Statement," "Industry Specific," and "Quantitative Metrics."
  1) "'No Disclosure' meant no mention of climate change-related risks or opportunities."
  2) "'Boilerplate Statements' encompassed generic language about potential risks from future regulation and the inability to quantify financial impacts."
  3) "'Industry Specific' disclosures represented tailored language addressing specific risks or strategies related to climate change, such as renewable portfolio standards in utilities or the fuel efficiency of new product lines in automobiles."
  4) "'Quantitative metrics', which represented the highest quality of disclosure, included comparable, quantifiable metrics such as measures of GHG emissions, energy use, and energy efficiency."

- A step-by-step description of the methodology of quality assessment of descriptive ESG disclosure practices is as follows:
  1) Identify descriptive disclosure criteria among the SASB standards.
  2) Assess descriptive disclosure practices of the sample firms according to 4 categories by Eccles et al., 2012: 1) No Disclosure, 2) Boilerplate Statement, 3) Industry Specific, and 4) Quantitative Metrics.
  3) Calculate the disclosure rate for each of the four categories for each sample year.