ESG Modelling Framework: Quantification and Measurement of ESG Factors in the Profit and Loss Statement

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Abstract

This paper suggests a framework to organically quantify and measure a firm's strategic and operational environmental, social, and governance (ESG) activities. Using the standard profit and loss statement, the framework is a guide through each financial line item, analysing incremental differences between two potential strategic paths for a firm: an *as-is strategy* and a *green strategy*. The objective of the framework is to guide financial decision-makers to model two business cases by helping estimate the opportunity costs of green strategies. First, the as-is business case quantifies the firm's strategic path as a continuation of its historical and current strategic choices, resulting in a set of assumptions about product volumes expected to be sold, pricing, and all cost positions. Second, the green business case adjusts the assumption positively or negatively for each financial line item towards the opportunity and risk that the green strategy offers. The incremental analysis of volumes, willingness to pay (price), cost of goods sold, operational costs, personnel expenses, and selling, general, and administrative expenses quantifies ESG activities in terms of operating profit, referred to as *green synergy* in this paper, to underline that profit is a function of interacting and cooperating stakeholders, including people and the planet.

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1. Introduction

The urgent need to realign ecosystems and business models towards more sustainable strategies, products, and value chains that contribute to economic growth, societal well-being, and environmental protection has attracted interest from researchers, corporations, investors, and governments in search of solutions. During the last two decades, corporate sustainability has become an increasingly important pillar in corporations' and investment firms' business and organizational strategies. The trend towards more sustainable business management has been further catalysed by catastrophic events like the COVID-19 pandemic and devastating natural events across the globe. Grewal and Serafeim (2020) define corporate sustainability as an intentional strategy that creates financial value through measurable impacts on society. The incorporation of environmental, social, and governance (ESG) factors into strategic financial planning, accounting, controlling, and reporting has been subject to multiple valuable perspectives, philosophies, concepts, and processes proposed by researchers, advocates, and practitioners. However, the question of precisely how to incorporate ESG activities into a firm's financial system most effectively and efficiently has not yet been sufficiently answered.

The *ESG modelling framework* presented in this paper offers an organic approach to incorporating sustainability factors into strategic financial planning and reporting. The framework is organic because it allows for pricing in the quantitative impacts of ESG activities on revenues, costs, and profits without requiring finance teams to implement new financial accounts. Rather, the opportunities and risks associated with a given ESG strategy or set of activities is woven into the *language* that business practitioners (e.g., chief financial officers [CFOs], business strategists, accountants, and controllers) already understand the best: the profit and loss (P&L) statement. In Section 2, we offer an overview of the different perspectives, philosophies, concepts, and processes contributed by research and initiatives before

synthesizing these insights for the conceptualization (logical incorporation into the P&L statement) and procedural guidance (computation of green synergies driven by ESG activities) of the framework in Section 3. Ultimately, the ESG modelling framework is intended to allow financial decision-makers to compute *green synergies*, a profit value expressed in monetary terms. We use that term because it emphasizes the notion that a firm's profit is a function of interacting and cooperating with stakeholders, including people and the planet.

Serafeim et al. (2019) call for reimagining capitalism as a more inclusive and sustainable form that accounts for the interest of every person and the planet. The authors suggest that business leaders need guidance and signals by connecting the impact on people and the planet with accounting statements. Mayer et al. (2021) propose the measuring purpose integrated framework, a general three-stage model incorporating purpose in the motives (mission, vision, strategic objectives), metrics (inputs, outputs, outcomes, impact), and money (valuation, return on investment). While Eccles (1991) observes a radical shift from treating financial figures as the foundation for performance measurement to treating them as one measure among several, Porter (2021) reflects that businesses are beginning to accept their responsibility to society, finding that business competition is shifting as companies work to address social and economic needs through profitable business models, thereby creating value. Freeman et al. (2007) aim to correct the traditional narrative of capitalism as value-capturing rather than value-creating, reframing that around the reinforcing concepts of stakeholders. Jensen (2001) argues that purposeful corporate decision-making can only be achieved with a single-value objective function. He observes a lack of specification in stakeholder theory concerning the necessary trade-offs involving the competing interests of financial claimants, employees, customers, communities, governments, and the environment. Freeman and McVea (2005) state that the impetus behind stakeholder management was to try to build a framework that was responsive

to the concerns of managers who were being challenged by elevated levels of environmental turbulence and change.

Grewal and Serafeim (2020) segment the research field into three branches: measuring, managing, and communicating corporate sustainability performance and find that measuring corporate sustainability is the least developed. It is precisely first measuring – or more accurately – quantifying through a business case hypothesis and then measuring through the business case outcome in the form of a P&L report that is the objective of this paper. We offer a novel framework that allows for the incorporation of all material aspects into each financial line item of a firm's P&L statement. Numerous initiatives have been undertaken to guide business towards more sustainable conduct to contribute to not only shareholders but also all other stakeholders: employees, customers, suppliers, society, and the environment. An impressive number of sustainability researchers, corporate sustainability executives, and green investors have amassed a large set of solutions to help decision-makers through metrics or force them through regulations and legislation to adopt business practices that benefit all stakeholders and to account for all resources, including natural resources, when measuring the a firm's true profit level. This paper suggests a further implementation of this notion by building a logical and quantitative bridge between strategic decision-making about "going green" and the green synergies, or economic attractiveness, of this path while incorporating all stakeholder interests. The ESG modelling framework is designed to fulfil two functions in contributing to more sustainable businesses and overall economic systems.

The first function of the ESG modelling framework is to give executives like CFOs a simple yet rigorous concept to derive two business cases. The first step is to model an as-is business case which defines assumptions for the size of the strategically relevant market (SRM), expected sales volume, expected willingness to pay (i.e., pricing), and cost estimates (raw

materials, operational costs, personnel costs, and other costs) based on unchanged business conduct, computing a five-year perspective on a firm's profits and losses. The second step is to model a green business case which re-assesses each financial line item with an eye towards the differences in terms of SRM size, expected sales volume, willingness to pay, and all raw material, operating, personnel, and other costs. Incremental analysis of both business cases will indicate the level of attractiveness of a firm towards a green path. The aforementioned set of assumptions cannot be identical for both paths. The incremental analysis of profits between comparing the two business cases is the monetary expression of the value that a company can create by going green.

Strategic decisions within firms are typically made on business cases. The ESG modelling framework is designed with these decision processes in mind, as the most efficient cultural change in corporations is achieved by persuading board members and other top executives that going green is good business rather than by forcing or incentivizing firms through regulation and legislation or taxation, respectively. However, regulation, law-making, and taxation remain important instruments to calibrate economic systems in specific sectors and around the globe.

The second function of the ESG modelling framework is to contribute to academic research by focusing investigations even more narrowly on the specific needs of key decision-makers. More precisely, the framework charts a course by which evidence derived from academic papers can be efficiently directed towards specific financial line items in P&L reports, which are decision-makers' primary basis to understand and incorporate green measures. Examples include evidence on the association of ESG activities on the effect on customers' willingness to pay in different market segments or ESG activities' impacts on raw material prices in a specific industrial sector. More precisely, it is crucial to examine how the pursuit of

a green strategy increases customers' willingness to pay because that might identify aspects such as status or ethics for which customers are open to paying a premium. Similarly, it is important to understand how changing a specific raw material choice affects the gross margin. If the new material is more expensive, further analysis of financial line items requires understanding whether that additional cost is accompanied by selling more units or obtaining a higher price or both. Further, the causal impact of work-from-home (WFH) optionality on employee satisfaction and thus employee loyalty, which reduces recruitment costs, needs to be considered. At the same time, academic investigations into how an as-is strategy in a specific sector is associated with shrinking revenue and profit potential can help decision-makers to calibrate their assumptions towards a more robust quantification of opportunity and risks. More precisely, they enable a more efficient comparison of two strategic paths: the as-is business case and the green case.

2. Literature Review

2.1. The Association of ESG Activities and Firms' Financial Performance – Status Quo and Challenges

The acceptance of ESG activities as a strategic and operational instrument depends on the impact they have on the economic and societal value-creation process. Waddock and Graves (1997) report a positive association between corporate social performance (CSP) and future financial performance, supporting the theory that effective management and CSP are positively linked. Ioannou and Serafeim (2021) document intra-industry convergence on sustainability actions over time in almost all sectors. They distinguish between imitative (copying actions of competitors) and unique (differentiating) sustainability strategies and actions, finding a positive association with company performance. Therefore, sustainability can be not so much a cost but more of an investment in a better competitive position, which should be reflected in both the top and bottom lines of a firm. Linked to this notion, the ESG modelling framework contributes

to quantifying this competitive advantage in a firm's strategic planning by determining the green synergies of a strategic path.

Brammer and Millington (2008) observe that both companies with low and unusually high CSP deliver better financial performance – poor social performers do best in the short run, and unusually good social performers do best over the long run. Serafeim (2019) constructed a measure of corporate purpose based on a large number of survey responses, suggesting that firms with employees who maintain strong beliefs in the meaning of their work perform better. Greening and Turban (2000) investigated CSP as a competitive advantage in attracting top talent, finding in experiments that job applicants are more likely to pursue jobs with socially responsible firms than with firms that have poor CSP. Dhaliwal et al. (2012) examine the relationship between the disclosure of non-financial information and analyst forecast accuracy, finding that the issuance of stand-alone corporate social responsibility (CSR) reports is associated with lower analyst forecast error. Chen et al. (2017) examined how CSR disclosure mandates impact firm performance and social externalities, finding that firms experience a decrease in profitability after CSR reporting mandates take effect. Downar et al. (2021) investigate the impact of a greenhouse gas (GHG) emissions disclosure mandate on firms' subsequent emission levels and financial performance. The authors find that the reporting mandate had a real effect on the variable to be disclosed without adversely affecting operating performance. Dhaliwal et al. (2011) find that firms with an inflated cost of equity capital in the previous year tend to initiate CSR activities in the current year and that initiating firms with superior CSP enjoy a subsequent reduction in the cost of equity and are thus more likely to raise equity and to raise more capital at that point. Flammer et al. (2012) study the integration of CSR criteria into executive compensation and report that the adoption of CSR contracting increases the long-term orientation of executives' decision-making, drives firm value, and increases the

number of social and environmental initiatives and green innovations. They suggest that these findings support the notion that CSR contracting helps direct management's attention to stakeholders that are less immediately salient but are eventually financially material to the firm, thus improving corporate performance. Gartenberg et al. (2019) analyse the strength of employee beliefs about their company's purpose, finding that belief in public companies is lower, especially in the salaried middle and hourly ranks when compared to senior executives.

Even though studies generally report a positive association between CSR and financial performance, the matter of its financial impact has not yet been robustly solved. Amel-Zadeh and Serafeim (2018) note the difficulties of using ESG information for investment decisions due to the lack of reporting standards, while Turker (2009) bluntly describes the measurement of corporate sustainability as problematic. Kotsantonis and Serafeim (2019) find a vast variety of ESG data and measures and how companies report them, meaning that inconsistencies abound. Further, they observe that there is a lack of transparency regarding ESG data providers' methodologies, creating market-wide inconsistencies and undermining their utility for decision-making. Another finding is that ESG researchers' imputation methods when dealing with data can explain bid discrepancies. These observations call into question ESG ratings as a robust data set for drawing causal interpretations in the context of strategic planning or investment decisions. Berg et al. (2022) investigate the divergence of ESG ratings based on data from the most prominent ESG rating agencies, documenting the divergence and mapping the different methodologies onto a common taxonomy of categories. They call for greater attention to how the data underlying ESG ratings are generated. Christensen et al. (2022) observe a substantial disagreement across rating agencies regarding what rating to assign to individual firms. The authors predict and find that greater ESG disclosure leads to greater ESG rating inconsistency.

2.2. The Association of ESG Activities and Firms' Financial Performance – Current Solutions

Serafeim et al. (2019) suggest three objectives for impact-weighted financial accounts: (1) translating social and environmental impact into comparable units that managers and investors intuitively understand; (2) the ability to aggregate these units meaningfully for decision-making; and (3) displaying these units in the same accounts as the financials, enabling the use of existing financial and business analysis concepts to evaluate corporate performance. Further, the Impact Frontiers Collaboration (2020) suggests operating principles for impact management: a framework for investors for the design and implementation of their impact management systems, ensuring that impact considerations are integrated throughout the investment lifecycle. The authors identify four elements of integrated practice: 1) create an impact rating to distinguish prospective investments; 2) select a financial valuation metric to estimate which prospective investments offer more or less expected risk-adjusted financial return; 3) conduct an integrated analysis of the existing portfolio to determine the implications for future investments; and 4) measure and manage the impact and financial performance of investments. The Impact Management Project (2017) reached a consensus that impact is the combination of material effects on people and the planet, suggesting a framework with five dimensions to measure impact: 1) what outcomes does the effect relates to, and how important they are to people and the planet; 2) how significant the effect is; 3) by whom the effect is experienced; 4) the effect's contribution to what is likely to occur anyway; and 5) which risk factors are material and how likely the effect is to differ from expectations. Further, the concept of materiality regarding the relevance of certain sustainability issues from the Sustainability Accounting Standards Board (SASB) on the business model is a further step towards the measurement of ESG activities and their impact on business outcomes. Freiberg et al. (2020) introduce a framework that disentangles the distinct stages of materiality based on the SASB

work: 1) the status quo, which describes the degree of misalignment between business and societal interest; 2) the catalyst stage, in which some companies deviate from equilibrium to capture more advantage; 3) the stakeholder pressure stage, in which companies experience pressure from NGOs, media, and other kay actors, with a negative market price reaction typically following; 4) the company response stage, in which the company tries to regain trust, seeking to mitigate negative market price reactions; 5) the regulatory response and innovation stage, in which regulators, lawmakers, and innovators aim to solve the ESG problems of the sector. Orlitzky et al. (2003) find in a meta-analysis that CSR appears to be more closely correlated with accounting-based measures of corporate financial performance than with market-based indicators.

This meta-analysis indicates that it is key to translate ESG measures into standard accounting terms, which constitute the language that business leaders, business owners, and financial employees understand. The effectiveness of a framework that is accepted by businesses will be determined by how much it is already written in the language they understand. The P&L is, along with the balance sheet and cash flow statement, the most important and best-understood language. An important additional perspective to existing approaches to incorporate ESG into performance measurement is that this framework is already anchored in the earliest stage of the P&L: the business case that serves as the profit – or loss – projection for the next five years. Most concepts aim to integrate a measurement as a reporting standard that analyses performance retrospectively, implicitly suggesting that a measurement of a strategy once it is produces actual numbers will influence the course of management decisions from that point forward. From a strategic and financial planning point of view, the impact of a framework is substantially higher if what is measured afterward was already part of financial planning in the initial stage. In simple terms, then, ESG activities should be priced

in the business case (thus the hypothesis of the later P&L) in the years prior to the regular reporting of the ESG key performance indicators.

Eccles et al. (2012) call for sector-specific materiality and sustainability reporting standards to account for differences between sectors. An industry or sector materiality is an interesting overarching view but does not answer what a given CEO or CFO should or can afford to do in the specific lifecycle stage their firm is currently in, which can vary substantially between firms within a sector. While SASB's materiality is still an excellent guide, this paper suggests a further step: to identify the materiality of sustainability activities for each company and ultimately price it into each financial line item. It is of utmost importance that each business executive determine materiality for the strategic decision setting he or she is in at the very moment. To assess each financial line item in the development of the green and as-is business cases, this framework thus allows the incorporation of a firm's materiality factors into the assumptions made about its future revenues, costs, and profits. In line with impact-weighted accounts (Serafeim et al., 2019) and the general concepts provided by the measuring purpose integrated framework (Mayer et al., 2021) and Impact Management Project (2017), the ESG modelling framework takes an additional towards the organic integration of sustainability into strategy, finance, and standard accounting procedures.

3. ESG Modelling Framework: Quantification of ESG Factors in the P&L of a Firm

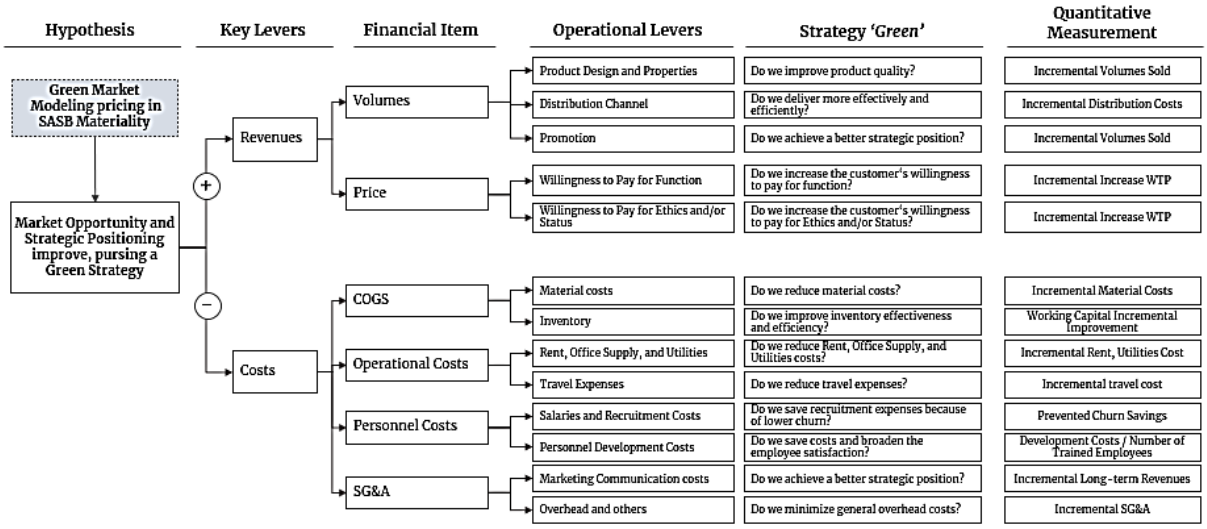
3.1. Rationale and Objective

The ESG modelling framework is rigorously derived from and embedded in the standard P&L of a firm, comprising revenues, costs of goods sold (COGS), operating and personnel expenses, and selling, general, and administrative (SG&A) and other costs. The important rationale is that changing decision-making towards more sustainable strategic conduct requires a closer link to the language of boardrooms and thus decision-making based on business cases, rather than

isolated evidence on one financial item such as operational costs, which does not provide information about the revenue impacts of the same decision. Further, it is key to help decision-makers quantify ESG decisions at the strategic planning stage rather than simply helping analyse the results in the form of an ESG key performance indicator in the P&L. A business case is a hypothesis an executive makes about a given market and business opportunity; that is, it is a hypothesis about a future P&L. The current controlling metrics measure P&L years after a strategic decision is made. This framework addresses the business case, helping to calibrate the business case to understand more thoroughly the incremental changes a sustainability (or green) strategy will have on a firm's bottom line; it helps to compute green synergies. It is important to note that some firms in certain industries might have business models that require more time to shift operations towards green strategic paths simply because a sudden change towards purely sustainable products and processes might endanger the firm's existence in the short term. Therefore, the ESG modelling framework is a technical tool to measure the attractiveness of a sustainability strategy that measures green synergies in the language that executives already use to determine their firm's strategic path. It is also important to note that green synergies could be negative for some business models. The validity of this framework is that it can provide an unbiased, tangible valuation of a green strategic path. This property is key to achieving acceptance from practitioners who face highly complex pressures from macroeconomic, market, customer, and competitive factors. At the same time, the framework helps minimize the bias in academic research that assumes green strategies are usually beneficial for a firm. Such strategies are undeniably best for the collective, society, and the planet. However, individual business contexts might require some firms to not make this shift in a given five-year planning cycle if doing so would endanger the firm's existence. By computing materiality for each firm in the specific decision setting of executives is one of the

major objectives of this framework. Figure 1 shows the entire framework, which is detailed in the sections below.

Figure 1. The ESG Modelling Framework

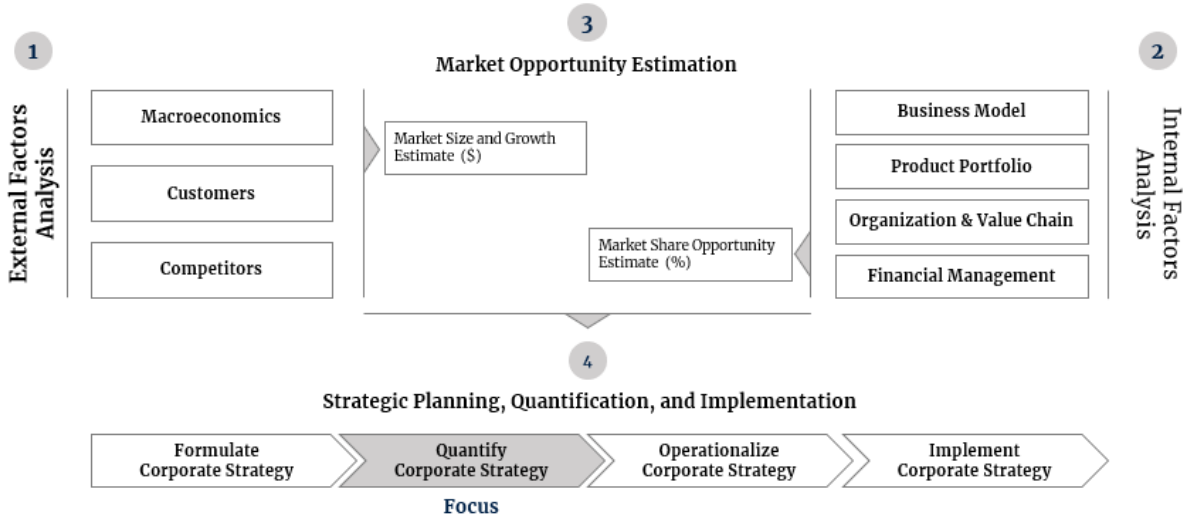


3.2. Market Opportunity Estimation: Hypothesis of Attractiveness of Market Opportunity and Improved Strategic Positioning by Pursuit of a Green Strategy

The ESG modelling framework is structured as follows: before pricing the ESG impact into the P&L, it is key to first derive a hypothesis about the attractiveness of a green strategy for the firm. This raises the question of how to estimate the market opportunity of pursuing a green strategy by incorporating materiality aspects from the SASB. Figure 2 shows the holistic strategic planning, quantification, and implementation process. The objective is to conduct an external analysis to determine the size and projected growth of the SRM and an internal analysis to determine the potential market share opportunity for the firm. SASB's materiality aspects are woven into both dimensions, as discussed in the next section. Estimations of the market opportunity and strategic positioning are used as the hypothesis in the following business case modelling process: the quantification of the market opportunity in a P&L format.

Estimating the market opportunity and strategic positioning will function as a starting point for the quantification of ESG activities. Both estimates, which are rough top-down computations, will then be tested as a hypothesis against the bottom-up quantitative model that is the ESG modelling framework. By implementing both top-down and bottom-up estimates, we heuristically account for the complexity of pricing sustainability factors into the different analytical dimensions in a firm's strategic planning and implementation processes.

Figure 2. Green Strategy Market Opportunity Estimation



3.2.1. *Market Opportunity Estimation: Hypothesis of Attractiveness of Market Opportunity*

The first step in pricing SASB externalities into the ESG modelling framework is to conduct an external analysis investigating macroeconomic factors such as political, economic, social, technological, legal, and environmental trends. For this analysis, practitioners typically implement PESTLE (Aguilar, 1967) analysis to ensure that political, economic, sociological, technological, legal, and environmental factors are appropriately considered. Based on the SASB materiality map, we allocate the materiality of *GHG* emissions, air quality, energy

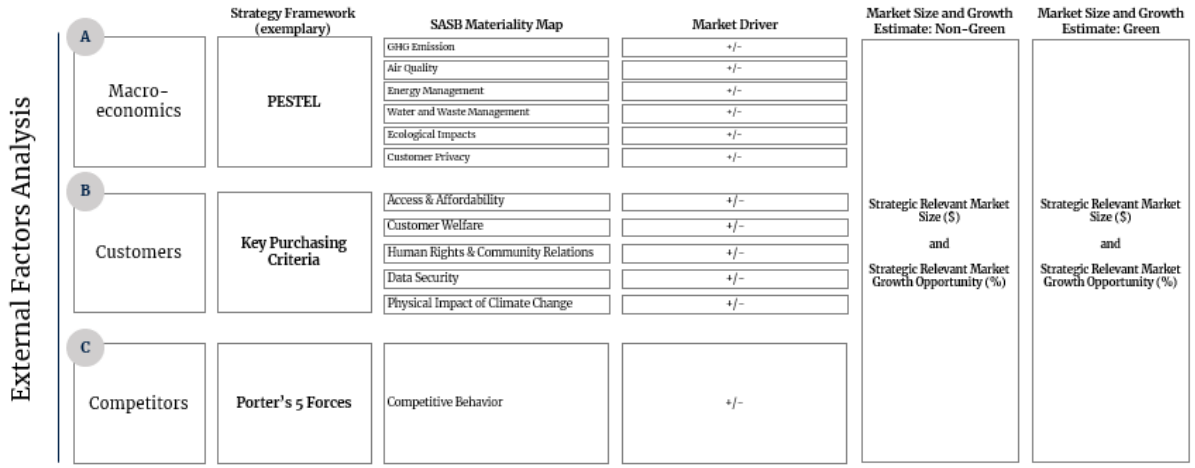
management, water and waste management, ecological impacts, and customer privacy as additional market variables in the PESTEL analysis. The objective is to examine the opportunities and risks associated with the aforementioned analytical items (see Figure 3).

The second step of incorporating externalities into the ESG modelling framework is to price SASB materiality into the customer analysis, in which we allocate the following aspects of materiality: access and affordability, customer welfare, human rights and community relations, data security, and physical impact of climate change. These analytical items are complemented by a typical key purchasing criteria analysis that practitioners conduct to measure customers' most important decision factors when choosing a product or service.

The third and final step in the external analysis complements the competitive analysis. Porter's five forces concept (1980) is often used for this purpose, and we suggest incorporating the SASB materiality competitive behaviour variable in this dimension.

The external analysis of macroeconomics, customers, and competitors incorporating SASB materiality functions as a guide to assess whether each of these factors positively or negatively influences market size and market growth. Ultimately, this analysis should allow for an indicative understanding of whether pursuing the green strategy is more attractive in terms of overall market opportunity, as measured in currency (e.g., US dollars). The key here is to accept that this analysis functions only as a rough estimate that is later used as the hypothesis in the ESG modelling framework. In sum, the external analysis should allow for a top-down assessment of whether the green strategy expands the opportunity because of its price in SASB materiality terms.

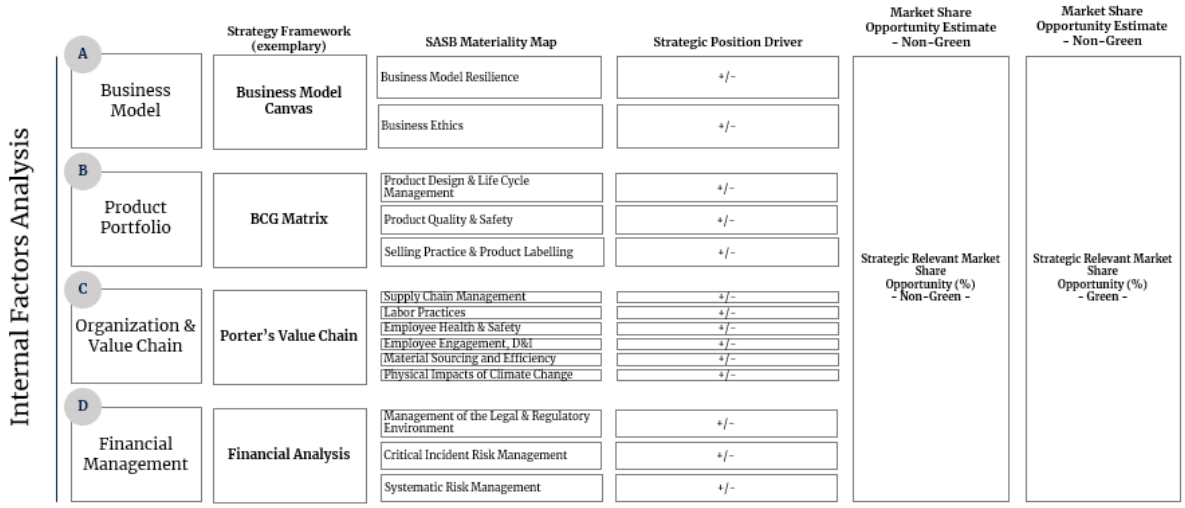
Figure 3. Pricing Materiality into the External Analysis



3.2.2. Market Opportunity Estimation: Hypothesis of Improved Strategic Positioning through Pursuit of a Green Strategy

To complete the market opportunity estimation, we suggest pricing SASB materiality into the internal analysis of the firm (Figure 4). We complement the dimensions of business model analysis, product portfolio, organization and value chain, and financial management with SASB materiality analytical items. The objective of this section is to determine whether the green strategy in principle improves a firm's strategic positioning as measured by increased market share opportunity. This estimate, along with the previously introduced method to estimate the overall potentially expanded market size or the market risk associated with pursuing the green strategy will function as a starting point for quantifying ESG activities. Both these top-down rough estimates will then be tested as a hypothesis against the bottom-up quantitative model: the ESG modelling framework.

Figure 4. Pricing Materiality into the Internal Analysis



In the first step of the internal analysis, we propose to complement the business model analysis with the two SASB materiality dimensions: business model resilience and business ethics. Exemplarily, we propose the business model canvas suggested by Osterwalder et al. (2010), but we emphasize that also other frameworks can be used. The key is to consider the materiality aspects of the business model and derive therefrom an assessment of whether it strengthens or weakens a firm's strategic positioning. Ultimately, the assessment enables making a rough estimate of the potential market share a firm can gain from the overall market size computed in the previous step.

The second step of the internal analysis is the firm's product and service offerings. Here, we suggest pricing in several SASB materiality factors: product life cycle management, product quality and safety, and selling practices and product labelling. Again, the question is how attractive a strategy with a greener product portfolio would be while explicitly considering SASB materiality factors. The answer should contribute to the assessment of a contribution to or reduction in strategic positioning.

Similarly, in the third step, the analysis of organization and value chain is suggested to price in the following materiality factors: supply chain management, labour practices, employee health and safety, employee engagement, diversity and inclusion, material sourcing, efficiency, and the physical impact of climate change. The same logic applies as in the previous steps: the assessment of each factor should provide an understanding of whether it is a positive or negative driver of the firm's strategic positioning.

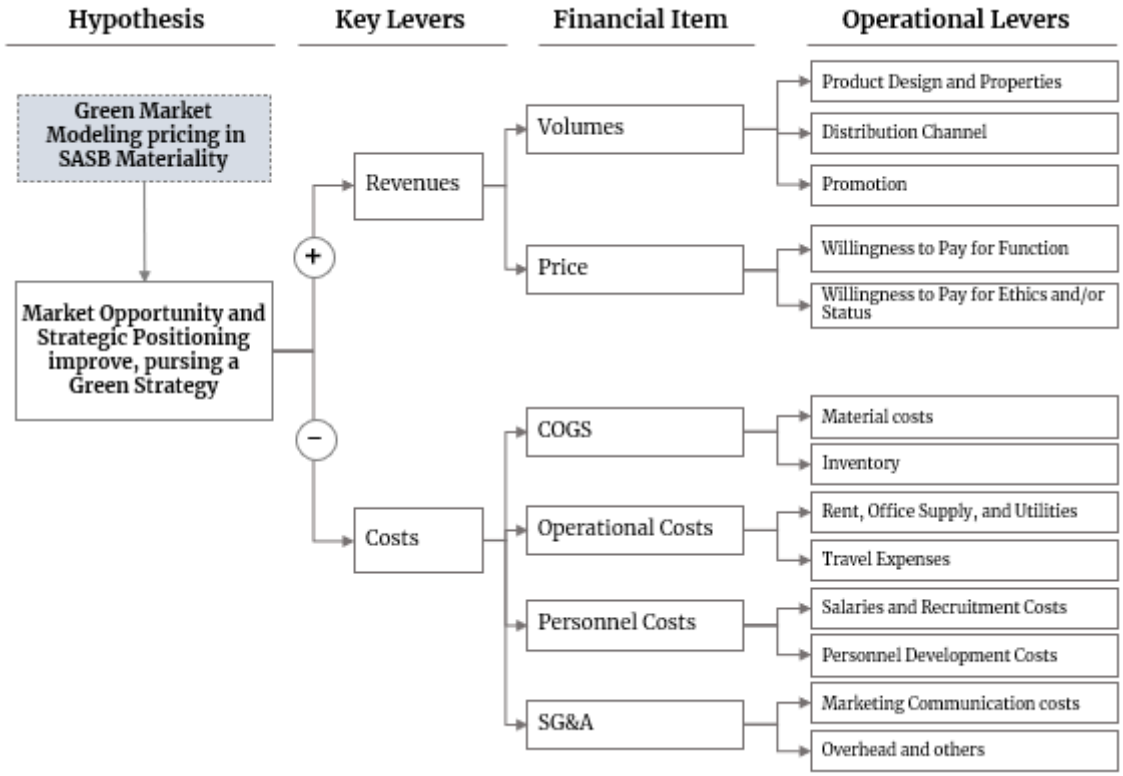
Finally, the last step in the internal analysis should include other materiality factors. We suggest complementing financial analysis (historical financial performance, revenue growth, profitability, cash flow, risk management) with the materiality factors management of the legal and regulatory environment, critical incident risk management, and systematic risk management.

3.3. Key Levers, Financial Items, and Operational Levers

Using the results from the top-down analysis to determine the market opportunity and strategic positioning as the hypothesis, we now use these estimates that priced in the sustainability factors of the bottom-up modelling of the green strategy business case to price sustainability factors into the business case, which is the quantitative basis for strategic planning and decision-making in firms. Its rationale and objective are to project the P&L statement of a firm. Therefore, the objective of this computation is to determine the profit that a firm could expect in each of the subsequent five years.

This hypothesis of an improved market opportunity by pursuing a *green strategy* is disentangled into the two key levers that are the determinants of profit: revenues, and costs. Each lever is then further disentangled into further branches, resulting in a logic tree (Figure 5).

Figure 5. Key Levers, Financial Items, and Operational Levers



The first lever, revenues, branches out into volumes (number of units sold) and price (unit selling price). Adapting the basic marketing theory concept of the four Ps – product, place, price, and promotion (McCarthy, 1960) – the ESG modelling framework assumes that product design and properties, distribution channels, and promotion are major drivers of volume. Price is expected to be determined by the customer's willingness to pay for function, status, and ethics.

The second lever, costs, branches out into COGS, operational costs, personnel costs, and SG&A costs. COGS accounts for the net value effect of units sold, leaving inventory (COGS = beginning inventory + purchases – ending inventory). A firm's operational costs include rent, office, supplies, and utility costs, while personnel costs comprise salaries, ancillary labour costs, recruitment costs, and personnel development expenses. Finally, SG&A costs

consist of all general and administrative expenses; that is, those not directly attributable to producing a good or service.

3.4. Guiding Questions for the Financial Modelling of a Green Business Case

To simplify modelling these financial line items, the following guiding questions and key variables for quantitative measurement are introduced (see Figure 6).

The quantification of the incremental and ideally additional revenues through positive changes to the volume and/or price variables that can be achieved with a sustainability strategy requires answering the question of how a greener product or service improves the offering enough for customers to buy more and/or pay a higher price. Customers might welcome a greener product but refuse to pay a higher price for it. Therefore, it is crucial to understand how the size of an SRM is altered by shifting towards a greener business model. We call this expanded market potential an expanded strategically relevant market (ESRM) to underline the potential of sustainability to increase revenue and as a more positive interpretation of the often-used interpretation of sustainability as a risk mitigation instrument against losing market share and revenue. The shift might have a positive impact by expanding the reach of the product to new customers (who had rejected the earlier, non-green product) and new regions, thus enlarging the ocean of opportunities for the company. At the same time, the greener product could account much better for macroeconomic trends, such as greener social behaviours, new regulations, and taxation, leading to lower revenue risks for the firm. It is crucial to answer the question of whether a customer segment has a higher willingness to pay if a firm is pivoting towards greener product portfolios; this question should be robustly investigated due to the impact of price on firm revenues. Ansoff (1965) provided useful guidance on investigating the

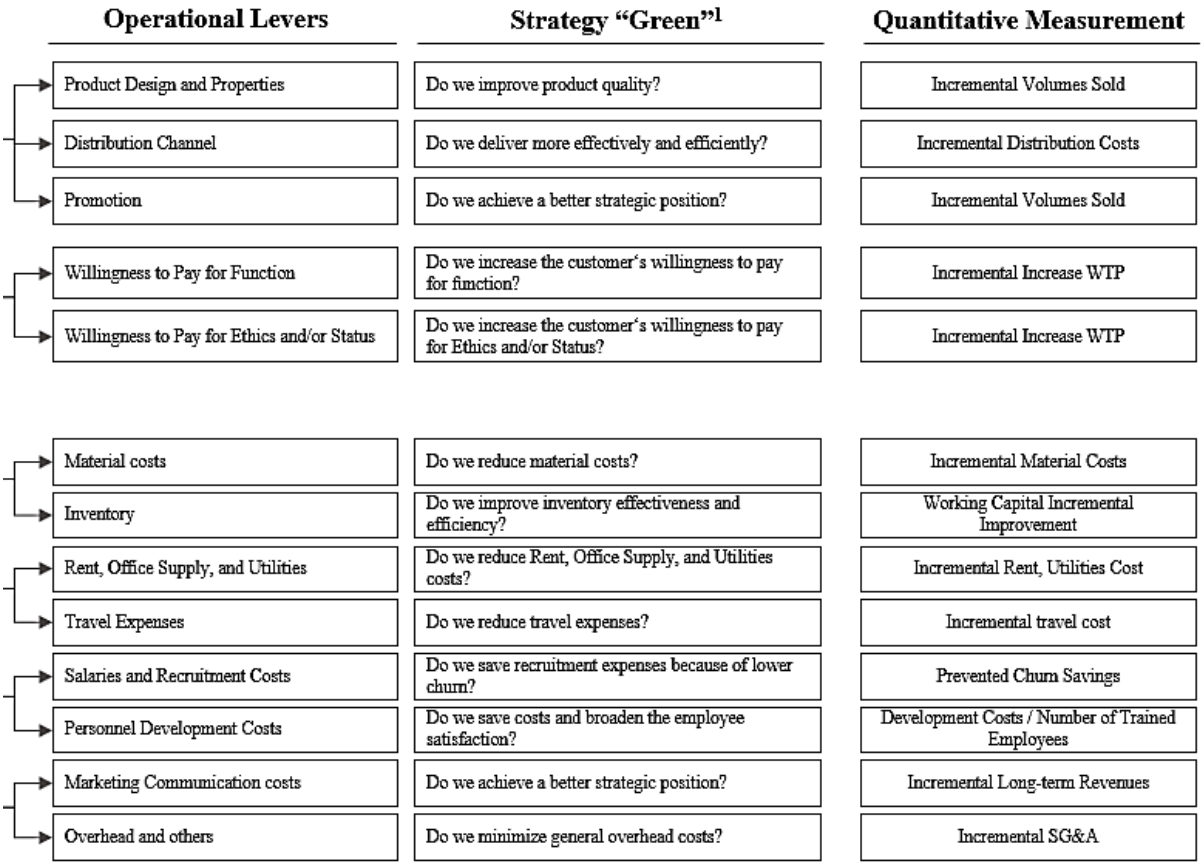
direction of expansion for a firm. The answers derived to the questions about incremental increases to volume and price that the *Green Strategy* might enable need to be compared to the additional or reduced costs and risks.

Because COGS is driven by raw material prices and inventories, the main question is to answer in this area is how a green strategy would impact the firm's COGS. In many cases, there might be a cost increase, which is among the reasons that firms are either unwilling or unable to depart from their existing business models. The key value of the ESG modelling framework is to understand the interaction of incremental additional revenue with incremental additional costs. Analysing only costs will not indicate whether a green strategy is attractive. For a top executive, the information that the overall industry is better off by moving towards green value chains does not help understand the specificity of her or his business reality, in which a large number of employees may depend on the executive's successful strategic decision-making.

A similar perspective applies to operational costs; the firm must have a good idea of how a green strategy would impact its operational costs. For example, would a shift towards a more sustainable operating model, such as a WFH protocol, improve or affect the firm's cost position? The pandemic belied to some extent the notion of in-office productivity when compared to WFH productivity, and pre-Covid studies had already shown that WFH could be a productivity driver for a firm (Baker et al., 2007; Bloom, 2014). However, Gibbs et al. (2021) reported a productivity decrease. Therefore, it is crucial to clearly understand how WFH affects the individual business; here again, an industry- or even country-wide indication of whether WFH increases or decreases value does not indicate how WFH might affect a given company. It is important to remember that this framework is designed to avoid a biased view or one-dimensional perspective on the value contribution of green strategies. In some cases, WFH might be a cost driver and in others an efficiency driver. It is advisable to investigate this

dimension rigorously in the context of a firm's particular business model before making a strategic decision. Another example to investigate is the extent to which greener travel policies impact travel expenses? During the pandemic, and associated travel bans and lockdowns, the hypothesis that travelling to customers was a fundamental business requirement in some sectors was partly rejected. To estimate how a green travel strategy would impact a firm's travel costs should include higher efficiency of sales meetings but also potential lost sales due to forgoing opportunities where trust and direct human interaction are key to closing a deal. These are but two examples on which practitioners should reflect. It is crucial to focus on the main question: does the sustainability activity or strategy move the needle for this specific financial line item in the business case?

Figure 6. Guiding Questions for Financial Modelling of Green Strategy Business Case



In addition to potential productivity gains in operational costs driven by a WFH protocol or optionality, such an approach can also influence the next financial line item: personnel costs. Depending on whether WFH decreases or increases employee satisfaction and employee turnover, a substantial incremental cost position needs to be considered when estimating the financial line item personnel costs in the green business case. WFH might be a source of cost savings due to lower employee turnover and thus lower recruitment and skill development costs. However, WFH might also reduce the hurdles for employees to switch jobs due to simpler recruiting processes (video conferencing interviews), making it more tempting and easier for employees to leave their current employer. Again, it is key to consider both directions of potential effects before making any assumptions about the impact of a green strategy, in this case on personnel expenses. An additional dimension to estimating personnel costs is the growing popularity of online training. While executive education and top talent programs were once a comparatively scarce resource for executives to allocate among their employees, the rapid rise of online offerings from top institutions has vastly increased the reach of such training. This might be a factor to consider in modelling personnel-related financial line items, as better personnel development offerings might decrease employee turnover and increase employee satisfaction.

Finally, the financial modelling of a green business case should incorporate assumptions about the incremental impacts of a sustainability strategy on SG&A costs and consider how the green path contributes to the strategic positioning of the firm in terms of branding and capital market perception in general. The impact of these long-term aspects is best assessed through a close linkage with the revenue projections in the first steps in the financial modelling of the green business case. Answering each question is the ideal opportunity for interacting with

researchers and academic and advisory institutions. In addition to delivering simple yet rigorous frameworks, as in many other business administration disciplines, the major contribution for practitioners is to help identify the causal impact of each sustainability measure – WFH, online training, low-travel policies, and so on – on the relevant financial line item. These examples are only a first set of research questions that have been already investigated; the key is to conduct more focused research on specific financial line items in the P&L that will allow for a better understanding of causal implications. A guide to the computation process is provided in the next section.

4. Computation of Quantitative Measures and Financial Data Sources

4.1. Computation of Quantitative Measures

The fundamental idea of the ESG modelling framework is to compute two business cases for a firm: the as-is case contains assumptions about volume, price, COGS, operational costs, personnel costs, and SG&A costs, while the green business case assesses the impacts on relevant financial line items of an expanded (or diminished) ESRM, greater or lesser customer willingness to pay, higher or lower raw materials costs or overall COGS, operational costs, personnel costs, and SG&A costs. The incremental changes to each line items will result in a net gain or net loss from pursuing the sustainability strategy. We use the term green synergy, which is synonymous with net gain, as it emphasizes the notion that a firm's profit is a function of interacting and cooperating with stakeholders, including people and the planet. It is important to note that the computation can also identify a net loss in a green strategy, in which case we refer to green dis-synergy. Again, the acceptance of the framework and its validity as a neutral instrument to reduce bias regarding the impact of ESG activities on the individual firm is the sole guide in the computation process.

To understand the impact of the green strategy on volume and price in greater detail, it requires computing the increment of both variables; that is, deriving the increased (or decreased) sales of the green strategy. Similarly, the incremental analysis of COGS, operating costs, personnel expenses, and SG&A will deliver values that allow for the computation of the overall net gain (green synergy) or net loss (green dis-synergy) from pursuing the sustainability strategy. Below, we elaborate on the standard sources from which to obtain data.

4.2. Financial Data Sources

Typically, the as-is case can be computed based on existing market, customer, competitor, and historical financial data that are provided by internal functions such as the strategic and operational controlling function of a firm. The green case, however, requires much more external data due not only to the novelty of this paradigm shift but also to its nature, as it spans many different economies, geographies, sectors, and cultures. Recommended instruments to estimate ESRM include implementing market models (size and growth) and customer surveys to capture willingness to pay for a greener product portfolio (see Section 3.2). Further, cost modelling, a standard finance and accounting procedure, can be exercised in the areas of raw materials, operational costs, personnel expenses, and SG&A. Finance and controlling professionals are thus not required to construct, learn, or compute new sustainability variables. The exception in the ESG modelling framework is the green synergy variable; however, it can be intuitively understood as net gain. This simplicity and intuitive understanding are crucial features of this framework: the practitioner is using standard procedures, which further increases the probability of acceptance of his or her sustainability computations, as there is no need to educate board members or key investors regarding new variables and their definitions and potential meaningfulness. That said, we emphasize that new sustainability variables do add

value and should be used where applicable but need to be presented in language that the vast majority of stakeholders and decision-makers will intuitively understand.

Research, academic initiatives, and advisory firms can further support the effectiveness and efficiency of data gathering by generating additional data, like industry surveys, and conjoint analysis to investigate the key purchasing criteria of customers, especially the variation of willingness to pay between green and non-green products. At the same time, macroeconomic PESTEL analysis is of substantial value for practitioners by helping them compute the size and growth of SRMs or derive predictions about changes in raw materials, energy, and labour costs. This intelligence is of utmost importance for strategists and financial practitioners. Again, the examples presented here of how research and academic initiatives can help practitioners gather more and better data are only indicative. There is a vast blue ocean of opportunities to contribute relevant data and insights geared to the needs of finance professionals when implementing the ESG modelling framework.

5. Conclusion

Measuring purpose, sustainability, and non-financial aspects, even when there is a broad understanding of their importance to long-term effects on firms, markets, government, societies, and cultures, poses a complex problem for top executives in their efforts to realign the business and operating models of their firms. A growing body of research and increasing number of academic initiatives, consulting firms, governmental agencies, regulators, and lawmakers have contributed to a much better understanding, acceptance, and reinforcement of ESG measures as part of a firm's business model. The ESG modelling framework aims to further contribute to this more sustainable business model thinking.

The first function of the framework is to give executives a simple yet rigorous way to derive two business cases. The first step is to model an as-is business case that defines assumptions for the size of the SRM, expected volume, and expected willingness to pay, along with COGS, operational, personnel, and SG&A cost estimates, based on unchanged business conduct, leading to a five-year P&L perspective for the firm. The second step is to model a green business case that re-assesses each financial line item in light of the differences in terms of SRM size, expected volume, willingness to pay, and all cost items. Incremental analysis of both business cases will indicate the level of attractiveness for a firm to take a green path. Strategic decisions within firms are typically made on business cases. This framework is designed for these typical decision processes, as the most efficient cultural change in corporations is achieved by convincing board members and top executives that green is a better business case rather than by forcing or incentivizing change by regulation and legislation or taxation, respectively, although those tools can be effective at the macro level.

The second function of the ESG modelling framework is to contribute to academic research to channel work that is even more focused on the specific needs of a decision-maker faced with determining a firm's sustainable strategies. More precisely, this framework offers a setting in which evidence derived from academic papers is channelled efficiently towards specific financial line items in the P&L, which has long been the primary tool decision-makers use, to understand and incorporate green measures. For instance, evidence on the association of ESG activities with customer willingness to pay in different market segments or ESG activities' impacts on raw materials prices in a specific industrial sector can be readily converted to a currency value that business leaders understand. At the same time, academic investigation into how an as-is strategy in a specific sector is associated with shrinking revenue and profit potential can help decision-makers calibrate a set of assumptions towards a more robust

quantification of opportunity and risks through a more rigorous comparison of the two business cases.

In addition to delivering a hands-on tool for practitioners to decide whether to implement green strategies in the language they already use to make strategic and operational decisions, the ESH modelling framework can better equip advocates for green strategies in corporations and investment teams with a tangible set of quantitative arguments in the familiar form of business case. The key is that this concept addresses causal effects at both the top and bottom lines, which is crucial to making a compelling boardroom argument that the higher costs of a green strategy are really a short-term investment of one to five years and not simply an additional cost burden or a long-term investment with a vague and distant payoff. More research should be conducted, especially concerning general patterns of market size (ESRM), customer willingness to pay (price), and the association of raw materials prices, operational costs, personnel expenses, and SG&A costs with green product portfolios and value chains.

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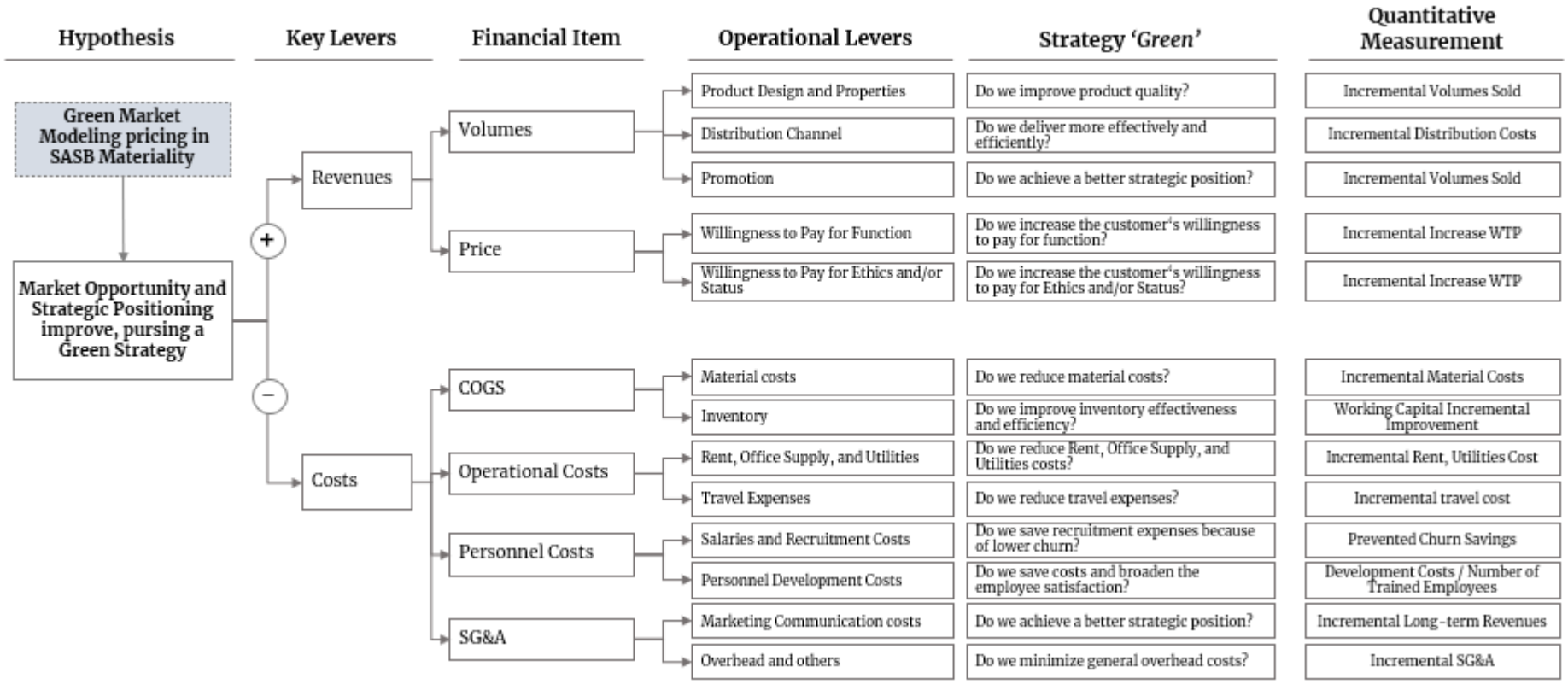
Appendix A: Strategic Framework for Financial Modelling of ESG Impact on P&L



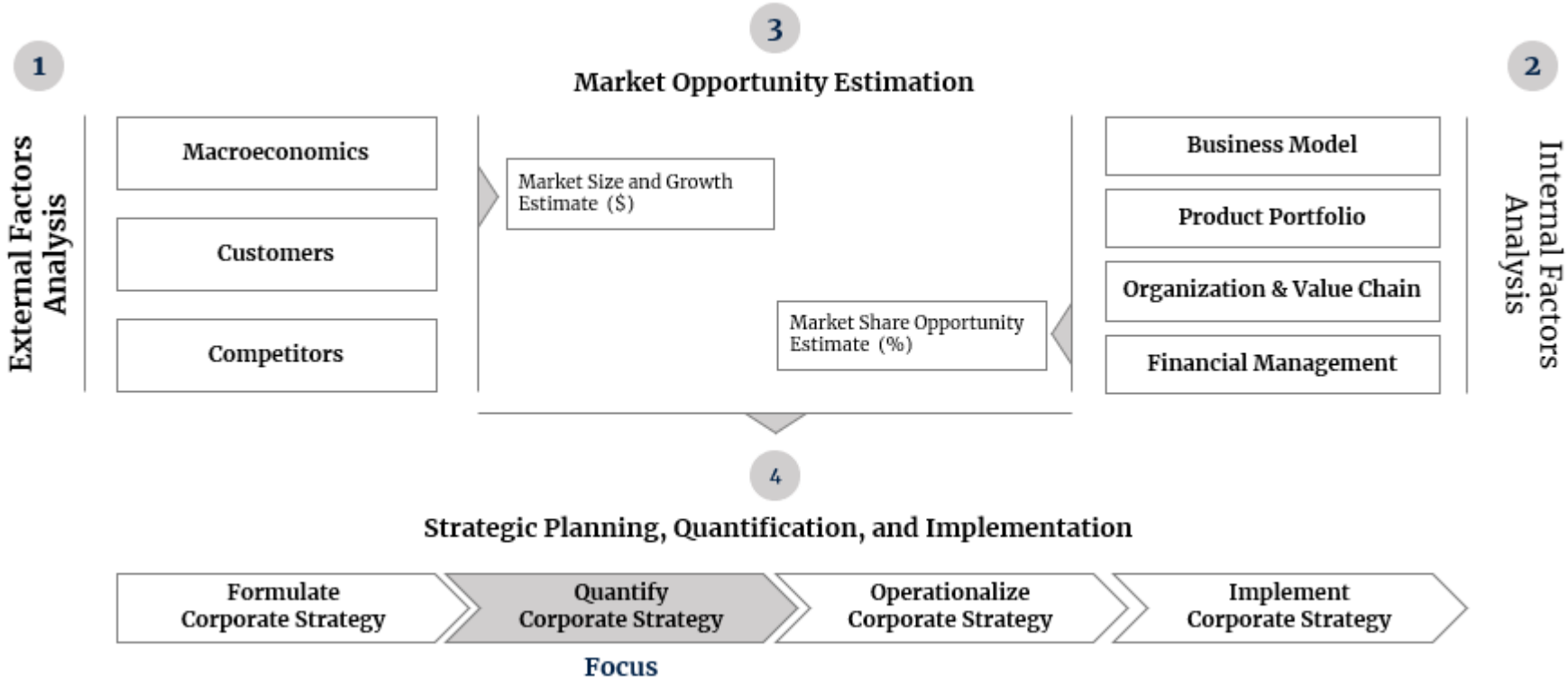
Appendix B: Computation of Measures

Quantitative Measurement		Financial Data 1		Financial Data 2		Financial Data 3		Financial Data 4
Incremental Volumes Sold	=	Expected Volumes Sold with Green Product Portfolio	-	Current Volumes Sold with Existing Product Portfolio				
Incremental Distribution Costs	=	Expected Distribution Costs via Green Channels	-	Current Distribution Costs via Existing Channels				
Incremental Volumes Sold	=	Expected Volumes Sold with Green Product Marketing	-	Current Volumes Sold with Existing Product Marketing				
Incremental Increase WTP Function	=	Expected Increase WTP Function	-	Current WTP for Function				
Incremental Increase WTP Ethics/Status	=	Expected Increase WTP Ethics/Status	-	Current WTP for Ethics/Status				
Incremental Purchasing Costs	=	Expected Purchasing Costs (Green Materials)	-	Current Purchasing Costs				
Working Capital Incremental Improvement	=	Expected Working Capital Requirement Green Inventory	-	Current Working Capital Requirement				
Incremental Operational Cost	=	Expected incremental Rent, Utilities Cost Green Office	-	Current Rent, Utilities Cost				
Incremental travel cost	=	Expected Travel Costs Green Fleet & Travel	-	Current Travel Costs				
Prevented Churn Savings	=	(Expected Churn Rate Green People Strategy (FTE)	-	Current Churn Rate (FTE))	x	Average Salary		
Development Costs / Number of Trained Employees	=	(Spending on Employee Development Green Learning	/	Number of Trained Employees)				
Incremental Long-term Revenues	=	(Expected Volumes Sold with Green Product Portfolio	x	Expected WTP for Green Products)	x	1 + Expected CAGR	^	Years
Incremental SG&A	=	Expected SG&A Green Operating Model	-	Current SG&A				

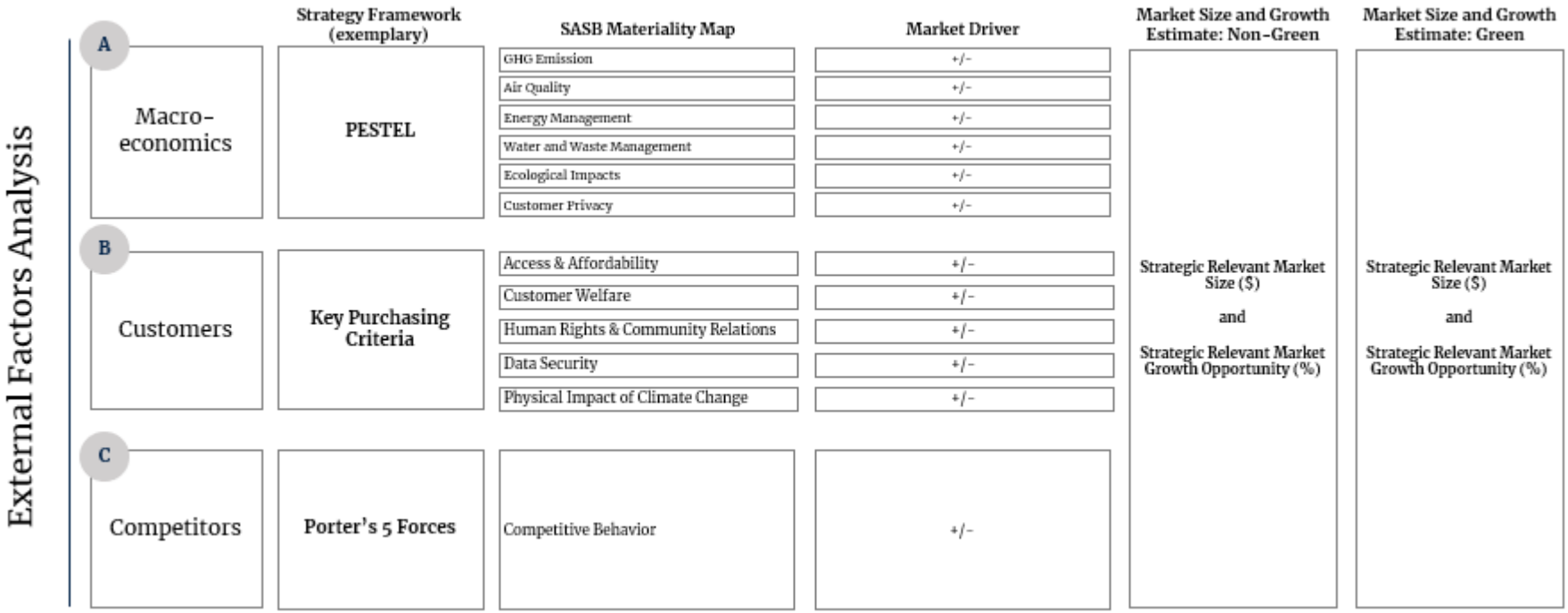
Appendix C: Financial Data Sources

Financial Data 1	Data Source 1	Financial Data 2 -4	Data Source 2
Expected Volumes Sold with Green Product Portfolio	Market Modeling SRM	Current Volumes Existing Products	Internal Controlling
Expected Distribution Costs via Green Channels	Market Modeling SRM	Current Distribution Costs	
Expected Volumes Sold with Green Products	Market Modeling SRM	Current Volumes Sold	
Expected Increase WTP Function	Customer Surveys	Current WTP for Function	
Expected Increase WTP Ethics/Status	Customer Surveys	Current WTP for Ethics/Status	
Expected Purchasing Costs (Green Materials)	COGS Benchmarks + Raw Material Prices Modeling	Current Purchasing Costs	
Expected Working Capital Requirement Green Inventory	Working Capital Analysis	Current Working Capital	
Expected incremental Rent, Utilities Cost Green Office	Operational Cost Modeling	Current Rent, Utilities Cost	
Expected Travel Costs Green Fleet & Travel	Operational Cost Modeling	Current Travel Costs	
Expected Churn Rate Green People Strategy	Personnel Cost Modeling	Current Churn Rate	
Spending on Employee Development Green Learning	Personnel Cost Modeling	Number of Trained Employees	
Expected Volumes Sold with Green Product Portfolio	Market Modeling SRM	Expected WTP for Green Products	
Expected SG&A Green Operating Model	SG&A Modeling	Current SG&A	
		Average Salary	
		Current Spending on Development	
		Current Spending on Development	

Appendix D: Market Modelling, Strategic Planning, Quantification, and Implementation Process



Appendix E: Market Modelling: How to Incorporate ESG Measures into Market Opportunity Estimates



Appendix F: Market Modelling: How to Incorporate ESG Measures as Strategic Position Drivers