

RESEARCH ARTICLE

The resource-based view, stakeholder capitalism, ESG, and sustainable competitive advantage: The firm's embeddedness into ecology, society, and governance

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Abstract

The main research question of the study is this: Is the firm embedded into ecology, society, and governance (ESG), or vice versa? Using the resource-based view as a theoretical lens, and stakeholder capitalism as a paradigm anchored in the *Dashgupta Review*, we demonstrate in a panel data over 26 years that at the firm level, the relationship between sustained competitive advantage and the ESG footprint is concave shaped, and the *impact inequality multiple* gaps of the ESG footprint are 4.75 times the providing capacity of the natural and business environment. To solve the common method variance, endogeneity, and unobserved heterogeneity, system GMM is used as a method in a dataset of US manufacturing firms from 1992 to 2019. At the end, we argue that extant attributes of a resource base for sustained competitive advantage have an inherent flaw anchored in the resource-based view, as they ignore the “environmental, social, and governance (ESG) friendliness” attribute of a resource. Managers need to rethink the objective of their firms if they want to survive in the new ESG-friendly economy with stakeholder supremacy.

KEYWORDS

endogeneity, ESG, ESG footprint, objective of the firm, resource-based view, stakeholder capitalism, sustainable competitive advantage, sustained competitive advantage, system GMM

1 | INTRODUCTION

The quest to understand the sources of sustained competitive advantage has inspired strategic management researchers to contribute from a diverse angle. This stream of research assumes the resource heterogeneity and stability of the strategic resources over time. The relationship between a firm's resources and sustained competitive advantage is possible if the resources are valuable, rare, inimitable,

non-sustainable, and organized (VRIN-O) (Bhandari et al., 2020; Barney, 1991; Barney et al., 2021). The resource-based view (RBV) focuses on the internal strengths and weaknesses of the firm in contrast to the external environmental model of competitive advantage where the focus is on the opportunities and threats.

Climate science enthusiasts and environmental economists are rallying behind *The Economics of Biodiversity: The Dasgupta Review* (Dasgupta, 2021) to address the imbalance between our demand and nature's supply. The review explicitly claims that the economic system is using 1.6 times the serving capacity of the biosphere—human mismanagement of the most precious asset, nature, is alarming. The

Abbreviations: ESG, environment, social, and governance; RBV, resource-based view; System GMM, system generalized methods of moments.

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ministries of finance and economy need to lead the way to enable the wider society to conduct proper decision-making with new success metrics, by reflecting on the premise that “humanity and global economy are embedded within nature, not vice versa.” This is an alarming state of affairs if we want to have sustainable development and meet the UN's sustainable development goals (SDGs) (Guia Arraiano et al., 2017; Liute & De Giacomo, 2021; Orazalin & Mahmood, 2021).

Scholars have been raising the need for stakeholder governance (Amis et al., 2020; Barney, 2018; Barney et al., 2021) to correct the imbalance between supply and demand of depleting resources. Humanity must be aware of reducing its demands on environmental, social, and governance-related (ESG) footprints and help sustain its supply capacity. All four Ps (politicians, plural sector, private sector, and public sector) must have a strong commitment to conservation and the restoration of ecosystems with a notion to drive a sustainable ecological footprint at individual and household levels. While Dasgupta (2021) provides a macroperspective of ecology, we delve into social and governance-related impact separate from the ecological impact at the firm level; out of the four Ps, our current study poses two research questions focused on the private sector: (1) What level of ecological, social, and governance footprint has the US manufacturing sector incurred while reaping good profitable growth? (2) Is the firm embedded into environment, sociology, and ecology, or vice versa?

Daft (1983) defined firms' resources based on the goal of improving efficiency and effectiveness. Any “assets, capabilities, organizational processes, firm attributes, information, knowledge, etc.” that serve the lofty goal of efficiency and effectiveness of the firm are called resources. Barney (1991) argued that not all physical capital, human capital, and organizational capital are important resources that serve the strategic purpose, and suggested the VRIN-O attributes of resources as the differentiating mechanism for sustained competitive advantage.

Achieving a competitive advantage is a strategic approach that is being pursued in parallel by all competitors. Thus, the focus of the study is not on the structural or environmental changes, such as technology changes or creative destruction (Schumpeter, 1942), which may make current resources redundant or not important, and competitive advantage may be over. However, when a firm has a sustained competitive advantage, the strategic approach is to create value that is unique to that firm only, where imitation of the same is not possible (Barney, 1991; Barney et al., 2021; Bhandari et al., 2020). The focus of our study, thus, is on the firm's VRIN-O attributes and how this can create sustained competitive advantage.

Based on the assumption that resources are heterogeneous and immobile at the same time, this study follows VRIN-O attributes which are history-dependent, causally ambiguous, and socially complex—embedded into the idiosyncrasy of the firm. To achieve the lofty goal of sustained competitive advantage, the majority of firms have profit maximization as their objective at the cost of ESG degradation (Freeman et al., 2021).

The firm's sustainability and ESG literature at firm level has been confronted by Porter and Kramer (2019) through the “shared value” concept. However, attempts to measure the “shared value” have not been very successful, even after Porter et al.'s (2011) contribution in

this direction. Extant research applied survey data or archival proxies in strategic management in general terms, while the latter is predominant in highly cited contributions. However, according to Ketchen et al. (2013) such studies are “castles made of sand.” Responding to the call, to avoid building these “castles made of sand,” we use computer-aided text analysis (CATA) and a machine learning technique called natural language processing (NLP) to build our measure of ecological footprint, our outcome, or criterion variable. To mitigate the reliability, validity, and generalizability of extant measures, a rigorous methodological approach is taken.

In a panel dataset of the US manufacturing sector between 1992 and 2019, panel regression using system GMM which handles common method variance, endogeneity, and unobserved heterogeneity (CEU) shows that as a firm's profit rises over time, the ESG footprint has a concave-shaped relationship. This finding has major implications for both theory and practice. First, the current VRIN-O attributes of the firm's strategic resources *are necessary but not sufficient conditions* for the much-required new objective of the firm—together with profit, a firm needs to respect social development, ecological justice, and governance compliance. Thus, in the end, a refined version of the (ESG) resource-based view (ESG-RBV) has been proposed following the research call from Barney (2018) and Barney et al. (2021). Second, post-estimation analysis shows that the US manufacturing sector is overusing the ESG by 4.75 times the level it can serve and regenerate for sustainable development, as envisioned by the UN's sustainable development regime (SDG-R). Second, based on the overuse of 4.75 times the providing capacity of the ecological systems, the United States is on the verge of being at melting point. Thus, as suggested by Dasgupta (2021), policymakers, conscious CEOs, managers, the plural sector, and ecological activist must act urgently before it's too late and the regenerative capacity of the ESG becomes impossible to recover.

In subsequent chapters, we first review the ecological footprint literature to assess the existing theories, measures, and implications. Next, we explain the CATA with the NLP approach, and its value in assessing the ecological footprint through the large corpus of unstructured texts in the firms' annual reports filed in the US Securities and Exchange Commission. For the reliability, validity, and generalizability of the measure, we introduce human judgment as a triangulation. Further, using system GMM, we use panel regression to assess the impact of sustained competitive advantage on the text-based ecological footprint. In the end, we discuss major implications for the RBV, and strategic management at large, to further the use of NLP and CATA-based techniques.

2 | STAKEHOLDER CAPITALISM AND ESG FOOTPRINT: A NEW OBJECTIVE OF THE FIRM

The Barnean and Freemanian schools of thought on stakeholder capitalism seek to achieve at the firm level that any human activity that leaves more ecological damage than nature can provide while regenerating itself is used as an ecological footprint (Dasgupta, 2021;

Pascual et al., 2021). Following this definition, and based on the extant literature on the environment, social, and governance (ESG) aspects of the firm, which is driven by the stakeholder capitalism doctrine, the current study assesses the ecological footprint as “1-ESG.” The detailed measurement of the ESG through computer-aided analysis (CATA) is presented in the measurement section 4.3.1.

2.1 | Value of “priceless” nature, social fabric, and governance

The traditional objective of the firm was profit maximization—with ruthless short-term execution, quarterly share price, and related performance reward mechanisms for the CEOs and the top management alike. In the pursuit of excellence in profit maximization, it has now finally been realized that we are seeing the major symptoms of the ecological sickness that the planet is facing. Of course, the inequality regime (Piketty, 2021) has emerged due to the accumulation of the majority of the wealth in the Top 1 percentile of the population. While too much orientation towards public sector-driven economy resulted in the collapse of the Soviet Union and allied countries, similar symptoms of too much liberalization and the free market economy without the proper control of the public sector have paralyzed the earth—and increased inequality in all aspects, including the impact inequality as suggested by Dasgupta (2021).

While the extant understanding of how can we even put a price tag on nature is equally valid, unless and until, we have objective measures of the ESG, we will not know what level of effort is needed to safeguard against irreversible damage to the biodiversity. Similarly, the impact on a society with a proper ethical governance mechanism must be assessed, and this assessment must drive the objective of the firm, rather than the orthodox measure of a single unit of profit maximization.

Our approach is an improved construct and measurement purpose, based on the preliminary attempts done by Porter et al. (2011) with a shared focus, sustainability, impact assessment, reputation, and compliance approach, to create and measure shared value and similar literature streams. As shown in the last row of Table A1, our focus is on the ecological footprint in contrast to extant measures for similar constructs. Porter and Kramer (2019) argued for the shared value creation, measurement, and validation which furthered the stream of research related to ESG. When the shared value concept is used, it is understood that the firm is having economic, societal, and environmental benefits as its objective. However, this approach suffers from the neglect of governance and compliance.

While compliance (Birnbau, 2016) became another small stream of research, a connected and valid approach similar to ESG has not existed for long. Arguments for a firm sustainability approach (Delai & Takahashi, 2011), an impact assessment approach (Social Impact Assessment, 1995), and a reputation approach (Hall & Lee, 2014) have been used as a lens to understand the new objective of the firm anchored in stakeholder capitalism. To cover the governance gap, and not to leave other smaller streams of research in societal and

environmental approaches, current research assesses the ESG friendliness of a firm through a CATA-based novel measurement approach. While the extant research used secondary data and the index created by CSR initiatives, we built a comprehensive measure based on the annual report discourses. The brief comparison of all of these streams of research is tabulated in Table A1, with a clear contrast in its presentation. The first part is our unique approach, while the second part shows that the subsequent assessment methods have their own approaches and objectives. Porter et al. (2011) have a detailed discussion of these approaches, but our synthesis does not exclude the extant research in this area.

In all extant constructs and measures, the assumption is that ecology and sociology are embedded into business and economics. However, we have proposed to reverse this assumption with an idea that the environmental, social, and governance impact assessment and protection is the main objective of the firm, and the firm is embedded into the sociology and ecology of the biosphere. We would like to emphasize that our measurement assesses the net ecological impact so that the firm can assess the providing or regenerative capacity of the ESG. This assessment is then helpful for managers, policymakers, and researchers, alike.

3 | COMPETITIVE ADVANTAGE AND ECOLOGICAL FOOTPRINT

The unique advantage that cannot be duplicated by competitors is called sustained competitive advantage (Bhandari et al., 2020; Barney, 1991). This is possible if a firm has VRIN-O resource attributes when focusing on the internal strengths and weaknesses to achieve efficiency and effectiveness. The success of the RBV since 1991 triggered an assessment of the contribution to strategic management from this stream of literature (Barney et al., 2021) which argues that there are three avenues for further research—creating synergy effect across theories, a focused approach on the RBV itself, and developing the strategic resource concept further.

Not only the originator Barney himself, but Freeman et al. (2021) also urged researchers to merge stakeholder theory and the resource-based view in their research. Despite its popularity, the RBV seems yet incomplete, while there is room for bringing sustainability, people, cooperation, and normativity at the same time. *Academy of Management Conference* has initiated a symposium in building a formal modeling approach to the RBV, pointing out the need for formal models that are reasonably better, and will have a remedial response to the criticisms that the RBV is predominantly verbal in nature, which attracted further criticism of its formal structure (Boysen et al., 2020). As rightly demanded by stakeholder theory and the formal modeling approach, the proponents of the business ecosystem are arguing that a new approach is needed to understanding the antecedents of the value of the resource and capability. Thus, RBV must be strengthened from the business ecosystem perspective where interorganizational cooperation becomes very important (Gueler & Schneider, 2021). These demand an understanding not only of the business ecosystem but also the natural

ecosystem, as the firm is being provided with every resource it needs by the biosphere, but almost without a price tag.

While the RBV's originator and Freeman et al. are calling for the revival of the research agenda, the looming crisis of biodiversity degradation (Dasgupta, 2021) raises concerns not only at the macrolevel but at the firm level as well. Profit maximization as the objective of the firm (Friedman, 1970) puts the planet in this situation. Therefore, the current level of providing and regenerative capacity of the ecology at the macrolevel has been exceeded by 1.6 times. This demands further assessment of the ecological footprint at the firm level.

The argument posed by Dasgupta (2021) has generated enough debate in both aisles of economic thought. Profit maximization as the objective of the firm argues that using nature as an asset and putting the "price on the priceless" is improper (Spash & Hache, 2021). However, the findings have created momentum among governments and scholars alike, in furthering the debate in different levels of analysis. The current study takes this granular approach to the US manufacturing firms and argues that their ecological footprint is above the limit the ecology can provide for. Assessment of the same for theoretical and practical implications is still needed, and the current study joins in with this new emerging literature at the firm level.

In a sustainable world, the ratio between sustained competitive advantage and the providing capacity of the ESG or biodiversity must not cross "1." This implies that all the profit growth the firms are reaping must be thought through from the ecological perspectives with the 4Ps in mind—people, planet, profit, and the plural sector. If the 4Ps-based objective of the firm is pursued, the ratio between sustained competitive advantage and ecological footprint will be 1, in the equilibrium condition. Until then, the biosphere and biodiversity keep the regeneration capacity intact. Beyond that, it will have alarming effects, as seen in climate change, droughts, floods, degradation of flora and fauna, and the mass extinction of species (Dasgupta, 2021). However, the current study expects that the ratio between sustained competitive advantage and the firm's ecological footprint is way high, mitigating the same is a must, and this relationship is concave, not linear. Marx's transformation of production value into production price perspective, and the sustained competitive advantage of the firm based on the VRIN-O attributes of strategic resources with idiosyncratic resource endowment and deployment, suffer from not accounting for the market factors (Dassler, 2020). While this is a problematic issue in the RBV, looking from the demand and supply perspective of biodiversity is still under-researched at the firm level.

The limits to growth suggested by Dasgupta (2021) provide a strong basis for our theorizing and hypothesizing that when profit keeps on growing, its ecological footprint takes a concave shape—suggesting that if the objective of the firm is to maximize only profit, the cost in terms of social degradation and ecological failure is increasing rapidly. The reasons for such a phenomenon are obvious, as the providing capacity of the biosphere and resource base of the planet is in danger if we focus only on profit maximization. While Friedman's doctrine argued that the only corporate social responsibility of the firm is to maximize profit, this notion leads firms to ignore the social and ecological degradation they are causing.

The emergence of the importance of the role played by multinational enterprises (MNEs) to fight against climate change brings our attention to the importance of developing a new objective of the firm to optimize ecological footprint rather than profit maximization (López et al., 2019). On the other hand, the importance of biodiversity's providing capacity in sustaining the economy argues that a balance of views from a pluralistic perspective is needed from conservation science, policy, and practice (Pascual et al., 2021).

While pricing the priceless argument plagues the assessment of the resource endowment of nature, it is important to measure the natural capital (Dasgupta, 2021; Polasky & Daily, 2021) to understand the gaps and devise an instrument to tackle the degradation of the same, so that environmental justice at the local and global level is possible (Martínez-Alier, 1997). Thus, the emergence of a new paradigm around ESG and its related footprint argues that the objective of the firm needs to be modified. So far, profit has been the outcome variable, suggesting that ecology and society are embedded into the firm. Thus, we reiterate the reversal of the equation and suggest that the firm is embedded in the ecology and society at large, and we must use an ecological–sociological footprint as an outcome variable. Thus, the current study argues that at the firm level, sustained competitive advantage and the ecological footprint have a concave-shaped relationship.

Hypothesis 1. The relationship between sustainable competitive advantage and ecological footprint is concave shaped.

4 | METHOD AND SAMPLE

4.1 | Sample

For this study, we collected data from 1992 to 2019, 27 years altogether. Data for hypothesis testing were collected using the following steps. First, most yearly filings for companies with a SIC code between 3500 and 3600 were obtained from the US Securities and Exchange Commission's (SEC) database (www.sec.gov), giving us 1208 companies and 37,690 filings. Next, 10-K405 and 10-KSB filings were removed from the data, as these are filed by very small companies not included in our analysis. This decreased the number of companies to 930 and the number of filings to 6148. Next, the financial data were collected from the Thomson Reuters Eikon service and connected to the annual reports. The connection was made using a multistep verification procedure. The Thomson Reuters database does not recognize the CIK code the SEC uses for company identification. Thus, we used the Python programming language (Van Rossum, 1995) to transform the CIK code to the ticker symbol for each company, which was then connected to the financial data. In this verification procedure, we used the SEC database, the Thomson Reuters Database, and the PermID service (www.permid.org) offered by Thomson Reuters. This process allowed us to reliably connect the annual reports and the financial data for 571 companies and 6088 10-K filings.

Last, the 10-K filings were cleaned of all unnecessary information following the guidelines of Loughran and McDonald (2016). In this process, the markup language tags, the ASCII-encoded segments, the XML-embedded documents, the characters between XBRL tags, and the HTML tags were removed from the documents. Furthermore, the tables were not considered necessary for textual analysis and were thus removed from the documents. After these steps, all of the remaining markup tags and excess linefeeds were removed from the reports. The cleaning of the annual reports was done using the Python programming language and the Pandas data-processing library (McKinney, 2010).

4.2 | Measures used

4.2.1 | Sustained competitive advantage

Profit per employee above the mean values was used as a measure of sustained competitive advantage, and it was divided by the number of employees. To normalize the data, a natural log of this ratio was used in the calculations as the measure of sustained competitive advantage. By using employees as the denominator, the measure becomes firm size agnostic.

4.2.2 | Control variables

Exploration and exploitation-related activities were used as controls apart from the lagged-dependent variable of the ESG footprint to control for unobserved heterogeneity. We also included year controls.

4.2.3 | ESG footprint

Deep ESG is an alternative approach that is better than existing measures such as complaint ESG, selective ESG, and illustrative ESG, which have a lack of proven approaches and lack of objective measurement standards.¹ The deep ESG uses the following approach (Long & Johnstone, 2021, p. 9):

identification rubric: Footprint and Utility; asset provenance: degrees of freedom; stakeholder controls; sustainability migration plan; and review and correction.

The seed words for our measurement keyword generation through rigorous machine learning, NLP, and CATA were based on this definition and approach of deep ESG. Once we measure the ESG coverage of a firm, we use the following formula to assess the deep ESG impact:

$$\text{Deep ESG footprint} = 1 - \text{Deep ESG.}$$

This approach considers a single firm or strategic business unit (SBU) or a portfolio of firms and SBUs, taking into consideration that

the objective of the firm is to be embedded too deep in ESG, but not the traditional approach of ESG embedded into the firm whose sole objective is to maximize profit.

More than 2000 papers were reviewed by Friede et al. (2015), and argued that the majority of the firms following ESG performed well in terms of financial performance, though the level of performance outcome has been mixed depending on the geography or various context-dependent moderating or mediation mechanisms (Zumente & Bistрова, 2021). The majority of these studies predominantly used traditional ESG measures and that is also based on archival proxies which have been criticized a lot (Ketchen et al., 2013). Thus, our approach is not to repeat the similar measurement approach, as has been done in the past, but to take the recent development in machine learning, NLP, and CATA, to open a new frontier of research in extracting real meaning in company discourses such as annual reports.

4.3 | Machine learning and natural language processing

As the context and corpus of our research are based on the annual reports of the US manufacturing sector, we could not readily adapt the extant keywords developed from news reports by Borms et al. (2021b, p. 226). However, we used the keywords identified by them as our seed words, and extended them using machine learning, NLP, and CATA, at large. Then we repeated the process given by Borms et al. (2021a) in detail, such as embedding text mining techniques.

4.3.1 | Computer-aided text analysis

The manually chosen keyword collection was augmented using the GloVe language model (Pennington et al., 2014). The GloVe is a learning algorithm for obtaining vector representations for words. It works on an aggregate global level to obtain word-word co-occurrence statistics from a corpus, acquiring word representations with interesting structures in the word vector space.

For example, in the vector space of a GloVe model, semantically similar words are close. Thus, the GloVe vector space has exactly the structure we needed in our application. We calculated the Euclidean distance of words in the GloVe vector space and selected words whose distance from the manually chosen keywords was smallest to search for similar words. We used the Gensim library in Python to construct our language model (Řehůřek & Sojka, 2011). Specifically, we implemented the GloVe 300-dimensional word vector model in our application. It is trained using the Wikipedia 2014 dump, which includes all the articles on Wikipedia in 2014, and the Gigaword 5 corpus, a comprehensive archive of newswire text data. Together, these two corpora have approximately 6 billion tokens (words) for training. The GloVe-300 model encodes 400,000 tokens as unique vectors, with all tokens outside the vocabulary encoded as the zero vector.

We added those 300-dimensional word vectors that are closest (by Euclidean distance) to the manually chosen seed words to our dictionary. By augmenting the manually chosen keyword collection with semantically similar words, we added an objective layer to our subjectively chosen keywords, thus improving the efficiency of our dictionary.

Such measures are flexible, have wider applicability, and enable longitudinal studies which are not possible in survey-based design or other methods.

4.4 | Reliability and validity: Human interpretation of the CATA model

For every measurement technique, reliability and validity are of utmost importance. If the reliability and validity cannot be established, the linkage between the construct and the measures is broken. To avoid this pitfall, we did manual coding for 15 randomly selected companies (Uotila et al., 2009). The definition of ESG was given to the coders rather than the keywords used in the CATA analysis. The inter-rater reliability measured by Cohen's kappa (Cohen, 1960) of the classification, with two coders resulted at 0.62. The correlation between CATA-based measurement and manual coding was 0.54. Thus, CATA and manual coding can be inferred to have similar indication and reliability, and validity with the CATA model. As suggested by Krippendorff (1980, p. 122) a keyword in context (KWIC) analysis was conducted to improve the CATA measures and their validity. Spurious words were blocked from the analysis.

4.5 | Analysis method

The novelty of the GMM lies in its capacity to handle common method variance (CMV), endogeneity (E), and unobserved heterogeneity (U), the CEU problem (Bhandari et al., 2020). First, to tackle CMV, the independent and dependent variables were measured from different sources combined with the lagging of the independent variable by 1 year; this year's impact of the independent variable is realized only the following year. Second, endogeneity was handled through the lagged values of predetermined variables and year dummies as instruments. Third, to cater to the unobserved heterogeneity, a lagged-dependent variable (ecological footprint per employee) was used as a control in the system generalized method of moments (GMM) and the specification (Wooldridge, 2009). This approach fulfills the basic reasoning for causal claims.

Researchers and editors are also demanding endogeneity-free research (Reeb et al., 2012) and result without common method variance (Podsakoff et al., 2003). A very popular approach called system GMM (Arellano & Bond, 1991; Roodman, 2009) in econometrics and economic research handles these problems through the inherent nature of the specification. Following the multiple arguments of key benefits (Keil et al., 2017), we also argue that system GMM handles not only endogeneity and common method variance problems but

also unobserved heterogeneity (Wooldridge, 2009) by using a lagged-dependent variable as a control.

5 | FINDINGS

A summary of the construct means, standard deviations, minimum and maximum values, and correlations matrix is shown in the Table A2. Winsorization at 1% level for all continuous variables was used. The ecological footprint per employee has a mean value of 0.69 with a standard deviation of 0.64. Similarly, another key variable of interest is profit per employee with a mean value of 1.42 and standard deviation of 0.37. Explorative innovation and exploitative innovation have a mean value of 0.18 and 1.99, respectively, and standard deviation of 0.13 and 1.27. Apart from these important data, the minimum and maximum range of each variables is reported in Table A2. Similarly, the correlation table shows reasonably low correlations. The highest correlation between the two innovation measures does not make the model multicollinear, as none of the parameters were dropped in running the Stata. Therefore, VIF assessment is not needed.

Autocorrelation AR1 (significant p values) and AR2 (insignificant p values) from the system GMM allow us to use the model for testing, as shown in Table A3. Similarly, a lagged-dependent variable as control is also significant, and the absolute value of the estimate is less than 1. Hansen J statistics with nonsignificant p values also support the key assumptions in assuring the model is ready for hypothesis testing. Similarly, the number of groups in instruments is higher than the number of instruments, to avoid overfitting of instruments. Chi-squared values are also significant to demonstrate the overall model fit. All hypothesized relationships are found to be significant at the .000 level of p values, with strong effect sizes, as shown in Models 2 and 3 in Table A3. Model 1 serves as the control model.

Ecological footprint per employee is used as a dependent variable in all three models. The independent variable is profit per employee. Model 2 reports the first-order model result, while the Model 3 reports the second-order, or quadratic model's, result. Model 3 clearly demonstrates a concave-shaped relationship where the first-order slope is slightly negative, and the second order slope is highly positive.

The longitudinal study of the US manufacturing sector's firm profitability per employee shows a concave relationship with an ecological footprint as shown in Figure A1. The findings imply that at the current level of resource consumption for the growth of the firm, profitability is unsustainable as it is rising with a rising slope.

The marginsplot command output from the Stata shows the concave shape of the relationship between sustained competitive advantage and ESG footprint in Figure A1. During the early stage of profit-making, it seems that the firm's ESG footprint is low, but as and when the profit performance goes higher and higher, the ESG footprint skyrockets. This demands a proper reflection of the firm's underlying assumptions behind the resource attributes, and the traditional assumption that ecology and society are embedded into the firm must be reversed—that is, the firm is embedded into society and ecology.

6 | DISCUSSION AND CONCLUSION

6.1 | Theoretical implications: Moving from sustained and sustainable competitive advantage

By pursuing his own interest [an individual] frequently promotes that of the society more effectually than when he really intends to promote it. I have never known much good done by those who affected to trade for the public good. (Adam Smith, *The Wealth of Nations*)

With high respect to Adam Smith, the father of economics, we beg to differ on this notion of a deliberate, self-interest, maximization approach by a firm, as demonstrated by our findings that the narrow self-interest of a firm degenerated the ecological and social fabrics alike. Extant research argues that the VRIN-O attributes of a resource give a firm a sustainable² competitive advantage.

Sustainability in extant research revolved around the profit maximization (Friedman, 1970) doctrine as the key objective of the firm. However, our study's arguments are proposing to change the objective of the firm towards economic, societal, and ecological impact (ESE), as shown in Figure A2. However, before achieving this objective, the firm must go through the mediation role of optimum ecological footprint (OEF) as an intervening mechanism. To arrive at this intermediating objective, and the ESE objective at the end, the extant resource attributes for ESE impact must be augmented with eco-friendly attributes apart from the extant VRIN-O attribute. Thus, in the currently improved conceptualization of the new eco-RBV VREINO, resource attributes are recommended for true sustainability of the firm with optimum ecological footprint and economic, societal, and ecological impact, as shown in Figure A2.

The reflection from Groom and Turk (2021) on the *Dasgupta Review* (Dasgupta, 2021) praises the contribution to humanity's survival, existence, and clear guidelines, given the action-driven metrics for the CBD COP15. While Dasgupta (2021) approached the economics of biodiversity in an "orthodox" approach in its assessment of the dire condition the planet earth is facing, the perspective is "unorthodox" (Groom & Turk, 2021).

It is "orthodox" in the use of extant language, such as "externalities," "natural capital," "shadow pricing," and "asset returns" in the literature, but the analysis, findings, juxtaposition with the extant literature, and simple models that a layman can understand are "unorthodox" in many senses. While the traditional objective function of the economist's perspective (Friedman, 1970) has been "environment embedded in the economy," the "unorthodox" perspective taken by Dasgupta (2021) is that the objective function of the economists must be anchored in "economy embedded in the environment"; with the latter approach, we give proper respect that the biodiversity demands and it is a bounded rational approach to growth, endorsing the "limits to growth" (Williamson, 1981).

Conscious firms are taking a step ahead of others in respecting the environment and social fabric, and they comply with government

regulations such as the Sarbanes Oxley Act (Zhang, 2007). However, the ESG footprint's concave relationship with the "profit maximization only" objective of the firm triggers an alarm for the firms' CEOs and boards, including policymakers. Thus, our proposition to tackle this issue at the resource base selection by the firm seems to mitigate its cause at the root level, as shown in Figure A2. Thus, in the currently improved conceptualization, the new eco-RBV VREINO (vs. VRIO) are recommended as resource attributes for true sustainability of the firm with optimum ecological footprint and economic, societal, and ecological impact, as shown in Figure A2.

6.2 | Reflections on the *Dasgupta Review* at the firm level based on the findings of our study

When we calculated the current profit to ESG ratio at the mean level, and compared it with the similar ratio of current profit to ecological (implies ESG) service providing capacity ratio, the impact inequality multiple is 4.75, as shown in Figure A3. To save the planet, the call is to the CEOs and managers to build sustainable development as the main agenda, in contrast to maximizing profit. Otherwise, the planet, society, and governance will face a disaster unseen so far.

The interesting debate on the traditional divide on the objective of the firm (Fama, 2021) will be reinvigorated between both aisles of the scholars, in the media, and with the public policy think tanks. Similarly, a reasonable debate on "pricing the priceless" will trigger the majority of contributions and constructive debate.

The findings of our study at the firm level from the US manufacturing sector concurs with the call from Dasgupta (2021) that at the macrolevel, the traditional conceptualization of the VRIN-O attributes of the firm resources for the sustainable competitive advantage should be implemented at the firm level (Barney, 1991; Bhandari et al., 2020) is necessary but not a sufficient condition for the sustainability of the firm, having an economic, societal, and ecological impact.

While Dasgupta (2021) provided macrolevel analysis, our study focused at the firm level, and in one country, but is of the highest importance from the ecological footprint-related issues. As done by Dasgupta (2021), our approach at the firm level was to assess the "impact inequality," and the multiple is 4.75 (Figure A3), implying that the policymakers, CEOs, and managers must limit growth and make it sustainable within the VREINO approach where "eco-friendly" attributes of the firms' resource use and consumption must be taken seriously. The goods and service providing capacity of the biodiversity in the US manufacturing sector is already suffering 4.75 times the overload, which will trigger many changes in biodiversity and biosphere alike.

Thus, the private sector can take the lead role in recognizing this as a major crisis in biodiversity, and reorient the objective function of the firm from a traditional profit-only perspective to one which involves the new "profit, societal impact, and ecological impact." In the latter approach, "the firm is embedded in the biodiversity or ESG," not vice versa, as assumed by the traditional RBV.

6.3 | Empirical and methodological contribution

In this study, we examined the relationship between sustained competitive advantage and ecological footprint using computer-aided text analysis (CATA) and a machine learning technique called natural language processing (NLP). We developed a new measure of ecological footprint at the firm level by leveraging a widely used CATA and NLP technique to unstructured text from annual reports of the US manufacturing sector from 1992 to 2019. To validate the measure created by us, we followed a novel method to utilize human interpretation of CATA-based outputs. For better causal insights by handling common method variance, endogeneity, and unobserved heterogeneity (CEU), we demonstrated how this new measure is related with a sustained competitive advantage from the resource-based view lens. A refined (ecological) resource-based view (eco-RBV) is proposed as a theoretical contribution, while the new approach to measuring ecological footprint is our empirical and methodological contribution.

6.4 | Pathway for adapting CATA and NLP into strategy

Social science has adapted machine learning, NLP, and CATA successfully, and a recent contribution in *Strategic Management Journal* (Choi et al., 2021) suggests that the modern methods are better predictors with accuracy and efficiency. While topic modeling is also gaining ground, CATA has been established since 2009 (Uotila et al., 2009) in strategic management discourse. The predominant research method in social science surveys and suffers from common method variance problems. Similarly, cross-sectional studies are normally pursued due to retrospective bias and role changes in the firm over time. However, with the CATA model, we can run longitudinal analysis which helps in avoiding unobserved heterogeneity and endogeneity. Analytical methods like system GMM handle these methodological black holes in its specification itself, with a lagged-dependent variable as control and use of instruments in the GMM function. Thus, the future of CATA and NLP-based measurement models seems promising.

6.5 | Managerial implications

The findings have major implications for sustainable economic growth and firm-level sustainability. Managers are urged to rethink their current paradigm of VRIN-O resource attributes towards a new bundle of resources with VRINEO attributes where E stands for ESG friendliness of a resource. Policymakers may benefit from taking UN sustainable development goals seriously, and start implementing rules and regulations that make firms environmentally and socially responsible in their very DNA.

For corporate entrepreneurship, or for that matter sustainable corporate entrepreneurship (Provasnek et al., 2017), and new international ventures or born-global research, a new call to come up with business model disruptions is an open challenge (De Giacomo &

Bleischwitz, 2020). While the traditional business model solely focused on profit maximization, the sustainability paradigm based on stakeholder capitalism demands the management of conflicting objectives of societal impact and environmental impact, separate from profit-making, without complying with the governance rules and regulations. Otherwise, Adam Smith's *Moral Sentiments* would not feel like justice. This is an audacious goal for humanity, to anchor future generations based on sound environmental policies, no matter whether pricing the priceless (nature) is justified or not. Shall we face mass extinction or take corrective action? Such research questions will trigger new debate and new discourses.

At this point in human civilization, firms are confronting the inherent challenge of eco-friendliness, as consumer awareness and government intervention to mitigate the ecological footprint and pollution in the biodiversity are increasing. The causal relationship between sustained competitive advantage and ecological footprint is not always clear at the firm level. Silo thinking in research streams in environmental economics, and extant thinking in strategic management, are using orthodox measures with inconclusive findings. Thus, this study introduces a novel methodology to address that problem: a machine learning-based technique to quantify ecological footprint from unstructured corporate annual report texts, and it proposes the (ecological) resource-based view (eco-RBV) as a new theoretical lens that helps managers to make a conscious choice in defining the attributes of the resources in use. If a firm's resource attributes do not include "eco-friendliness," that resource is of no value for the firm.

6.6 | Policy implications

While we are reviewing the current trend in ecological, social, and governance-related policy changes, BBC (2021) broadcasts headline news on major climate change-related policy changes by the EU for the whole bloc, with an audacious goal of reaching carbon neutral status by 2050. Based on the 4.75 multiple of overuse of the ecological, social, and governance footprint, achieving this goal within the time-frame needs sweeping changes in R&D, innovation, competition, and financial and economic instruments and investments. While Dasgupta (2021) argued for efficient use of technology and innovation to serve this transformation, we are yet hesitant to quantify and assess the same at the firm level, as development of the measurement instrument and its validation is further due.

6.7 | Conclusion and further research

The major research question we asked at the beginning was how to enhance our understanding of the gap between the current level of ESG awareness and the providing capacity of the ESG and biosphere. Using the resource-based view as the theoretical lens, we argued that VRIN-O attributes of a resource base have an inherent flaw, as they ignore "eco-friendliness." For this, we proposed the revised RBV framework where eco-friendliness becomes one of the major

attributes of a resource base. Following the Dasgupta (2021) approach at the firm level, we were able to assess this gap to be in the range of 4.75. Similarly, the sustained competitive advantage has a concave-shaped relationship with the ecological footprint. Departing from the traditional measurement techniques, we used machine learning, NLP, and CATA approaches to count keywords from the annual reports to understand the ESG discourse. To solve the common method variance, endogeneity, and unobserved heterogeneity, system GMM was used as an analysis method. Managers and policymakers may have the first assessment of the gaps in the ecological footprint in order for their firms to become environmentally friendly.

Further research in understanding the impact of technology in solving the current ecological breakdown is due, as measures to assess this impact have not yet been developed. Also, Spash and Hache (2021) critiqued Dasgupta's (2021) approach which could be a good research agenda at the firm level. While RBV argued for resource endowment and deployment angle (Barney, 1991; Bhandari et al., 2020), further research in understanding the impact of such a resource base, and the market factors at the same time, would make the model more comprehensive, through Marx's transformation of production value into production prices (Dassler, 2020).

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ENDNOTES

¹ For detailed review and definition, please refer to Long and Johnstone (2021, pp. 1–9).

² In the original conceptualization of sustainable competitive advantage, it just meant long-lasting in terms of profit-making as the objective of the firm. It does not have an ecological or social impact on this conceptualization.

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APPENDIX A

TABLE A1 Understanding the purpose of measurement

Measurement focus	What to measure?	Why measure?	For whom?
Author's approach			
<i>Ecological footprint (author's contribution)</i>	<i>What is the level of net impact in the ESG?</i>	<i>To ensure that the providing or regenerative capacity of the ESG is sustained</i>	<i>Management Policymakers Researchers</i>
Extant research's approach adapted from 2011			
<i>Shared value (Porter & Kramer, 2019)</i>	Joint business and social value creation	To grow the total shared value created	Primarily for management <ul style="list-style-type: none"> Targeted communication to external stakeholders
<i>Sustainability (Delai & Takahashi, 2011)</i>	Efficiency in the use of input factors (e.g., natural resources and labor) and improved product and community impacts	To minimize negative externalities and augment positive impacts To maintain a license to operate	Management <ul style="list-style-type: none"> Communication to external stakeholders
<i>Impact assessment (Social Impact Assessment, 1995)</i>	The long-term social and economic development impacts of operations and/or philanthropy	To track progress on social and economic development impact To maintain a license to operate	Communication to external stakeholders
<i>Reputation (Hall & Lee, 2014)</i>	How societal impacts contribute to company reputation	To manage reputation	Primarily for management
<i>Compliance (Birnbau, 2016)</i>	Compliance with laws and voluntary policies, standards, and codes	To ensure adoption and compliance To maintain a license to operate	Management <ul style="list-style-type: none"> Communication to external stakeholders

Source: Author's augmentation of Porter et al. (2011, p. 12).

TABLE A2 Descriptive statistics and correlation table

Variable	Descriptive statistics					Correlation tables			
	Obs	Mean	Std. dev.	Min	Max	1	2	3	4
Ecological footprint per employee	6088	0.6887993	0.6446971	-2.00373	7.377127	1.0000			
Profit per employee	3205	1.421963	0.3743028	0.203795	12.06306	.0157	1.0000		
Explorative innovation	8148	0.1776482	0.1332894	0.0011667	0.6784403	-.0664	.0064	1.0000	
Exploitative innovation	8148	1.9931	1.268829	0	6.356655	-.0665	-.0450	.8409	1.0000

TABLE A3 System GMM panel regression with ecological footprint per employee as dependent variable

Variables	Control Model 1	Model 2	Model 3
	Ecological footprint per employee	Ecological footprint per employee	Ecological footprint per employee
Profit per employee		0.0761 (0.0681)	-0.232*** (0.0754)
(Profit per employee) ²			0.0418*** (0.00746)
Control variables			
Eco footprint lagged	0.518*** (0.0171)	0.384*** (0.0146)	0.360*** (0.0102)
Explorative innovation	-225.7*** (87.56)	-5.069* (2.587)	-7.150*** (2.132)
Exploitative innovation	32.29** (12.55)	0.301 (0.251)	0.414** (0.182)
Constant	-24.80** (10.76)	0.407 (0.273)	0.845*** (0.211)
Wald $\chi^2(29)$	1547.89***	2246.08***	2337.08***
Observations	5870	5870	5870
Number of groups	218	196	196
Number of instruments	106	106	133
First-order autocorrelation (AR1) (p values)	.000	.000	.000
Second-order autocorrelation (AR2) (p values)	.50	.190	.201
Hansen J statistics (p values)	.702	.643	.638

Note: Year dummies are excluded in the reporting, available upon request. Standard errors in parentheses.

*p < .1. **p < .05. ***p < .01.

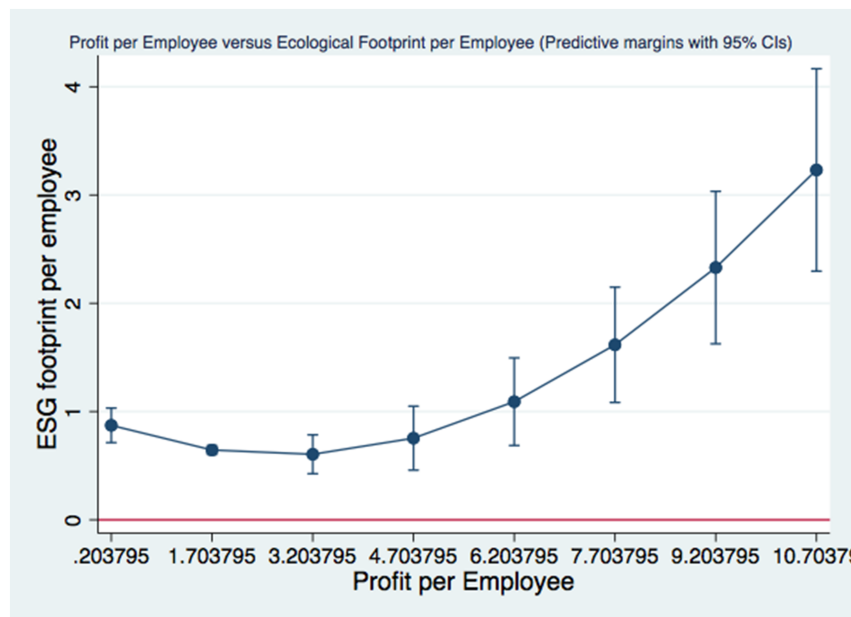


FIGURE A1 Relationship between profit per employee and ecological, social, and governance footprint per employee

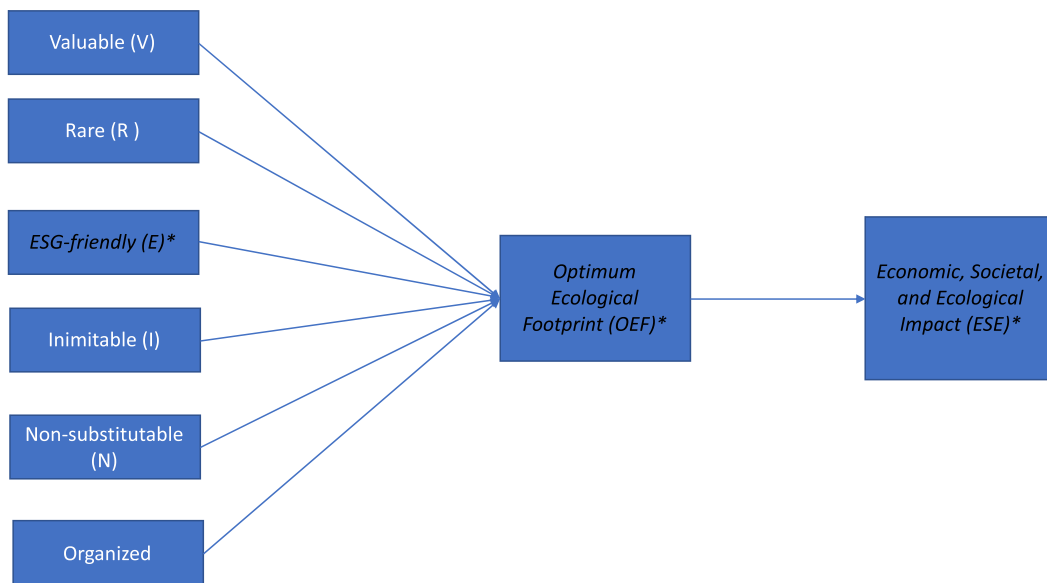


FIGURE A2 Author's articulation of eco-resource-based view (eco-RBV) (conceptualized and modified from Barney, 1991)

FIGURE A3 Author's assessment of the impact inequality multiple at the firm level in US manufacturing firms

