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Penalty Zones in International Sustainability Standards: Where Improved Sustainability Doesn't Pay

Nicole Darnall[a], Konstantinos Iatridis[b], Effie Kesidou[c] and Annie Snelson-Powell[d]

[a]Arizona State University; [b]School of Management, University of Bath; [c]Leeds University Business School, University of Leeds; [d]University of Bath

ABSTRACT Adopting an international sustainability standard (ISS) helps firms improve their sustainability performance. It also acts as a credible market 'signal' that legitimizes firms' latent sustainability practices while improving their market value. But how do these signals function when firms adopt multiple ISSs? We show that the relationships between firms' ISSs adoption and their market value and their sustainability performance appear positive. However, beyond a tipping point of 2 ISSs, firms' market gains decline, even though their sustainability performance continues to improve until a tipping point of 3 ISSs. Differing tipping points create a gap that we refer to as the 'penalty zone' – the place where market value declines, even though firms' actual sustainability performance continues to improve. The penalty zone arises because of imprecisions in market signals and serves as a significant barrier to firms wishing to further their sustainability agenda through additional ISS adoption.

Keywords: international sustainability standards, market value, penalty zone, signal incongruence, signalling theory, sustainability performance

INTRODUCTION

International sustainability standards (ISSs), such as the ISO standards, the United Nations Global Compact, and the Global Reporting Initiative framework, are externally certified process requirements or specifications that are designed to improve firms' sustainability. Unlike ecolabels, which typically focus on standardizing sustainable products

Address for reprints: Effie Kesidou, Professor in Economics of Innovation and Sustainability, Head of Graduate School (Business Faculty), Leeds University Business School, University of Leeds, Leeds, UK (e.kesidou@leeds.ac.uk).

in the marketplace, ISSs internationally standardize firms' internal sustainability procedures, which generally promote greater environmental (and/or social) responsibility through risk management, assessment, performance expectations, and third-party audits. To legitimize their sustainability efforts, increasingly, firms are using ISS adoption as a means to 'signal' information about their sustainability activities that are otherwise unobserved by market participants. These signals appeal to market participants who value firm sustainability, and help external stakeholders identify and invest in more sustainable firms (Heras-Saizarbitoria et al., 2020). For these reasons, adopting an ISS can improve firms' market value (Coulmont and Berthelot, 2015) and sustainability performance (Darnall and Kim, 2012).

However, there is still much to learn about *how* these signals function, especially when firms adopt *multiple* ISSs. Does the market value firms' adoption of multiple ISSs in a way that parallels firms' actual sustainability performance? How do market participants rationalize firms' increasing costs of adopting multiple ISSs? These important problem-driven questions (Davis, 2015; Wickert et al., 2021) are the focus of our research.

We suggest that the relationships between (1) multiple ISS adoption and market performance and (2) multiple ISS adoption and sustainability performance are both positive and increasing before reaching optimal tipping points, after which, market and sustainability performance decline. We further suggest that the optimal points differ, and the relationships do not move in parallel. Distinctions occur because ISS market signals are imprecise in that they do not fully reflect firms' sustainability performance. Additionally, while adopting multiple ISSs signals information about a firm's sustainability performance, it also signals information about firms' ISS implementation costs. These costs are unobserved by market participants and relate to firms' increasing internal coordination needs, employee training, auditing, and certification. Beyond the tipping point, markets regard many phenomena as 'too-much-of-a-good-thing' (Liu et al., 2020; Pierce and Aguinis, 2013). In the case of ISSs, market participants underestimate the sustainability performance benefits of ISS and overestimate the costs, even as firms' actual sustainability performance continues to improve. The result is that beyond a tipping point, firms' market gains decline, even though their sustainability performance continues to improve before reaching its own tipping point. The gap between tipping points is what we refer to as the 'penalty zone'. In the penalty zone, the number of ISSs that optimize market value is fewer than the optimum number of ISSs that maximize sustainability value. The primary contribution of this study is to understand the conditions that place firms in the penalty zone. Signalling theory is the lens through which we do so.

This research explores the presence of the penalty zone for 1618 publicly traded companies from 2007–2016 (12,550 firm-year observations), and across 18 sectors and 47 advanced and emerging economies. We employ a fixed-effects panel data econometric approach that attempts to control endogeneity bias arising from unobserved heterogeneity and simultaneity by including firm and year fixed effects and by using 1-year lags of all explanatory variables. We then apply several robustness analyses to test the inverted U-shaped relationship (with differing optimums) between ISSs and market value and between ISSs and sustainability performance.

Our results indicate that initially the relationships between firms' ISSs adoption and their market value and their sustainability performance appear positive, suggesting that the information signals created by ISSs lead to improvements in market value and that these gains are based on the credible sustainability efforts delivered by ISS adopters. However, sustainability performance gains decline after an optimum point of 3 ISSs and market gains decline beyond 2 ISSs. The difference between these two optimums offers evidence for the penalty zone, where firms' market performance declines, even though firms continue to improve their sustainability performance. These findings are important because, while stakeholders globally are demanding that firms further improve their sustainability performance, the penalty zone is a source of tension that can discourage firms from responding to these demands.

Our findings offer a more nuanced and comprehensive view of the adoption of sustainability standards. While ISS adoption can serve as a credible market signal that addresses information asymmetries around firms' sustainability activities, when firms adopt multiple ISSs, the relationship is more complicated because firms that adopt multiple ISSs also simultaneously signal information about their increasing sustainability costs. Because these signals are not accurate representations of firms' true sustainability benefits and costs, a gap is created where firms continue to derive additional sustainability benefits (i.e., improved environmental and/or social performance) from continued ISS adoption, but the market fails to reward it.

SIGNALLING THEORY AND ISS

Market Signals and Firms' Market Value

The core focus of signalling theory involves situations where 'different people know different things' (Stiglitz, 2002, p. 469) with some seeking to leverage their informational advantage and others seeking to reduce their informational disadvantage (Bergh et al., 2019). Referred to as information asymmetries, problems arise when individuals with an informational advantage are in a position to influence the decision-making of individuals with informational disadvantages if the latter had access to this information (Elitzur and Gavious, 2003). Information asymmetries create at least three problems. First, information disadvantaged individuals cannot make decisions that are rational because they lack information to do so. Second, information advantaged individuals forgo rewards related to their information because there is no credible way to convey that information. Third, individuals with informational disadvantages incur costs with becoming informed.

Applied to organizations, firms are often advantaged by possessing information that is not widely available to market participants. Yet market participants often seek this information and may shift their investment decisions if the information were available to them. This information asymmetry disrupts market participants' decisions to allocate their scarce resources (Akerlof, 1970) and make rational buying decisions (Alchian and Demsetz, 1972). It also impedes firms' ability to differentiate themselves from their competitors. Moreover, in the absence of firms providing this information, there are significant costs to market participants who seek this information on their own, if the information is available at all. The outcome is that market participants are discouraged from becoming informed and some individuals choose to avoid making market decisions altogether (Miller, 1992).

Signalling theory is a foundation for understanding how parties address information asymmetries by relying on market signals. A 'signal' refers to the activities or attributes of individuals in a market which, by design or accident, alter the beliefs of, or convey information to other individuals in the market (Spence, 1974). To resolve information asymmetries, individuals with information advantages communicate (signal) information which is perceived to be valuable to individuals with information disadvantages, also known as the signal 'receiver' (Connelly et al., 2011). The signal is observable, even though the underlying information is not. The receiver then chooses how to interpret this signal and act in a way that is rational (Connelly et al., 2011).

If a signal communicates information that is uniformly positive or negative, then it is considered to be congruent (Drover et al., 2018). Most previous signalling research has focused on behaviours that derive from a single congruent signal. However, increasingly, researchers have questioned the validity of this setting since signal receivers are likely to be exposed to multiple signals. In the presence of multiple signals, opportunities increase for signal incongruence (Bergh et al., 2019; Drover et al., 2018; Reineke et al., 2012; Vergne et al., 2018), a situation in which signals are neither uniformly positive nor negative (Drover et al., 2018).

One type of signal incongruence occurs when some signals deliver positive information whereas other similar signals deliver negative information (Drover et al., 2018). This type of incongruence arises because of different types of signals about a single issue. Some signals may offer positive information cues whereas others may offer negative cues (Vergne et al., 2018).

Another type of signal incongruence arises from the presence of multiple (but similar) signals around a single issue. In this setting, the signals are perceived initially as delivering positive information. However, as the number of similar signals increases, this positivity declines. Also referred to as 'imbalanced incongruence' (Drover et al., 2018) we suggest that one reason why these signals arise is because there is 'too-much-of-a-good-thing', a situation in which the signal receiver initially perceives a signal as being positive, but only to a tipping point, after which its additional signals are perceived with less favourable response. It is this type of signal incongruence that is the focus of our research. Related to market value, in the presence of imbalanced incongruent signals, market participants reward firms for undertaking multiple (similar) activities until a tipping point, after which the market no longer rewards these activities in the same way and firms' market value declines.

ISS Adoption, Market Signals, and Firms' Market Value

Related to sustainability, firms' internal sustainability commitments are generally unobserved attributes to external stakeholders. This setting is problematic for market participants who wish to divert their investment toward more sustainable firms (Potoski and Prakash, 2009). Adoption of ISSs decreases information asymmetries between firms and their stakeholders (King et al., 2005) by offering an externally observable signal about the firm's unobserved sustainability activities. Observability comes in the form of firms publicly disclosing their ISS adoption in corporate reports and on their website.

In order for ISSs to influence market participants, they must be considered credible signals. Information credibility refers to the extent to which external stakeholders perceive firms' sustainability information to be trustworthy and reputable (Joshi et al., 2007). ISSs are credible signals for two reasons. First, ISSs are designed to govern firms' sustainability behaviours (Terlaak, 2007) by way of structures that establish sustainability performance goals and operative rules that can enhance sustainability performance (Short and Toffel, 2010). ISS structures require firms to develop commitment statements and adhere to specific process requirements, including pledges for continual improvement. They also typically ask firms to evaluate their relevant sustainability impacts and establish their sustainability goals prior to translating their sustainability goals into action (Iatridis et al., 2016). In order to implement an ISS, firms typically train their employees, enhance their communications structures, and create processes that coordinate and monitor progress, while addressing implementation discrepancies. Continual improvement is emphasized by periodically auditing the ISS implementation process. Each of these features is costly to implement, requiring significant internal commitment and resources (Darnall and Edwards, 2006), and designed to improve process certainty and implementation uniformity (Potoski and Prakash, 2004). The outcome is enhanced comparability and transparency across ISS adopters' sustainability practices and improved sustainability performance. Some of the most widely used ISSs include the ISO standards, the United Nations Global Compact, and the Global Reporting Initiative framework.

The second reason why ISSs are credible signals relate to the fact that many ISSs require third party certification, which obligates firms to hire an independent party who verifies conformity to the standard. Verification imposes rules with expectations that firms develop routines and systems to improve sustainability outcomes (de Moor and de Beelde, 2005). Moreover, verification imposes costs to firms in the way of preparing for the audit and hiring an external verifier, which help increase firms' commitment to the ISS (Darnall et al., 2022), which enhances stakeholder attitudes toward the perceived legitimacy of a firm's sustainability information (Schepers, 2010) and their willingness to act on it. Once certified, firms are required to demonstrate that their ISSs are continually functioning in order to maintain their certification. Certification is costly (Darnall and Edwards, 2006) and requires firms to document and disclose information about less observable aspects of their operations (Potoski and Prakash, 2009), which offers a strong signal of conformance to stakeholder and ISS expectations. By encouraging conformance to societal requirements for better sustainability performance, ISSs help legitimate a firm's operations. Certification thus provides market participants greater confidence that a firm will improve its overall sustainability performance (Darnall and Carmin, 2005; Heras-Saizarbitoria et al., 2020). This offers ISS adopters 'a protective buffer against greater difficulties' that might come from negative media publicity (Bergh et al., 2019, p. 146).

While firms can self-report their commitment to sustainability, self-reports generally lack credibility with external stakeholders (Darnall et al., 2018), in large part because these information cues are not third party verified (Chen et al., 2014).

For these reasons, adopting ISSs serves as market signals that provide credible information about firms' unobservable sustainability practices and enables firms to widely promote their commitment to sustainability (Boiral, 2003). Adoption facilitates investment by market participants who believe that sustainable firms are more desirable than conventional firms (Doh et al., 2010; Riedl and Smeets, 2017). Firms that adopt an ISS are, thus, more likely to have a stronger positive market value over non-adopters (González-Benito and González-Benito, 2005).

HYPOTHESES DEVELOPMENT

Multiple ISS Adoption, Market Signals, and Firms' Market Value

We suggest that firms which choose to adopt *multiple* ISSs certifications send even *stronger* signals about their sustainability commitments. These firms may therefore accrue even greater market value than firms with fewer (or no) ISSs certifications – at least until a critical tipping point, after which market value declines.

Our rationale relates to the fact that ISSs focus on specific aspects of sustainability. As such, firms that wish to address their broader sustainability impacts often do so by adopting more than one ISS. Differences in ISSs also enhance opportunities for firms to appeal to a broader array of market participants (Ferrón-Vílchez and Darnall, 2016). As an example, firms which adopt an ISS that emphasizes modern slavery prevention may enhance their appeal to market participants who value workers' rights in the supply chain. If this is the only ISS that firms adopt, they may forgo prospects to appeal to other market participants who value environmental stewardship (Ferrón-Vílchez and Darnall, 2016). Similarly, firms that decide to adopt an ISS that focuses only on environmental sustainability may forgo important market opportunities related to market participants' concern about ethical supply chain labour (Hockerts and Wüstenhagen, 2010). ISS distinctions therefore create opportunities for firms that adopt multiple ISSs to send stronger signals about their wide array of sustainability commitments. These stronger signals create greater opportunities for firms to appeal to a broader array of market participants, which further improves their market value.

Additionally, multiple certifications provide 'proof points', which reassure market participants that a firm's performance has been assessed by multiple expert evaluators and that their internal processes are within expected norms and values (Graffin and Ward, 2010). By voluntarily inviting greater scrutiny through multiple external certifications, firms that adopt more certifications send stronger positive signals about their commitments 'to conform to accepted market norms and standards' (Lanahan et al., 2022, p. 855), which enhances market participants' confidence about the firm's commitment to improving its sustainability performance.

However, we anticipate that multiple ISS adoption creates 'imbalanced incongruence' (Drover et al., 2018) in which ISSs are perceived initially as delivering positive information but only to a tipping point, after which the signals are perceived less positively. This idea of 'too-much-of-a-good-thing' is seen in other settings. For instance, prior research indicates that the relationship between corporate responsibility/philanthropy and financial performance is positive before it declines (Flammer, 2015; Wang et al., 2008). A similar relationship is also seen in studies that consider firms' efforts to obtain multiple certifications, although these certifications relate to HR practices and CEO prestige rather than sustainability. Moreover, in their assessment of Best Places to Work certifications, Dineen and Allen (2016) found that certifications are associated with lower employee turnover until an optimum point at which additional certifications are associated with higher employee turnover rates. Additionally, this relationship is mirrored when firms obtain multiple certifications from the same certification body (Lanahan and Armanios, 2018). Similarly, Wade et al. (2006) suggest that, beyond a point, multiple CEO certifications might encourage overconfidence by senior management which leads to riskier decision-making that undermines the firm's long-term performance and discourages investors.

Applied to the case of ISSs, we suggest that when firms adopt multiple ISSs, initially they produce a positive signal, but beyond a critical tipping point, market participants regard these signals as 'too-much-of-a-good-thing', causing market value declines with additional ISS adoption. Imbalanced signal incongruence arises because adopting multiple ISSs signals positive information about a firm's sustainability performance, but it also signals information that can be perceived negatively about firms' ISS implementation costs.

Some implementation costs can be shared. For instance, ISSs that focus on ensuring fair wages in the supply chain may involve employee training that is similar to the training needed for ISSs that seek to eliminate child labour in their supply chain. Since both ISSs require supplier verification, the supplier evaluation criteria will be similar, and responsibility may be assigned to the same department. However, this training is likely to differ significantly from what is needed to adopt an ISS that focuses on improving a firm's environmental stewardship, and the implementation responsibility of this ISS may be assigned to a different unit (e.g., the environment department) (Gianni et al., 2017). As firms adopt more ISSs, so does the probability that they will be managing a wider array of differing goals, which can increase organizational complexity, bureaucracy (Ikram et al., 2020), and administrative delays (Kaufmann et al., 2019). This setting gives rise to organizational *diseconomies of scope* (Panzar and Willig, 1981), where, beyond a tipping point, the adoption of more ISSs leads to greater inefficiencies and costs than the sum of individual ISS adoption costs.

Although these costs are generally unobservable to external stakeholders, it is widely perceived that adopting an ISS can be costly (Darnall and Edwards, 2006). On the one hand these costs convey information about the organization's commitment to sustainability, but on the other, firms' adoption of *multiple* ISS certifications also serves as a negative signal about firms' increasing sustainability cost. However, the information conveyed by these signals is typically imprecise (Connelly et al., 2011) and so while signals can reduce information asymmetries, they do not eliminate them. So, while stakeholders see that sustainability costs are rising, they are uncertain by how much. Uncertainty associated with these estimates encourages market participants to avoid taking on additional risk (Ilut and Schneider, 2014) due to fears that increasing commitment to sustainability may decrease profits (Flammer and Bansal, 2017). The outcome is that although investors might support firms' sustainability commitments, they also exercise caution by overestimating the actual costs associated with these commitments or underestimating firms' actual sustainability performance benefits.

In this setting, we expect that markets will reward firms that adopt multiple ISSs, but only to an optimum point. Beyond this optimum, additional ISS adoption conveys a negative information cue to market participants that causes them to disinvest. The result is a decline in firms' market value which is largely due to imbalanced incongruent signals. This important extension to signalling theory accounts for the mechanisms in which multiple signals send information cues about a firm's unobserved positive characteristics, but, beyond a tipping point, also signal information about negative attributes.

Accordingly, we hypothesize that:

> *Hypothesis H1*: Firms that adopt more ISSs have a greater market value than firms that adopt fewer (or no) ISSs, but only until an optimal point beyond which more ISS adoption reduces market value.

Multiple ISS Adoption and Firms' Sustainability Performance

Signalling theory informs how firms can rely on signals to convey information about their unobservable behaviours, thus facilitating market decisions. When these signals are precise, the optimal number of ISSs that a firm adopts to maximize its sustainability performance and minimize its costs would be the same as the optimal number of ISSs that the market would reward. In the sections below, we examine how multiple ISS adoption affects firms' *actual* sustainability performance. This elaboration provides a critical baseline for assessing signalling precision.

Prior research suggests that firms which adopt certified ISSs have stronger sustainability performance over their competitors (Delmas and Pekovic, 2013; Melnyk et al., 2003). Depending on the type of ISS, sustainability performance benefits relate to reductions in air pollution, waste minimization, water use, and energy consumption (Boiral et al., 2018; Erauskin-Tolosa et al., 2020), in addition to reductions in forced/compulsory labour, child employment, and discrimination at work (Iatridis et al., 2016). ISS adopters are also more likely to develop capabilities (Darnal et al., 2008; Darnall and Kim, 2012) and resources needed for continually improving their sustainability performance, while enhancing labour productivity (Delmas and Pekovic, 2013).

Given that certification standards often have differing goals, firms that adopt multiple certifications may deliver stronger performance than firms that adopt fewer or no standards (Lanahan and Armanios, 2018; Lanahan et al., 2022). Applied to ISSs, distinctions in their focus create opportunities for firms to address different aspects of their overall sustainability performance. For instance, a firm that adopts one ISS that has the goal to ensure fair wages in their supply chain is likely to deliver more sustainability performance benefits than a firm with no ISSs. Similarly, that same firm is likely to deliver even more sustainability performance benefits if it adopts three ISSs focused on ensuring fair wages, eliminating child labour in their supply chain, and improving environmental stewardship, respectively.

However, as adopting ISSs is costly (Darnall and Edwards, 2006), we argue that, beyond a tipping point, firms' actual cost of adopting additional standards will outweigh the sustainability benefits of pursuing additional ISS certifications. This is because multiple standards are an inefficient way to organize a well-coordinated sustainability strategy (Bitzer et al., 2008). At this tipping point, ISSs become 'too-much-of-a-good-thing' because additional ISS adoption leads to diseconomies of scope that come with increased organizational complexity, bureaucracy (Ikram et al., 2020), and administrative delays (Kaufmann et al., 2019). These factors make it difficult for the firm to continue increasing its sustainability performance.

For these reasons, we expect that multiple ISSs adoption will lead to stronger sustainability performance, but only until an optimum point at which additional ISS adoption declines firms' sustainability performance.

Hypothesis H2: Firms that adopt more ISSs have greater positive sustainability performance than firms that adopt fewer or no ISSs – until an optimal point, beyond which more ISS adoption is related to reduced sustainability performance.

Penalty Zone

Signalling theory suggests that when market signals are accurate, they convey information that is an accurate representation of firms' unobserved activities. In the penalty zone, market participants lack the precise information about firms' unobserved sustainability performance benefits and costs associated with multiple ISS adoption.[1] While firms have a better understanding than market participants about their sustainability performance benefits and costs, there is no market mechanism to convey this information more accurately. As a result, market participants, who initially perceived the ISS signal as a positive information cue about firms' sustainability efforts, reach a tipping point in which they perceive the ISS signal as a negative information cue about firms' increasing costs. The outcome is that market participants decrease their investments even though firms are still improving their actual sustainability performance.

The penalty zone is the gap where the optimal number of ISSs which a firm should adopt to maximize its sustainability performance is greater than the number of ISSs that the market continues to reward, as illustrated in Figure 1. This gap has remained unexplored in the relationship between market signals, market value, and sustainability performance. It is also an important explanation for the mechanism behind why, beyond a critical tipping point, market participants regard multiple ISS signals as 'too-much-of-a-good-thing' and market value declines with additional ISS adoption, even though sustainability performance continues to improve. The penalty zone serves as a significant barrier to firms wishing to further their sustainability agenda through additional ISS adoption.

Hypothesis H3: The number of ISSs that optimize firms' market value is fewer than the number of ISSs that optimize their sustainability performance.

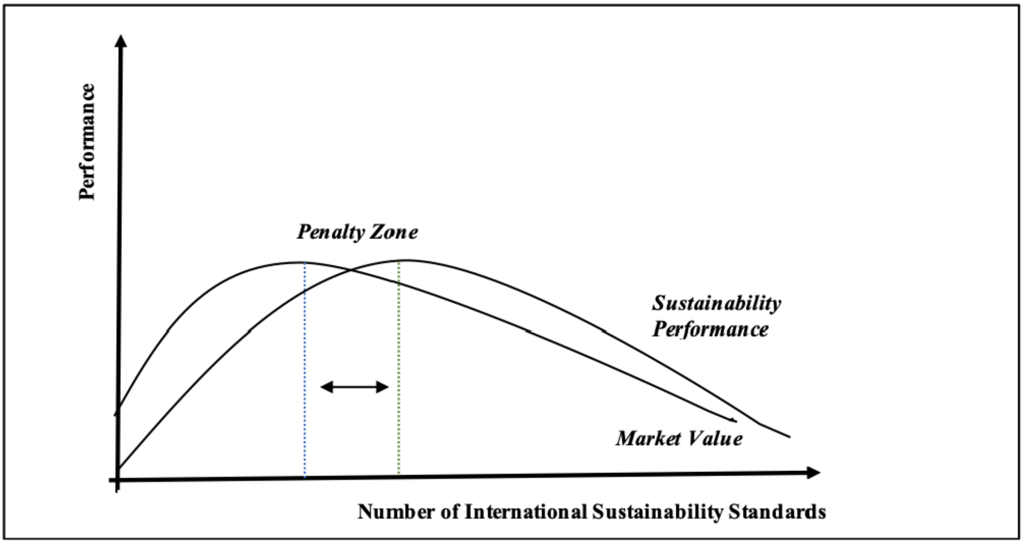

Figure 1. ISS performance penalty zone [Colour figure can be viewed at wileyonlinelibrary.com]

Notes: Figure 1 is only for illustrative purposes – to identify the penalty zone and the different optimums between market value and sustainability performance.

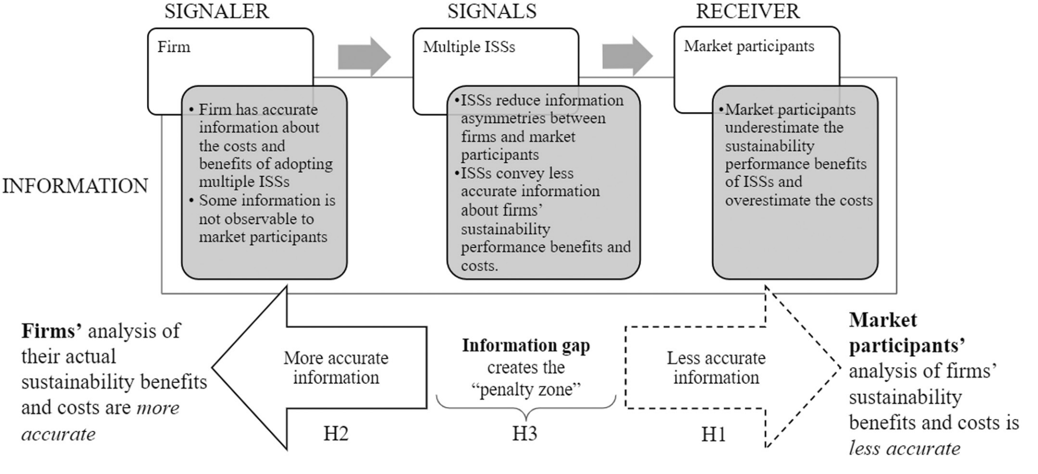

Figure 2. Conceptual framework

Figure 2 illustrates the relationship between H1 and H2. It shows how firms' adoption of multiple ISSs acts as a signal that helps resolve information asymmetries related to firms' sustainability performance benefits and costs (H1). Further, the image illustrates how ISSs can improve firms' actual sustainability performance benefits and that firms' understanding of these benefits (and affiliated costs) is more accurate than what is perceived by market participants (H2). The figure also illustrates how imprecisions in the signalling accuracy of multiple ISSs give rise to the 'penalty zone' (H3) – the space where adopting multiple ISSs is related to declines in market performance, even though sustainability performance benefits continue to accrue.

METHODOLOGY

We measure sustainability performance and ISS adoption based on data obtained from ASSET4 environmental, social, and governance (ESG) Thomson Reuters, which collects in-depth, transparent, auditable, and comparable ESG data based on publicly available sources (e.g., annual reports, non-government organization websites, corporate social responsibility reports). It includes over 5266 global companies with shares in stock indices, including S&P 500, NASDAQ 100, MSCI World, STOXX600, Russell 1000, FTSE 100, ASX 300, and MSCI Emerging Market (Thomson Reuters, 2012). Over 120 analysts across countries gather more than 750 evaluation data points for every firm on a bi-weekly basis. Subsequently, the ASSET4 analysts transform these data points into 280 comparable key performance indicators (KPI),[2] which are organized in 18 categories within three pillars: environmental performance scores, social performance scores, and corporate governance performance scores (Thomson Reuters, 2013). For example, (a) environmental performance scores include information on energy reduction, carbon dioxide emissions, recycling of water and waste; (b) social performance scores include information about employment quality, health and safety, training and development, diversity, human rights, community, and product responsibility; and (c) corporate governance performance scores include board structure, compensation policy, board functions, shareholders rights.[3]

We also obtained financial and economic data, including assets, R&D expenditures, and sales from Datastream Thomson Reuters. We then merged the ASSET4 and Datastream datasets to create an unbalanced panel dataset of 12,550 firm-year observations based on a sample of 1618 large publicly traded companies. The dataset covers 10 years (2007–16), 18 sectors (based on the FTSE industry classification), and 47 advanced and emerging economies.

Dependent Variables

We use Tobin's Q to measure a company's *market value* (*Tobin's Q*). Prior research related to corporate social responsibility (Hawn and Ioannou, 2016; Surroca et al., 2010) uses this measure to assess the value of long-term intangible investments, such as ISS. This variable is constructed by taking the ratio of the sum of market capitalization and total assets minus the book value of shareholders' equity divided by the total assets of a firm in each year in our sample.[4]

We measure *sustainability performance* (*SustainPerf*) following Cheng et al. (2014). Specifically, we constructed a composite index using the annual environmental, social, and corporate governance scores for each firm in every year. Prior research on the construction of a KLD index[5] specifies the use of equal weights to each component of the index (Surroca et al., 2010; Waddock and Graves, 1997; Zhao and Murrell, 2016).

Sustainability is a broad and complex concept with various pillars. The rationale behind the summation of the environmental, social, and corporate governance elements is to create a sustainability index that measures the multidimensional appraisal of a firm's sustainability performance. While examining each sustainability dimension separately is an interesting research idea that may lead to equally interesting findings, this is also a different research question. In line with previous studies, we assign equal weights to each ASSET4 KPI. *SustainPerf* is thus a weighted average of the environmental, social, and governance scores for each firm and for every year in the panel dataset.

Independent Variable

We consider three types of ISSs (Table I). The first type consists of process-focused standards, which aim to assist firms continuously improve their operations by adopting best practices, policies, and procedures (United Nations, 2013). Examples include the ISO 9001 and ISO 14001 management systems standards as well as the Global Reporting Initiative (GRI). ISO 9001 has been included by international governance organizations (e.g., European Commission and the OECD) and prominent industry associations (e.g., the United States Council for International Business), in their lists of the most well-known sustainability standards (Iatridis et al., 2016). The standard ensures that products are safe for use and do not include hazardous materials that might impact the environment or threaten human health (Iatridis and Schroder, 2016). ISO 14001 is a management standard that emphasizes continuous improvements in firms' environmental processes (Iatridis and Kesidou, 2018). Similarly, GRI is a standard that articulates processes and expectations for sustainability reporting (GRI, 2016). All process-focused standards are designed to improve firms' internal procedures and activities.

Outcome-focused standards emphasize the sustainability impact of a firm's operations or activities. Examples include water use, biodiversity, or greenhouse gas emissions. These outcomes may accrue during a product's life cycle or during a specific phase of production (United Nations, 2013). Other examples include the International Labor Organization's Fundamental Principles and Rights at Work, which specify outcomes, such as collective bargaining and the abolition of forced and compulsory labour (ILO, 2003).

Some ISSs emphasize both processes and outcomes. One example is the United Nations Global Compact, which describes 10 principles with process-focused requirements, such as undertaking initiatives to promote greater environmental responsibility. This ISS also emphasizes outcomes including the elimination of all forms of forced and

Table I. Types of international sustainability standards

Type	*Characteristics*	*Examples*
Process-focused	• Promote best practices, policies, procedures and/or continuous improvement	• ISO 9001 • ISO 14001 • Global Reporting Initiative
Outcomes-focused	• Emphasize the sustainability impact of a firm's operations or activities • Outcomes may accrue during a product's life cycle or during a specific phase of production	• International Labor Organization's Fundamental Principles and Rights at Work
Hybrid (process- and outcomes-focused)	• Designed to improve firms' internal procedures and activities, in addition to sustainability impacts	• United Nations Global Compact • OECD Guidelines for Multinational Enterprises

compulsory labour and abolishing child labour (UNGC, 2020). Similarly, the OECD Guidelines for Multinational Enterprises focus on processes and outcomes around fair wages, combating bribe solicitation and extortion, and promoting sustainable consumption (OECD, 2011).

We construct our *ISS* variable by taking into consideration all three types of ISSs. Additionally, the ISSs had to be applicable to any industry and geographical region. These additional limitations were important since many ISSs focus on a single industry (or product) and are recognized in some regions but not others (Iatridis and Schroder, 2016). Finally, we only included ISSs that were auditable by third parties and were the outcome of a wide stakeholder consultation process (Iatridis and Schroder, 2016). Within this sample, we include six of the most widely diffused ISSs (Iatridis and Schroder, 2016).[6] As process-focused standards, we include ISO 9001 and ISO 14001, in addition to GRI. To account for standards that assess outcomes, we include the ILO Fundamental Human Rights. By including Global Compact and the OECD Guidelines for Multinational Enterprises, we account for standards that emphasize both process and outcomes.

We measure *ISS* by creating a numerical (count) variable that measures the total number of ISSs {0,1,2,3,4,5,6} adopted by a firm. The *ISS* variable takes the value of =0, if a firm does not adopt any ISS, and the value of =6, if a firm adopts all possible ISS. Using a summation is appropriate because our central research question focuses on *the value of adopting multiple standards*.

Table II shows the pairwise nonparametric correlation of the six ISSs. Our results indicate that firms' adoption of different ISSs is correlated (i.e., Spearman *rho*

Table II. Pairwise correlation of international sustainability standards

Variable	*1*	*2*	*3*	*4*	*5*	*6*
1. ISO14001	1.000					
2. ISO9001	0.3428 (0.000)	1.000				
3. Global Reporting Initiative	0.0852 (0.000)	0.0878 (0.000)	1.000			
4. UN Global Compact[a]	0.1131 (0.000)	0.1243 (0.000)	0.1430 (0.000)	1.000		
5. ILO Human Rights[b]	0.0754 (0.000)	0.1031 (0.000)	0.1371 (0.000)	0.3269 (0.000)	1.000	
6. ILO Human Rights[b]	0.0203 (0.035)	0.0456 (0.000)	0.0859 (0.000)	0.2761 (0.000)	0.3694 (0.000)	

Note: Spearman rho nonparametric coefficients. We report the estimated correlation coefficient and exact p-value in parenthesis.
[a]UN GlobalCompact: United Nations Global Compact.
[b]ILO HumanRights: International Labor Organization's Fundamental Principles and Rights at Work.
[c]OECDGuideMNC: OECD Guidelines for Multinational Enterprises.

coefficients are positive and statistically significant at $p < 0.01$). Furthermore, we examine the reliability of our *ISS* variable assessing Cronbach's alpha. The results show that Cronbach's alpha is 0.81, thereby indicating that our ISS measure has strong internal consistency and reliability and that the six items measure the same underlying construct.

Control Variables

We control for time-varying factors that could influence a firm's market value or sustainability performance, such as research and development, size, and sales growth (Cheng et al., 2014). Consistent with previous studies, we measure research and development (*R&D/assets*) as a firm's total expenses on research and development, which includes all direct and indirect costs related to the creation and development of new processes, techniques, applications, and products with commercial possibilities (Berrone et al., 2013; Mudambi and Swift, 2014). We divide this value by total assets and take the natural logarithm.

We measure firm size (*Size*) by calculating the natural logarithm of its net sales, which is consistent with prior research (Hawn and Ioannou, 2016). This variable represents gross sales and other operating revenue less discounts, returns, and allowances. Finally, to measure firms' growth, we calculate the annual change in sales (*Sales_Growth*).

Econometric Approach and Identification Strategy

We model the relation between market value and ISSs by building on prior quantitative approaches that focus on the links between market value, standards (Berrone et al., 2013; Short and Toffel, 2010), and social responsibility (e.g., Barnett and Salomon, 2012; Waddock and Graves, 1997). equation (1) depicts *Tobin's Q* − as a function of ISSs adopted in the previous year. equation (1) asserts that market value in the current period is related to a firm's adoption of ISS in the past, as ISS might provide a more noticeable signal to the market regarding a firm's sustainability (Hawn and Ioannou, 2016). Additionally, we include the quadratic term of ISS to account for U-shaped effects arising from multiple ISS adoption. Finally, equation (1) controls for a firm's investments in innovation (Surroca et al., 2010), firm's size, and firm's growth measured by the annual change in sales lagged by one year, (Cheng et al., 2014).

$$\begin{aligned} Tobin's\ Q_{i,t} = {} & \beta_1(ISS)_{i,t-1} + \beta_2\left(ISS\_SQ\right)_{i,t-1} + \beta_3(R\&D/assets)_{i,t-1} + \beta_4(Size)_{i,t-1} \\ & + \beta_5(SalesGrowth)_{i,t-1} + \alpha_i + \tau_t + \varepsilon_{1,t} \end{aligned} \tag{1}$$

We model the relation between ISS and sustainability performance by drawing on previous ISS studies (Berrone et al., 2013; Short and Toffel, 2010) which have shown that adoption of ISS improves a firm's sustainability performance. Hence, equation (2) depicts sustainability performance as a function of prior ISSs adoption. Also, the quadratic term of ISS is included to account for U-shaped effects arising from multiple ISS adoption. equation (2) controls for the firm's past innovation, which is consistent with research showing that a firm's sustainability performance is driven by intangible resources and investments in R&D (Hawn and Ioannou, 2016; Surroca et al., 2010). We also control for firms' annual sales growth, as better performing firms are more likely to invest in sustainability (Waddock and Graves, 1997). Finally, equation (2) controls for firm size.

$$SustainPerf_{i,t-1} = \beta_1\,(ISS)_{i,t-2} + \beta_2\big(ISS\_SQ\big)_{i,t-2} + \beta_3(R\&D/assets)_{i,t-2} + \beta_4(Size)_{i,t-2} + \beta_5(SalesGrowth)_{i,t-2} + \alpha_i + \tau_t + \varepsilon_{2,t} \quad (2)$$

Both Equations include firm fixed-effects, which account for time-invariant firm-specific characteristics that affect market value and sustainability performance respectively. Additionally, we include year fixed-effects, by incorporating in equation (1) and equation (2), dummy variables for each year in our sample period to control for a changing economic setting (Benlemlih and Bitar, 2018). Finally, ε_{1_t} and ε_{2_t} are the error terms that include omitted time-varying variables.

Endogeneity from unobserved heterogeneity. We decided against a pooled OLS estimation (Waddock and Graves, 1997) to avoid producing biased and inconsistent estimates due to endogeneity arising from differences in the characteristics of firms that explain variations in their market value and sustainability performance (Surroca et al., 2010). In other words, the pooled OLS model may attribute predictive power to independent variables, which arises because of the firm's heterogenous time-invariant characteristics. We overcome endogeneity arising from time-invariant heterogeneity by applying a fixed-effects model, by including (α_i) in equation (1) and equation (2), which are firm dummies that capture time invariant firm effects.

Endogeneity from contemporaneous simultaneity. To overcome endogeneity arising from the fact that market value (or sustainability performance) and ISS could be simultaneously determined, we use lags of all independent variables by one year (Carlos and Lewis, 2018; Lewis et al., 2014; Reid and Toffel, 2009). Using one-year lags of the explanatory variables obviates contemporaneous reverse causality (Clemens et al., 2012). This identification strategy utilizes the lagged value of ISS in order to 'exogenise' it when estimating the effect of ISS on either market values or sustainability performance. The assumption made is that since $Tobin's\,Q_{i,t}$ cannot possibly cause $(ISS)_{i,t-1}$, then replacing $(ISS)_{i,t}$ with $(ISS)_{i,t-1}$ rules out concerns that ISS is endogenous to *Tobi's Q*. In equation (2) we use two-year lags of all independent variables. This is because *SustainPerf* is lagged by one year during the data construction. Specifically, the ASSET4 analysts provide a firm with an ESG score in year *t*, thus benchmarking its performance against the other firms using information available in the fiscal year *t*-1 (Cheng et al., 2014).

Robustness analysis. We conduct two sets of robustness analysis. First, we test the robustness of the inverted U-shaped relation (H1 and H2) by formally testing for the presence of a quadratic relationship following the steps suggested by Lind and Mehlum (2010) and using Fieller's (1954) and Sasabuchi's (1980) suggested methods. Prior research shows that it is not sufficient to demonstrate the existence of a quadratic relationship solely by showing that the squared terms are statistically significant and with opposite signs because the tipping point required to confirm inverted U-shaped may lay outside the range of the data, or very near the edge. Thus, Lind and Mehlum (2010) recommend following a framework developed by Sasabuchi (1980) to test for the presence of an inverted U-shaped and compute confidence intervals for the estimation of the extreme value based on Fieller's (1954) method.

Second, we follow Haans et al. (2016) to further assess the robustness of the inverted U-shaped relation by including dummies that reflect the various segments of ISS. Specifically, we estimate equation (1) by replacing ISSs and ISS_SQ with a set of dummies, which allows us to explore the shape of the relationship between Tobin's Q and ISSs further. We set as benchmark dummy *ISS_2–3* equals to 1, when ISS takes the values of 2–3 (i.e., a range around the turning point in equation 1) and equals 0 otherwise. We also generate the following dummies: *ISS_0* (equals 1, when ISS takes the value of 0, and 0 otherwise); *ISS_1* (equals 1, when ISS takes the value of 1, and 0 otherwise); *ISS_4* (equals 1, when ISS takes the value of 4, and 0 otherwise); *ISS_5–6* (equals 1, when ISS takes the values of 5 or 6, and 0 otherwise).

Next, following the same method, we estimate equation (2) by replacing ISSs and ISS_SQ with a set of dummies, whereby the benchmark dummy *ISS_3–4* equals 1, when ISS takes the values of 3–4 (i.e., a range around the turning point in equation 2), and equals 0 otherwise. We also generate the following dummies *ISS_0* (equals 1, when ISS takes the value of 0, and 0 otherwise); *ISS_1–2* (equals 1, when ISS takes the value of 1 or 2, and 0 otherwise); *ISS_5* (equals 1, when ISS takes the value of 5, and 0 otherwise); and *ISS_6* (equals 1, when ISS takes the value of 6, and 0 otherwise).

RESULTS

Table III presents the descriptive statistics and the correlation matrix of variables used in the econometric analysis. The mean value of ISS is 0.88, suggesting that on average firms in our sample have adopted less than one ISS. Figure 3 depicts the distribution of ISSs among firms in the sample. Specifically, 63 per cent of firms in our sample have adopted 0 ISSs, 12 per cent adopted 1 ISS, 11 per cent adopted 2 ISSs, 7 percent adopted 3 ISSs, 4 per cent adopted 4 ISSs, 2 per cent adopted 5 ISSs, and only 1 per cent of the observations adopted 6 ISSs. The correlation between market value and ISS is negative, yet the coefficient is very small (0.08) and does not account for the inverted U-shaped effects between the two variables. Consistent with our expectations, sustainability performance is positively correlated with ISS. Again, this coefficient does not capture the inverted U-shaped relationship between two variables. The mean variance inflation factor (VIF) is 4.27 of the independent variables, indicating that multicollinearity is unlikely to be a concern.

Table IV presents the results of the fixed-effects panel data estimation, which examines the relationship between ISSs and market value. Model 1 only includes the control variables, firm-fixed effects, and year fixed-effects. The results of Model 1 show that firms in our sample, which invest in innovation boost their market value, whereas firms with large sales experience lower their market value (consistent with Belenzon (2012); Hawn and Ioannou (2016)). Model 2 presents the results of equation (1). The estimated coefficients of the control variables remain fairly consistent. The results of fixed-effects panel data analysis

Table III. Descriptive statistics and correlations

Variable	*1*	*2*	*3*	*4*	*5*	*6*
1. *Tobin's Q*	1					
2. *SustainPerf*	−0.122	1				
	(0.000)					
3. *ISS*	−0.080	0.558	1			
	(0.000)	(0.000)				
4. *R&D/Assets*	0.352	−0.003	−0.077	1		
	(0.000)	(0.671)	(0.000)			
5. *Size*	−0.442	0.135	0.339	−0.278	1	
	(0.000)	(0.000)	(0.000)	(0.000)		
6. *SalesGrowth*	0.0023	−0.010	0.040	−0.027	0.104	1
	(0.006)	(0.201)	(0.000)	(0.001)	(0.000)	
Mean	1.89	0.58	0.88	0.3	15.60	3.94e+07
SD	14.56	0.61	1.38	0.12	3.04	1.05e+09
Min	0.06	0	0	−0.04	0	−9.24e+10
Max	2.78	2.26	6	7.15	26.15	4.40e+10

Notes: n = 12,550. We report the estimated correlation coefficient and exact p-value in parenthesis.

show that the lagged estimated coefficient of ISS exerts a significant positive effect upon market value in our sample ($\beta_1 = 0.017$, p = 0.007). In Model 2, we test for the inverted U-shaped with the squared-term of ISS and show that the lagged ISS_SQ has a significant negative effect upon market value ($\beta_2 = -0.003$, p = 0.014). Figure 4 provides a graphical illustration of our results, as suggested by Haans et al. (2016). It shows that the point where ISS appears to exert negative effects upon market value – or the 'turning point' – is approximately 2 ISS, in that if firms adopt more than 2 international sustainability standards, their market value declines.

Robustness of Inverted U-Shaped Relation

The fact that ISS and its squared terms are statistically significant and have opposite signs, are necessary – but not sufficient – criteria to demonstrate the existence of an inverted U-shaped (Lind and Mehlum, 2010). To overcome this concern, we test the robustness of the analysis by following Sasabuchi (1980). This allows us to test for the presence of an inverted U-shaped relation between ISS and *Tobin's Q*, and compute Fieller's (1954) confidence intervals for the estimation of the extreme value based. The results in Table V indicate that indeed there is an inverted U-shaped relationship (inverse U-shaped) in our sample, with an optimum point of 2.5 ISSs (p = 0.018). We obtained the 95% Fieller confidence interval as [1.671 to 5.149], which indicates that the lower bound is further from zero. Thus, our results suggest that the adoption of standards increases the firm's market value up to 2.5 standards and beyond this point firms' market value declines.

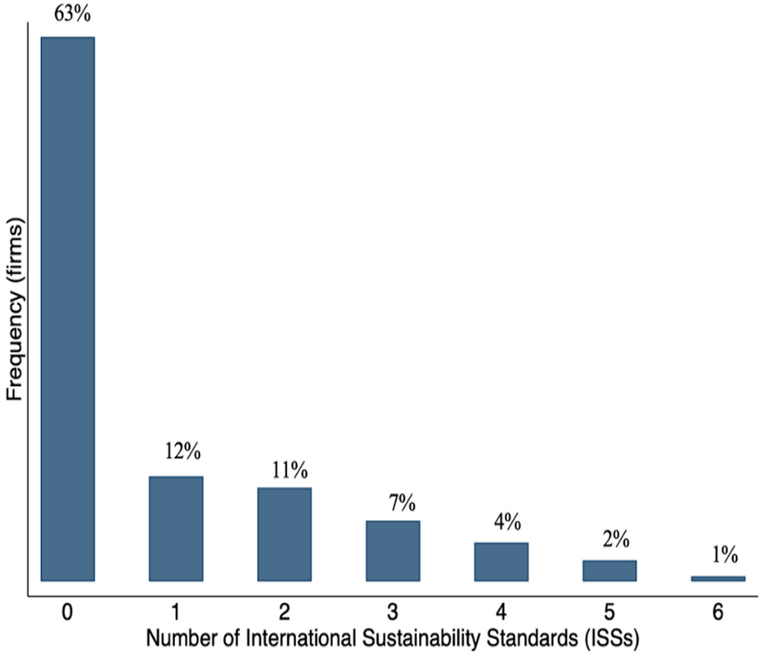

Figure 3. Distribution of ISSs among firms in the sample [Colour figure can be viewed at wileyonlinelibrary.com]

Notes: The number of firms that adopted ISSs on average over the period of 10 years are as follows: 1019 firms have not adopted any ISS; 194 firm adopted 1 ISS; 178 firms adopted 2 ISSs; 113 firms adopted 3 ISSs; 65 firms adopted 4 ISSs; 33 firms adopted 5 ISSs; 16 firms adopted 6 ISSs.

Table VI presents the results of the fixed-effects panel data estimation, which examines the impact of ISS upon sustainability performance. Model 1 shows the analysis including only the control variables, firm fixed-effects, and year fixed-effects. The results show that large firms have higher sustainability performance. The coefficients of the control variables remain consistent in Model 2, which presents the results of equation (2). The results of fixed-effects panel data analysis show that the lagged estimated coefficient of ISS exerts a significant positive effect upon sustainability performance ($\beta_1 = 0.135$, $p < 0.001$) in our sample. Model 2 also tests for the inverted U-shaped with the squared-term of ISS. It shows that the lagged ISS_SQ has a significant negative effect upon sustainability performance ($\beta_2 = -0.019$, $p < 0.001$). Figure 5 shows that the point where ISS appears to exert negative effects upon sustainability performance – or the 'tipping point' – is approximately 3 ISSs, in that if firms adopt more than 3 international sustainability standards, their sustainability performance will decline.

In Table VII, we assess the inverted U-shaped relationship between ISSs and sustainability performance. The results indicate that there is an inverted U-shaped relationship, with an optimum point of 3.4 ISSs ($p = 3.83\text{e-}09$). We also obtained the 95% Fieller confidence interval as [3.074 to 3.844]. This suggests that ISS adoption increases the firm's sustainability performance up to 3.4 ISSs, beyond which firms' sustainability performance declines.

Table IV. The impact of ISS upon market value (*Tobin's Q*)

	Model 1 *Coefficient* *Standard error* *(p-value)*	*Model 2* *Coefficient* *Standard error* *(p-value)*
ISS		**0.017**
		0.006
		(0.007)
ISS_SQ		**−0.003**
		0.001
		(0.014)
R&D/assets	**0.034**	**0.034**
	0.005	*0.005*
	(0.000)	(0.000)
Size	**−0.042**	**−0.044**
	0.008	*0.008*
	(0.000)	(0.000)
SalesGrowth	**2.01e-12**	**2.04e-12**
	1.83e-12	*1.84e-12*
	(0.273)	(0.266)
Constant	**1.269**	**1.304**
	0.150	*0.151*
	(0.000)	(0.000)
Year fixed-effects	Yes	Yes
Firm fixed-effects	Yes	Yes
Observations	12,550	12,550
R-squared	0.125	0.139
No. of firms	1618	1618

Notes: The table shows the results of the fixed-effect panel data analysis, whereby equation (1) is tested by Model 1 with dependent variable *Tobin's Q*. We report the estimated coefficient in **bold**, standard error in *italics*, and exact p-value in parenthesis.

Finally, we formally test H3, namely, the number of ISSs that optimize firms' market value is fewer than the number of ISSs that optimize their sustainability performance. We do so by conducting a postestimation analysis that tests if the coefficients of ISS_SQ are the same in the market value equation (1) and in the sustainability performance equation (2), by running a seemingly unrelated regression. This allows us to estimate the simultaneous covariance of the coefficients of ISS_SQ in models 2 in Tables IV and VI. Next, we store the results and test the null hypothesis that the difference between the two coefficients statistically equals zero. Our results indicate that the value of the Chi-Square is 253.44 with a probability of $p < 0.001$, thus we reject the null hypothesis that the coefficients of ISS_SQ in equation 1 and 2 are the

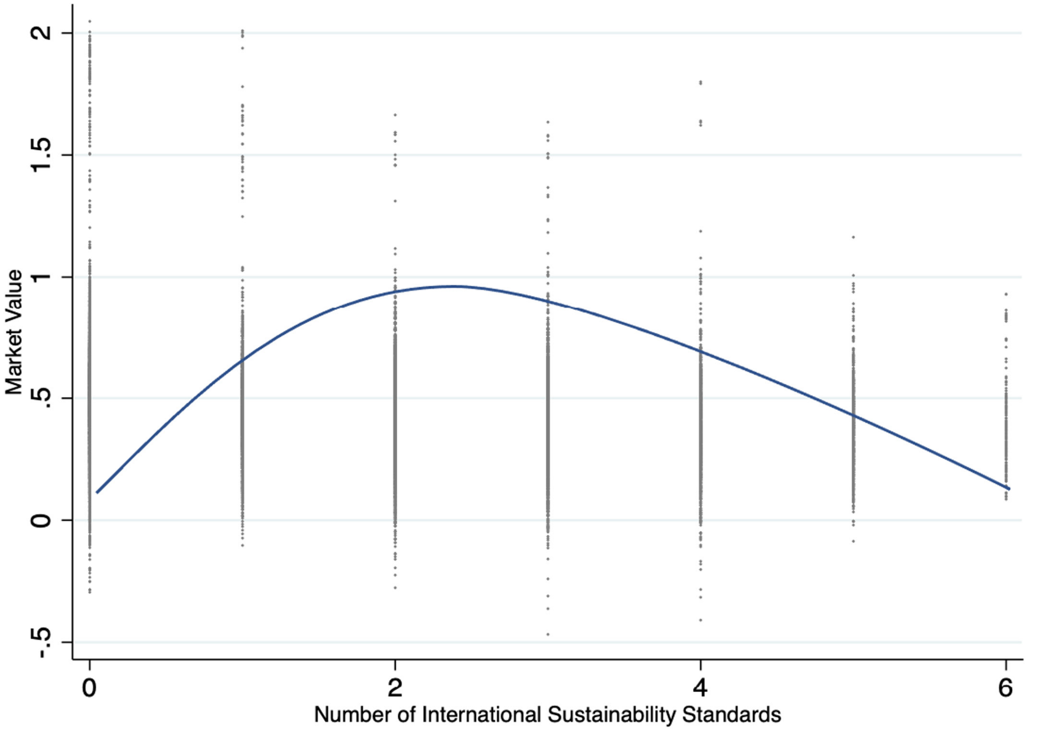

Figure 4. Predicted relationship between market value and the number of international sustainability standards [Colour figure can be viewed at wileyonlinelibrary.com]

Table V. Test for inverted U-shaped relationship between market value and ISS

ISS_SQ	*Market Value (Tobin's Q)*
Extreme point	2.5
Overall Sasabuchi's test of presence of inverted U-shape t-value	2.09
p-value	(0.018)
95% Fieller interval for extreme point	[1.6727576; 5.149578]

Note: Sasabuchi (1980) tests and Fieller (1954) confidence intervals

same. This confirms H3 suggesting that the number of ISSs that optimize firms' market value (2.5 ISSs) is fewer than the number of ISSs that optimize their sustainability performance (3.4 ISSs).

Further Robustness Analysis

Our robustness analysis uses dummies to capture the various segments of ISS (Haans et al., 2016). The results for equation (1) are reported in Table VIII. Our findings indicate that, below the benchmark, the dummy which reflects 0 adoption of ISS (*ISS_0*) is negative and statistically significant at $p < 0.01$. The dummies above the

Table VI. The relationship between ISS and sustainability performance

	Model 1 *Coefficient* *Standard error* *(p-value)*	*Model 2* *Coefficient* *Standard error* *(p-value)*
ISS		**0.135**
		0.010
		(0.000)
ISS_SQ		**−0.019**
		0.002
		(0.000)
R&D/assets	**−0.001**	**−0.015**
	0.009	*0.008*
	(0.904)	(0.064)
Size	**0.194**	**0.155**
	0.016	*0.012*
	(0.000)	(0.000)
SalesGrowth	**0.006**	**−5.37e-12**
	0.004	2.89e-12
	(0.163)	(0.063)
Constant	**−3.406**	**−2.930**
	0.283	*0.224*
	(0.000)	(0.000)
Year fixed-effects	Yes	Yes
Firm fixed-effects	Yes	Yes
Observations	11,249	11,249
R-squared	0.095	0.158
No. of firms	1603	1603

Note: The table shows the results of the fixed-effect panel data analysis, whereby equation (2) is tested by Model 2 with dependent variable *SustainPerf*. We report the estimated coefficient in **bold**, standard error in *italics*, and exact p-value in parenthesis.

benchmark (*ISS_4* and *ISS_5–6*) are all negative, but not statistically significantly different from the benchmark. Thus, our results suggest that even though there are decreasing returns in market value for increased adoption of ISS, no negative returns can be observed.

The results of the robustness analysis for equation (2) are reported in Table VIII. Our findings indicate that below the benchmark both dummies are negative and, crucially, the dummy that captures 0 adoption of ISS (*ISS_0*) is negative and statistically significant at $p < 0.01$. One dummy above the benchmark (ESG_5) is positive but insignificant, whilst the ESG_6 dummy is negative and different from the benchmark at 10% significance level. Thus, our results suggest that there are decreasing returns in

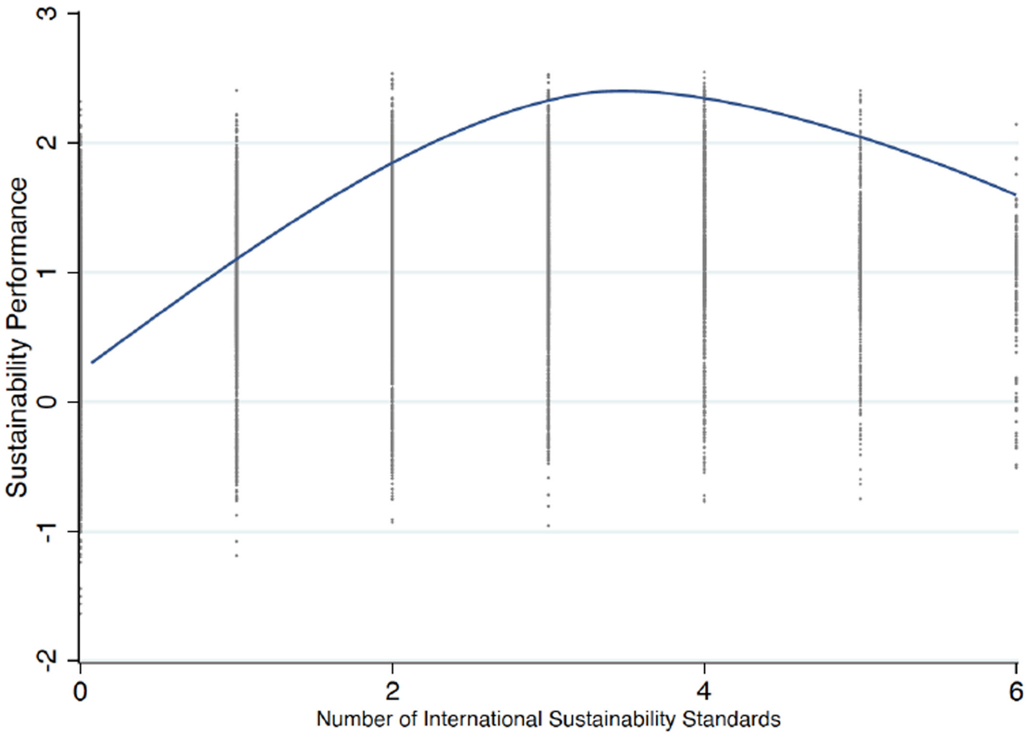

Figure 5. Predicted relationship between sustainability performance and the number of international sustainability standards [Colour figure can be viewed at wileyonlinelibrary.com]

Table VII. Test for inverted U-shaped relationship between ISS and sustainability performance

ISS_SQ	*Sustainability performance (SustainPerf)*
Extreme point	**3.4**
Overall Sasabuchi's test of presence of inverted U-shape t-value	5.78
p-value	(3.83e-09)
95% Fieller interval for extreme point	[3.0741322; 3.8443988]

Note: Sasabuchi (1980) tests and Fieller (1954) confidence intervals. Scientific e notation 3.83e-09 = 3.83×10^{-9} = 0.00000000383.

sustainability performance for increased adoption of ISS and there are also negative returns for only 6 ISS.

DISCUSSION

ISSs help firms improve their sustainability performance (Darnall and Kim, 2012; Ferrón-Vílchez and Darnall, 2016; González-Benito and González-Benito, 2005; Short and Toffel, 2010) and 'signal' credible information to market participants about

Table VIII. Robustness analysis: Fixed-effect panel data analysis with ISS dummies

	Market Value (Tobin's Q) Coefficient	*Sustainability Performance (SustainPerf) Coefficient*
	Standard error	*Standard error*
	(p-value)	*(p-value)*
DUMM ISS_0	***−0.026***	***−0.216***
	0.009	*0.018*
	(0.005)	*(0.000)*
DUMM ISS_1	***0.006***	
	0.009	
	(0.523)	
DUMM ISS_1–2		***−0.017***
		0.014
		(0.232)
DUMM ISS_2–3	*Benchmark*	
DUMM ISS_3–4		*Benchmark*
DUMM ISS_4	***−0.013***	
	0.011	
	(0.240)	
DUMM ISS_5–6	***−0.006***	
	0.015	
	(0.659)	
DUMM ISS_5		***0.020***
		0.022
		(0.365)
DUMM ISS_6		***−0.074***
		0.044
		(0.096)
R&D/assets	***0.034***	***−0.019***
	0.005	*0.007*
	(0.000)	*(0.010)*
Size	***−0.045***	***0.151***
	0.008	*0.009*
	(0.000)	*(0.000)*
SalesGrowth	***2.13e-12***	***−5.00e-12***
	1.849e-12	*2.94e-12*
	(0.246)	*(0.089)*
Constant	***1.340***	***−2.547***
	0.152	*0.169*
	(0.000)	*(0.000)*

(Continues)

Table VIII. (Continued)

	Market Value (Tobin's Q) Coefficient *Standard error* *(p-value)*	*Sustainability Performance (SustainPerf) Coefficient* *Standard error* *(p-value)*
Year fixed-effects	*Yes*	*Yes*
Firm fixed-effects	*Yes*	*Yes*
Observations	*12,550*	*12,406*
R-squared	*0.138*	*0.189*
No. of firms	*1618*	*1832*

Notes: The table shows the estimation results of the robustness analysis including dummies that reflect the various segments of ISS. In equation (1) the dependent variable is Market Value (Tobin's Q) and the benchmark is DUMM ISS_2–3, which is the range around the turning point in equation (1). In equation (2) the dependent variable is Sustainability Performance (SustainPerf) and the benchmark is DUMM ISS_3–4, which is the range around the turning point in equation (2). We report the estimated coefficient in **bold**, standard error in italics, and exact p-value in parenthesis.

their otherwise unobservable sustainability activities (Heras-Saizarbitoria et al., 2020; Siegel, 2009). As ISS adoption also allows market participants to identify and invest in more sustainable firms (Heras-Saizarbitoria et al., 2020), it can improve adopters' market value (Coulmont and Berthelot, 2015). Through a quantitative analysis of 1618 large firms over 10 years (12,550 firm-year observations), this research extends signalling theory and ISS research by advancing problem-driven research that explores how these signals function when firms adopt *multiple* ISSs. Our findings offer several contributions.

Penalty Zone and Imprecise Signals of Information

The primary contribution of this research relates to the discovery and articulation of the 'penalty zone', where the number of ISSs that optimize firms' market value is fewer than the optimum number of ISSs that maximize their sustainability value. While previous research has suggested that firms' sustainability signals can improve their market value (e.g., Testa et al., 2015) by decreasing information asymmetries (Hockerts and Wüstenhagen, 2010) and improving market participants' confidence about the validity of firms' sustainability claims (Cheng et al., 2014), the penalty zone offers an important and unexplored aspect to this discussion and illustrates that market and sustainability performance do not move in parallel. It also contributes to signalling theory by elaborating on the notion that firms which adopt multiple ISSs signal credible information to market participants. This information allows market participants to assess companies' unobservable sustainability commitments. However, adopting multiple ISSs also signals information about the firms' unobservable adoption costs and the diseconomies of scope that come with meeting diverse sustainability goals. These costs relate to increases in organizational complexity, bureaucracy (Ikram et al., 2020), and administrative delays (Kaufmann et al., 2019). While earlier research has assessed the benefits of sustainability signals, their accompanying diseconomies of scope (and costs) have not been considered.

Moreover, as these signals are unobserved, they are not a precise representation of firms' actual activities. As such, market participants have incomplete information about firms' sustainability performance and their affiliated costs of ISS adoption. These signalling imprecisions cause market participants to invest less in firms with multiple ISSs than would be the case if ISS signals offered more complete information. The practical outcome is that the optimal number of ISSs that market participants reward is fewer than the optimal number a firm should adopt to maximize its sustainability performance. These differences in optimum points define a 'penalty zone', where firms that continue to adopt ISSs and improve their sustainability performance experience a decline in their market value.

The penalty zone represents an important elaboration to signalling theory and an explanation for the mechanism underpinning 'too-much-of-a-good-thing'. It offers a more nuanced view of sustainability signals and additional explanatory dimension to studies suggesting that markets compensate firms that emit multiple credible signals of sustainability performance (e.g., Durand et al., 2019; Feng et al., 2020; Ortiz-de-Mandojana and Bansal, 2016). We show that sustainability signalling does not always lead to market participants' positive reaction. In the ISS setting, beyond a point, firms that convey multiple sustainability signals are punished. In practice, this setting presents a significant hurdle to advancing broader sustainability goals. These novel findings would not have been revealed had we assessed a more limited number of ISSs.

Sustainability Standards Might Not Always Increase Market Value

Our second contribution relates to broader discussions about the relationship between 'social responsibility' and financial performance where many scholars suggest that firms' socially responsible behaviour increases their financial returns (e.g., Ferrón-Vílchez and Darnall, 2016; Flammer, 2015; González-Benito and González-Benito, 2005; Short and Toffel, 2010; Testa et al., 2015). Within these discussions, a smaller, but growing number of scholars are pointing to the complexity between firms' social performance and their financial returns (e.g., Dineen and Allen, 2016; Flammer, 2013; Lewis and Carlos, 2022; Wang et al., 2008).[7] One example relates to firms that are identified on highly reputable social performance rankings lists. Firms identified on these lists initially yield a positive market value prior to experiencing subsequent abnormally negative returns (Dineen and Allen, 2016). Such complex patterns are seen in philanthropy, where scholars illustrate that firms which engage in philanthropic activities are initially rewarded by markets until an optimal point, after which they are not (Wang et al., 2008) along with declining stakeholder support because continued philanthropy also signals information that the firm may be misappropriating its corporate resources (Lewis and Carlos, 2022). A similar pattern is seen when firms adopt multiple certifications in that, beyond a tipping point, their performance declines (Lanahan and Armanios, 2018; Lanahan et al., 2022). Related to the environmental arena, firms that adopt green initiatives, but are accused of 'eco-harm', are more immunized from accusations of eco-harmful behaviour (Flammer, 2013). However, when these same firms continue to adopt green initiatives, their financial returns decline (Flammer, 2013).

Our findings offer another important dimension to these discussions. Following an initially positive relationship between firms' adoption of multiple ISSs and firms' market value, beyond a tipping point in the number of ISSs, this relationship becomes negative. We suggest that this finding is due to the fact that, in the presence of imprecise information, market participants tend to be risk averse (Ilut and Schneider, 2014) and fear that increasing sustainability commitments may decrease profits (Flammer and Bansal, 2017). In this setting, they exercise caution when firms appear to be adopting 'too many' ISSs.

These findings illustrate the signal incongruence that arises from the presence of multiple signals (Drover et al., 2018) and offers empirical support for the notion of imbalanced incongruent signals, where multiple (but similar) signals are perceived initially as delivering positive information. Beyond a tipping point, market participants perceive the adoption of multiple ISSs signals to be 'too-much-of-a-good-thing' and begin reducing their investment in these firms even though firms continue to improve their sustainability performance.

Diseconomies of Scope – When ISSs Reduce Sustainability Performance

Our third contribution relates to a growing body of research suggesting that firms which adopt an ISS can improve their sustainability performance (Darnall and Kim, 2012; Ferrón-Vílchez and Darnall, 2016; González-Benito and González-Benito, 2005; Short and Toffel, 2010). Performance gains accrue because certification standards often have differing goals (Lanahan and Armanios, 2018; Lanahan et al., 2022), which create opportunities for firms to address different aspects of their overall sustainability performance. Our findings extend these prior insights by offering evidence that adopting multiple ISSs can further improve firms' sustainability performance. However, we also show that beyond an optimum number of ISSs, these sustainability performance gains decline because of diseconomies of scope that increase firms' internal inefficiencies (Panzar and Willig, 1981). Thus these inefficiencies diminish the sustainability performance benefits that come with additional ISS adoption.

Finally, by assessing firms' adoption of multiple ISSs, this research more accurately reflects firms' existing options and the complexity that comes with these options. Our findings explore the limits of ISSs, and the mechanisms for why they become too-much-of-a-good-thing, thus causing sustainability performance to decline.

Limitations and Future Research

One limitation to our approach is that we assume that the signalling value across different types of ISSs is equivalent. In practice, market participants may perceive some ISSs and their signals to be more valuable than others. Future research should explore the extent to which the size of the penalty zone changes based on which ISSs that firms adopt. For instance, ISSs with less international prominence may also be valued differently by market participants, which could create a larger penalty zone for firms because the market does not value them as much as the more well-known ISSs. Alternatively, firms that adopt ISSs that focus on the broad range of sustainability impacts – environment, social, and governance – may experience a smaller penalty zone than firms that adopt ISSs that predominantly focus on one sustainability dimension because the market values firms' holistic sustainability approaches to a greater extent than more focused approaches. However, the penalty zone may be greater for firms that pursue a more holistic sustainability approach because market participants perceive the coordination costs and their associated diseconomies of scope will be greater across diverse ISSs.

Additionally, the size of the penalty zone could change based on whether an ISS is process-focused, outcome-focused, or hybrid (both process- and outcome-focused). For instance, outcome-focused ISSs emphasize specific sustainability metrics that firms must track. These ISSs, therefore, may provide investors with more credible information about whether the ISSs are improving firms' sustainability performance, which may yield greater market benefits. By contrast, process-focused ISSs do not focus on specific sustainability metrics, but instead emphasize a more holistic approach to sustainability improvements based on the firm's sustainability priorities. Because of this more holistic focus, it could be that firms which adopt these ISSs subsequently demonstrate stronger sustainability performance improvements than firms that adopt outcome-focused ISSs. However, because the link between outcome-focused ISSs and their sustainability improvements is less direct, market participants may value adoption of outcome-focused standards to a lesser extent. If so, these firms would experience a larger penalty zone.

Our research also assumes that the sequence in which a firm adopts their ISSs leads to equivalent outcomes. However, the order of ISS adoption may affect firms' sustainability performance and market value. While there is some evidence that adoption sequence matters in case of integrated management systems, especially because some involve more complementary resources (Gianni et al., 2017), little is understood about ISS adoption sequencing and how it affects firms' sustainability performance. It could be that some ISS adoption sequences lead to quicker and/or greater sustainability benefits than others. If so, adoption sequencing may also have bearing on the size of the penalty zone. Future research is needed to consider these issues further.

Prospective research should also explore the sustainability benefits and market responses that come when firms adopt a variety of sustainability approaches – beyond ISSs, which tend to emphasize conformity, best practices, and changes to existing products and processes (Hart, 2010; Kurapatskie and Darnall, 2013). It could be that when firms adopt a wider array of sustainability approaches, including more radical activities and innovations, which affect their core business strategies, the optimal points of sustainability performance benefits and market returns differ even more significantly than seen when firms adopt multiple ISSs, thus creating an even larger penalty zone.

Finally, our results offer some insight into recent discussions related to the merits of ESG. Environmental, social and governance criteria, or ESG, is a sustainability assessment approach that companies use to evaluate their overall sustainability impacts and report their findings publicly. By publicly reporting this information, firms hope to influence market participants' investment decisions. However, if these reports are not third party verified (Chen et al., 2014), they are prone to criticisms that come with firms' self-reported sustainability commitments (Darnall et al., 2018). In this setting, firms may struggle with finding credible market signals to convey their wider array of sustainability approaches, which may further increase the size of the penalty zone as investors have less access to information about the benefits and costs of firms' diverse ESG activities. ISSs may be one way to improve the credibility of these reports and address recent criticisms about ESG, especially since our findings demonstrate that ISSs improve firms' sustainability performance and reward their improved sustainability performance, at least until they become 'too-much-of-a-good-thing'.

Our hope is that the evidence we have presented here provides a rationale for additional investigations of these ideas.

CONCLUSION

This research extends signalling theory by offering justification for how multiple ISS adoption signals information about firms' unobservable sustainability performance benefits and costs. Our research offers an important explanation for the mechanism behind why, beyond a critical tipping point, multiple ISS adoption becomes 'too-much-of-a-good-thing' and both market value and sustainability performance decline. As the market signals about firms' sustainability benefits and costs are imprecise, these tipping points differ, giving rise to a penalty zone – the place where the optimal number of ISSs which a firm should adopt to maximize its sustainability performance is greater than the number of ISSs that the market continues to reward. The penalty zone serves as a significant barrier to firms wishing to further their sustainability agenda through additional ISS adoption.

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NOTES

[1] Although imprecise, ISSs are a readily available means for market participants to assess firms' sustainability benefits and costs. While market participants could purchase proprietary data related to firms' actual sustainability performance through a third party (e.g., MSCI, Sustainalytics, Moody's), these data are costly which discourages many market participants from becoming informed. In instances where investors purchase the third party data, they must obtain skills to assess and interpret the information. Related to firms' costs of adopting sustainability activities, this information is not available from any third party source and the aggregated information that firms disclose in their balance sheets (e.g., current assets, fixed assets, current liabilities, long-term liabilities, equity) does not focus on sustainability costs specifically.

[2] The original 750 data points are reported in different units or formats, which include both quantitative and qualitative information. For example, 'CO_2 emissions' are measured in tons of carbon dioxide, whilst 'energy use' is measured in kilowatt hours. Another indicative example regarding the diversity of data points, is the calculation of 'health and safety' which is measured as the total number of injuries and fatalities including no-lost-time injuries relative to one million hours worked.

[3] Corporate governance and sustainability are strongly linked (e.g., Walls et al., 2012; Walls and Hoffman, 2013), in large part because the corporate governance structure is responsible for ensuring that sustainability matters are incorporated into the strategy, decision-making, risk and accountability reporting of the corporation. Additionally, diverse boards tend to be more socially responsible (Byron and Post, 2016).

[4] Here we conceptualize market value based on the relationship between a firm's market valuation and its intrinsic value. We operationalize market value with Tobin's Q ratio, which measures market valuation as the sum of market capitalization and total liabilities and captures the intrinsic value by total assets, i.e. Tobin's Q = (Market capitalization + Total liabilities)/Total assets.

[5] KLD Index was created in 1990 and includes 400 publicly traded companies with high ESG scores.

[6] Adoption data speak to the popularity of these ISSs. ISO 9001 has been adopted by more than 918,000 firms globally. As an additional indication of its prominence in popular discussions, we also searched this ISS name using Google. That search yielded 117 M Google hits. More than 428,000 firms have adopted ISO 14001 (ISO 2021 survey); a search of ISO 14001 yielded 36 M Google hits. The UN Global Compact has been adopted by more than 20,000 firms (UN Global Compact, 2022), and has 14 M Google hits. More than 10,000 firms follow the GRI reporting standards, including 96 per cent of the world's 250 biggest companies reporting their sustainability efforts in line with the standard (GRI, 2022; KPMG, 2020). A Google search for GRI yields nearly 30 M hits. Adoption numbers associated with the ILO Human Rights and the OECD Guidelines for Multinational Enterprise Guidelines are not tracked in part because they are endorsed by governments rather than standard setting organizations (ILO, 2019). However, these standards represent two of the original guidelines for corporate sustainability that have formal government recognition (ILO, 2019), although any firm can adopt them. A Google search for the International Labor Organization's Fundamental Principles and Rights at Work standard yields more than 15M hits. It is endorsed by 45 governments (ILO, 2019). Similarly, the OECD MNE (1M Google hits) is endorsed by 38 member governments of the Organization for Economic Cooperation and Development (OECD) and 12 non-member governments (Hohnen, 2009).

[7] Our work offers another dimension to both Barnett and Salomon (2012) and Lewis and Carlos' (2019) studies, which assessed firm behaviours during earlier time-periods. Our study is congruent with both studies' suggestion for a curvilinear relationship. However, our inverted U-shape presents a different asymmetry to Barnett and Salomon's (2012) non-inverted U-shape in the relationship between corporate social performance and financial performance. Similarly, Lewis and Carlos (2019) propose that marginal inclusion in highly reputable corporate social performance rankings might lead to decreases in market value, but companies not on the rankings list perform better. The different time-periods for these two studies offer one explanation for the variations in findings. Barnett and Salomon's (2012) study uses data from 1998–2006. Lewis and Carlos (2019) use data from 1996–8. However, between 2007–16, when our data were collected, the social norms and expectations around corporate sustainability had changed significantly, especially as business topics of climate change and social equity had become more mainstream (e.g., Wickert and Risi, 2019). As firms have increasingly experienced greater scrutiny from stakeholders and shareholders for their *lack* of sustainability action (e.g., Flammer, 2013), which affects their financial performance (e.g., Dineen and Allen, 2016; Flammer, 2013; Wang et al., 2008), these earlier findings about firms' corporate social performance activities may be less relevant today.

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