A Meta-Analysis of Sustainable Supply Chain Practices and Performance: The Moderating Roles of Type of Economy and Innovation[1]

Abstract

Purpose – In recent years, sustainable supply chain practices (SSCP), including corporate social responsibility (CSR), have been recognised as important means of developing firms' sustainability performance (SP). However, empirical findings on the SSCP–SP interaction are inconsistent and even contradictory. This research presents a quantitative meta-analysis that aims to uncover SSCP–SP interactions based on the correlations found in previously published empirical studies.

Design/methodology/approach – Based on the main and moderating variables and selection criteria, 64 sample studies were selected after a systematic literature review and meta-analysis.

Findings – The findings confirm a positive correlation (0.438) between SSCP and SP. The results also reveal various critical moderators identified through meta-regression.

Practical implications – This study provides insights for operations managers and policymakers regarding the significance of control variables (e.g. ISO certification, type of economy, innovation approach, data collection method) on the relationship between SSCP and SP for business operations. This research uncovers the impacts of ISO regulations and proposed hypotheses through the lens of the natural resource-based view (NRBV) and institution-based view (IBV).

Originality/value – This research is unique in that it provides a systematic view of the SSCP–SP interaction, validates the results through a theoretical lens (NRBV and IBV) and generalises the results by evaluating the moderation effects via checking prior literature.

Keywords: Meta-analysis; Corporate social responsibility; Sustainable performance; Natural resource-based view; Institutional-based view.

1 Introduction

In the current corporate climate, firms are emphasising sustainability along with competitive advantage (Zameer et al., 2020). Many reports have shown that businesses with a 'sustainable

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culture' perform better than traditional firms over the long term (Huo et al., 2019). In recent years, scholars have sought to broaden the boundaries of sustainable growth in the field of service firms' supply chains (Zhao et al., 2021). Based on the triple bottom line (TBL) paradigm, it is evident that sustainable supply chain practices (SSCP) may resolve both environmental and social problems (Vanalle et al., 2017). According to González-Benito and González-Benito (2005), SSCP generally involve planning, communicating and operating strategies. Building processes for firm objectives, practice allocation and results evaluation are linked to planning strategy in terms of corporate social practices, which are used to build environmental policies (Golicic & Smith, 2013). Communication strategy is connected to external green practices (EGP), which are mostly used in communications to notify a firm's partners, vendors and consumers of its environmental activities (e.g. regular reports to consumers, suppliers and government bodies) (Tsai & Liao, 2017). Operations strategy is connected to internal green practices (IGP), meaning firms' process- and product-related practices. This includes laying out procedures to limit firms' resource use, substituting harmful and polluting by-products and developing green products. IGP seeks to create procedures and products that are better for the environment (Lin & Niu, 2018). Thus, operational strategies are typically used to describe the ideas of green innovations, eco-innovations and environmental responsibility (Tsai & Liao, 2017). A variety of societal, cultural, economic and environmental factors are frequently used to evaluate SSCPs in business studies and have been integrated into the context of corporate social responsibility (CSR) (Wood, 2010). While the literature examining the link between sustainability and business performance covers a variety of CSR factors, concern regarding the environmental aspect of sustainability has increased as firms become more aware of supply chains' effects on the environment and society (Wu & Pagell, 2011).

A growing number of firms are embracing metrics like environmental safety measures and social variables to assess sustainable development (Saeed and Kersten, 2019). Saeed and Kersten (2019) classified drivers of SSCP and found that market and regulatory pressures are the major drivers of sustainability practices. Similarly, Saeed et al. (2018) asserted that adopting sustainability practices provides an opportunity for organisations to become more competitive, in addition to improving social and environmental performance. Esfahbodi et al. (2016) conducted an empirical study testing the interrelationships among SSCP, environmental performance (ENP)

and economic performance (ECP). However, their proposed SSCP framework needs adjustment for existing green SSCP, which may focus exclusively on environment-related attributes.

Contrary to the above studies, Hervani et al. (2022) argued that prior studies related to SSCP and sustainability performance (SP) have overlooked the social sustainability aspect (e.g. Golicic & Smith, 2013; Fang & Zhang, 2018). In addition, several meta-analyses (Fang & Zhang, 2018; Govindan et al., 2020; Qorri et al., 2021) did not comprehensively explore CSR's impacts on sustainable firm performance, an important variable to examine for understanding firms' socially responsible practices. Moreover, little empirical research has integrated the social and environmental implications of the SSCP inquiry (Wong et al., 2020). Al Zaabi et al. (2013) stated that these practices are unprofitable and adopting them invites additional costs. However, SSCP is believed to provide long-term economic benefits to firms rather than short-term gains (Fung et al., 2021).

Additionally, several challenges occur regarding supply chains when implementing sustainable practices and can have negative impacts, specifically during the initial stage of sustainability practices (Gopal & Thakkar, 2016). The results of previous empirical studies are inconsistent, which may create uncertainty among practitioners who intend to pursue SSCP and discourage further SSCP implementation. For instance, Barnett and Salomon (2006) report that sustainability activities reduce firms' financial performance through incurring additional costs. Similarly, Aupperle et al. (1985) argue that firms opting for proactive sustainability practices face competitive disadvantage. Therefore, there is a clear impetus to take a more rigorous quantitative approach (compared with the extensive SSCP and SP literature) that integrates the inconsistent results of previous empirical findings by exploring potential moderators.

Furthermore, concerning social welfare-oriented supply chain practices, CSR sustainability activities are considered helpful to society and the environment (Li et al., 2019). Therefore, inclusive sustainable assessment and verification should affect social and environmental risk avoidance, efficiency and credibility (Gualandris et al., 2015). The analysis of SSCP implementation from a CSR perspective can yield useful insights for businesses adopting and implementing SSCP, which may enable them to embrace SSCP by using CSR as a driver and improve company performance. However, prior studies lack a comprehensive analysis of how social sustainability affects firm performance (Govindan et al., 2020).

Table 1 presents a comparison of previous studies with the present study, showing a lack of good-quality samples in previous meta-analyses. Moreover, few previous meta-analyses have explored more than one theoretical viewpoint when analysing moderators of the SSCP–SP relationship.

<Insert Table 1 here>

Govindan et al.'s (2020) important meta-analysis only examined environmental and social firm performance and the impact of sustainability practices. The authors did not consider firms' economic performance and only considered studies from 2010 to 2018. Another recent meta-analysis by Qorri et al. (2021) tested the relationship between sustainable supply chain management practices and economic, environmental, social and operational performance; however, it did not include CSR as an independent variable to analyse its impact on selected dimensions of firm performance. Golicic and Smith (2013)'s meta-analysis examined green supply chain management (GSCM) practices and firm performance – including market, accounting and operational performance – and found no relationship between GSCM practices and environmental and social performance. In addition, Geng et al. (2017)'s meta-analysis examined the connection between GSCM techniques and economic, environmental, social and operational performance. However, their sample only included manufacturing research from Asian emerging economies and did not consider CSR viewpoints with GSCM practices.

This study attempts to integrate the results of previous studies from a supply chain perspective to examine the influence of green practices and CSR on firms' SP. This generates valuable insights that can bridge the gap in the current literature. To compare our study with previously conducted meta-analyses, we selected only studies conducted within the past eight years to highlight current contributions in this field. Only studies conducted to identify the relationship between green or sustainable practices and firm performance, along with various moderators, were included.

The natural resource-based view (NRBV) asserts that, to transform potential threats into competitive advantage, the allocation of a firm's capabilities and resources change when environmental pressures increase due to the natural environment's operational impacts on firm performance (Hart & Dowell, 2011). Moreover, it is necessary for firms to identify the influence of their sustainable practices on their performance. To this end, the NRBV contributes a theoretical mechanism that provides a link between a firm's environmental actions and profit. The NRBV has

gained support in supply chain research, including in the area of environmental sustainability practices, as a strategic approach that can improve firm performance at the economic, market and operational levels (Golicic & Smith, 2013).

In addition, this study is supported by the institutional-based view (IBV), which is used to examine how customers and governmental bodies affect business strategy. By emphasising government activities as an important element affecting corporate policies, practices and profitability, the IBV expands the industry-based approach. According to the IBV, consumer demand, government regulations and programmes and competitiveness are drastically 'distinct' in developing economies and differ from industrialised nations (Li et al., 2019). By exploring the interactions and collaborations among a focal organisation and its stakeholders, the IBV gives insights into the deployment of both digitalised platforms and process innovation (Rodríguez-Espíndola et al., 2022). The IBV can also elucidate the acceptance and dissemination of sustainability efforts, as local institutions and stakeholder interactions influence the adoption of socially responsible behaviours (Ashworth et al., 2009). Therefore, this study uses the NRBV and IBV to analyse the role of SSCP, including the environmental and social aspects of sustainability, in enhancing firm performance. In short, the following research gaps are addressed in this work:

1. A systematic review of quality studies covering the SSCP–SP relation is lacking (Cao & Lumineau, 2015; Iftikhar et al., 2021). More specifically, CSR and social aspects of sustainability (Qorri et al., 2021) are underexplored. In this context, journal quality refers to high levels of internal and external reliability based on the judgements of editors and experts in the business and management field or a highly ranked Chartered Association of Business Schools (CABS) journal.
2. Most previous empirical literature has focused mostly on one or two indicators rather than providing a systematic view of integrated SSCP work (EGP, IGP, CSR) and SP (ENP, SOP, ECP), which somewhat limits the significance of its SSCP–SP analysis to (Golicic & Smith, 2013; Govindan et al., 2020; Kuzma et al., 2020).
3. No prior studies have validated their results on the SSCP–SP relation with an integrated theoretical viewpoint to explore both external pressures and firms' internal resources. In addition, no studies have generalised their moderation results with theoretical validation

and checking for publication bias of collected samples (Cao & Lumineau, 2015; Chahal et al., 2020).

Based on the above gaps, this study aimed to address the following three research questions:

RQ1: What is the overall relationship between SSCP and SP in the existing literature?

RQ2: Which theory is applicable for interpreting the moderation effect (strong or weak) between SSCP and SP?

RQ3: Which tool can be employed to analyse the main relationship (SSCP–SP) and moderation effect?

Meta-analysis, a statistical technique for quantifying research findings across many studies, was adopted in this study. To conduct the meta-analysis, relevant existing literature was collected using the Web of Science and ScienceDirect databases during the time period of 2003–2022 (up to the time of conducting this study in early 2022). The complete process is described in the systematic literature review section.

The rest of the paper is organised as follows. Section 2 presents the systematic literature review, descriptive statistics, data coding and theoretical background, including hypothesis development. The research methodology is given in Section 3. Section 4 provides the analysis of the study. In section 5, the results of the study are explained. Section 6 discusses the findings and the theoretical and practical contributions of the study. Sections 7 and 8 provide conclusions and suggest future research directions.

2 Systematic Literature Review

We performed a systematic literature review, as recommended by Geng et al. (2017), of empirical studies on the effects of GSCM and CSR practices on SP. The time frame of sample collection was 2003 to 2022. We used different combinations ('OR' and 'AND') of keywords related to GSCM, IGP, EGP, CSR and SP to search two well-known portals: Web of Science and ScienceDirect. Only two databases were used to reduce the likelihood of mixing 'apples and oranges' in meta-analyses (Esteves et al., 2017). We took keywords from articles where the searched variables appeared in the title, abstract and keywords. In addition, following the advice of reviewers and our own knowledge, we included three articles that were not found in the database search but were relevant to our work (i.e. Abou-foul et al., 2020; Barnett & Salomon, 2012; Flynn et al., 2010). This initial screening process yielded 480 papers, of which 155 were duplicates. We

also made efforts to collect unpublished works, such as theses, dissertations, conference proceedings and any unpublished empirical research related to the SSCP–SP relationship. However, as all unpublished studies appeared to use similar data, constructs and measures, we did not select any unpublished studies for further analysis due to duplication effects (Wood, 2008). To improve the initial screening, we applied inclusion and exclusion criteria. After phase 2, our sample included 155 papers from the CABS Journal Quality List (Rowlinson et al., 2011). After phase 2, we validated the content of the collected samples by checking their hypotheses for relevance to the current research and coded common items for main and moderating variables. After Step 3, we were left with 64 studies. The complete inclusion and exclusion process (Köbis et al., 2021) at each stage is shown in Figure 1 for the 64 studies considered in the meta-analysis (provided in Table A1 of the Online Appendix A). Note that as this exceeds the threshold sample size of 30 (Hedges & Olkin, 2014), the analysis is valid.

<Insert Figure 1 here>

2.1 Descriptive Statistics

The highest numbers of selected research papers were from 2017 (n = 9) and 2020 (n = 9), followed by 2012 (n = 6), 2015 (n = 6), 2019 (n = 6), 2008 (n = 4), 2014 (n = 4), 2013 (n = 3), 2016 (n = 3), 2022 (n = 3), 2021 (n = 2) and 2010 (n = 2). Most articles were published in the *International Journal of Production Economics* (n = 12), followed by the *International Journal of Operations and Production Management* (n = 10), *Journal of Operations Management* (n = 7), *International Journal of Production Research* (n = 7) and *Business Strategy and the Environment* (n = 7). Most articles were from the United Kingdom (n = 14), followed by China (n = 12), the United States (n = 12), Malaysia (n = 3), Spain (n = 3) and India (n = 3). The majority used covariance-based structural equation modelling (n = 40) to analyse their empirical data, followed by regression (n = 16) and partial least squares structural equation modelling (n = 8). Although many articles (n = 31) did not explicitly adopt any theoretical perspective, others adopted the resource-based view (n = 7), stakeholder theory (n = 6), NRBV (n = 4), dynamic capability theory (n = 4), stakeholder resource-based view (n = 2) and institutional theory (n = 2).

2.2 Data Coding

We coded 64 empirical studies on the SSCP–SP relationship published between 2003 and 2022 for meta-analysis. Two authors and three independent research assistants (coders) recorded the data

following a coding scheme consisting of two main parts: key characteristics of sample studies (i.e. study name, publication year, industry type, country, firm practices certification, firm innovation level) and methodological aspects (i.e. construct type, sample size, data collection method, method of analysis). To ensure that the items of each construct in the primary studies belonged to the respective constructs in our study presented in Table 2, 75% of the items should closely match our definition (Hunter & Schmidt, 2004). Considering the conceptualisations of the variables of interest, SSCP was categorised into IGP, EGP and CSR, and SP was categorised into environmental performance (ENP), social performance (SOP) and economic performance (ECP). Likewise, we coded the publication year (time horizon) of the collected studies as either before or after 2015. For type of economy, we coded the countries of respective studies as either developing or developed nations. We coded firm certification as either ISO certified or ISO not specified. Regarding data collection method, each study was coded as either offline (actual visit) or online (secondary data). Similarly, industry type was coded based on the firm's manufactured products as either consumable or non-consumable. Finally, approach to innovation was coded as either highly innovative or traditional. We calculated inter-coder reliability based on the number of judgements on which coders agreed. This coding and discussion process yielded satisfactory (above 90%) inter-coder reliability of 92% (Perreault & Leigh, 1989).

<Insert Table 2 here>

2.3 Theoretical Background

We integrated two theories – the NRBV and IBV – because they explore different aspects of SSCP's impact on firm performance. The NRBV links SSCP (i.e., green practices and CSR) with their impact on a firm's economic, social and environmental performance. Nevertheless, the NRBV is a resource-side approach that builds justifications for benefit acquisition by enterprises by focusing primarily upstream on the supply chain and inside firms (Priem & Swink, 2012). The demand-side approach, which focuses on downstream consumers and other non-shareholders (e.g. government entities), is neglected by the NRBV, which explains policies to enhance asset generation (Golicic & Smith, 2013). Therefore, we integrated the IBV with the NRBV, as the IBV explores other aspects that may influence SSCP's impact on firms' SP (Rodríguez-Espíndola et al., 2022). Institutional theory explores how external pressures drive a company to implement organisational sustainable practices (Li et al., 2020a).

SSCM is crucial to promote sustainability in the industry (Tonelli et al., 2013). Research related to SSCP has increased dramatically over the years in several sectors. According to Mathivathanan et al. (2018), SSCM involves the 'management of social, economic, and environmental impacts of the firms' operations', and it promotes beneficial manufacturing practices across the product lifecycle. Recently, SSCP has become a major global concern due to customer expectations, government regulations and pressure on customers to buy green products (Marcon et al., 2017). The resource-based view claims that operations based on sustainable practices enhance firm performance (Govindan et al., 2020). Similarly, following the NRBV, Golicic and Smith (2013) studied the association between sustainable practices and their influence on firms' environmental and economic performance. Govindan et al. (2020) also argue that, following the NRBV, implementing sustainable practices and environmentally sensitive operations in any part of a company's supply chain will enhance firm performance. Mao et al. (2017) also applied the NRBV to examine the relationship between firm performance and carbon emissions reduction. They found that firms' ENP could be improved by reducing carbon emissions through improving processes but doing so might hamper financial performance.

The IBV is widely employed in studies examining environmental management in organisations (Hoffman, 1999; Yawar & Kauppi, 2018). The benefit of the IBV is its justifications for why specific actions are taken even when they do not seem to produce a clear economic benefit (Glover et al., 2014). The IBV can describe how decisions about sustainable activities are impacted by shifts in social values, technological developments and regulations (Ball & Craig, 2010). According to Morali and Searcy's (2013) survey of the academic literature on sustainable supply chains, institutional theory generally aids in comprehending the sustainable practices that businesses undertake regarding their external stakeholders. However, the social dimension of sustainability is not often the focus of studies on SSCM (Ashby et al., 2012; Touboulic & Walker, 2015). Ball and Craig (2010) discovered that enterprises become more environmentally conscious as a result of normative pressures, and they claim that institutional research is necessary to comprehend new social norms – such as ethical values and ecological thinking – and organisations' responses to environmental issues. According to Campbell (2007) and Preuss (2009), stakeholder pressure, concerns about legitimacy and governmental and private rules are the primary variables that influence the adoption of socially responsible activities. Furthermore, Tate et al. (2011)

asserted that institutional pressures influence the adoption of socially and environmentally responsible practices in supply chain strategies.

According to the IBV, organisations function inside societal systems, and their activities are not limited to dyadic inter-relationships. This means that a key motivating factor driving corporate action is socially oriented and should be integrated into institutional bodies and associated organisational structures (Ashrafi et al., 2020). The dominant aspects of CSR and SP research, which holds the 'exhaustive non-economical motivating factors' may influence firms' patterns of behaviour (e.g. cultural context, policies, regulatory requirements). It also provides a useful conceptual framework for understanding the inter-relationships among shareholders and non-shareholders (e.g. consumers, governments, non-profits) (Hasan et al., 2018). According to Wolf (2014), companies applying CSR initiatives report reduced pressure from internal and external stakeholders, which might enhance GSCM. In addition, CSR may assist businesses in paying greater attention to social concerns, environmental protection and social welfare, which may result in changes in management behaviours (Chernev & Blair, 2015). In the context of sustainability, previous meta-analyses of the sustainability literature have focused primarily on environmentally sustainable practices (Golicic & Smith, 2013). A comprehensive analysis of studies addressing social and environmental sustainability is missing (Govindan et al., 2020).

Therefore, following the steps suggested by Geng et al. (2017) and Fang and Zhang (2018) for conducting a systematic review, we compiled empirical studies (shown in the Online Appendix) that considered the correlation between SSCP, CSR and SP in different industries. Based on the existing literature, the following hypotheses were formulated.

2.4 Proposed Hypotheses

This section presents various hypotheses for understanding the relationship among sustainable practices, CSR and SP through various theoretical lenses. Moderator variables were identified based on industry type, national economic type, time horizon, ISO certification, approach to innovation (innovative vs traditional) and the effect of the time horizon. Finally, a conceptual framework for deeper analysis is presented based on the proposed hypotheses and identified moderators.

2.4.1 Overall Relationship Among Green Practices, CSR and SP

IGP relate to the strategic activities relevant to interorganisational problems and involve strengthening internal processes to improve environmental, economic and social results (Raut et al., 2019). According to the IBV, environmental pressures exerted on organisations by various stakeholders and regulatory pressures exerted on manufacturers by governments lead to adopting IGP in the supply chain (Li et al., 2020a; Rodríguez-Espíndola et al., 2022). According to Yang (2018), IGP in supply chains and external green collaborations enable firms to achieve green performance. Ali et al. (2021) followed the NRBV in their empirical study on small and medium enterprises in China and found that sustainable manufacturing practices positively influenced firms' SP. Similarly, Li et al. (2018) adopted the NRBV to analyse GSCM performance and found that IGP was positively associated with improved SP. Lin and Sheu (2012) examined the role of the resource-based view in influencing green supply chain practices and SP. Similarly, Saeed et al. (2018) conducted an empirical study to identify the impact of IGP and EGP on economic and environmental performance through the application of resource dependence theory. Ahmed and Najmi (2018) adopted institutional theory to provide evidence of IGP's influence on firms' economic and green performance and found that IGP positively impact green performance. However, other research has shown a negative correlation between IGP and SOP (Younis et al., 2016) and an insignificant relationship between IGP and ECP (Zhu et al., 2013). Activities related to IGP represent a company's capacity to implement a sustainability policy intended to reduce the negative environmental effects of its services, such as the engagement of senior management, cross-functional collaboration, green production, eco-design and internal green management (IGM) (Blanc et al., 2019). IGM includes proper training, employee incentives for environmental suggestions and pollution-mitigating plans. Green production includes environmentally friendly firm practices, and eco-design consists of incorporating reuse, recycle and recovery into service and product design. Thus, IGP are consistent with the sustainability dimensions of the TBL (Bourlakis et al., 2014). Therefore, the following hypothesis is established:

H1: *IGP will be positively and significantly associated with SP*.

Govindan et al. (2014) suggested that EGP are activities that involve external collaboration with partners, suppliers or consumers. In this study, EGP can be described as 'external environmental managing activities that facilitate collaboration with [supply chain] partners or

stakeholders for environment goals, social goals, and strategies' (De Giovanni, 2012). EGP include green purchasing (GP1), green packaging (GP2), investment recovery and reverse logistics. GP1 involves using green suppliers and buying environmentally friendly raw materials; GP2 involves using eco-friendly, reusable, recyclable and returnable packaging (Renwick et al., 2013). Reverse logistics involves recovering, replacing and reselling end waste and returned by-products. Thus, EGP mainly involve collaborating with vendors, second-tier suppliers and end consumers to reduce the adverse impact of products and practices (Guo et al., 2020; Huang & Li, 2018). Govindan et al. (2014), adopting the NRBV and stakeholder theory, found that GSCM practices positively influence firm performance. Similarly, Baah et al. (2021), following the NRBV, reported a positive association between green practices and firms' SP. Contrasting the promising results of these theories, neoclassical economic theory frequently suggest a negative connection between sustainable EGP and firms' SP. According to Aupperle et al. (1985), a business that chooses proactively sustainable initiatives will be at commercial risk. Ahmed and Najmi (2018) conducted an empirical study adopting the IBV and found that EGP have an insignificant relationship with firms' green performance. Zhu et al. (2013) studied the impact of green supply chain practices on Chinese manufacturers' performance and found that EGP do not fully influence ECP. According to Barnett and Salomon (2006), EGP initiatives entail significant expenses for firms, resulting in lower ECP. Green et al. (2012), on the other hand, found that EGP in terms of engagement with customers and capital payback are positively related to ENP but not ECP. Thus, EGP are consistent with the suitability dimensions of the TBL. Therefore, the following hypothesis is proposed:

H2: *EGP will be positively and significantly associated with firms' SP*.

According to the IBV, firms have started to extend their CSR from internal manufacturing to supply chain stakeholders. Thus, CSR is described as 'a fulfilment of the financial, moral, ethical and contractual obligations required of community' (Saeed et al., 2018). According to Govindan et al. (2020), CSR's main role is to create revenue for stakeholders; being engaged in social sustainability activities decreases profitability and results in a higher business interaction expense and lowered ECP. Bird et al. (2007), following stakeholder theory, argued that it is challenging for firms to maintain their market share and profitability without creating value for stakeholders. According to Chi (2011), implementing CSR practices enables companies to create a reliable

supply chain over the long term. Alt et al. (2015) contributed to the CSR and NRBV literature and focused on improving firms' ENP. Similarly, Oware and Mallikarjunappa (2019), adopting the NRBV, found that CSR positively influenced the financial performance of firms in India. However, following the principal–agent theory, Lazonick and O'Sullivan (2000) argued that generating profits for stakeholders is a firm's main responsibility and that involvement in environmental and social sustainability practices incurs high agency relationship costs and reduces firm profits. Martinez-Conesa et al. (2017), stressing stakeholder theory, confirmed the influence of organisational innovations and CSR initiatives (social and environmental) on improving firms' performance. Waheed and Zhang (2020) adopted stakeholder theory in a study of China and Pakistan and found that CSR practices positively influenced firms' sustainable and competitive performance in both countries. Thus, CSR may lead to achieving TBL outcomes. Therefore, the following hypothesis is proposed:

H3: *CSR practices will be positively and significantly associated with firms' SP.*

2.4.2 Moderating (Sub-group) Hypotheses

The nature of underlying correlations may change when the studies sampled for meta-analyses are carried out in varied populations with varying business sizes and across several industries. Thus, investigating a range of potential moderators can elucidate variations in outcomes. The hypotheses proposed based on moderators' impacts on SSCP and SP is explained below.

The correlation among green production, CSR, SP and SSCP has varied over time. Before 2015, most firms were at an earlier stage of technology adoption due to coercive influence (Espíndola et al., 2022). Thus, most firms found highly positive interactions among green production, CSR and SP, as these firms were not affected by globalised competition and other supply chain disruptions (Shen et al., 2019). Yet some studies have noted that adoption of SSCP has improved since 2015 due to increased institutional pressure on firms from governmental and non-governmental organisations – which is in line with the IBV – as well as ISO regulatory bodies (Choi & Luo, 2019; Govindan et al., 2020). In sum, green supply chain practices and CSR have had diverse interactions with SP over time. Therefore, the following hypothesis is proposed:

H4: *The effects of green practices and CSR on firms' SP will be significantly stronger after 2015 than before 2015.*

The regulations and organisational norms of developed nations differ from those of emerging economies (Wu & Jia, 2018). In addition, higher environmental taxes (in terms of GDP per capita) in developing countries compel corporations to follow sustainable practices (Choi, 2013). Planned incentives for economic development are often higher in developed economies than in emerging ones. It has also been suggested that environmental concerns are positively associated with GDP per capita (Franzen, 2003) and that developed countries are more concerned about the environment (Govindan et al., 2020). Laws and regulations are also often more rigid in developed versus underdeveloped countries (Wu & Jia, 2018). As a result, firms with stronger environmental performance in industrialised nations should be rewarded more than those in developing ones (Govindan et al., 2020). However, surprisingly, Govindan et al.'s (2020) meta-analysis found that green and sustainable practices enhance firms' performance more significantly in developing economies than in developed economies. Furthermore, customers in developing nations, according to Biswas and Roy (2015), are slowly becoming more environmentally aware. However, in underdeveloped nations, a lack of high-quality data for use in decision-making contributes to poor SP. As a result, in developed economies, given the importance of information technologies, the association between sustainability practices and company performance should be stronger than in emerging nations (Govindan et al., 2020). Similarly, Zhu et al. (2008) observed that customers in developing economies are more concerned about the environment and high social growth, which may increase stakeholder pressure. However, limited data is available regarding decision-making in the sustainable development of service firms in developing economies. Sustainable practices in emerging nations are inferior to those of advanced nations. Thus, SSCP may be more closely related to SP in developed countries than developing countries. Therefore, the following hypothesis is proposed:

H5: *The effect of green practices and CSR on firms' SP will be significantly stronger for developed economies than developing economies*.

Previous studies have found that ISO-certified organisations are more likely to follow GSCM procedures (Zailani et al., 2012a). The ISO certification procedure confers extensive knowledge and expertise on environmental and social issues for organisations that encourage the implementation of SSCP (Ann et al., 2006). Zhu et al. (2008) outlined a favourable association between ISO 14001 certification and the implementation of sustainable procedures in the field of

organisational development. They claimed that the expertise and awareness developed through the ISO 14001 certification create an impetus that contributes to acceptance of SSCP at the firm level. Similarly, Zailani et al. (2012b) suggested in the Malaysian context that ISO 14001–certified companies are more likely to collaborate with their suppliers in adopting green practices and with consumers for green purchasing. Nevertheless, the significant cost of an ISO certificate may divert capital from investments in sustainable operations (Ann et al., 2006). Several studies also indicate that businesses benefit from adopting SSCP regardless of whether they are ISO certified (Geng et al., 2017). Furthermore, standards like the ISO 14001 are expensive (Vanalle et al., 2017). Firms attempt to implement SSCP congruent with these standards despite actually obtaining those (Zhu et al., 2012). Thus, the following hypothesis is proposed:

H6: *The effect of green practices and CSR on firms' SP will be more significant for ISO-certified firms than for non-certified firms.*

Kim and Peterson (2017) claimed that response rates are better for offline data collection than online. Since participating experts have more time to respond offline than online, it is relatively easier for experts to answer offline survey questions (Liu et al., 2016). However, some studies have shown that online data are more authentic than offline data due to reduced bias. Therefore, the following hypothesis is proposed:

H7: *The effect of green practices and CSR on firms' SP will be significantly stronger for studies using offline methods of data collection compared with online methods.*

Businesses in consumable industries (CI) have different operational capabilities and SP than those in non-consumable industries (NCI) (Chavez et al., 2017). In addition, because CI are diverse and more focused on consumer perceptions and workers, the effects of manufacturing and distribution of commodities are harder to specify in CI (Liao et al., 2017). In considering types of interrelationships among firms and consumers, studies have found that the correlations among supply chain resilience, supply chain integration and SP are weaker in CI than NCI. Thus, the following hypothesis is proposed:

H8: *The effect of green practices and CSR on firms' SP will be significantly stronger for CI than NCI.*

Zhu and Sarkis (2004) and Zhu et al. (2005) have argued that SSCP have not contributed to better economic performance in Chinese manufacturing firms. An early stage of SSCP adoption at

the firm level usually requires investment, which increases operational costs and reduces economic benefits despite positively impacting social and environmental performance (Xiao & Choi, 2019). In contrast, some studies have examined the negative relationship between SSCP and environmental performance, as there is a lack of internal environment management, green production plans, green purchasing and eco-design (Lee, 2008). Thus, findings are mixed regarding the SSCP–SP relationship. Therefore, the following hypothesis is proposed:

H9: *The effect of green practices and CSR on firms' SP will be varied for economic, environmental and social performance studies.*

Innovative strategic CSR initiatives improve organisations' efficiency and effectiveness. However, an innovative outcome does not improve ENP and SOP to a large extent due to avoiding green practices and human safety during technology adoption. Some studies have noticed a high positive correlation among traditional practices, ECP, SOP and ENP (Guo et al., 2005). Meanwhile, CSR's impact on GSCM may be influenced by information technology (e.g. big data analytics; Liu & Zhang, 2017). In GSCM, big data analytics and related technologies have strong potential (Wang et al., 2020) to – for example – aid enterprises in properly identifying environmental demands (Wamba et al., 2017) and capturing environmental data (Kwon et al., 2014). This may moderate the impact of green practices and CSR (both internal and external) on firms' SP. On the other hand, Guo et al. *(*2020) asserted that green innovation reduces firms' environmental burden and that these innovation efforts correspond to improved products, practices and systems. Furthermore, they examined how green innovation mediates the relationship between environmental ethics and firm performance. Contrary to this, Abiodun et al. (2019) reported a positive moderating impact of innovation on the relationship between environmental resource abundance and firm performance. Thus, it may be concluded that traditional and innovative-based practices influence IGP (e.g. IEM, GD), EGP (GP, RL) and CSR (e.g. DM, CDM) differently. Thus, the following hypothesis is proposed:

H10: *The effect of green practices and CSR on firms' SP will be significantly stronger for innovative firms than traditional firms.*

Based on the above, a combined hypothesis model was formulated, as shown in Figure 2.

<Insert Figure 2 here>

2.5 Interplay Among Proposed Hypotheses and Various Theoretical Lenses

Table 3 shows the various theoretical lenses and variables on which the hypothesis has been proposed to analyse the impact of SSCP on firms' SPs in the presence of various moderators.

<Insert Table 3 here>

3 Research Methodology

A flow chart of the complete research process for this study is presented in Figure 3.

<Insert Figure 3 here>

The process of conducting the meta-analysis is described below.

3.1 Meta-Analysis

In our meta-analysis, we derived the individual correlation coefficients of the identified sample based on SSCP–SP relationships (Hunter & Schmidt, 2004) and consolidated the findings using existing studies with conflicting and inconclusive results (Govindan et al., 2020). We adopted the stepwise meta-analysis approach suggested by Muka et al. (2020) because it provides a truly systematic review of the literature and aids in conceiving and designing evidence syntheses. This step-by-step meta-analysis guide simplifies this complex process and increases readers' understanding.

Step 1: We selected research papers by searching related keywords, as shown in Figure 1.

Step 2: We applied exclusion criteria to the selected articles depending on the variables' (SSCP and SP) correlations reported in the empirical studies. Some papers were excluded through hypothesis checking regarding moderators (control variables) or sub-group impacts on main variables.

Step 3: Our sample contained 17 studies that shared one or more authors with another study; thus, we examined these for duplication following the detection heuristic provided by Wood (2008). Sixteen sets (e.g. Boon-itt, S.; Chavez, R.; Chowdhury, S.; Dai, J.; Foerstl, K.; Gunasekaran, A.; Huo, B.; Jabbour, C. J. C.; Lai, K.; Lawson, B.; Malesios, C.; Sarkis, J.; Soares, A.; Wong, C. Y.; Wong, C. W. Y.; Zhu, Q.) had completely different samples, and one set (e.g. Yu et al., 2017; Yu et al., 2019) examined different construct items, with the exception of supply chain integration. We also aggregated any similar categorical effects (e.g. sustainability-based performance) within single studies to ensure that independent effects were used (Wood, 2008).

Step 4: We determined the effect size to represent the interrelationships among variables. The effect size may be a correlation coefficient or obtained from other static coefficients, such as a beta coefficient or chi-squared.

Step 5: We estimated the mean correlation coefficient based on the individual correlations of selected samples. We used the random-effects model, as given by the following expression (Schmidt & Hunter, 2014):

$$\check{r} = \sum[w_i r_i] / \sum w_i ,$$

where w_i is the weight of the i^{th} sample and r_i is the individual effect size.

Step 6: We estimated the corrected mean effect size to reduce measurement errors in the main hypothesis checking. The expression below helps determine the corrected effect size based on mean reliability (Hunter & Schmidt, 2004):

$$\check{r}_c = \check{r} / \sqrt{\check{r}_{xx}} . \sqrt{\check{r}_{yy}}$$

where $\check{r}_{xx}$ is the reliability coefficient of supply chain integration practices and $\check{r}_{yy}$ is the reliability coefficient of SP.

Step 7: We tested the level of heterogeneity in the sample studies to determine the variations in effect size. I^2, T^2 and Q are the statistical formulas given by Higgins et al. (2003) for calculating heterogeneity, as given below:

$$I^2 = ((Q - df)/Q) * 100\%$$

$$Q = \sum w_i * r_i^2 - [\sum(w_i * r_i)]^2 / \sum w_i^2$$

$$T^2 = (Q - df)/C, \text{ where } C = \sum w_i - (\sum w_i^2)/\sum w_i$$

where df denotes the degree of freedom equal to k -1, where k is the number of studies; Q represents the error variance of the sample studies; T^2 reflects the absolute variation in the scale or the absolute value of the true variance, rather than a proportion of observed variance; and I^2 denotes the 'total variance caused by heterogeneity or proportion of variance that is true'. A higher I^2 value implies greater heterogeneity (Higgins et al., 2003):

I^2 = 25% : low heterogeneity

I^2 = 50% : moderate heterogeneity

I^2 = 75% : high heterogeneity

Note that if I^2 is more than 75%, the random-effects model is preferred over the fixed-effects model (Borenstein et al., 2010). In the event of high heterogeneity, sub-group (non-metric

parameters) analysis and meta-regression (metric parameters) must be adopted to analyse the moderators' impact on the main hypothesis (the impacts of control variables on the SSCP–SP relationship).

Step 8: Checking publication bias is a prerequisite for hypothesis testing. We used funnel plots (trim-and-fill approach) to qualitatively evaluate publication bias (Duval & Tweedie, 2000). A funnel plot is a scatterplot of individual effect sizes from the collected studies against a measurement scale of study precision (standard error) (McDaniel et al., 2006). Additionally, this 'fail-safe *N* test' is used to quantitatively check for the non-existence of publication bias in samples (Rothstein et al., 2005). This test calculates the surplus numbers of studies with insignificant correlations that need to be added to the sample to reverse the inter-relationship to significant. As suggested by Rosenthal (1991), the minimum *N* value at a 95% confidence interval is $N_{fs} > 5 \times$ number of studies + 10, where N_{fs} is the fail-safe *N* value.

Step 9: We checked the validity of the hypotheses, taking into account moderation effects, by using bivariate hierarchical approaches like sub-group analysis (Schmidt, 2017) and meta-regression. The sub-group approach provided more robust outcomes due to its compatibility with high heterogeneity (Schmidt, 2017).

Step 10: Meta-regression can also be used to analyse whether observed heterogeneity is the outcome of a single sample or demographic factors. Meta-regression is identical to traditional linear regression, which is often used to assess the influence of a single attribute on dependent variables. Meta-regression is also conducted where more than 10 studies are included in a meta-analysis (Thompson & Higgins, 2002).

4 Analysis

4.1 Main Hypothesis Checking

The analysis of the forest plot of H1–H3 is given in detail in the Online Appendix. Table 4 and Figure 4 show the correlation results and hypothesis testing. EGP is most correlated with SP (0.45), followed by IGP (0.44) and CSR (0.42). All three hypotheses are supported, as the confidence interval does not include zero with significance (p = 0.000). The high I^2 value (over 75%) indicates potential moderators. Finally, the N_{fs} value shows that the collected sample is above the minimum threshold value to avoid publication bias. Moreover, the SSCP–SP relationships are significant at p = 0.000.

<Insert Table 4 here>

<Insert Figure 4 here>

4.2 Moderator Impacts on H1 (IGP–SP)

Table 4 and Figures 5–11 show the impact of subgroup analysis on HI. Hypotheses H4–H10 are supported with positive correlations and significant effects ($p < 0.01$) on the IGP–SP relationship. The results of forest plots for subgroup analysis on H1 are shown in Figures A3-1–A3-7 of the Online Appendix. Blue circles represent the correlations and sample sizes of individual studies; circle size denotes the study's sample size, and its centre distance denotes its correlation. Red circles denote the aggregated result of an individual subgroup. Similarly, green circles denote the aggregated result of all subgroups. Black lines represent confidence intervals and green lines denote prediction intervals (Govindan et al., 2020).

4.3 Moderator Impacts on H2 (EGP–SP)

Table 4 and Figures 5–11 shows the impact of sub-group analysis on H2. Hypotheses H4–H6 and H8–H10 are supported with positive correlations. However, H7 is not supported, meaning that offline data collection has an insignificant effect ($p > 0.01$) on the EGP–SP relationship. The results of forest plots for subgroup analysis on H2 are shown in Figures A3-8–A3-14 of the Online Appendix.

4.4 Moderator Impacts on H3 (CSR–SP)

Table 4 and Figures 5–11 show the impact of sub-group analysis on H3. Hypotheses H4–H10 are all supported with positive significant ($p < 0.01$) correlations for the CSR–SP relationship. The results of forest plots for subgroup analysis on H3 are shown in Figures A3-15–A3-21 of the Online Appendix.

<Insert Figures 5–11 here>

4.5 Meta-Regression of Combined Studies

Meta-regressions of publication year and effect size are shown in Figure 12 for H1, Figure 13 for H2 and Figure 14 for H3. The effect sizes of the sample studies are related to publication year. As shown in Table 4, there are significant and low relationships (lower regression coefficient) between correlations and publication years for each hypothesis except H2. The confidence interval does not include zero for H1 ($B = 0.02$, $\beta = 0.32$, $p < 0.01$), H2 ($B = 0.01$, $\beta = 0.11$, $p > 0.01$) or H3 ($B = 0.02$, $\beta = 0.27$, $p < 0.01$).

<Insert Figures 12–14 here>

*4.6 **Publication** Bias **Testing***

4.6.1 Testing Publication Bias for H1

Figure 15 shows a symmetrical funnel plot of the collected samples for H1. In these plots, studies are uniformly dispersed around the mean and most are clustered together; hence, there is no significant publication bias.

<Insert Figure 15 here>

4.6.2 Testing Publication Bias for H2

Figure 16 shows a symmetrical funnel plot of the collected samples for H2. In these plots, studies are uniformly dispersed around the mean and most are clustered together; hence, there is no significant publication bias.

<Insert Figure 16 here>

4.6.3 Testing Publication Bias for H3

Figure 17 shows a symmetrical funnel plot of the collected samples for H3. In these plots, studies are uniformly dispersed around the mean and most are clustered together; hence, there is no significant publication bias.

<Insert Figure 17 here>

4.6.4 Testing Publication Bias of Combined Samples

Figure 18 shows a symmetrical funnel plot of the collected samples for all combined studies. In these plots, studies are uniformly distributed across the mean; hence, there is no significant publication bias. Following Duval and Tweedie's (2000) non-parametric trim-and-fill approach, we did not observe any imputed data, which indicates there were no significant changes in *p* values during the trimming process.

<Insert Figure 18 here>

5 Results

The results are presented in three sections: main variable analysis, sub-group analysis and meta-regression. First, we tested the associations of IGP, EGP and CSR with firm environmental, social and economic performance. We then tested the moderating relationships. In our database, 64 studies can help test the link between SSCP and SP.

5.1 Main Variable Analysis

We used meta-analysis to quantify the SSCP–SP relation. The overall SSCP–SP relationship is significantly positive (Z = 21.30, p = 0.000). Additionally, the combined effect size is 0.438, supporting the overall hypothesis (SSCP–SP). The above finding may be explained by the emergence of SP as a concept in response to the growing global awareness of SSCP (Yadlapalli et al., 2018). SP is considered the sustainable attributes and integration of environmental and CSR philosophy along the intra- and inter-firm managing of the upstream and downstream multi-tier system within supply chains (Zameer et al., 2020). We analysed each attribute of SSCP on firms' SP. The effects of IGP, EGP and CSR on SP are significant. The effect sizes for IGP, EGP and CSR are 0.44, 0.45 and 0.42, respectively. Thus, H1, H2 and H3 are supported by a positive correlation with SP (Muka et al., 2020). EGP has the largest effect size, followed by IGP and CSR. The CSR–SP relationship is supported by Zailani et al. (2012b), who observed that coercive (regulatory and reward) and normative (customer) pressures had a substantial favourable impact on adoption of EGP for GSCM, resulting in greater ENP. Suppliers, customers and market-associated normative influences are crucial in adopting IGP (Zhu et al., 2013). Additionally, businesses can take inspiration from their global rivals or supply chain allies to improve their environmental competencies (Saeed et al., 2018). Some prior studies have proposed considering institutional factors related to history, politics and culture predictors for CSR engagement, as corporations are more logically compelled to embrace CSR by firms that legitimise their initiatives, whereas stakeholders are motivated by such institutions (Campbell, 2007). The individual fail-safe value showed no publication bias. The fail-safe N of the combined relationship (SSCP–SP) is 8,418, which exceeds the minimum threshold sample size ($5 \times 64 + 10 = 330$), indicating insignificant publication bias.

5.2 Sub-group Analysis

After validating the main hypothesis, it is necessary to check the impact of the control variables (moderators) on the SSCP–SP relationship. We observed from H1 (IGP–SP) that seven moderators must be examined in the sub-group analysis. For H1, the statistical results for type of economy (developed vs developing) do not support H5, which means that IGP–SP is more closely correlated with developing countries (r = 0.48) than developed countries (r = 0.44). The above results are not aligned with H2 (EGP–SP) or H3 (CSR–SP). This finding may be explained by the

increasing awareness of green practices among consumers in developing countries, which forces firms to implement IGP. Zhu et al. (2011) indicate that regulations in developed countries have also increased institutional pressures for companies in developing countries to enhance green operations (i.e. IGP). In many developed markets, such as the United States, laws and regulations are important coercive pressures that drive firms' green practices (EGP), which supports H5 for H2. According to Aguinis and Glavas (2019), in a developing economy, CSR's impact on company performance is ambiguous because the motivations for individual CSR sense-making in various situations may change according to cultural and societal factors, supporting H5 for H3. However, several prior studies have revealed a positive association between CSR and firms' successful performance in developing economies, indicating an increasing realisation of Western CSR ideals in emerging Asian economies (Govindan et al., 2020; Kolk et al., 2010).

For H1, the statistical results of the time horizon support H4, which means IGP and SP are more closely correlated after 2015 (r = 0.47) than before 2015 (r = 0.42). These results are supported for H2 (EGP–SP) and H3 (CSR–SP). This finding may be explained by the limited focus prior to 2015 on CSR-based external sustainable practices due to poor technological infrastructure for external coordination and regulations affecting only internal sustainable practices (Choi, 2018). Intra-firm sustainable initiatives have been incorporated at a larger scale after 2015 due to institutional pressure and improved innovative approaches (Gao et al., 2018).

For H1, the statistical results for ISO certification status (ISO certified vs non-certified) support H6. IGP and SP are more closely correlated for ISO-certified firms (r = 0.49) than non-certified firms (r = 0.42). These results do not align with H2 (EGP–SP) but are aligned with H3 (CSR–SP). ISO-certified practices confer a high degree of knowledge and training on environmental issues for organizations that encourage the implementation of SSCP (Yusuf et al., 2007). Furthermore, expertise and awareness on the implementation of ISO 14001 certification have created enthusiasm that has inspired the adoption of SSCP (Ann et al., 2006).

For H1, the statistical results for method of data collection (online vs offline) do not support H7. There is a constant IGP-SP relation for online (r = 0.45) and offline (r = 0.45) data collection. These results are not aligned with H2 (EGP–SP) or H3 (CSR–SP), indicating varying results for online and offline modes of data collection. These findings may be explained by the fact that some results from offline surveys claimed more influence of SSCP on ECP (Liu et al., 2016) compared

with online data . Nevertheless, some research based on online data (e.g. Cao & Zhang, 2011) has shown a stronger impact of integrating green practices on SP compared with offline data (Han et al., 2017).

For H1, the statistical results for type of firm product (CI vs NCI) do not support H8. IGP and SP are more closely correlated for firms in CI (r = 0.48) than NCI (r = 0.41). These results are aligned with H2 (EGP-SP) and H3 (CSR-SP). There has recently been a greater need for SSCP in CI firms compared with NCI firms due to the COVID-19 pandemic, which increased pressure from consumers and regulatory bodies (Ivanov, 2020).

For H1, the statistical results for types of SP (ENP, ECP and SOP) support H9. There is a varied IGP–SP relationship for ENP (r = 0.55), ECP (r = 0.41) and SOP (r = 0.44). These results are aligned with H2 (EGP–SP) and H3 (CSR–SP). The initial stage of SSCP adoption may require significant investment, which may increase ECP along with SOP and ENP (Xiao & Choi, 2019). However, as the period of SSCP adoption increases, SOP and ENP may decrease while ECP increases due to low green practices adoption at every stage of the supply chain.

For H1, the statistical results for type of innovative approach (innovative vs traditional) support H10. There is a varied IGP–SP relation for innovative (r = 0.47) and traditional (r = 0.44) firms. The above results are not aligned with H2 (EGP–SP) but are aligned with H3 (CSR–SP). This result may be explained by the fact that some studies conducted at an earlier stage of technology adoption showed a negative correlation for H10 (Lee, 2008), but some studies conducted at the maturity stage of innovation showed a positive correlation for H10 (Ramanathan et al., 2020).

5.3 Meta-Regression

A significant ($p < 0.01$) relationship (including zero in the confidence interval) was observed for HI and H3. However, the relationship was insignificant for H2 ($p > 0.01$). Thus, the effect size does not change with time, as the regression coefficients for each hypothesis are very small (β_1 = 0.32, β_2 = 0.11, β_3 = 0.27). These findings are supported by Li et al. (2020b), who indicated that linear regression showed no identifiable trends for the present research study (SSCP–SP). We observed a negligible change in p values after following the trim-and-fill approach. Hence, the

collected samples are authentic representatives of the comprehensive literature (McDaniel et al., 2006).

6 Discussion

With mounting demands on sustainable growth in companies around the world, it is important to systematically analyse both the individual and cumulative impacts of sustainable firms' activities on the different parameters of supply chain efficiency (Longoni et al., 2018; Yu et al., 2019). According to the NRBV, firms' environment-responsive processes and activities in every aspect of the supply chain are expected to result in enhanced efficiency (Dong et al., 2019). In contrast, GSCM methods have not improved the economic performance of Chinese manufacturing enterprises, according to Zhu and Sarkis (2004) and Zhu et al. (2005). However, the idea of applying GSCM practices was still in its infancy in that research. Early stages of implementation typically call for expenditures, which increase operating costs and reduce financial gains. On the other hand, new research has looked at the link between GSCM procedures and financial success (Adomako & Tran, 2022; Agyabeng-Mensah et al., 2020). According to Hart and Dowell (2011) and Wood (2010), strategy planning research has only rarely made an extensive effort to explore the relationship between sustainability plans and business profitability (with the exception of CSR viewpoints).

The IBV proposes that, to deal with coercive, normative and mimetic pressure, firms should promote moral, CSR and green practices (IGP, EGP) that lead to improved results (Freeman, 2010). According to the IBV, non-governmental organisations, CSR standard-setting organisations and CSR frameworks and networks are normative institutions that establish the necessary norms for a company (Muthuri & Gilbert, 2011). According to Sardana et al. (2020), CSR is frequently viewed as a strategic tool for gaining reputational legitimacy and expanding a company's market potential, hence improving its financial and social success. Companies are thought to be more aware of CSR concerns and more inclined to behave in a socially responsible manner if they contact with or are members of CSR-promoting organisations (Ali & Frynas, 2018). In a recent study of 28 Indian listed commercial banks, Maqbool and Zameer (2018) showed that banks with superior CSR procedures performed better on both accounting and market performance indicators. Hence, companies that participate in CSR obtain several performance benefits.

6.1 Theoretical Contributions

This paper has many important theoretical contributions. The results are aligned with the NRBV and IBV, considering both intra and inter-firm strategies such as green design, green purchasing, reverse logistics and CSR practices. Our investigation is timely from both a managerial and a theoretical perspective, given that most studies on SSCP and firm performance are based on the environmental dimension of sustainability and often overlook the social dimension. This study explored several strategies for guiding sustainable outcomes based on green and CSR practices. This research also operationalised the main variables based on the NBRV and IBV, namely SSCP (IGP, EGP and CSR) and SP (ECP, ENP and SOP). We examined the impacts of IGP, EGP and CSR on firms' SP according to the NRBV and IBV. Further, we showed the viability of the NRBV by focusing on CSR initiatives in managing external and internal stakeholders in firms' supply chains. This study is also linked to the IBV through its encouragement of social activities, like improving employees' skills, eliminating hazardous work environments and promoting diversity and community rights.

Our findings align with a recent study by Qorri et al. (2021) based on the NRBV, which suggested that SSCP are closely linked with firms' SP. They further stated that both intra and inter-firm practices – such as green design, green purchasing and reverse logistics – can be regarded as packages of strategic resources that can bring enhanced performance and complement the NRBV. The results of our study are also aligned with previous meta-analyses (Geng et al., 2017; Golicic & Smith, 2013; Govindan et al., 2020). In our study, EGP was most highly correlated with SP, followed by IGP and CSR. This supports the findings of Govindan et al. (2020), who reported that green supply chain practices lead to stronger firm performance than social practices. However, Mishra and Suar (2010) supported the role of increased CSR in enhancing firm performance.

This study emphasises the importance of the NRBV, demonstrating that firms' competitiveness might arise from using resources or capabilities outside of company confines. Second, the analyses confirm the NRBV perspective, implying that all stakeholder assets must be handled to capitalise the skills and abilities needed to attain SP. We also confirmed the NRBV with our finding that developed economies need to follow stricter sustainable initiatives compared with developing economies, which results from the high SSCP–SP correlation for developed nations. The lower results for offline data collection are also aligned with the NRBV, as offline data collection

depends on field visits, which may lead to less involvement of stakeholders or experts in sustainability growth.

This study supports the IBV because the results indicate a positive effect of CSR for all primary stakeholders. This could create satisfaction among shareholders and non-shareholders, who can make cost advantages and efficiency gains through handling coercive, normative and mimetic pressure, which will eventually enhance firm performance (Mishra & Suar, 2010). According to the IBV, the expectations of various stakeholders should be the same across nations with comparable cultural traits, whereas the concept of CSR varies by country (del Mar Miras-Rodríguez et al., 2015). The findings of our study suggest that IGP and SP are more closely correlated in developing economies than in developed economies. This supports the findings of Govindan et al. (2020), who revealed that implementing sustainability practices is more beneficial for firms in developing economies than in developed economies. The results of our study could be explained by Sarkis et al.'s (2011) finding that regulations in developed countries have also raised institutional pressures for companies in developing countries to enhance green operations. Meanwhile, developing countries have increasingly enforced strict regulations (i.e. coercive pressures), leading manufacturers to implement GSCM practices, the effects of which are quite remarkable (Zhu et al., 2007). The findings of our study are aligned with the IBV, as CSR practices positively influence SP in developed economies more than in developing economies.

Further, the SSCP–SP relationship was moderated strongly by firms' innovative practice. To handle mimetic pressure, companies may follow competitors' innovative approaches because of their success, as successful companies are regarded as benchmarks in their industry. Our findings reveal that firms' approaches to innovation and type of economy have a strong influence on company behaviours regarding CSR sustainability concerns and sustainability outcomes. This is supported by the IBV, as developed economies' institutional structures and their impact on performance are driven by a company's CSR decisions. Hence, this research offers a different and more complex view on adoption of CSR sustainability practices in light of the IBV.

6.2 Managerial Implications

Our findings have practical implications for managers, who are accountable for SSCP problems and everyday operations. As our meta-analysis concisely collects evidence from a large number of studies, it helps managers identify the existing relationships among factors proven by various

studies. Moreover, because meta-analysis increases the accuracy of results, managers can use our work to understand the findings in the existing literature. The current study focuses on the impact of SSCP on SP, finding that the effect of sustainable practices on firms' financial, social and environmental success is significant. This should inspire businesses to implement sustainable policies to achieve long-term advantages. In addition, the results reveal that the impact of CSR on SP is stronger than that of IGP and EGP. Thus, managers should be mindful of their social accountability to stakeholders, customers and the economy to achieve the maximum SP outcome. Furthermore, the results of this study benefit managers by helping build their confidence in implementing environmental and socially sustainable practices, which will help improve their firms' sustainable performance. To further strengthen managers' confidence, our findings report practices that are already improving many firms' performance. Moreover, this research can guide managers in implementing a combined 'carrot plus stick' approach that uses both rewards and punishment to encourage employees' adoption of green practices. This research may also encourage policymakers to take proactive decisions to implement inter-firm green practices. Second, the results of this study suggest that year of data collection positively moderates the effect of SSCP on firm performance, implying managers should prioritize SSCP when strategizing to improve firm performance. Our results suggest that customer awareness and pressure may motivate firms to implement GSCM practices and CSR. Managers at small and medium enterprises can use these findings to leverage information and understanding to brand and advertise their activities to attract customers. This important finding shows that ISO regulations can stimulate firms to adopt SSCP for environmental innovation and thereby increase firms' competitiveness, which motivates managers to adopt ISO-certified suppliers and practices.

These research findings provide managers with multiple SP-measuring attributes, which may facilitate elaborating the advantages of implementing SSCP. The findings of our study benefit managers in identifying the benefits of implementing SSCP based on different moderators we studied, such as ISO certification, type of economy, time horizon, innovative approach and type of products produced. Furthermore, SP-based subgroup analysis showed that managers should be more focused on ENP, followed by SOP and ECP. Thus, IGP, EGP and CSR should be oriented more towards firms' ENP. Finally, based on time horizon sub-group analysis, managers should

also observe that the impact of SSCP on SP is increasing rapidly over time, which should motivate managers to increase their investments in the coming years.

6.3 Unique Contributions

The present study considered aspects of CSR, green practices and SP research, which holds that exhaustive non-economic motivating factors may influence firms' patterns and behaviours (e.g. cultural context, policies, regulatory requirements). Thus, the present research takes a multi-dimensional approach to SSCP–SP relationships. It also provides a useful conceptual framework for understanding the roles of shareholders and non-shareholders (consumers, governments, non-profits) in developing firms' SP. Furthermore, it provides a systematic review of quality studies covering the integrated SSCP–SP relationship – more specifically, CSR and social-oriented aspects of sustainability. To fill the gaps in existing research, this study offers unique outcomes related to the SSCP–SP relationship with an integrated theoretical viewpoint to explore both external pressures and firms' internal resources with generalized moderation results and theoretical validation.

Consequently, we anticipate that the present analysis will lead to progress regarding environmental SSCP in both concept and practice, in addition to providing an insightful summary of high-quality past studies. Therefore, this study is important in identifying drivers, metrics, contexts and additional elements that may affect the success of environmental and CSR practices relevant to the supply chain. The study also benefits downstream consumers by involving them (due to institutional pressure, in line with the IBV) in environmental issues and motivating them to accept green practices, services or innovative products. This results in positive outcomes such as reduced waste, less costly green products and improved product and service quality. Our research also benefits upstream suppliers by helping them to develop high-quality green products or procedures (based on the NRBV) with suppliers that decrease health hazards to consumers. Further, the present research can help important suppliers obtain Occupational Health and Safety Assessment Series (OHSAS) 18001 accreditation. Thus, the present research has implications for both upstream stakeholders (managers, suppliers) and downstream stakeholders (consumers) due to its integration of two theoretical viewpoints (i.e. NRBV and IBV). Therefore, the present study achieves the necessary objectives by overcoming research gaps and provides insightful theoretical and practical implications.

7 Conclusion

The present work systematically analysed 64 collected studies on the SSCP–SP relationship for service firms. Our research provides a basic understanding of the relationships among firms' SSCP (IGP, EGP and CSR) and several aspects of SP (ECP, ENP and SOP). IGP emphasises green design, green production and internal environment management. This paper proposed a hypothesised model for exploring the empirical-based correlations between SSCP and SP. Further, we presented a meta-analysis of the 64 selected articles using descriptive statistics to test the direct effects of the main variables and mediating effects of the moderating variables. We observed that EGP is most highly correlated (r = 0.45) with firms' SP, followed by IGP (r = 0.44) and CSR (r = 0.42). Furthermore, we reported the moderating influences of innovation capabilities and type of economy in the development process of SSCP, which adds to the literature on the link between CSR and SP.

The main hypotheses are supported with high significance ($p < 0.000$) and a high I^2 value (> 75%), indicating the presence of heterogeneity in the proposed relations. Therefore, we performed a subgroup analysis on the main correlations, which showed that all moderators positively mediate the SSCP–SP relation. We also performed a meta-regression to analyse the variations of sampled correlations with publication years, finding a low impact of mean-centred publications on correlations. Publication bias was checked using symmetric funnel plots for qualitative checking and the fail-safe N test (minimum threshold number of studies) for quantitative checking.

This study has a few limitations. First, this research mainly focuses on the NRBV and IBV, considering the sustainable green practices, CSR and regulatory pressures via various inter- and intra-firm stakeholders but is less orientated towards intra-firm sustainability outcomes. We also included fewer data points based on the collected samples for performing hierarchical sub-group analysis. Although there is heterogeneity in the sub-group analysis, our research is limited to sub-group analysis and does not go beyond this (i.e. meta-regression of each sub-group). We did not consider more attributes of the main variables in our sub-group analysis, such as green purchasing, green production and eco-design. In addition, we did not test the alternative model structures of the proposed framework (Figure 2). Another limitation is that some publication bias may remain in this study due to using the trim-and-fill method for funnel plots. Finally, our meta-regression was constrained to a specific time frame due to limited data.

In the future, more analytical approaches, such as co-citation analysis and author-wise citations, might be used to conduct in-depth bibliographic analysis. More studies may be included to increase the number of data points for conducting a meta-regression of each sub-group. In the future, more samples from manufacturing industries (e.g. automotive and construction industries) may be collected to represent more generalised results of contradictory outcomes. Finally, in future work, a meta-analysis with structural equation modelling could be used to explore and test the alternative model structures of the proposed framework.

8 Future Research Directions

The current study examined the relationship between SSCP and SP through a meta-analytical quantitative approach. In total, 64 studies were selected for a systematic literature review. We identified the current state of research and examined the relationships among the studied variables. As discussed above, this study provides various theoretical and managerial contributions but possesses some limitations identified through a thorough literature review. We have attempted to categorise these limitations based on different areas of exploration to help future researchers in accomplishing their goals accordingly. Hence, future research directions are provided based on various areas of limitation in the current study. Based on the above discussion, the future research questions shown in Table 5 may be used to extend this research.

<Insert Table 5 here>

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Table 1: Comparison of previous studies with the present research

Study	P	MQS	NS	SS	Theory			SSCP			SP			Moderators						HN	MR
					IBV	NRBV	AO	IGP	EGP	CSR	ENP	SOP	ECP	TH	TE	ISOR	MDC	TFP	IA		
Golicic and Smith (2013)	2000-2011	1*	31	15160		×		×	×				×	×	×					3	
Cao and Lumineau (2015)	2002-2012	1*	149	33051			×			×			×		×			×		9	×
Geng et al. (2017)	1996-2017	1*	50	25680				×	×		×	×	×			×				5	
Fang and Zhang (2018)	2004-2016	1*	54	9313				×	×		×		×	×	×	×				10	×
Tsai et al. (2019)	2006-2018	1*	92	72258				×	×				×	×	×			×		9	×
Govindan et al. (2020)	2010-2017	1*	118	47019		×	×	×	×	×			×	×	×			×		5	
Kuzma et al. (2020)	2012-2019	1*	15	9785											×		×			4	
Manhart et al. (2020)	2010-2018	1*	26	5906			×						×							4	×
Iftikhar et al. (2021)	2000-2019	1*	56	22615			×						×		×			×		7	
Qorri et al. (2021)	1996-2019	2*	143	33886		×	×	×	×	×	×	×	×		×	×		×		13	
Present study	**2003-2022**	**3***	**64**	**118056**	×	×		×	×	×	×	×	×	×	×	×	×	×	×	**10**	×

P: Period, MQS: Minimum Quality of Samples (As per CABS ranking), NS: Number of Samples, SS: Sample Size, IBV: Institutional Based View, NRBV: Natural Resource Based View, AO: Any Other Theory, HN: Numbers of Hypothesis, MR: Meta Regression

Table 2: Description of the main variables and their common aliases

Main variables	Explanations	Common items	Representative studies
Internal green practices (IGP)	IGP cover management-level operations and procedures, such as cross-functional collaboration for green technologies and overall qualitative environment protection. Internal green management therefore refers to internal organisational activities, including top leadership involvement, environmental compliance initiatives and department collaboration for environmental enhancements.	Use eco-friendly products (e.g. recyclable resources)	Abdul-Rashid et al. (2017), Geng et al. (2017), Fang and Zhang (2018), Cousins et al. (2019), Chan et al. (2022)
		Reduce CO_2 pollution during production or processing	
		Have innovative strategic plans that incorporate environmental concerns	
		Develop novel technologies to stop contamination and/or harmful emissions at their source	
		Maintain current environmental laws and standards (14001 ISO certified)	
External green practices (EGP)	EGP include green supplier collaboration and green customer collaboration. A central corporation and its suppliers collaborate on regulating cross-firm management operations, especially knowledge transfer and competitive alliances, for environmental reasons as part of green supplier collaboration. To increase transparency and enable collaborative management for the environment, green customer collaboration entails strategic knowledge exchange and coordination among a focal firm and its consumers.	Select green suppliers (14001 ISO certified)	De Giovanni (2012), Green et al. (2012), Abdul-Rashid et al. (2017), Fang and Zhang (2018), Adomako and Tran (2022)
		Motivate suppliers to adopt innovative green practices (e.g. reverse logistics)	
		Adopt energy-efficient innovative logistics operations (e.g. warehouse location and routes)	
		Cooperate with suppliers to create sustainable product lifecycle (e.g. eco-design, lifecycle assessment)	
		Motivate consumers to accept green practices, services or innovative products	
Corporate social responsibility (CSR)	According to CSR perspectives, ethical and moral considerations play a role in how corporations make decisions and behave toward their local communities. When seen from the viewpoint of stakeholders, CSR also has to do with meeting the	Conduct inspections to ensure workers' health and safety	Soares et al. (2017), Croom et al. (2018), Tang et al. (2012), Yu et al. (2019), Zhao et al. (2021)
		Help important suppliers obtain OHSAS 18001 accreditation	
		Take regulators' suggestions for planning and executing stages	

	expectations and demands of the stakeholders of a business.	Collaborate with non-governmental organisations to discover viable remedies for environmental issues	
		Develop high-quality products or procedures with suppliers that decrease consumers' health risks	
Environmental performance (ENP)	Environmental outputs are the effects of SSCP on both the internal and external environmental harm caused by organizations. ENP includes cutting back on use of solid toxic products as well as air and water pollutants.	Reduction in hazardous and dangerous items used	Green et al. (2012), Esfahbodi et al. (2016), Dey et al. (2019), Jadhav et al. (2019), Liu et al. (2020), Wong et al. (2020)
		Reduced CO_2 generation	
		Reduced energy needed to process solid waste	
		Reduced ecological mishaps and protection of local biodiversity	
		Increased adherence to environmental regulations	
Social performance (SOP)	SOP measures advancements in consumer health, workplace safety and stakeholder welfare in general. SOP was used in this study to assess the effects of GSCM and CSR activities related to improving the image of a firm and its products, safeguarding the health and safety of its employees and fostering consumer trust and fulfilment.	Improved communication with stakeholders and communities	Abdul-Rashid et al. (2017), Papadas et al. (2017), Ramanathan et al. (2020), Rodríguez-Espíndola et al. (2022)
		Enhanced social living standards	
		Increased technological knowledge and preservation of interests and obligations of those serving communities	
		Increased work satisfaction for employees	
		Improved brand image	
Economic performance (ECP)	ECP is firm success, which refers to overall profitability as a key justification for businesses to adopt GSCM and CSR policies. .	Increased market share and overall profit	Dey et al. (2019), Li et al. (2019), Agyabeng-Mensah et al. (2020), Ramanathan et al. (2020)
		Reduced expenditures for purchased resources, waste remediation and energy use	
		Growth in rate on return for investment and increased sales	

Table 3: Role of theoretical lenses in hypothesis formulation

Theoretical lens	Hypothesis	Variables	Theoretical contribution to hypothesis formulation	References
Natural resource-based view (NRBV)	H1	Pollution mitigation, product stewardship, sustainability development	Pollution mitigation aims to decrease waste using a continuous-improved strategy (i.e. reducing ecosystem harm and deterioration by monitoring pollutant discharge, energy consumption and resource use). Product stewardship emphasises incorporating partners' or experts' voices at each stage of the value chain (e.g. consumer involvement in product design and manufacturing). According to sustainability development theory, a unified objective is crucial to creating the continual excitement required for green innovations or improvements (i.e. lowering the impacts of firms' operations and goals on natural resources).	Hart and Dowell (2011); Cousins et al. (2019); Han and Huo (2020)
	H2	Pollution mitigation, product stewardship, sustainable development		
	H3	Product stewardship, sustainability development		
	H4	Product stewardship		
	H5	Pollution mitigation, product stewardship, sustainability development		
	H6	Product stewardship		
	H7	Product stewardship		
	H8	Product stewardship, sustainability development		
	H9	Pollution mitigation, product stewardship, sustainability development		
	H10	Product stewardship, sustainability development		
Institutional-based view (IBV)	H1	Coercive, normative and mimetic pressures	Institutional theory investigates how outside forces influence a firm's decision to adopt organisational procedures. Homogeneous drives may be divided into three categories – coercive, normative and mimetic – in accordance with institutional theory. The main forces behind businesses implementing social and environmental policies are coercive influences, which are frequently applied by external actors (e.g. governments, industries, professional alliances). Customers and suppliers in the marketplace are the major influencers on how GSCM and social practices are implemented by companies in light of normative constraints. Due to mimetic influence, businesses often imitate opponents due to their achievements, and prosperous businesses are constantly held up as regulatory requirements.	Dacin et al. (2002); Li et al. (2019); Rodríguez-Espíndola et al. (2022)
	H2	Coercive, normative and mimetic pressures		
	H3	Coercive, normative, and mimetic pressures		
	H4	Normative pressures		
	H5	Coercive and normative pressures		
	H6	Coercive pressures		
	H7	Coercive pressures		
	H8	Normative pressure		
	H9	Mimetic pressure		
	H10	Normative and mimetic pressure		

Table 4: Combined hypotheses, moderation, and meta-regression results

Hypothesis	*N*	*K*	*r*	95% CI		95% PI		*Z*	*P*	*Q*	I^2 %	N_{FS}
				LL	UL	LL	UL					
SSCP-SP	118056	103	0.438	0.41	0.48	-0.15	0.81	21.30	0.000	5289.50	98.07	8418
IGP-SP	8999	37	0.44	0.38	0.50	- 0.02	0.76	12.88	0.000	566.85	93.65	1759
EGP-SP	5954	29	0.45	0.39	0.51	0.07	0.73	12.20	0.000	259.93	89.23	1584
CSR-SP	103103	37	0.42	0.36	0.48	-0.13	0.79	10.66	0.000	2311.84	98.44	1175

Moderation results: H1

Moderators	Sub-group	*n*	*K*	*r*	95% CI		*Wt.%*	*Q*	P_Q	I^2	T^2	95% PI	
					LL	UL						LL	UL
Economy	UD	13	3020	0.48	0.38	0.57	41.10	102.57	0.00	0.88	0.03	0.11	0.74
	D	24	5979	0.44	0.35	0.52	58.90	441.53	0.00	0.95	0.08	-0.11	0.78
Data collection	Off	9	2135	0.45	0.37	0.53	57.58	532.68	0.07	0.75	0.01	0.21	0.65
	On	28	6864	0.45	0.37	0.53	42.42	152.48	0.00	0.95	0.08	-0.10	0.79
ISO	ISO	18	4238	0.49	0.40	0.57	51.10	189.21	0.00	0.91	0.04	0.08	0.76
	NA	19	4761	0.42	0.32	0.51	48.90	321.56	0.00	0.94	0.07	-0.13	0.77
Innovative	IN	17	3341	0.47	0.38	0.55	51.30	162.22	0.00	0.90	0.05	0.03	0.76
	NA	20	5658	0.44	0.35	0.53	48.70	357.85	0.00	0.95	0.07	-0.07	0.77
Time horizon	A 2015	25	5618	0.47	0.40	0.53	77.65	258.27	0.00	0.91	0.04	0.06	0.74
	B 2015	12	3381	0.42	0.27	0.55	22.35	287.13	0.00	0.96	0.10	-0.25	0.82
Industries products	CI	21	5553	0.48	0.40	0.56	57.00	407.14	0.00	0.95	0.08	-0.06	0.80
	NCI	16	3446	0.41	0.30	0.51	43.00	159.60	0.00	0.91	0.05	-0.03	0.72
Performance	ENP	20	4374	0.55	0.48	0.62	33.54	191.84	0.00	0.90	0.04	0.18	0.79
	SOP	19	3629	0.44	0.34	0.53	31.56	195.71	0.00	0.91	0.05	-0.03	0.75
	ECP	30	7722	0.41	0.33	0.49	34.90	513.84	0.00	0.94	0.07	-0.10	0.75

Moderation results: H2

Moderators	Sub-group	*n*	*K*	*r*	95% CI		*Wt.%*	*Q*	P_Q	I^2	T^2	95% PI	
					LL	UL						LL	UL
Economy	UD	11	2582	0.44	0.35	0.52	63.00	53.40	0.00	0.81	0.02	0.15	0.66
	D	18	3372	0.47	0.37	0.56	37.00	203.67	0.00	0.92	0.06	-0.02	0.78
Data collection	Off	8	1924	0.40	0.32	0.47	56.66	17.49	0.01	0.60	0.01	0.21	0.56
	On	21	4030	0.48	0.39	0.56	43.34	219.98	0.00	0.91	0.05	0.03	0.77
ISO	ISO	19	3732	0.46	0.36	0.54	54.97	168.79	0.00	0.89	0.04	0.04	0.74
	NA	10	2222	0.46	0.35	0.56	45.03	88.31	0.00	0.90	0.04	0.02	0.75

Innovative	IN	12	1890	0.43	0.28	0.55	27.01	111.49	0.00	0.90	0.06	-0.11	0.77
	NA	17	4064	0.48	0.40	0.55	72.99	145.10	0.00	0.89	0.03	0.12	0.73
Time horizon	A 2015	20	4371	0.48	0.40	0.55	79.42	179.98	0.00	0.89	0.04	0.09	0.74
	B 2015	9	1583	0.41	0.23	0.56	20.58	73.89	0.00	0.89	0.05	-0.11	0.76
Industries products	CI	18	3510	0.51	0.44	0.58	53.37	120.99	0.00	0.86	0.03	0.17	0.74
	NCI	11	2444	0.37	0.23	0.49	46.63	123.75	0.00	0.92	0.05	-0.15	0.73
Performance	ENP	18	3528	0.52	0.42	0.61	28.38	210.22	0.00	0.92	0.06	0.05	0.81
	SOP	16	3106	0.42	0.31	0.51	32.50	156.15	0.00	0.90	0.05	-0.05	0.73
	ECP	23	4905	0.42	0.34	0.50	39.12	222.87	0.00	0.90	0.04	0.00	0.71

Moderation results: H3

Moderators	**Sub-group**	***n***	***K***	***r***	**95% CI**		**Wt.%**	***Q***	P_Q	I^2	T^2	**95% PI**	
					LL	**UL**						**LL**	**UL**
Economy	UD	13	3236	0.43	0.35	0.51	61.39	85.89	0.00	0.86	0.03	0.10	0.68
	D	24	99867	0.44	0.34	0.53	38.61	1748.31	0.00	0.99	0.08	-0.14	0.79
Data collection	Off	8	2642	0.40	0.24	0.54	28.21	48.68	0.00	0.86	0.02	0.05	0.66
	On	29	100461	0.44	0.36	0.52	71.79	1990.68	0.00	0.99	0.09	-0.14	0.80
ISO	ISO	12	91144	0.48	0.33	0.60	24.14	938.42	0.00	0.99	0.18	-0.41	0.90
	NA	25	11959	0.42	0.34	0.49	75.86	712.44	0.00	0.97	0.07	-0.11	0.76
Innovative	IN	17	5436	0.48	0.38	0.56	52.39	334.83	0.00	0.95	0.07	-0.04	0.79
	NA	20	97667	0.40	0.29	0.50	47.61	1216.07	0.00	0.98	0.07	-0.14	0.76
Time horizon	A 2015	23	5548	0.49	0.42	0.56	52.92	246.54	0.00	0.91	0.04	0.10	0.75
	B 2015	14	97555	0.33	0.20	0.45	47.08	739.58	0.00	0.98	0.04	-0.12	0.67
Industries products	CI	26	8238	0.47	0.40	0.54	56.80	510.80	0.00	0.95	0.06	-0.01	0.78
	NCI	11	94865	0.34	0.18	0.48	43.20	428.89	0.00	0.98	0.04	-0.10	0.67
Performance	ENP	10	2588	0.60	0.47	0.69	27.86	139.77	0.00	0.94	0.06	0.11	0.85
	SOP	25	6675	0.46	0.39	0.53	36.69	328.98	0.00	0.93	0.05	0.04	0.75
	ECP	25	99815	0.39	0.30	0.47	35.45	1226.62	0.00	0.98	0.06	-0.09	0.73

Results of meta-regression

Hypothesis	**Effect**	**B (Estimate)**	**SE**	**CI LL**	**CI UL**	***β*** **(regression coefficient)**	***Z*-value**	***p*-value**
H1	Intercept	0.45	0.01	0.43	0.48	0.32	42.79	0.00
	Time	0.02	0.00	0.01	0.02		7.55	0.00
H2	Intercept	0.50	0.01	0.47	0.53	0.11	38.35	0.00
	Time	0.01	0.00	0.00	0.01		1.80	0.07
H3	Intercept	0.37	0.01	0.35	0.39	0.27	43.02	0.00
	Time	0.02	0.00	0.02	0.03		9.25	0.00

Table 5: Future directions for exploring SSCP-SP interrelationships

Area of exploration	Description	Future research questions
Under-evaluated SSCP-SP samples	This research considered a limited sample pf studies for evaluating individual SSCP–SP relationships (IGP–SP, EGP–SP and CSR–SP).	• What may be the other factors of IGP, EGP and CSR based on operationalisation? • What may be the other factors of ECP, ENP and SOP based on operationalisation? • What may be a negative impact of SSCP practices on firm SP?
Presence of causality	Although the analysis confirms the presence of significant positive relationships between SSCP and SP, the presence of causality cannot be confirmed due to the limitations of the meta-analysis methodology.	• How can time-based data be collected to confirm causality? • What may be another approach (e.g. Bayesian inference) for analysing the presence of causality?
The trade-off between ENP and ECP for firms' SP	Although the analysis confirms a positive and significant impact on ENP and ECP, the trade-off between ENP and ECP of SP has not been considered.	• What may be different trade-off scenarios (e.g. high production cost at the initial stage of SSCP adoption) while undertaking various SP outcomes? • How can an optimised green supply chain model be proposed that incorporates both pollution emissions and economic outcomes?
'Win-win' strategy	In the present meta-analysis, the relationship between SSCP and firms' SP is linear, and we have not discussed the 'win-win' strategy.	• How can the benefits of a firm's SSCP adoption by a firm be distributed to various supply chain partners and stakeholders? • What are the antecedents of SSCP implementation, which may involve creating value for each stakeholder at the upstream, downstream and closed-loop levels?
SSCP impact in various sub-group contexts	Even though the present research explored seven sub-group contexts, it ignores the Hofstede dimensions.	• What are the various Hofstede dimensions (e.g. power distance of nations, societal individualism)? • What are the impacts of the Hofstede dimensions on the SSCP–SP relationship? • What may be the scale (relative vs absolute) of the Hofstede dimensions' metric attributes for multivariate analysis (meta-regression)?

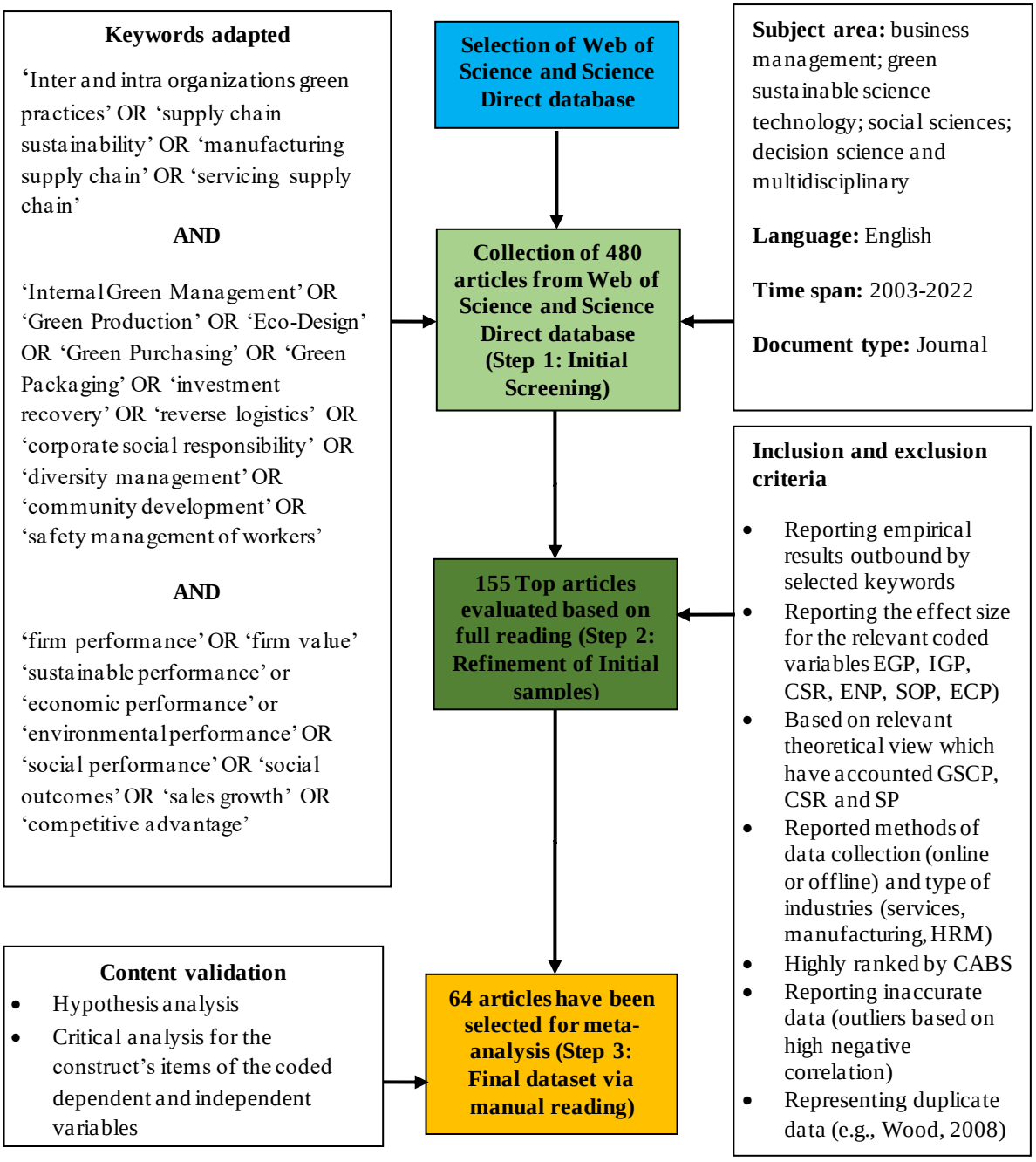

Figure 1: Systematic review flowchart with exclusion and inclusion criterion (Köbis et al., 2021).

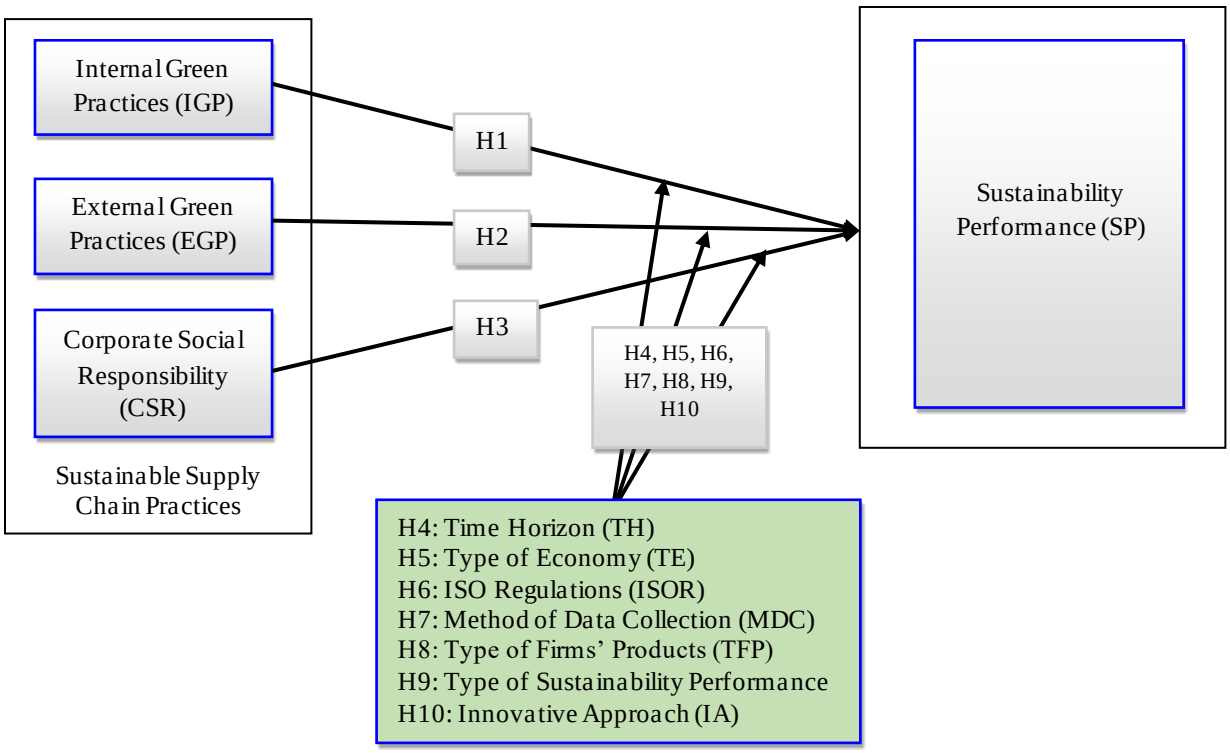

Figure 2: Framework of hypothesis formulation

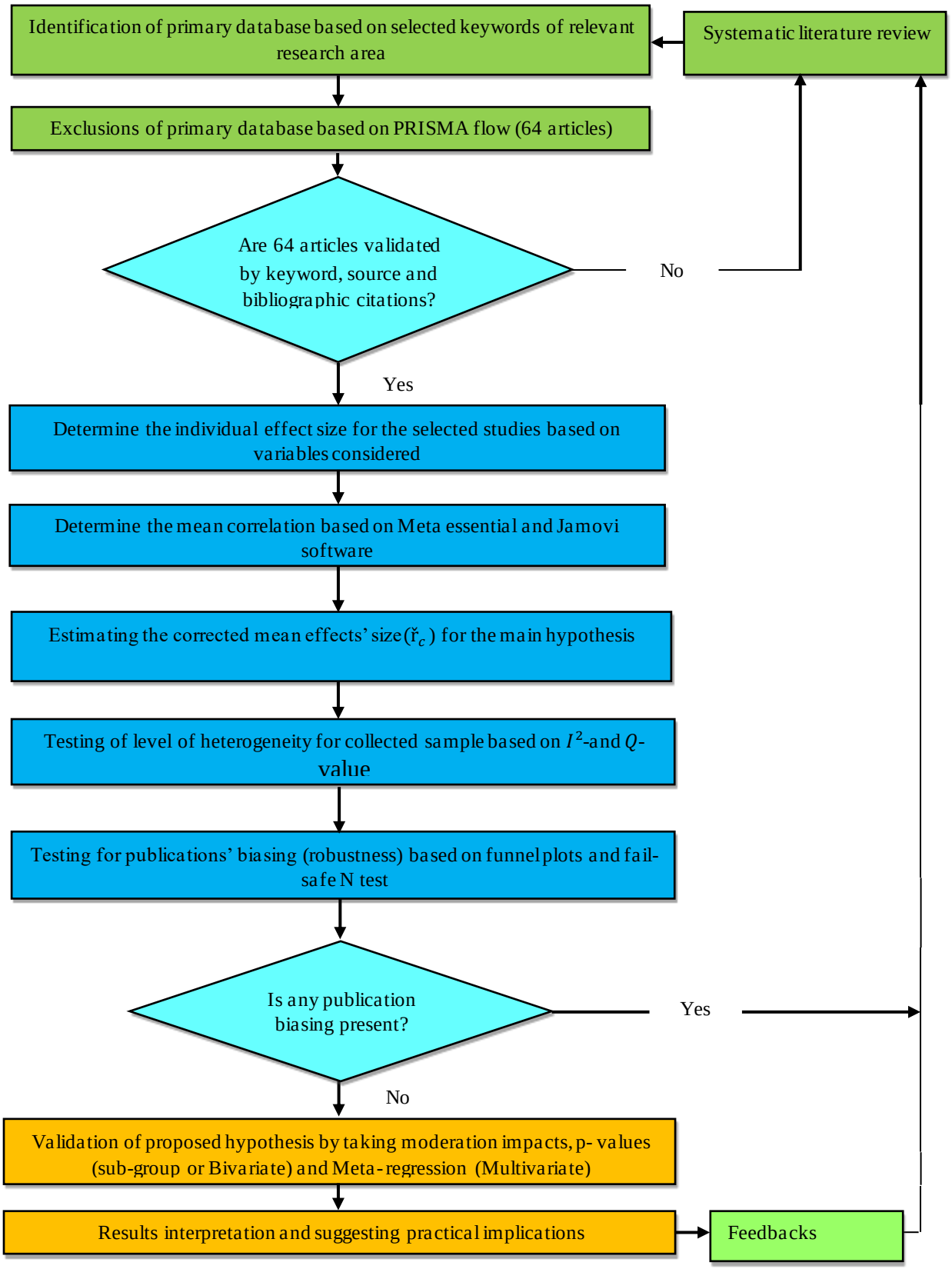

Figure 3: The research methodology process of the study

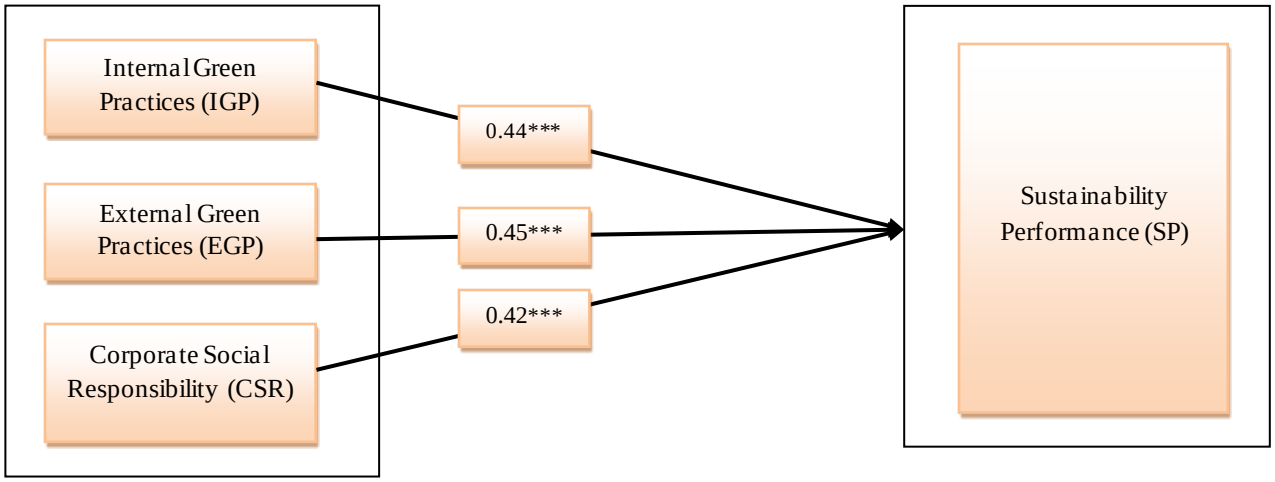

Figure 4: The meta-analysis outcomes of the main proposed model

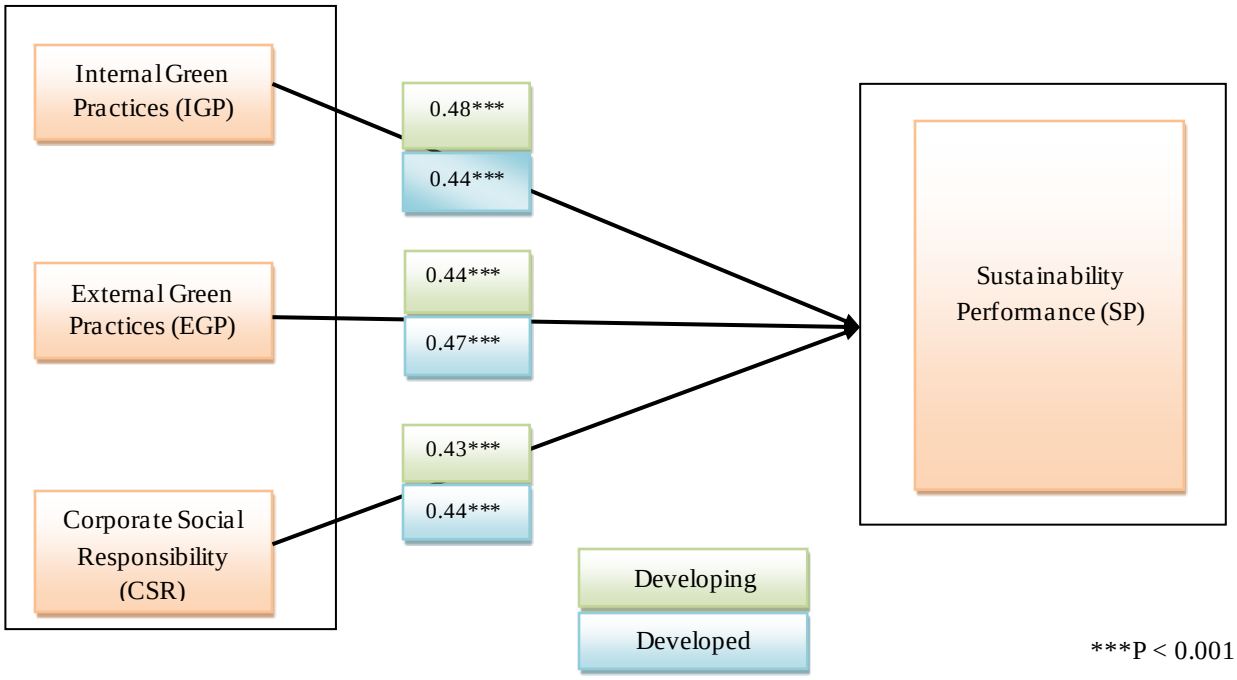

Figure 5: Results of the subgroups analysis by type of economy

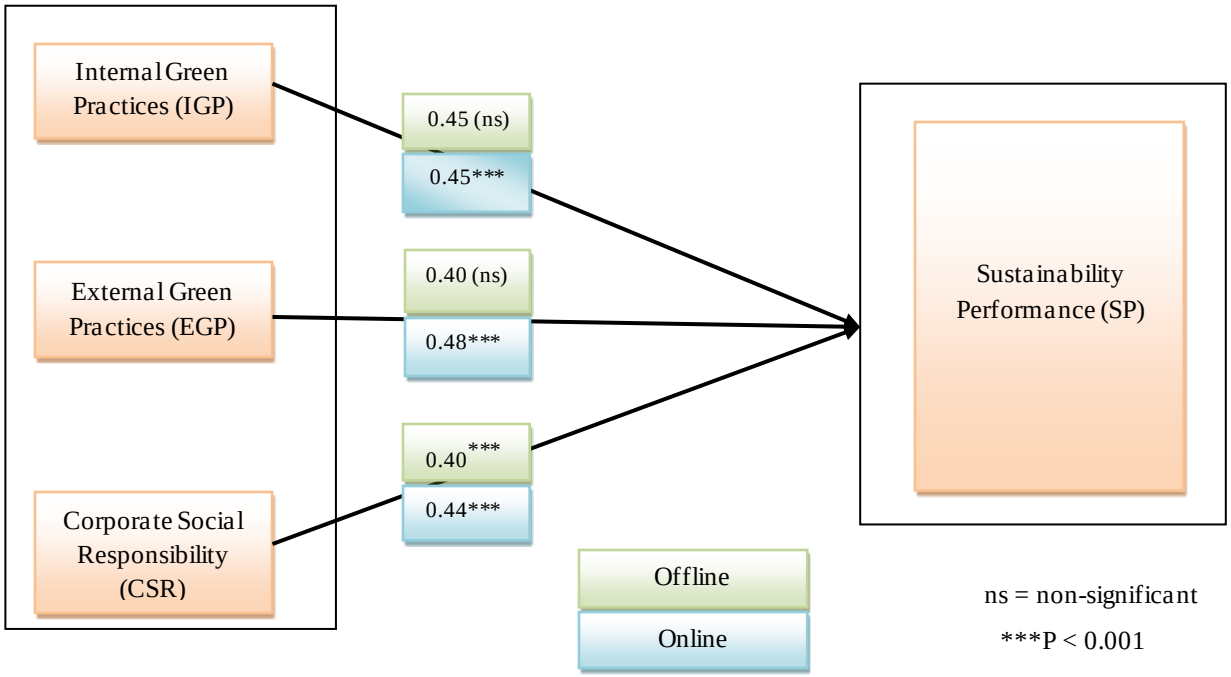

Figure 6: Results of the subgroups analysis based on data collection method

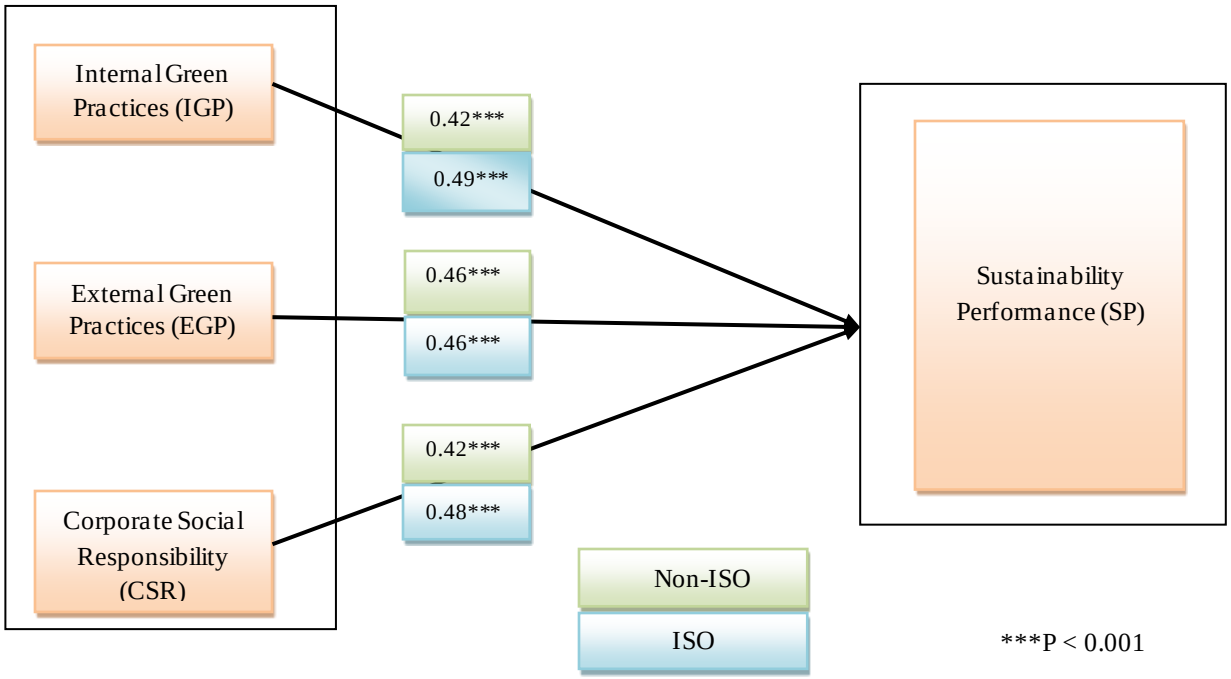

Figure 7: Results of the subgroups analysis based on ISO certification

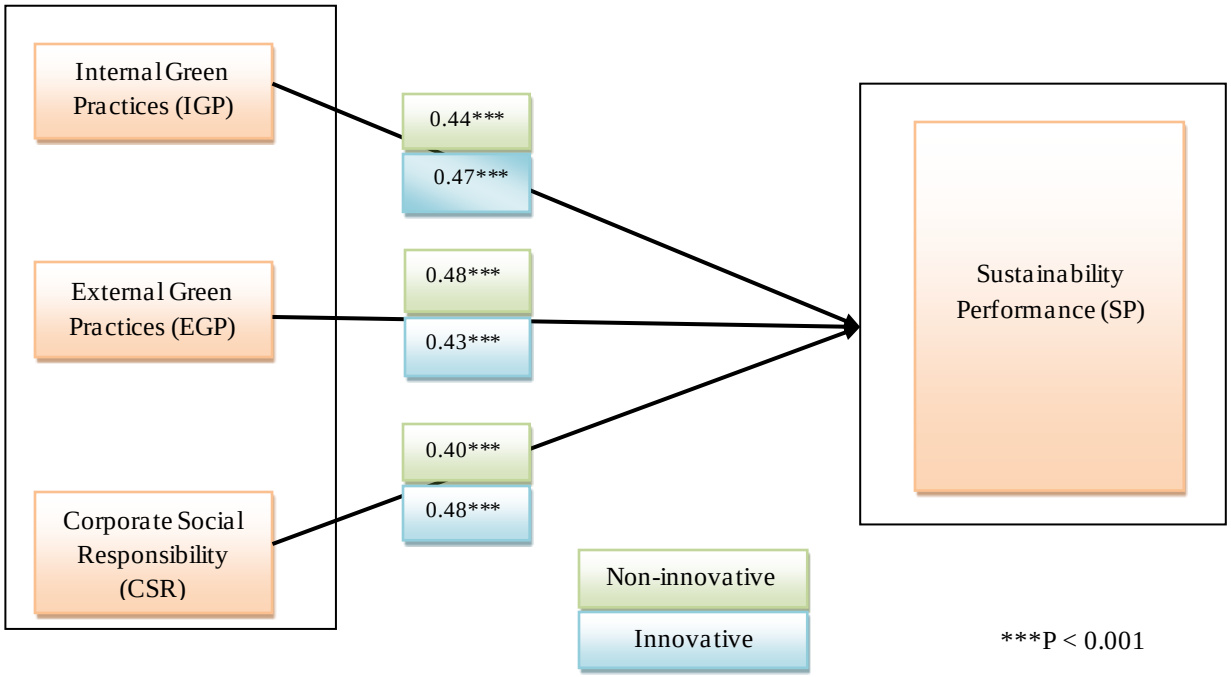

Figure 8: Results of the subgroups analysis based on an innovative approach

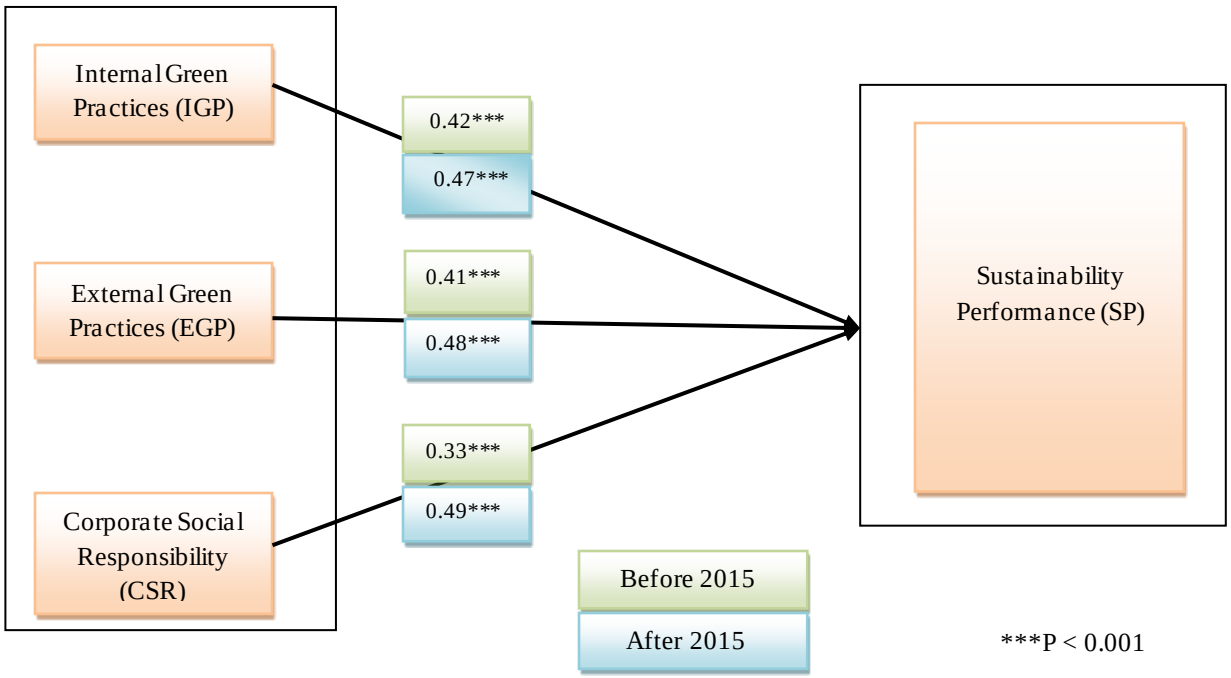

Figure 9: Results of the subgroups analysis based on a time horizon

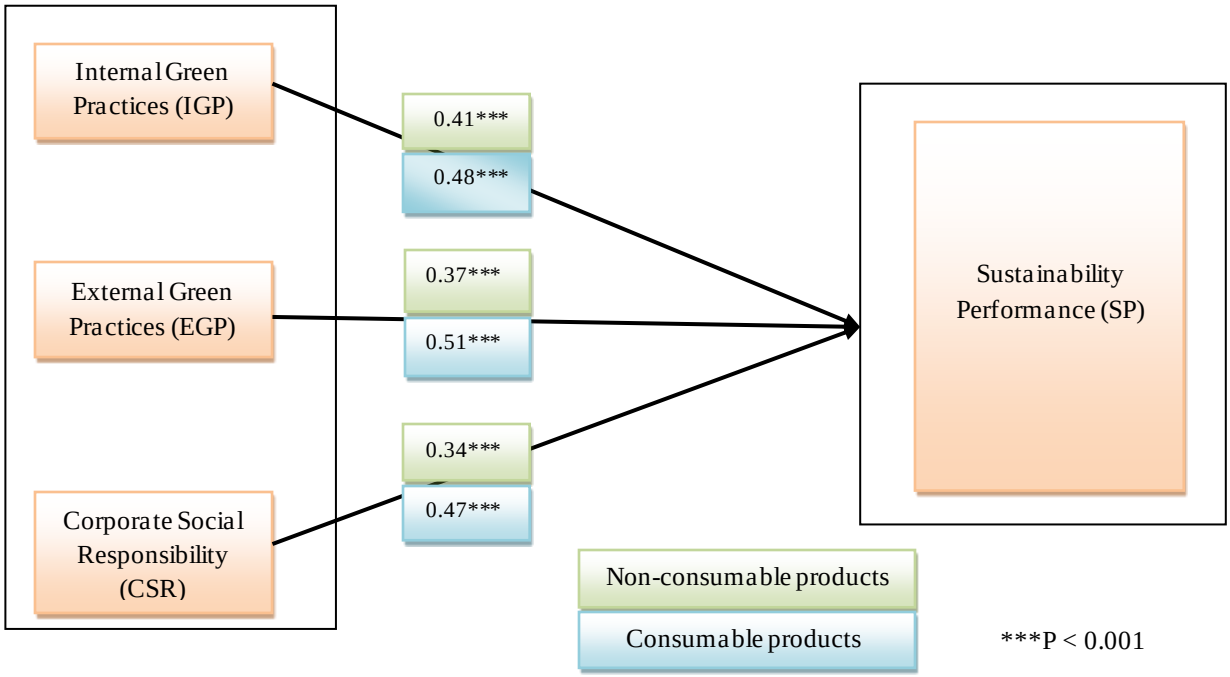

Figure 10: Results of the subgroups analysis based on industries products

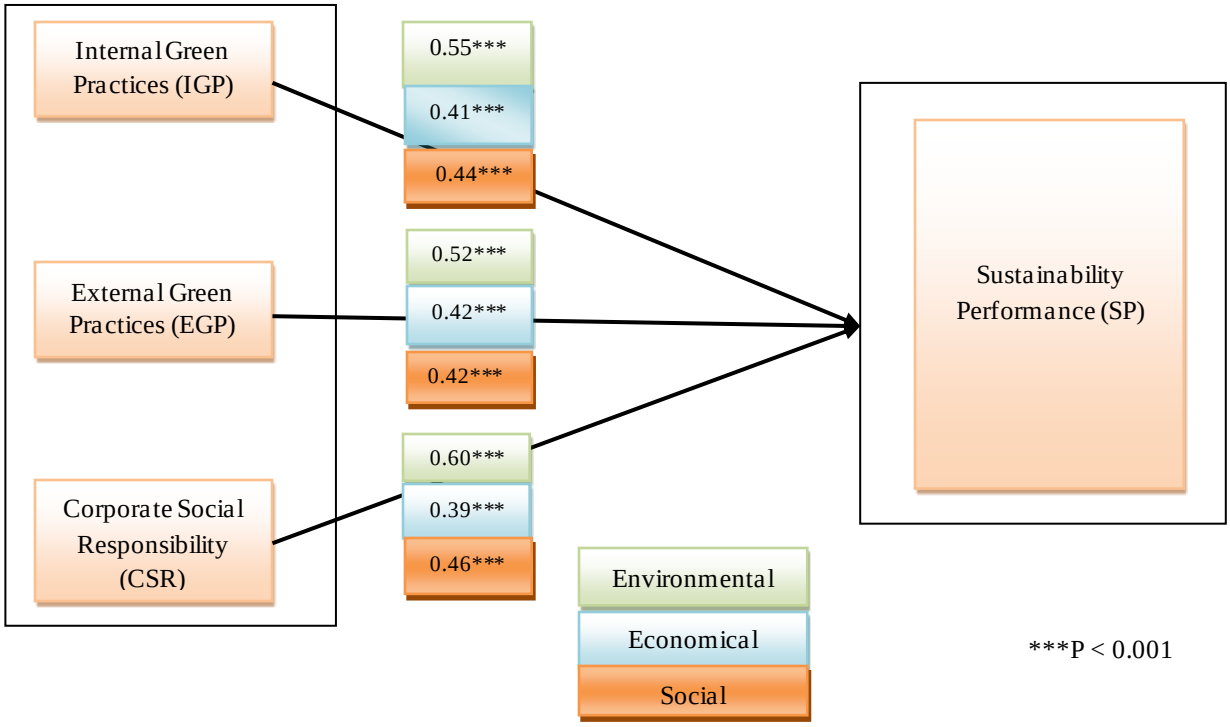

Figure 11: Results of the subgroups analysis by sustainable performance type

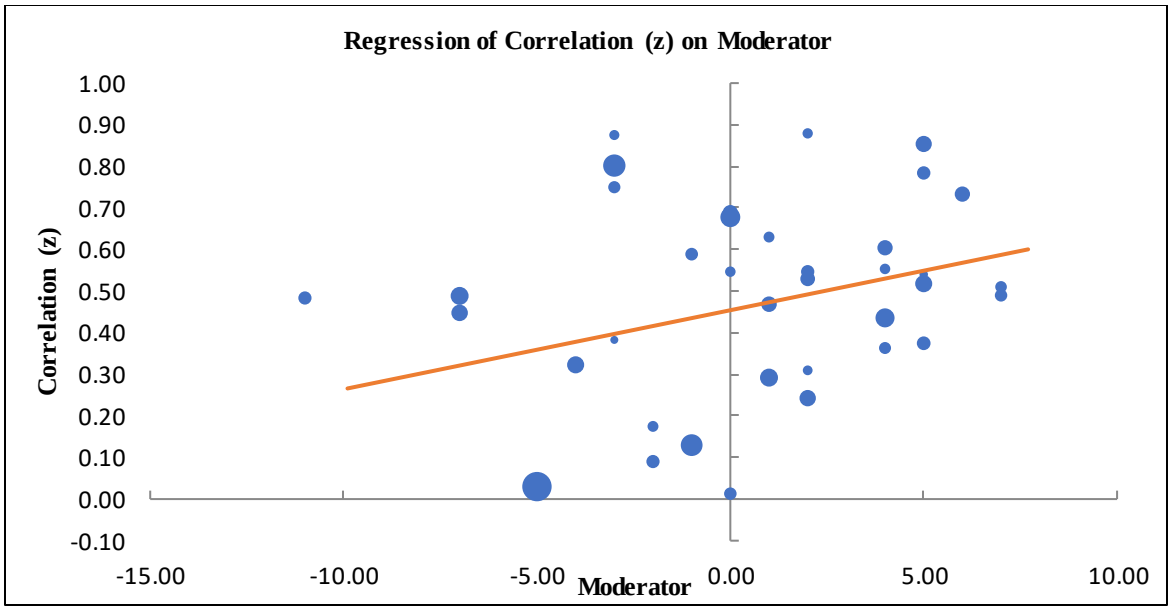

Figure 12: Meta-regression plot of H1

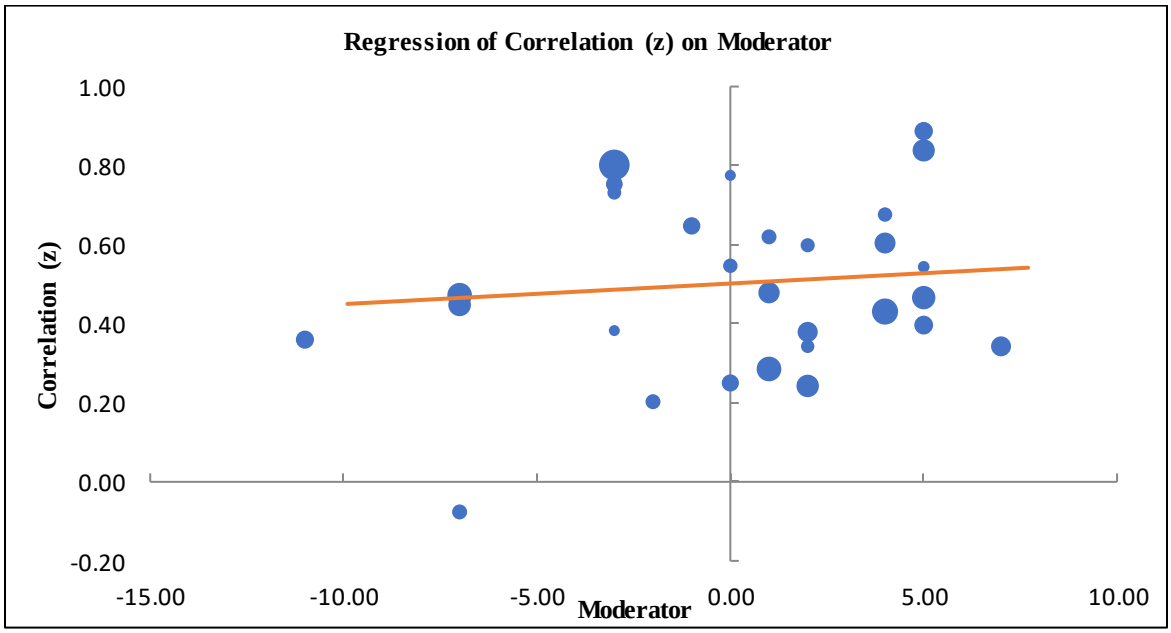

Figure 13: Meta-regression plot of H2

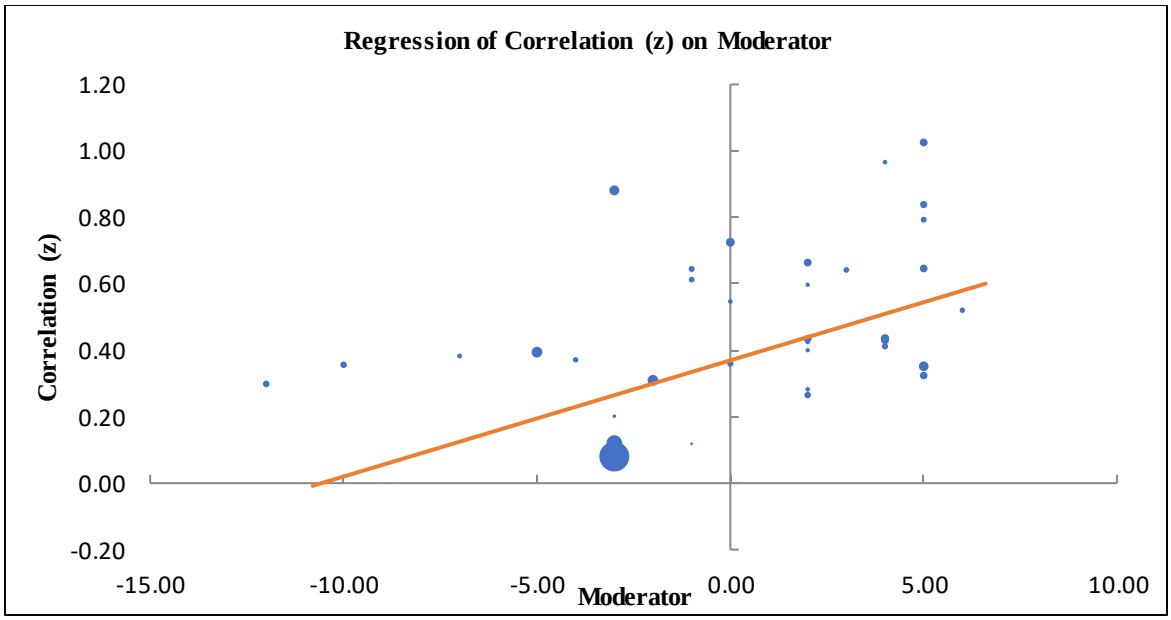

Figure 14: Meta-regression plot of H3

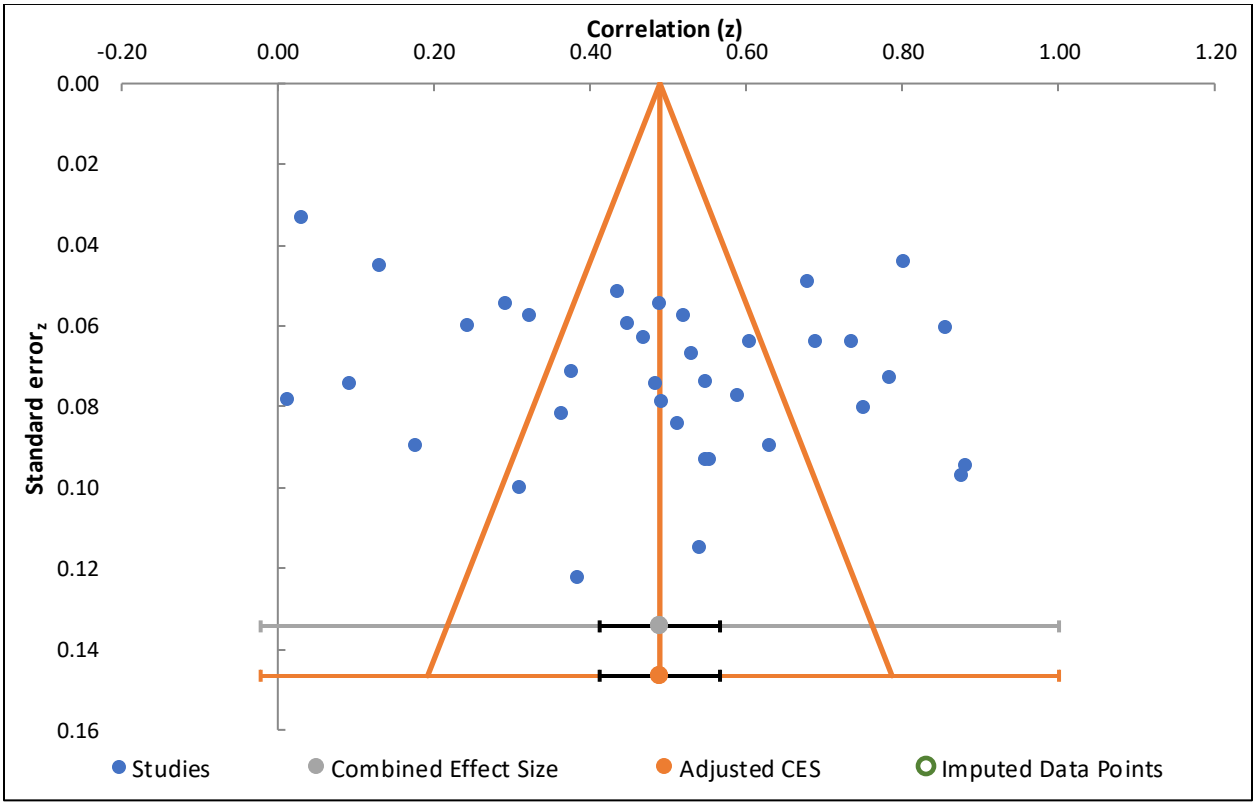

Figure 15: Publication biasing for IGP-SP (H1)

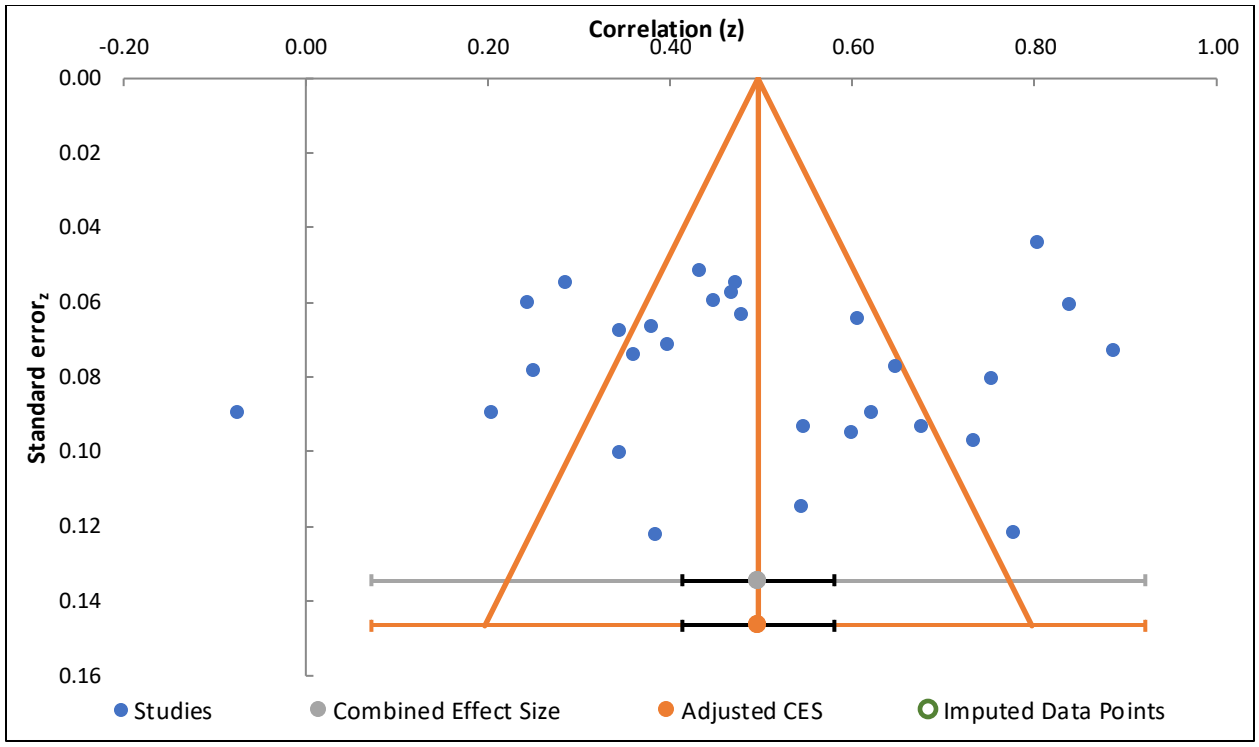

Figure 16: Publication biasing for EGP-SP (H2)

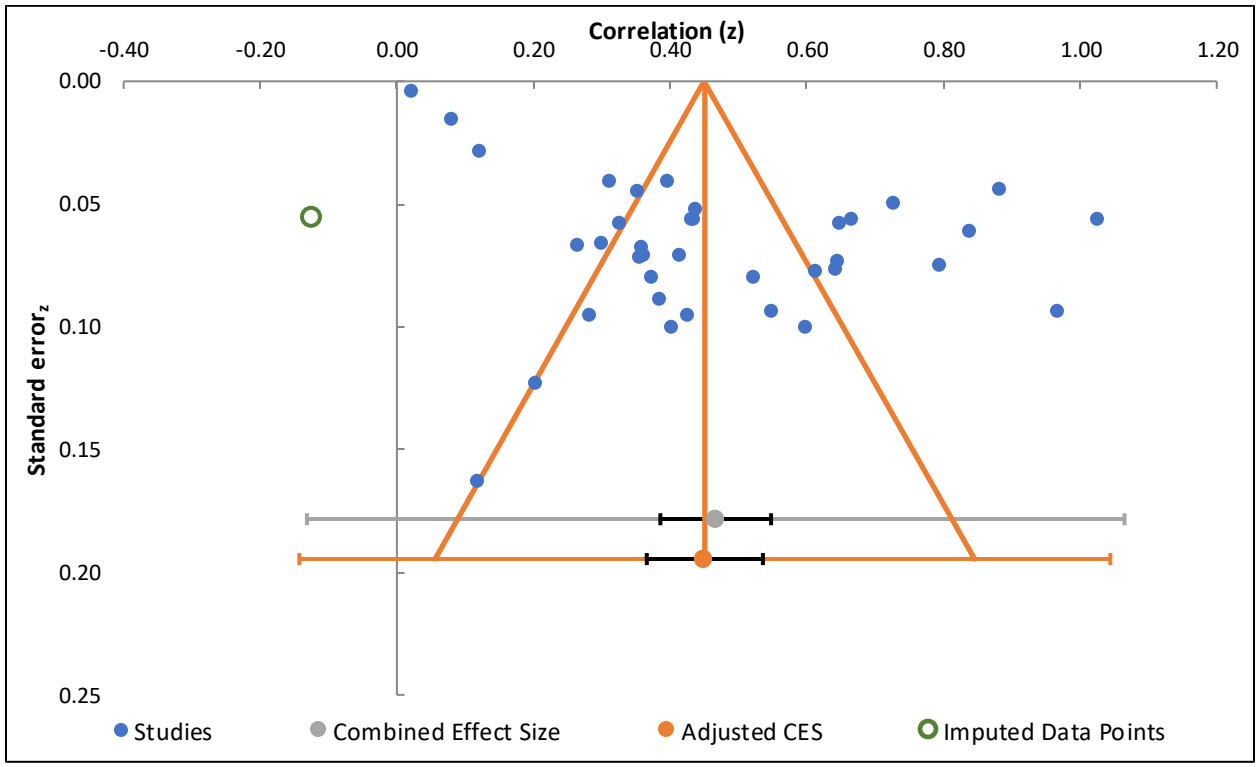

Figure 17: Publication biasing for CSR-SP (H3)

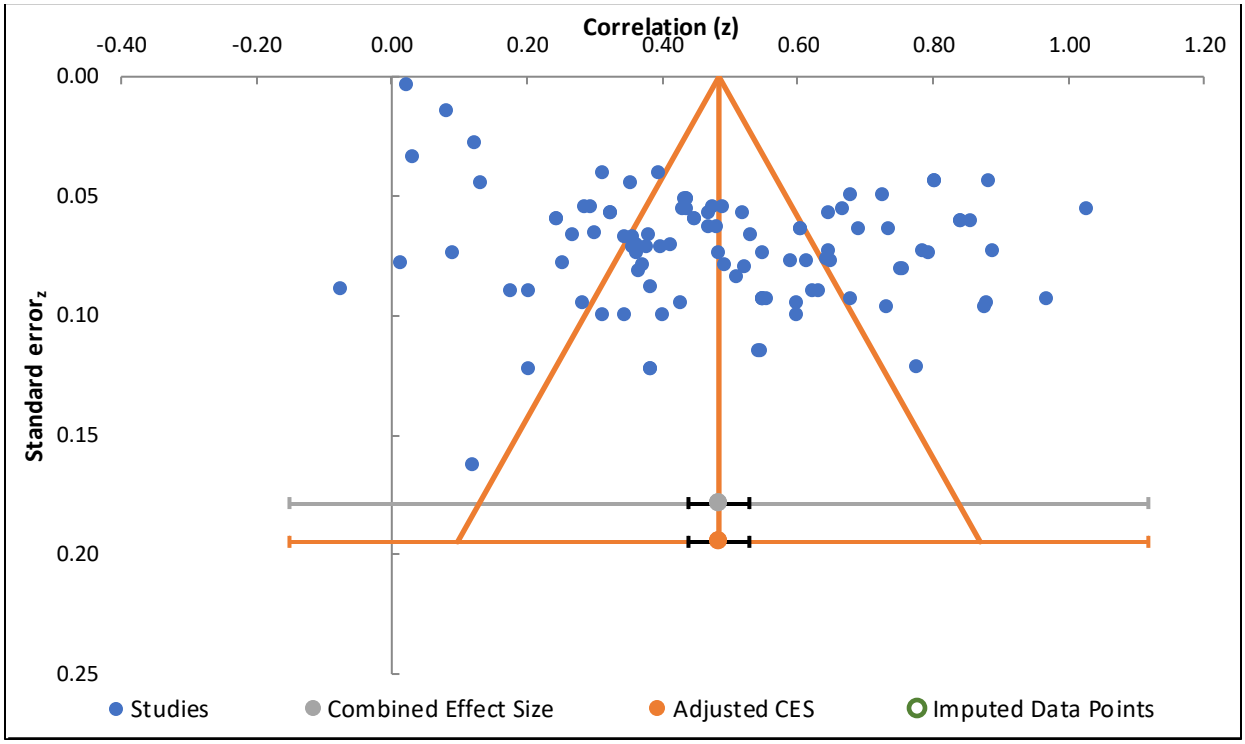

Figure 18: Publication biasing based on trim and fill for combined hypothesis (SSCP-SP)

Online Appendices

Appendix A1: Coding results of the identified samples

Table A1: Coding results of the identified samples

S. no	Author	Contribution	Country	Method of survey	ISO (ISO and not applicable)	Innovative (innovative and not applicable)	Type of industry (consumable and non-consumable)	MCP	Sample size
1	Abdul-Rashid et al. (2017)	ENP, SOP, ECP	Malaysia	Online	ISO	NA	NCI	2	115
2	Abou-foul et al. (2020)	ECP	UK	Online	NA	IN	CI	5	185
3	Agyabeng-Mensah et al. (2020)	ECP	China	Online	ISO	NA	CI	5	278
4	Adomako and Tran (2022)	ECP	UK	Offline	NA	IN	NCI	7	225
5	Barnett and Salomon (2012)	ECP	UK	Online	NA	NA	NCI	-3	4730
6	Boon-itt et al. (2017)	SOP	Thailand	Online	NA	IN	NCI	2	104
7	Carballo-Penela and Castromán-Diz (2014)	ECP	Spain	Online	NA	NA	NCI	-1	41
8	Carey et al. (2011)	SOP, ECP	UK	Online	NA	IN	NCI	-4	163
9	Chan et al. (2015)	ECP	China	Online	NA	IN	NCI	0	250
10	Chan et al. (2022)	SOP	New Zealand	Online	NA	IN	CI	7	145
11	Cheng et al. (2008)	SOP	Taiwan	Offline	ISO	NA	CI	-7	288
12	Christensen et al. (2005)	ECP	USA	Online	NA	NA	CI	-10	227
13	Cousins et al. (2019)	ENP	UK	Online	NA	IN	CI	4	248
14	Croom et al. (2018)	SOP	USA	Online	ISO	IN	NCI	3	175
15	Dai et al. (2017)	SOP	China	Online	NA	IN	NCI	2	229
16	Dangelico (2014)	ECP	Italy	Online	NA	NA	CI	-1	500
17	Darnall et al. (2010)	ECP	USA	Offline	NA	NA	CI	-5	907
18	De Burgos Jiménez et al. (2013)	ECP	Spain	Online	ISO	NA	NCI	-2	186
19	De Giovanni (2012)	ENP, SOP	Portugal	Online	NA	NA	CI	-3	110
20	Dey et al. (2019)	ENP, SOP, ECP	UK	Offline	ISO	IN	CI	4	119
21	Dögl and Behnam (2014)	ENP, ECP	Germany	Online	NA	NA	NCI	-1	193
22	Dubey et al. (2015)	ENP, SOP, ECP	India	Online	ISO	IN	NCI	0	167
23	Esfahbodi et al. (2016)	ENP, ECP	UK	Online	ISO	IN	CI	1	128
24	Flynn et al. (2010)	SOP, ECP	USA	Offline	NA	IN	CI	-5	617
25	Green et al. (2012)	ENP, ECP	USA	Online	ISO	NA	CI	-3	159
26	Hollos et al. (2012)	SOP, ECP	Germany	Online	NA	NA	NCI	-3	70
27	Hsu et al. (2016)	ENP, SOP, ECP	USA	Offline	ISO	NA	NCI	1	342
28	Huang and Li (2015)	ENP, ECP	Taiwan	Online	NA	NA	NCI	0	418
29	Huo et al. (2013)	SOP	China	Offline	NA	IN	CI	-2	617
30	Jadhav et al. (2019)	ENP, SOP	Australia	Online	NA	NA	NCI	4	154
31	Kamble et al. (2019)	ENP, SOP, ECP	India	Online	NA	IN	CI	4	205
32	King and Lenox (2009)	ECP	USA	Online	ISO	NA	NCI	-6	88531
33	Kim and Rhee (2012)	ENP, SOP, ECP	South Korea	Online	ISO	IN	CI	-3	525
34	Lai et al. (2013)	SOP, ECP	Hong Kong	Offline	NA	IN	NCI	-2	128
35	Lee (2008)	ENP, SOP, ECP	South Korea	Online	ISO	IN	NCI	-7	129

36	Lee et al. (2015)	ENP, SOP, ECP	Malaysia	Online	ISO	NA	CI	0	119
37	Li et al. (2016)	ENP, SOP	China	Offline	NA	NA	NCI	1	256
38	Li et al. (2019)	ENP, SOP, ECP	China	Online	ISO	NA	CI	4	383
39	Liu et al. (2020)	ENP, SOP, ECP	China	Offline	ISO	IN	NCI	5	200
40	Mani et al. (2020)	SOP	France	Online	NA	NA	CI	5	327
41	Nath and Agrawal (2020)	ENP, SOP	India	Online	NA	NA	CI	5	311
42	Papadas et al. (2017)	SOP	UK	Online	NA	IN	CI	2	103
43	Ramanathan et al. (2020)	ENP, SOP ECP	UK	Online	ISO	IN	CI	5	79
44	Rodríguez-Espíndola et al. (2022)	ENP, SOP, ECP	UK	Online	NA	IN	CI	7	165
45	Rosenzweig et al. (2003)	ECP	USA	Online	NA	NA	CI	-12	238
46	Saeidi et al. (2015)	SOP, ECP	Malaysia	Online	NA	NA	CI	0	205
47	Schmidt et al. (2017)	ECP	Switzerland	Online	NA	NA	CI	2	284
48	Singh et al. (2021)	ECP	Ireland	Offline	NA	IN	NCI	6	248
49	Soares et al. (2017)	SOP	UK	Online	NA	NA	CI	2	325
50	Srivastava et al. (2017)	ECP	USA	Offline	NA	NA	CI	2	115
51	Tachizawa et al. (2015)	ENP	Spain	Online	ISO	NA	CI	0	71
52	Tang et al. (2017)	SOP, ECP	China	Offline	NA	IN	NCI	2	188
53	Tang et al. (2012)	ECP	USA	Online	NA	IN	CI	-3	1300
54	Vaidyanathan and Devaraj (2008)	SOP	USA	Online	NA	IN	CI	-7	131
55	Wong et al. (2020)	ENP, ECP	UK	Online	ISO	IN	CI	5	192
56	Wu et al. (2014)	ECP	Taiwan	Online	NA	IN	CI	-1	172
57	Yang et al. (2011)	ENP, ECP	USA	Online	ISO	NA	NCI	-4	309
58	Yu et al. (2017)	SOP	UK	Online	NA	IN	CI	2	329
59	Yu et al. (2019)	SOP	UK	Online	NA	IN	CI	4	329
60	Yu et al. (2020)	ECP	China	Offline	ISO	NA	CI	5	308
61	Zaridis et al. (2020)	SOP, ECP	Greece	Offline	NS	NA	CI	5	504
62	Zhao et al. (2021)	SOP, ECP	China	Offline	ISO	IN	CI	6	162
63	Zhu and Sarkis (2004)	ENP, ECP	China	Offline	ISO	NA	NCI	-11	186
64	Zhu et al. (2008)	ECP	China	Online	ISO	NA	CI	-7	341

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Appendix A2: Results of Forest Plots

Forest plot of H1

The forest plot of the collected sample of 37 studies based on H1 (IGP-SP) is shown in Figure A1. For testing the hypothesis, a random effect model is used since the fixed-effect model should not be used for the samples which are drawn from different economies, different industries, different modes of data collection, different innovative approaches, etc. The black rectangles distance from the central dotted line represents the correlation and the size of the black rectangle represents the sample size of the study. Also, the bracket values are representing the confidence interval (CI). Finally, the diamond at the bottom is representing the aggregated correlation, sample size, and confidence interval of the complete sampled studies based on H1. The aggregated results showed a correlation of 0.44 and CI of (0.38, 0.50).

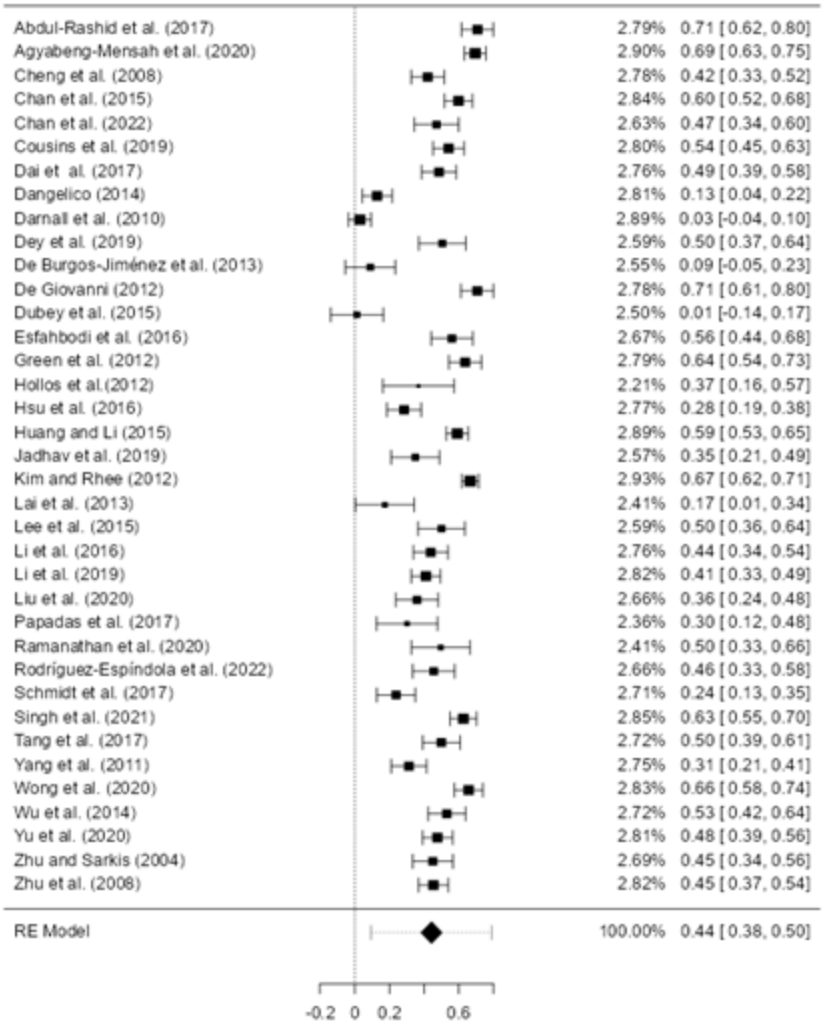


Figure A2-1: Forest plot results of H1

Forest plot of H2

The Forest plot of the collected sample of 29 studies based on H2 (EGP-SP) is shown in Figure A22. The aggregated diamond results showed a correlation of 0.45 and CI of (0.39, 0.51).

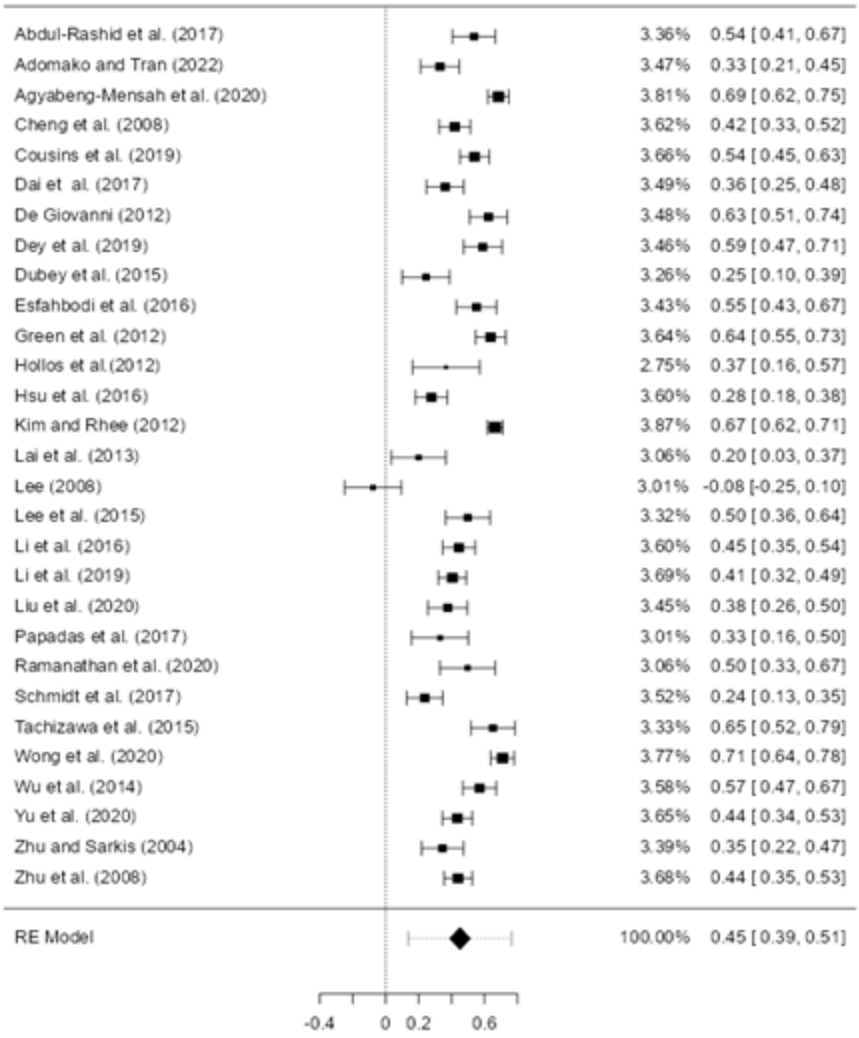


Figure A2-2: Forest plot results of H2.

Forest plot of H3

The Forest plot of the collected sample of 37 studies based on H3 (CSR-SP) is shown in A23. The aggregated diamond results showed a correlation of 0.42 and CI of (0.36, 0.48).

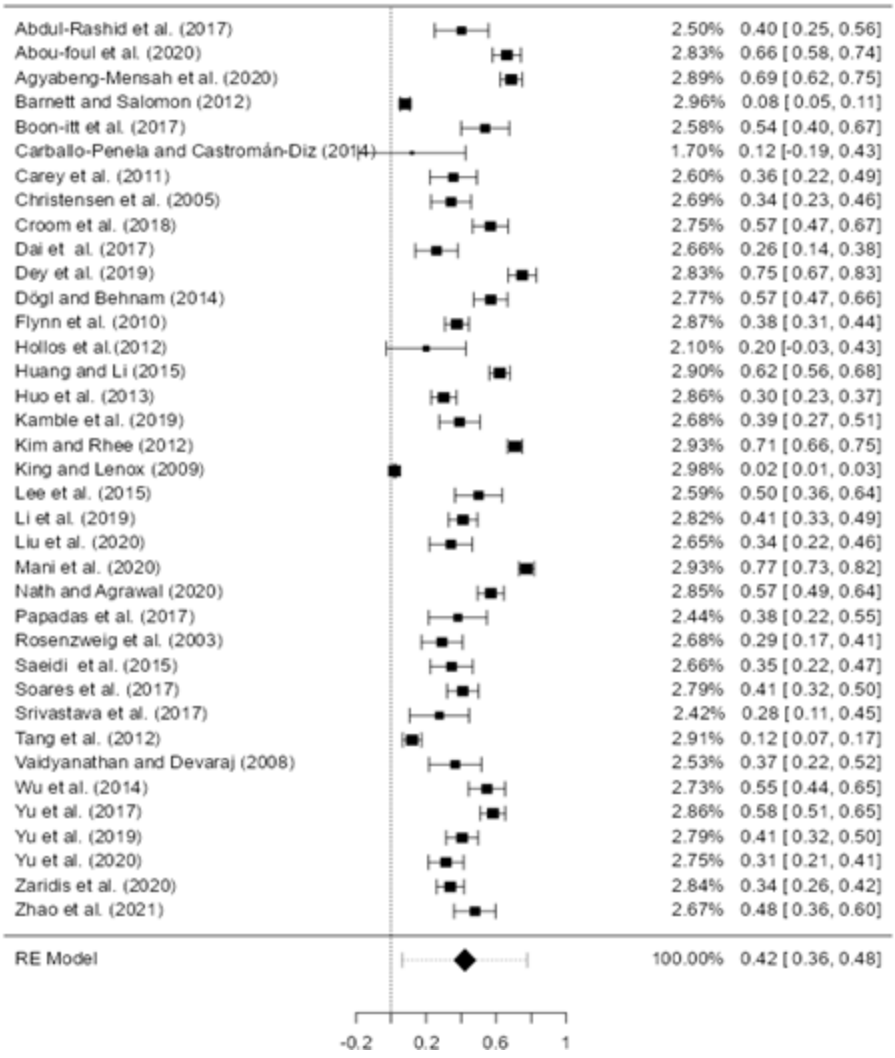


Figure A2-3: Forest plot results of H3

Online Appendix A3

Forest plots for sub-group analysis

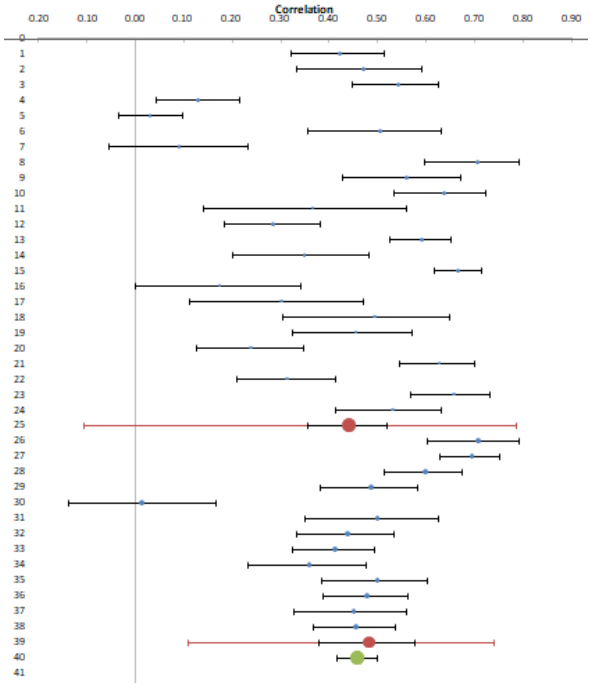


Figure A3-1: Country based subgroup for H1

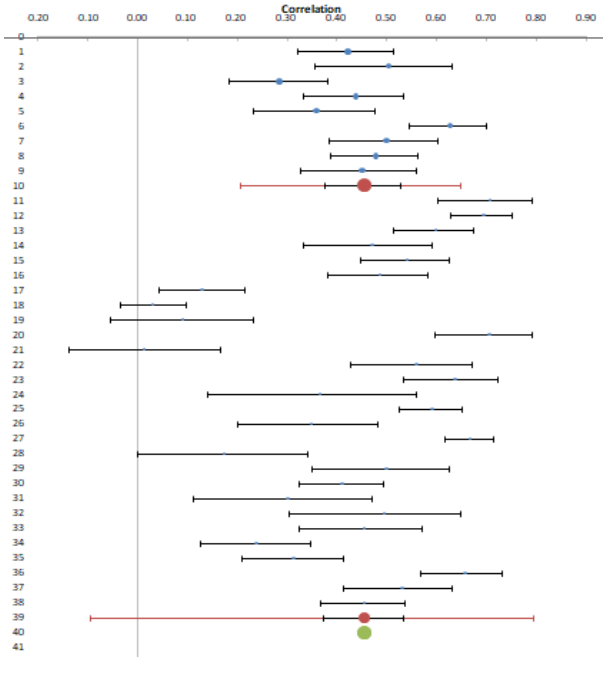


Figure A3-2: Type of survey-based subgroup for H1

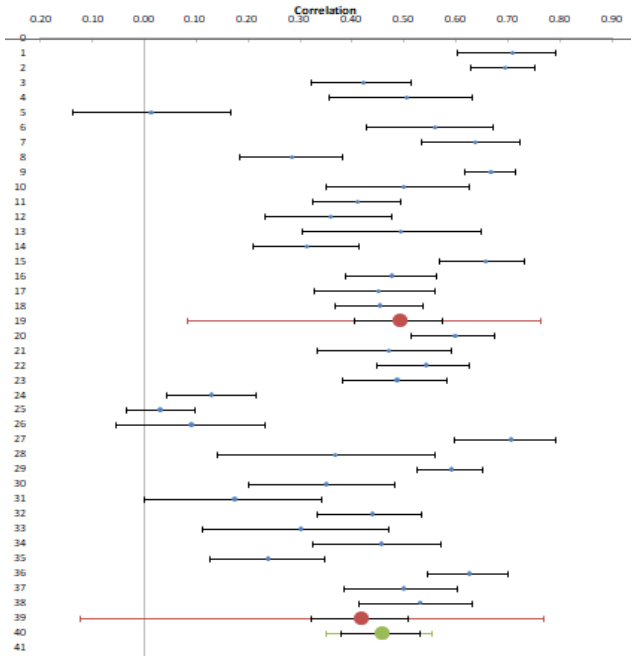


Figure A3-3: ISO based sub group for H1

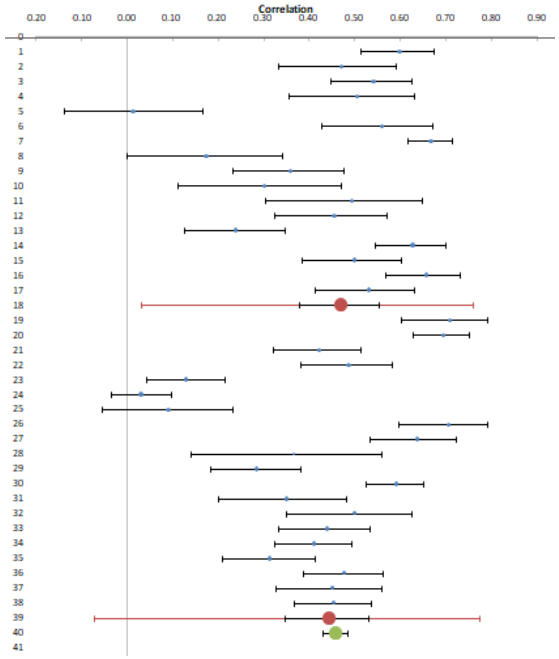


Figure A3-4: Innovative based subgroup for H1

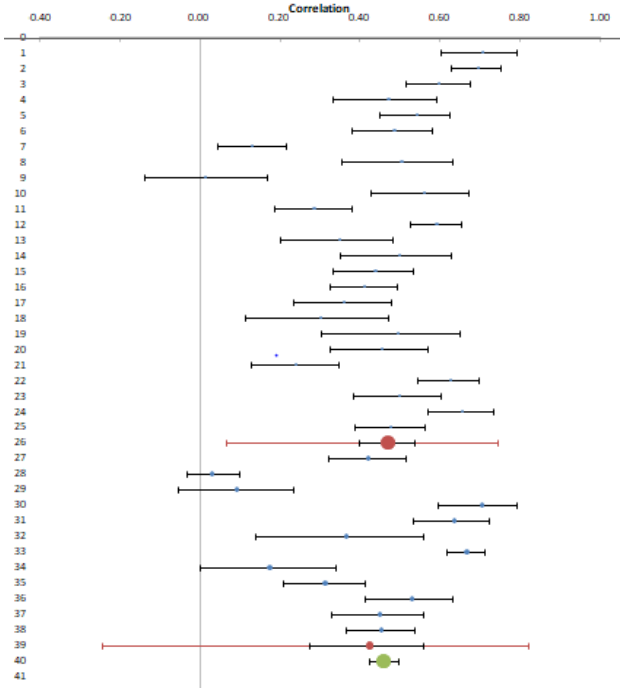


Figure A3-5: Time horizon-based subgroup for H1

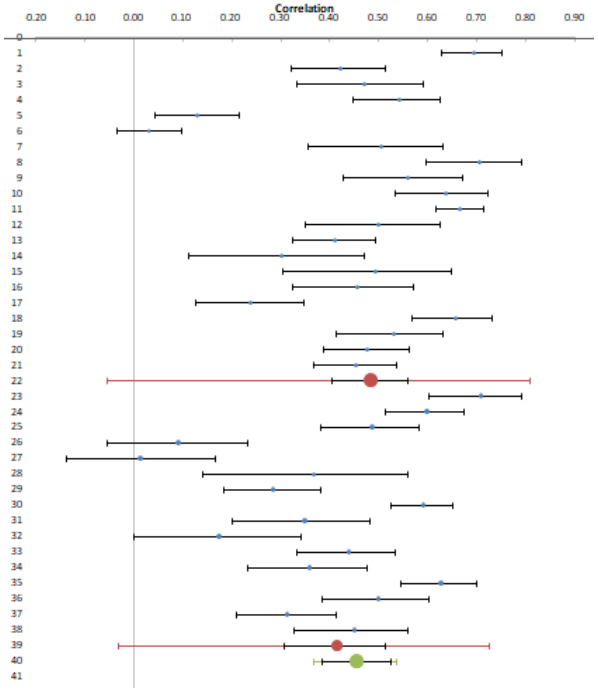
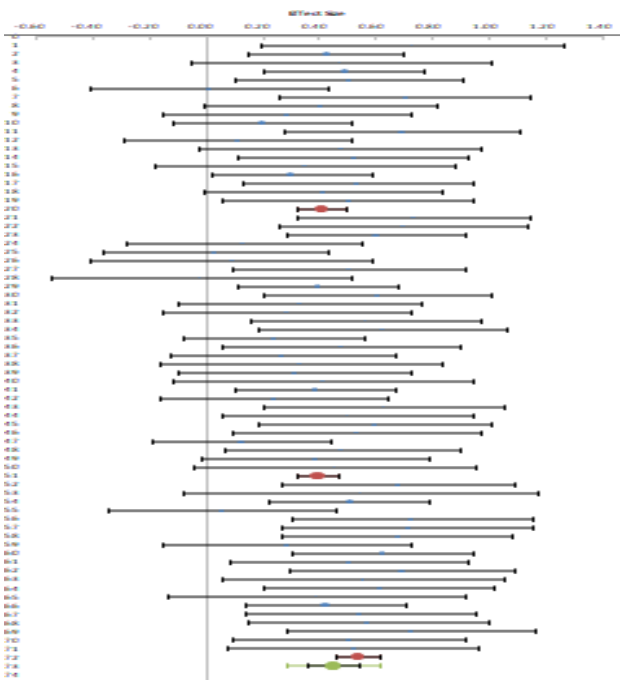


Figure A3-6: Product type-based subgroup for H1



A3-7: SP type based subgroup H1

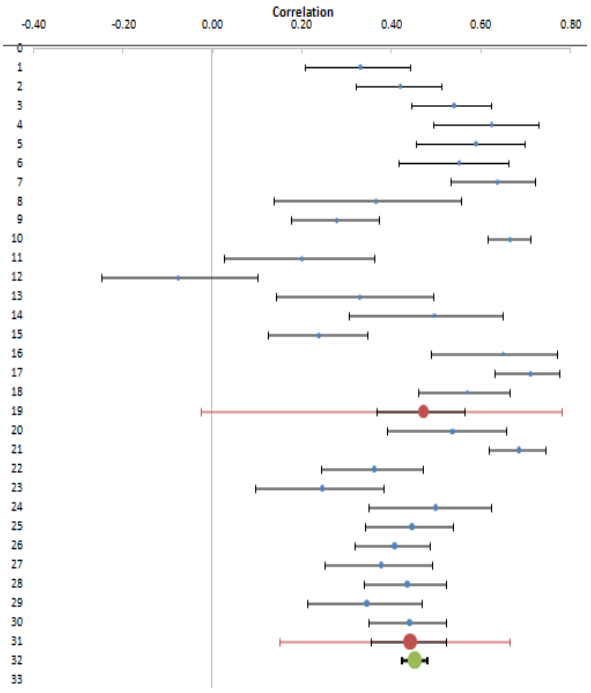


Figure A3-8: Country based subgroup for H2

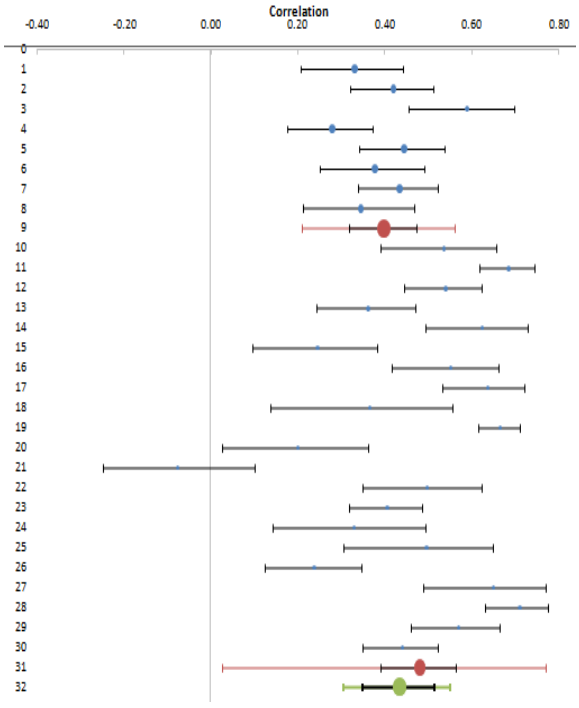


Figure A3-9: Type of survey-based subgroup for H2

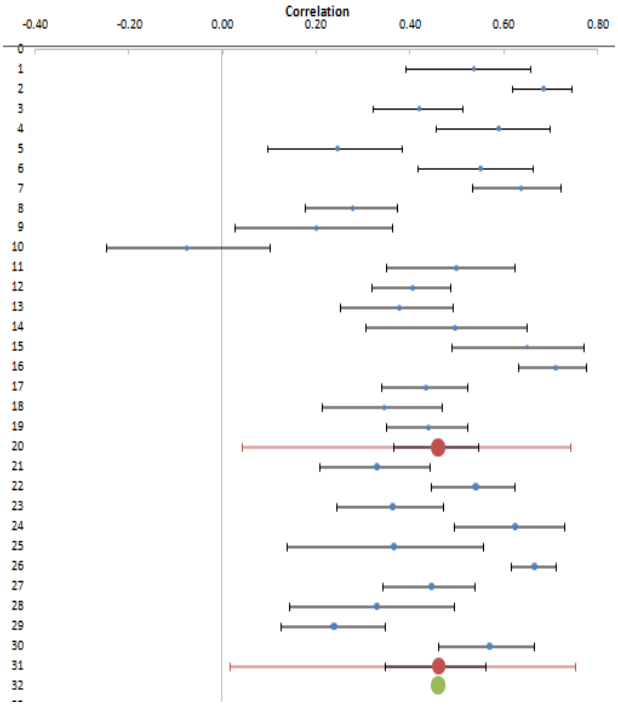


Figure A3-10: ISO based subgroup for H2

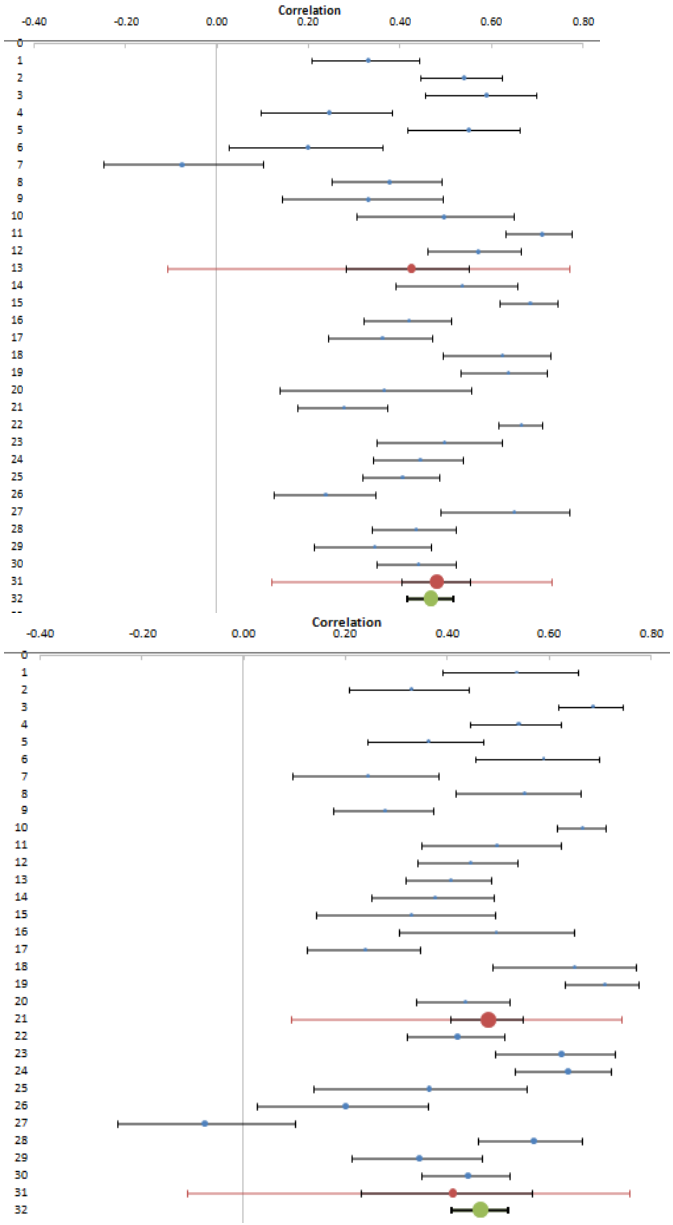


Figure A3-11: Innovative based subgroup for H2

Figure A3-12: Time horizon-based subgroup for H2

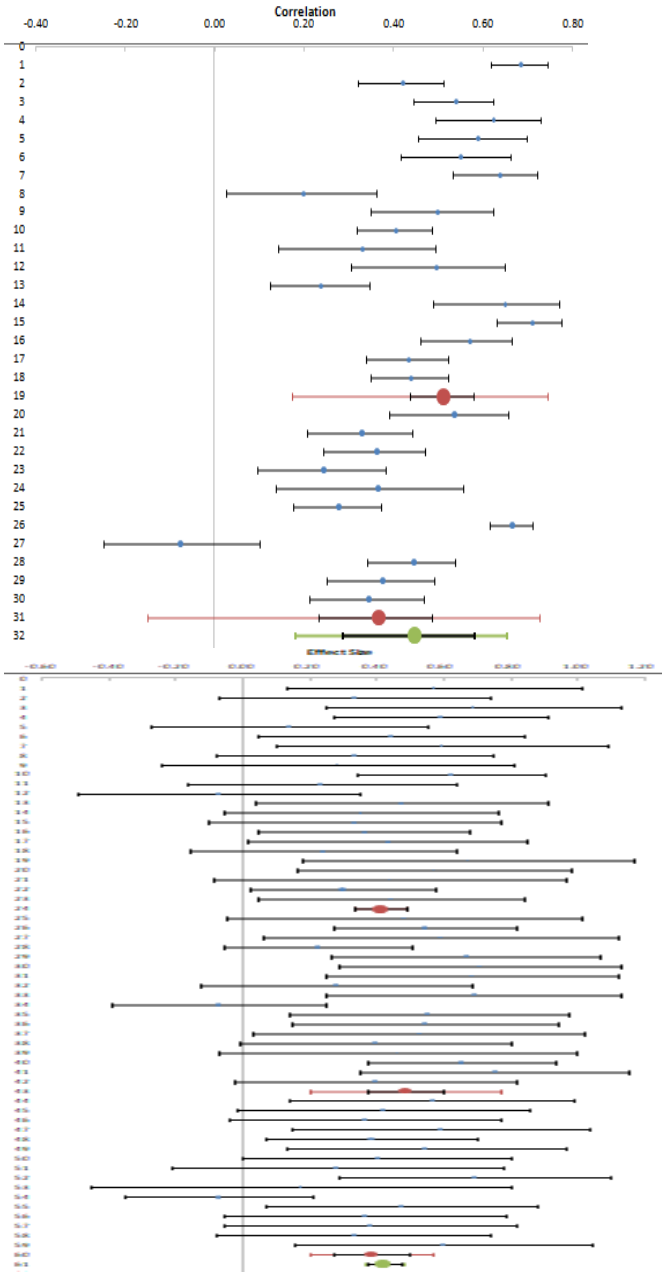


Figure A3-13: Product type based subgroup for H2

Figure A3-14: SP type-based subgroup for H2

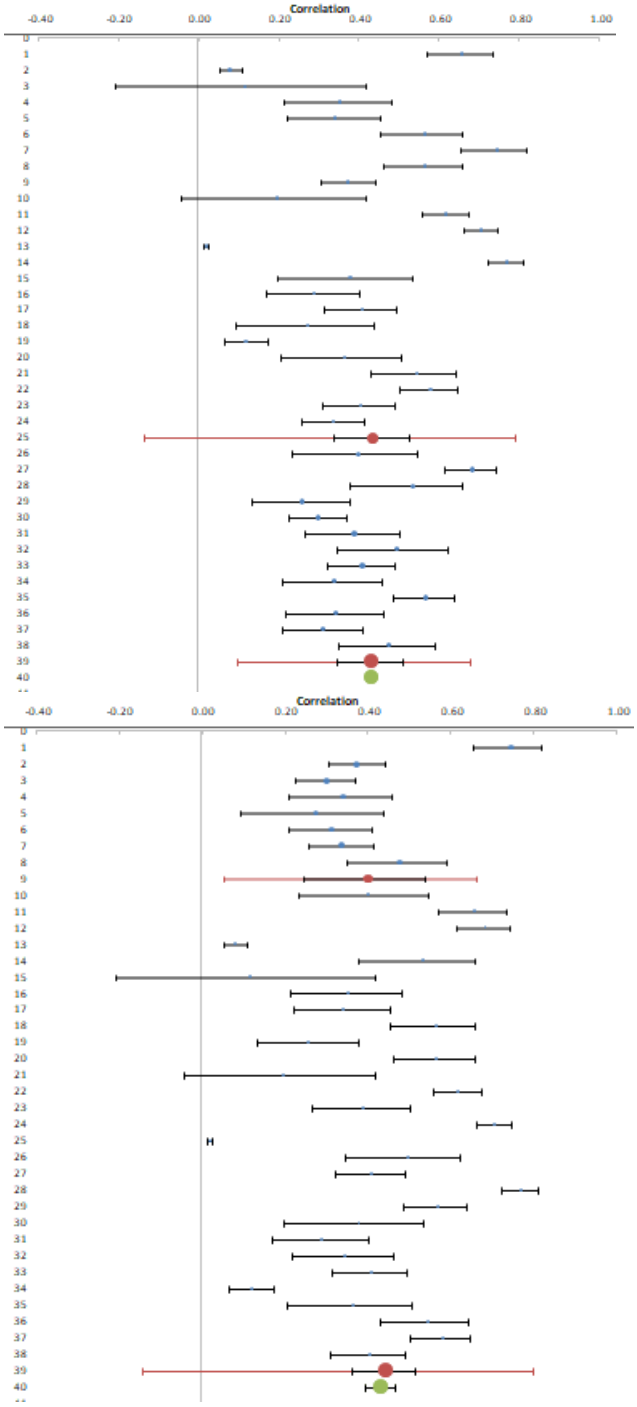


Figure A3-15: Country based subgroup for H3

Figure A3-16: Type of survey-based subgroup for H3

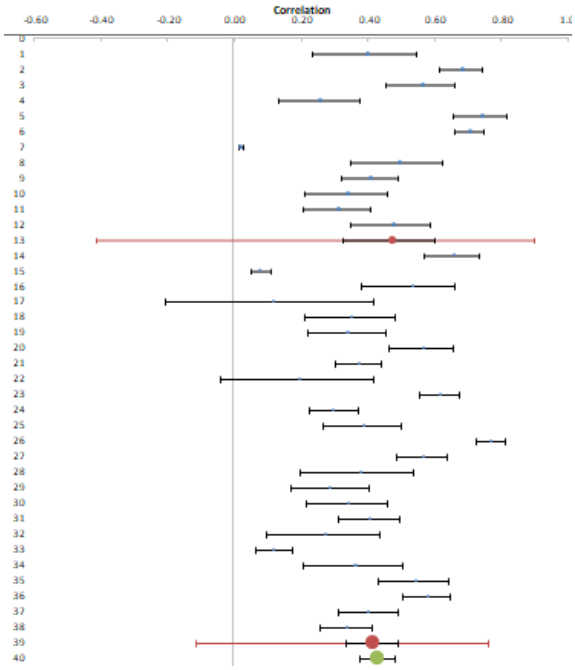


Figure A3-17: ISO based subgroup for H3

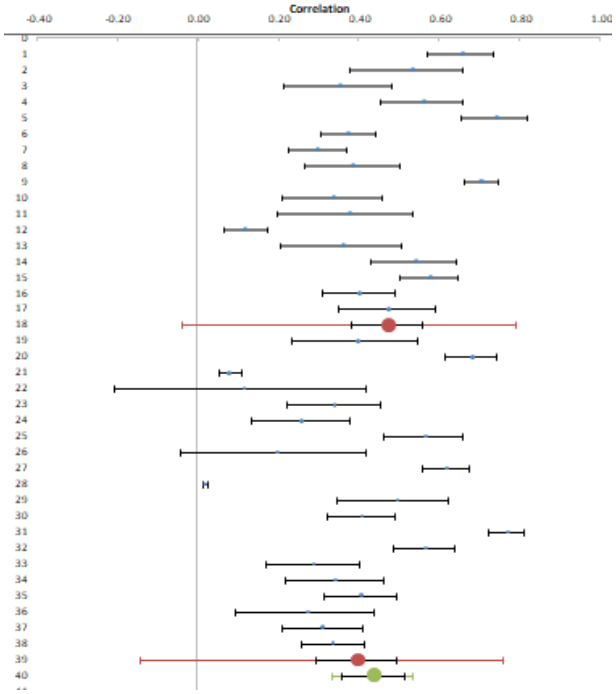


Figure A3-18: Innovative based subgroup for H3

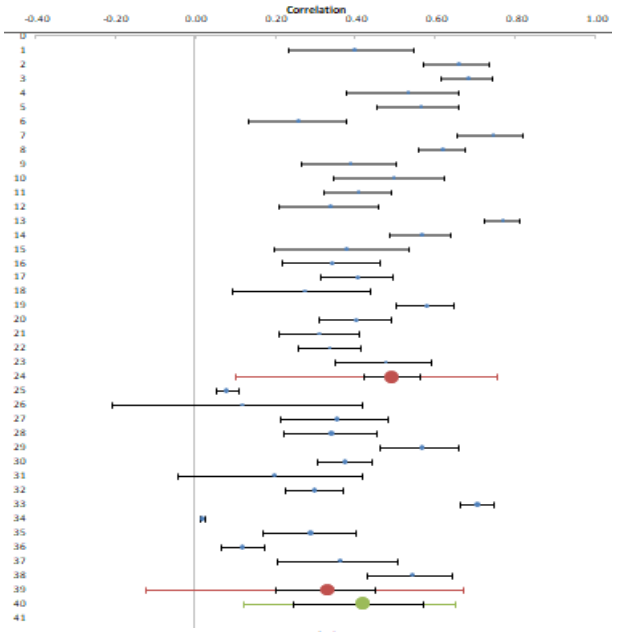


Figure A3-19: Time horizon-based subgroup for H3

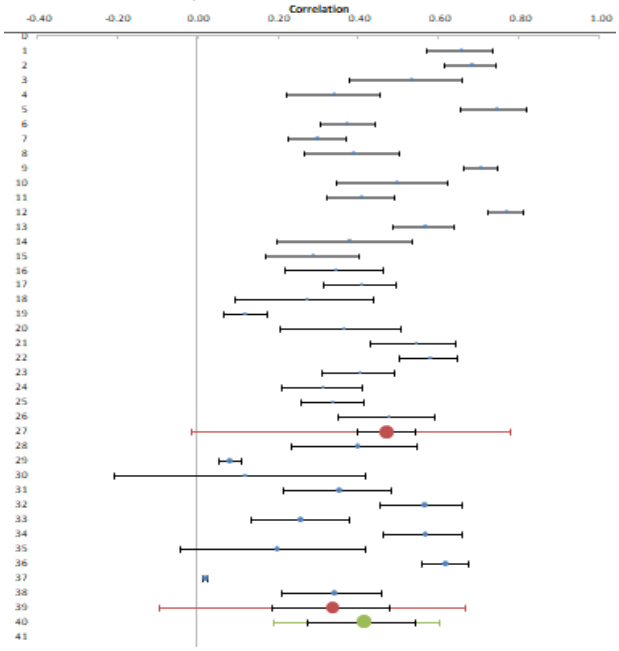


Figure A3-20: Product type - based subgroup for H3

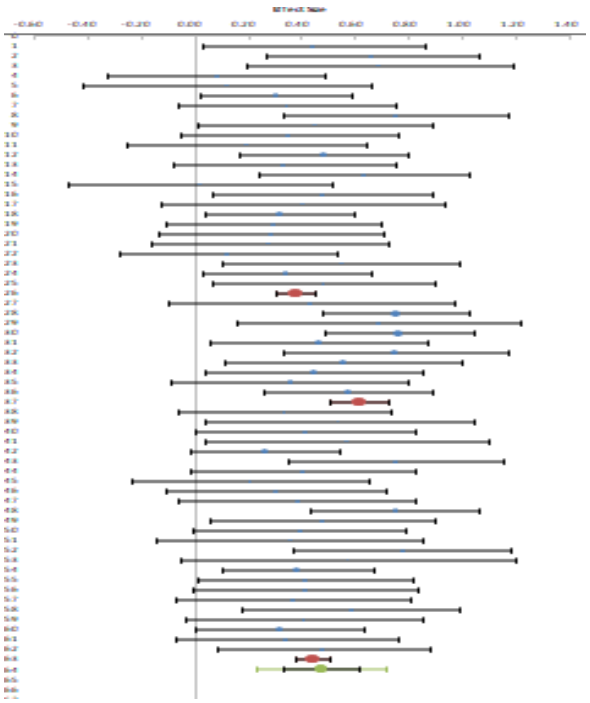


Figure A3-21: SP type-based subgroup for H3