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Advancing the understanding of voluntary sustainability standard organizations' geographic diffusion: the role of national institutions in global agrifood

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Abstract
Voluntary sustainability standard organizations (VSSOs) are influential non-state actors shaping the governance of global value chains, especially in low- and middle-income economies (LMIEs) where transnational production is concentrated. They play a pivotal role in aligning international trade and investment flows with sustainability and development objectives. Yet, their diffusion across LMIEs remains uneven, and the institutional determinants of their geographical presence remain poorly understood. Focusing on the global agrifood sector—where VSSOs are particularly widespread—this study provides a systematic, cross-national analysis of how national institutional environments relate to VSSOs' geographical presence. Using a novel dataset covering 131 agrifood VSSOs and country-level indicators of institutional development, we build a VSSO–country network and apply correlation analyses to examine which institutional dimensions co-vary with VSSO presence. Results show that VSSOs are significantly more active in countries with well-developed trade, technical assistance, financial, and social protection institutions—key enablers of private sustainability governance. Conversely, we find no association between the strength of environmental institutions and VSSO diffusion. We build on these findings to identify institutional development targets that LMIE policymakers should consider if seeking to promote VSSO diffusion as part of their policy goals and in response to value-capture opportunities in GVCs.

Keywords Eco-standards · Global value chains · Institutions · Standards · Sustainability · Corporate social responsibility

Introduction

Voluntary sustainability standard organizations (VSSOs) are non-state actors, including coalitions of multinational corporations and multi-stakeholder initiatives, that create voluntary sustainability standards: private regulations aimed at improving the sustainability of international business activities (Bennett, 2017; De Bakker et al., 2019; Marques et al., 2023; UNCTAD, 2022; UNFSS, 2025; Vogel, 2008). VSSOs have become prominent institutional actors in shaping governance efforts to reduce harm to the natural environment, improve labor conditions, and enhance social outcomes in global value chains (GVCs) by developing and promoting standards intended to transform how transnational production is organized (Bartley, 2018; Fransen & Kolk, 2007; Gereffi & Lee, 2016; Goerzen & Van Assche, 2023; Locke, 2013; Marx et al., 2024). VSSOs' influence on GVC organization has been substantial. For example, the total land area where the production of cocoa, coffee, tea, bananas, cotton, soybeans, sugarcane, and oil palm is organized in compliance with standards such as Fairtrade, Rainforest, 4C, and Better Cotton (among the others) passed from about 2.5 million hectares in 2008 to close to 23 million hectares in 2022 (ITC, 2025a).

Despite mixed evidence of their impact against social, environmental, and economic indicators, VSSOs are

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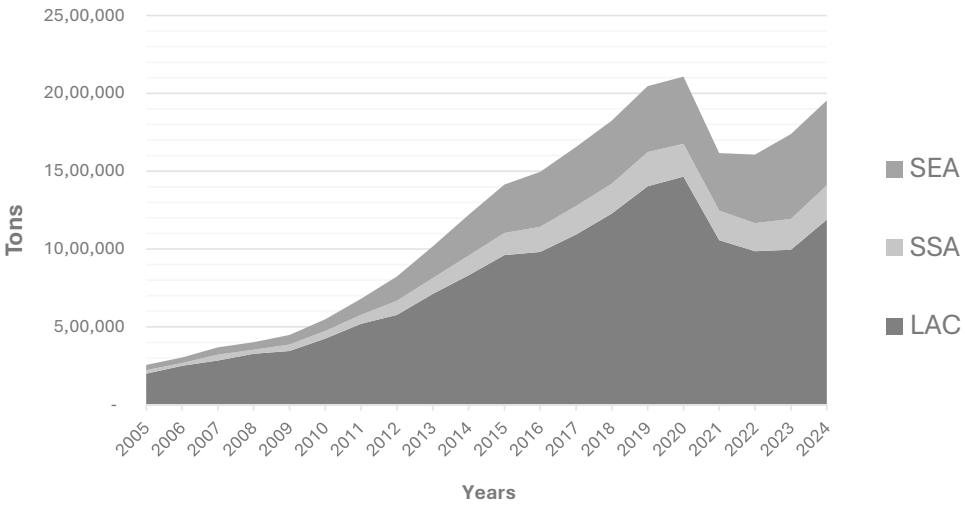


Fig. 1 Certified coffee production: Estimated Regional Evolution 2005–2023 [Latin America and Caribbean (LAC), Sub-Saharan Africa (SSA), South-East Asia (SEA)]. Note: The estimates are based on the authors' original elaboration of publicly available trade statistics datasets (FAO, FiBL, ICO, ITC, WTO, World Bank)

assumed to improve the sustainability and equity of GVCs, particularly in low- and middle-income economies (LMIEs)[1] where many GVC activities are concentrated (Fiorini et al., 2019; Flankova et al., 2024; Lambin & Thorlakson, 2018; Marques & Eberlein, 2021; Meemken et al., 2021; Schleifer et al., 2022). This is achieved by specifying production and trade requirements that firms must meet to maintain access to global markets (Van Assche & Narula, 2023). In this context, standards are positioned as tools not only for reducing the negative externalities of international business but also for fostering economic, social, and environmental upgrading in LMIEs (Barrientos et al., 2011; De Bakker et al., 2019; De Marchi & Gereffi, 2023; Golgeci et al., 2021; Marques et al., 2023; McDermott & Pietrobelli, 2017; UNFSS, 2022). Furthermore, amid the current rise in mandatory sustainability regulations such as the EU Deforestation Regulation, VSSOs offer multinational corporations "a proactive pathway […] to align their operations with these emerging legal requirements" (ITC, 2025a, p. xii; see also Cosimo et al., 2024; IISD, 2025; UNFSS, 2025). The promotion and diffusion of VSSOs in LMIEs is a prominent policy and business strategy for reconciling trade, investment, sustainability, and regulatory goals in the global economy (Goerzen et al., 2025).

Research to date provides two key insights about the diffusion of VSSOs. First, their success is closely tied to the strength and configuration of local institutional environments in which standards are implemented (Amengual & Chirot, 2016; Castaldi et al., 2023; Goerzen et al., 2021; Locke, 2013; Manning et al., 2012). For example, in the Brazilian sugarcane sector, labor standards initiatives by global buyers such as Coca-Cola achieved positive outcomes thanks to a parallel but disconnected enforcement regime, guaranteed by the national government's strong legal, inspection, and prosecution mechanisms (Coslovsky & Locke, 2013). In LMIEs, robust institutions also enhance firms' capacity to meet the technical, managerial, and financial demands of compliance, which often involve resource-intensive upgrades in production and management practices (Henson & Humphrey, 2010; Lambin & Thorlakson, 2018; Marx et al., 2024; McDermott, 2014). For example, in Central America, communities of producers could develop the capabilities to comply with environmental standards thanks to the creation of new local support institutions by alliances of public and private actors. These new institutions created and expanded local networks for knowledge circulation and resource access aimed at product and process innovation (Perez-Aleman, 2012). Similarly, government support institutions that ensure the inclusion and participation of local private and public actors in problem-solving processes and resource mobilization were critical to the success of the Mendoza wine district in Argentina by fostering local producers' ability to meet international standards (McDermott et al., 2009).

Second, the diffusion of standards across LMIEs remains uneven. For example, VSSO-compliant coffee production remains primarily concentrated in Latin America and the Caribbean. In contrast, the adoption and diffusion of coffee standards are more challenging in Sub-Saharan Africa and South-East Asia, despite coffee being a cornerstone of multiple economies across these three macro-regions (Fig. 1). While GVC activity is highly concentrated in these regions, significant barriers persist to the widespread adoption of standards in LMIE supply chains, undermining the potential for a positive impact of VSSO-based governance (Lee et al.,

[1] We use the acronym "LMIE" to refer to economies classified by the World Bank as low-income, lower-middle-income, and upper-middle-income. https://datahelpdesk.worldbank.org/knowledgebase/articles/906519

2012; Marx & Wouters, 2015; Meemken, 2020; UNCTAD, 2022; UNFSS, 2020).

Existing research on VSSOs provides only partial insights into how national institutions influence their global diffusion and into the factors that explain their uneven distribution (Aragon-Correa et al., 2020; DeFries et al., 2017; Garrett et al., 2021; Meemken et al., 2021). One limitation concerns the narrow empirical scope of current studies. Although more than 450 VSSOs are estimated to operate globally (UNCTAD, 2022), much of the existing knowledge on their uptake and institutional dynamics is derived from single-case or small-N comparative studies focusing on specific standards, sectors, or countries (Marx et al., 2024; Meemken et al., 2021). This body of work often concentrates on a few well-studied examples—such as the coffee industry, the Forest Stewardship Council, or the apparel sector in Bangladesh—limiting broader generalizability. A second limitation lies in the diversity of theoretical traditions, analytical perspectives, and levels of analysis. The literature approaches the VSSO–institutional nexus from various perspectives, including those of VSSOs themselves (Tashman et al., 2022), multinational corporations (Goerzen et al., 2021), suppliers (Toffel et al., 2015), and LMIE governments (Marques & Eberlein, 2021). The institutional dimensions under examination vary widely, ranging from the content and stringency of norms to the organizational capabilities required for compliance, governance structures in GVCs, and corporate sustainability performance. Existing knowledge remains fragmented and context or actor-specific.

Developing a macro-level understanding of how institutional development relates to the geographic presence of VSSOs is critical. It can improve our knowledge of how the local context is associated with the geographical dispersion of transnational sustainability governance (Bartley, 2018; Van Assche & Narula, 2023) and contributes to supporting national policymakers in LMIEs who are investing in institutional reforms to facilitate standards adoption and promote upgrading within GVCs (De Marchi & Alford, 2022; McDermott, 2014; Pietrobelli et al., 2021; Pipkin & Fuentes, 2017; Ricks & Doner, 2021). Furthermore, as rising sustainability reporting regulatory pressures push VSSO members to more careful and costly monitoring of LMIE suppliers' performance (Wilhelm, 2024), a consolidated global understanding of the institutional–VSSO diffusion nexus would help contextualize the analysis of MNCs' global sourcing strategies going forward (Goerzen et al., 2025).

This study offers a systematic, macro-level assessment of how national institutional development is associated with VSSO diffusion, transcending the particularities of individual products, standards, or value chains. VSSO diffusion refers to the expansion of standard-setting organizations establishing their presence in a broad range of LMIEs, reflecting their growing transnational reach and influence. While conceptual work and case studies suggest a causal role of domestic institutions as enablers or barriers to VSSO uptake, we face a lack of reliable and comprehensive longitudinal datasets documenting the historical patterns of geographical diffusion of the global VSSO population *and* the developmental trajectory of individual countries' institutions. This makes the verification of any causal relationship unfeasible. Therefore, our study consolidates and advances the literature by developing an original cross-sectional dataset, which we use to generate evidence about the correlation of institutional strength and VSSO global diffusion in the context of LMIEs. We ask: *How is the geographic diffusion of VSSOs associated with country-level institutional development?*

To test our hypotheses, we focus on the global population of agrifood VSSOs, a compelling context given its empirical richness, policy relevance, and the outsized role these standards have played in reshaping agrifood value chains. We construct a global dataset capturing the geographical scope of 131 agrifood VSSOs. This dataset is used to generate a VSSO–country network. It draws on multiple data sources, including the International Trade Centre (ITC) Standards Map (ITC, 2025b), as well as ten databases that document the presence and activities of national institutions across countries. We then conduct a series of correlation analyses between this network and selected country-level institutional development indicators, focusing on institutional dimensions identified in prior research as critical for VSSO uptake.

Our findings strengthen the confidence of existing qualitative and conceptual arguments about the institutional enablers of VSSO diffusion and identify new puzzles that future research should seek to address. We show that VSSOs are more present in countries with stronger trade, technical assistance, financial, and social protection institutions, reinforcing and extending insights from case-based studies. Contrary to expectations, however, the strength of environmental stewardship institutions has no correlation with VSSO diffusion. We discuss how these findings inform policy debates and strategic decisions surrounding the use of VSSOs as governance tools to improve the sustainability of GVC production. We also contribute to international business policy scholarship by bridging cross-disciplinary research traditions engaged in understanding the relationship between sustainability governance, economic development, and international business through a consolidated overview of the institutional development–VSSO diffusion nexus. Finally, we contribute to international business policy practice by clarifying the institutional conditions associated with the spread of private sustainability governance mechanisms.

Literature review: VSSOs and institutional development in LMIEs

Institutions are an essential construct of this study. We broadly define institutions as the formal and informal rules, processes, and enforcement mechanisms that shape and discipline the environment in which social interactions and organizational conduct occur (North, 1990; Ostrom, 1990). Three main lines of research investigate the nexus of VSSO diffusion and national institutions in LMIEs. The first research stream focuses on the perspective of LMIE firms and smallholder producers pursuing standard compliance to integrate and compete in GVCs (Gereffi & Lee, 2016; McDermott & Pietrobelli, 2017; Meemken, 2020; Perez-Aleman, 2011). The second line of research examines VSSO diffusion from the strategic perspective of MNCs that promote standard adoption among their suppliers (Castaldi et al., 2023; Fransen et al., 2019; Goerzen et al., 2021; Marques et al., 2023). The third research stream applies a global governance perspective focusing on the determinants of VSSO private governance effectiveness in LMIEs where suppliers operate (Auld, 2014; Bartley, 2018; Flankova et al., 2024; Locke, 2013). We review these research bodies and highlight their main contributions to the understanding of how institutional development in producing countries matters to the geographical diffusion of VSSOs.

Institutional support for GVC suppliers' standard adoption in LMIEs

A highly interdisciplinary body of research assesses the economic, social, and environmental impact of agrifood standards on firms, communities, and GVCs in LMIEs (Barrientos & Smith, 2007; DeFries et al., 2017; Dietz & Grabs, 2022; Garrett et al., 2021; Krishnan et al., 2023; Meemken, 2020). This line of inquiry contributes to understanding VSSO diffusion through the lenses of LMIE firms and smallholder producers seeking standard compliance. It focuses on the domestic and international factors that enable or hinder standard adoption, and the subsequent economic, social, and environmental impact (Meemken et al., 2021; Schleifer et al., 2022). This work complements research on how LMIE firms build the organizational capabilities to meet buyers' requirements and, therefore, integrate and upgrade in GVCs (McDermott & Pietrobelli, 2017; Perez-Aleman, 2011). An essential argument that emerges is that VSSOs tend to operate more in middle- and high-income countries that provide stronger institutional support to firms and producers' organizations as they undergo the challenging processes to achieve standard compliance (Lee et al., 2012; Marx & Wouters, 2015; Oya et al., 2018).

For example, it has been argued that standards as a supplier selection mechanism allow VSSOs to shift the costs of environmentally sustainable production on GVC suppliers, imposing a supplier's 'sustainability squeeze' (Ponte, 2020, 2022). Suppliers are burdened with identifying and mobilizing the additional resources required to develop a 'sustainable product' complying with VSSO requirements (e.g., sustainable coffee, sustainable cocoa, etc.). National institutions play a crucial role in enabling such resource mobilization. They contribute to lowering the cost of standard compliance for producers by accelerating the building of know-how, facilitating access to credit and investments, and improving market linkages (Lee et al., 2012; McDermott & Pietrobelli, 2017; Perez-Aleman, 2012; Ricks & Doner, 2021). As a result, VSSOs tend to be more effective, and their members face lower barriers to standard adoption in GVCs when domestic institutions are in place that effectively support firm-level learning and access to financing.

Case studies identified various enabling institutions. Domestic provision of robust export facilitation services and effective technical assistance tailored to national firms' upgrading goals enabled firms and producers to build standard compliance capabilities in Southeast Asian agricultural sectors (Greenville & Kawasaki, 2018; Ricks & Doner, 2021). Access to feasible private, public, and blended financing options tailored to the firms' funding needs is crucial for SMEs' successful green innovation and environmental upgrading in the Latin American coffee sector (Ferretti, 2023; Perez-Aleman & Sandilands, 2008). Cross-sectoral efforts to build ad hoc institutions were crucial for the Mexican agrifood industry to develop domestic capacity for adopting transnational food safety standards, which led to enhanced capacity to reap the opportunities opened by NAFTA (and then CUSMA) (Fuentes & Pipkin, 2024; McDermott & Avendaño Ruiz, 2024). Similar findings motivated, but have not yet empirically tested, the broader argument that VSSOs are more likely to operate in LMIEs with stronger institutions that support domestic firms' upgrading within GVCs.

National institutions and MNCs' promotion of VSSOs

The second research stream builds on premises similar to those of supplier-focused GVC research but shifts the analytical lens to the perspective of multinational corporations (MNCs). This body of work examines how MNCs leverage VSSOs to fulfill environmental and social corporate responsibility commitments (Fransen et al., 2019; Goerzen & Van Assche, 2023; Kolk, 2012). VSSOs are frequently positioned as key instruments through which MNCs enable the sustainability upgrading of local producers, often via corporate social responsibility (CSR) programs or cascade-compliance mechanisms aimed at building supplier capabilities

for standard adoption (Castaldi et al., 2023; Gereffi & Lee, 2016; Marano et al., 2024). However, the developmental role of VSSOs in these contexts is closely shaped by the commercial and operational priorities of the lead firms that promote them (De Bakker et al., 2019; Grabs, 2020; Marques et al., 2023; Schleifer, 2019; Vogel, 2008). As such, MNCs adopt VSSOs not only as governance mechanisms but also as part of CSR strategies aimed at improving the legitimacy and reputational integrity of their sourcing practices.

MNCs' adoption of VSSOs does not happen in a vacuum. One country's institutions' quality and the degree of pressure domestic institutions exert on the compliance schemes influence the MNCs' ability to foster suppliers' and subsidiaries' social and environmental upgrading (De Marchi & Gereffi, 2023; Gereffi & Lee, 2016; Goerzen et al., 2021). Furthermore, producing countries' institutional development influences the design and implementation of effective CSR practices, which often rely on cascading-compliance models to stimulate environmental upgrading in the GVCs (Fransen, 2013; Narula, 2019). Importantly, domestic institutional conditions not only facilitate or constrain implementation but also influence the strategic architecture of CSR itself. Research shows that national institutions can shape MNCs' decisions about which governance tools—such as standards or labor rights initiatives—are most appropriate or effective in each context (Husted & Allen, 2006; Rathert, 2016). MNCs that are committed to sustainable sourcing calibrate their CSR strategies to align with or capitalize on favorable institutional environments that incentivize supplier compliance and facilitate upgrading.

In many instances, MNCs' consideration of institutional pressures will push them to avoid costly CSR strategies that entail structuring an efficient cascading compliance system in a local context that registers weak institutions. In such cases, MNCs may relocate their sustainable sourcing operations to countries with more favorable institutional conditions, thereby reducing the costs and risks of promoting standard compliance (Goerzen & Van Assche, 2023; Van Assche & Narula, 2023). A potential implication of this line of research is that VSSOs would diffuse more in countries where stronger national institutions reduce the costs of standard compliance as a mechanism for selecting sourcing locations and suppliers. Institutional strength may become an even more influential factor as MNCs face increasingly strong regulatory pressures related to the monitoring and reporting of their GVC sustainability measures (Goerzen et al., 2025; Wilhelm, 2024).

Private governance effectiveness and national institutions in LMIEs

Groundbreaking research in the area of global sustainability governance focuses on the interaction of VSSO private governance with national institutions and how that impacts VSSO effectiveness (Auld, 2014; Bartley, 2018). Building on the premise that numerous instantiations of global governance are ultimately about local processes, institutions, and capabilities (Sassen, 2008), this research stream finds that private governance's ability to discipline supply chains effectively depends on VSSOs' dynamic complementarities with "technical assistance, capability-building initiatives, and innovative government regulatory efforts." Such complementarities enable VSSOs to be adaptive to local circumstances and benefit from a mutual reinforcement of the public and private regulatory systems (Locke, 2013; p.3). VSSO diffusion cannot be disentangled from the local institutional arrangements that VSSOs confront. VSSO private governance can only be as strong and effective as the national institutions that influence its application (Amengual & Chirot, 2016; Locke, 2013).

Empirical research underscores the critical role of domestic institutions in shaping the outcomes of private sustainability governance. For instance, in Hewlett–Packard's supply chain, strong national institutions were found to be more influential in securing supplier and subsidiary compliance with standards than either audit intensity or corporate supply chain power (Distelhorst et al., 2015). Similarly, countries with stronger social institutions and greater engagement in the International Labour Organization's treaty regime tend to host suppliers with better social performance (Toffel et al., 2015). In the Dominican Republic, improvements in labor regulation among suppliers have been attributed to the synthesis of mutually reinforcing public–private regulations that build on the complementary action of national institutions and VSSOs (Amengual, 2010).

The national institutional context also influences whether the degree of stringency of VSSOs' governance determines a more effective sustainability impact and VSSO uptake. Stringency is the extent to which the VSSO's system of rules keeps VSSO members accountable for improving their environmental performance according to defined targets and commitments (Castka & Corbett, 2016; Tashman et al., 2022). For environmentally focused VSSOs, having clearer, quantifiable, and enforceable impact targets, transparent monitoring processes, and effective sanctions mechanisms fosters the ability to generate impact. They do not necessarily encourage VSSO uptake, though (Flankova et al., 2024; Tashman et al., 2022). In fact, evidence suggests that institutional pressures in the local context influence the firms' perception of VSSO stringency. Stronger environmental institutional pressures would drive MNCs toward VSSO participation. Multinationals operating in institutionally weak locations would be less likely to join a VSSO instead (Tashman et al., 2022). As such, VSSOs would be more present in contexts that register a qualitatively strong domestic institutional context and higher-quality VSSO governance.

The dependency of VSSO uptake on national institutional strength reveals a fundamental tension at the heart of transnational private regulation. On one hand, VSSOs often establish ambitious sustainability standards that place significant demands on suppliers. On the other hand, the MNCs driving these initiatives also expect their suppliers to maintain operational flexibility and deliver cost efficiencies, goals that may be difficult to reconcile with the requirements of social and environmental upgrading (Bartley, 2018; Goerzen & Van Assche, 2023; Grabs, 2020). This dilemma is illustrated in recent research on the coffee sector, which finds that no VSSO has succeeded in simultaneously achieving commercial success and meaningful sustainability impact. More stringent standards tend to hinder uptake by producers due to high compliance costs. At the same time, standards that are easier to adopt are often associated with minimal improvements in environmental or social outcomes (Dietz & Grabs, 2022). Amidst these trade-offs and limitations of VSSO governance as a GVC-disciplining tool, national institutions become an essential factor in determining whether and how VSSOs diffuse across sectors and geographies.

These three research streams provide compelling evidence that domestic institutional development plays a pivotal role in shaping the diffusion of VSSOs in LMIEs, suggesting that a causal link exists between stronger institutions and the spread of VSSOs. Yet, despite these insights, the literature remains fragmented—lacking a unified cross-national framework that systematically identifies which institutional domains matter most for global VSSO diffusion. Our study makes a substantial step toward consolidating the fragmented cross-disciplinary insights by testing a theoretically grounded model about the association of specific dimensions of national institutional development and the global diffusion of VSSOs. Our goal is to identify the institutional dimensions in correspondence with which VSSOs seem to proliferate more, indicating where a causal relationship is most likely to exist and paving the way for future data collection and research efforts.

Hypothesis development

The insights emerging from the literature review suggest that VSSOs are more likely to diffuse in countries showing a high-quality set of national institutions. Stronger institutions facilitate supplier-level capability building for standard compliance (McDermott & Pietrobelli, 2017; Meemken et al., 2021; Perez-Aleman, 2011, 2012), which would encourage VSSOs to operate at the location. Stronger institutions also facilitate the role of MNCs in promoting standard adoption, making CSR efforts more efficient and aligned to MNCs' sourcing location strategies (Castaldi et al., 2023; Goerzen et al., 2025), therefore suggesting MNCs will steer VSSO diffusion toward institutionally strong contexts. High-quality national institutions complement VSSO's private governance, whose regulatory power and effectiveness must adapt to the context of standards implementation (Bartley, 2018; Locke, 2013). VSSOs would thus be more likely to diffuse in countries where national institutions have strong capabilities to integrate standards. Finally, strong national institutions are likely to boost MNC participation in VSSOs whose sustainability rules are particularly stringent (Flankova et al., 2024; Tashman et al., 2022). This also points to stronger VSSO uptake in countries with high-quality formal and informal institutions.

This interdisciplinary body of research thus argues that VSSOs' need to efficiently govern environmental and social performance across GVCs shapes where and how they expand. Specifically, VSSOs are likely to avoid locations where weak institutions raise the costs and risks of standard implementation. Instead, they will prioritize countries where institutional strength reduces these burdens. In this regard, we argue that VSSOs can be understood as extensions of GVC lead firms' sustainable sourcing strategies, selectively engaging with LMIEs where production can be located under more credible and cost-effective conditions. Therefore, considering the causal claims of existing conceptual and case-study research on the nexus of VSSOs and institutional development, we can at least expect the in-country presence of VSSOs *to be correlated* with the strength of domestic institutions that are relevant to standard adoption. In the remainder of this section, we abduce five dimensions of national institutional development that existing research suggests are particularly important for VSSO engagement. We develop a corresponding set of hypotheses about their correlation (Fig. 2), which we test in the empirical section of the manuscript.

VSSO diffusion and trade support institutions

We deduce the importance of trade support institutions to VSSO diffusion primarily from evidence of the institutional enablers of firm-level standard adoption. Standard adoption by firms in LMIEs is associated with their regional and global trade integration. VSSOs promote a binary regime of 'in or out' of a specific GVC (Goerzen & Van Assche, 2023; Lee et al., 2012). For example, in the coffee and cocoa sectors, lead firms will source their 'quotas' of sustainable coffee and cocoa only from those producers' organizations whose crops obtained a third-party certification because of standard compliance. Once the product is certified, it must be sold on the export market to access a price premium. The ability of coffee producers to reap the benefits of product certification also depends on their ability to trade their product efficiently—not only to produce it (ITC, 2021; UNCTAD, 2022).

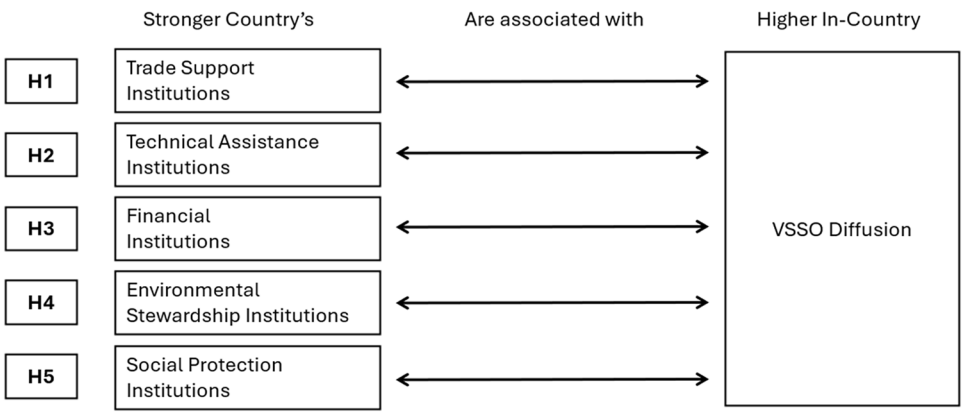


Fig. 2 Hypotheses summary

LMIE suppliers' export capability benefits from robust trade institutions, which are the institutions tasked with enabling economic exchange at domestic, regional, and global levels. National regulations, policies, and infrastructure are key to fostering smooth export operations from farm gate to international shipment. They enable firms and producers' organizations to reduce the costs involved in standard compliance and participation in GVCs (Marx et al., 2024; UNCTAD, 2022). For example, strong trade institutions reduce the bureaucratic burden of export processes and due diligence tasks; they create material infrastructure (roads, storage facilities, ports, etc.) that support access to markets; they provide technical assistance to interpret foreign markets' entry requirements. Trade institutions are essential to reduce export costs and maximize the economic benefits (and incentives) of domestic firms' standard compliance. We expect VSSOs to factor these cost-reducing and standard-adoption incentives into the risk and cost profiling of LMIEs as sourcing locations to promote a standard. Therefore:

Hypothesis 1: *We expect VSSO diffusion to be positively correlated with the strength of in-country trade support institutions*.

VSSO diffusion and technical assistance institutions

Institutions that provide technical assistance to LMIE firms to improve their processes, products, and functions also emerge as critical. The study of LMIE suppliers' upgrading in GVCs highlights that such technical assistance is essential to developing the capabilities to upgrade, including those for VSSO adoption (McDermott & Avendaño Ruiz, 2024; Ricks & Doner, 2021). Domestic firms' interactions with technical assistance institutions enable the recombination of knowledge enclosed in standards and associated with GVC supplying relationships (McDermott, 2014). LMIE governments integrate technical assistance initiatives into their GVC-oriented policies to stimulate firms' upgrading. Sometimes, those initiatives focus on fostering capabilities creation to address standard requirements (De Marchi & Alford, 2022; Marques et al., 2023; Pietrobelli et al., 2021). LMIE institutions enable the use of standards as springboards for domestic firms' environmental upgrading and global trade integration.

Strong technical support institutions represent a fertile ground for VSSO diffusion. By creating an enabling environment for production improvements linked to standard compliance, they represent an attractive factor for VSSOs seeking to expand their presence in new LMIEs. Consequently:

Hypothesis 2: *We expect VSSO diffusion to be positively correlated with the strength of in-country technical assistance institutions*.

VSSO diffusion and financial development

Access to feasible financing options is a cornerstone for firms' capacity to upgrade and comply with standards, especially in agri-commodities sectors (Ferretti, 2023; Perez-Aleman & Sandilands, 2008; UNFSS, 2022). A lack of access to finance and investments affects firms in LMIEs, hindering their upgrading opportunities. Standard adoption entails higher operating costs than conventional production. For example, rural producers' organizations are confronted with increasingly high administrative and due diligence costs to reach value-added markets for sustainable products (Dietz & Grabs, 2022; ITC, 2021; FAO, 2022). Standard compliance also requires infrastructural investments, R&D funding, and reliable working capital supply to sustain the shift to new production practices (Perez-Aleman, 2012; UNCTAD, 2023). For instance, VSSO-certified coffee and cocoa production demands producers' organizations a variety of investments, such as the reforestation of monocultural plantations to shade crop plants or the introduction of dynamic agroforestry and regenerative agriculture systems to foster biodiversity conservation and climate adaptation

(ITC, 2021). These investment needs are hard to meet for the largest share of LMIE suppliers (Voora et al., 2022).

Domestic financial institutions are essential to broaden the base of LMIE suppliers that can adopt standards. The overall development of the national financial system and the presence of policies and regulations that enable the supply of credit and financial resources to current and potential GVC suppliers are critical. For VSSOs seeking sourcing location advantages, strong institutions in those areas entail a larger pool of suppliers who can independently fund their upgrading and meet VSSO-defined product requirements. We expect VSSOs to be more present in countries where financial institutions guarantee a relatively larger and higher-quality supply of credit to firms in their sector. Therefore:

Hypothesis 3: *We expect VSSO diffusion to be positively correlated with the strength of in-country financial institutions that support domestic firms' access to credit and investment.*

VSSO diffusion and environmental stewardship and social protection institutions

VSSO solutions to GVC sustainability issues share the domestic arena with national institutions specifically designed to tackle environmental and social issues in production (Bartley, 2018; De Marchi & Alford, 2022; Gereffi & Lee, 2016). The necessary complementarity of global VSSOs and national environmental stewardship and social protection institutions shapes VSSOs and LMIEs policymakers' decisions.

From the perspective of a VSSO seeking to impose a stringent discipline on its chains, stronger environmental stewardship and social protection institutions will entail that local firms are already relatively good sustainability performers. Faced with strong and enforceable regulations, firms must develop the capabilities to meet the compliance requirements in their domestic systems (Bartley, 2018; Flankova et al., 2024). This will shorten the gaps that firms must compensate for to achieve the environmental and social performance that the VSSO demands (De Marchi & Gereffi, 2023). Institutionally strong contexts lower the risk that suppliers will fail to comply with standards or be poor sustainability performers. This is attractive to VSSOs, which seek to maximize the effectiveness of their environmental and social governance and want to retain the cost advantages of dispersed production (De Bakker et al., 2019; Goerzen et al., 2025; Ponte, 2022). We expect these risk-reducing considerations to drive VSSO location choices.

From a LMIE government perspective, strengthening domestic institutions that offer a shield to the natural environment and workers' rights may enable a high road to trade integration but conflict with the cost-based competitiveness of domestic firms participating in regional and global markets (Barrientos De Marchi & Alford, 2022; Pietrobelli et al., 2021). It has been shown that LMIE governments' decisions on how to counter-balance the private governance of VSSOs account for industrial policy goals, developmental tasks, and value-capture opportunities in GVCs (Marques & Eberlein, 2021). For example, agrifood export is an essential source of employment and GDP for many LMIEs, influencing how policymakers modulate the relationships with VSSOs (Lambin & Thorlakson, 2018; Marques & Eberlein, 2021). LMIE governments may decide to prioritize policies that foster productivity while maintaining weak environmental stewardship and social protection institutions. This may boost productivity and trade integration in markets in which low costs shape competition. A productivity focus would also reduce institutional complementarities with VSSOs as they seek locations that enable the effectiveness of sustainability norms. For instance, public policies in Brazil pushed productivity investments that made Brazilian coffee extremely competitive on global markets but increased deforestation and reduced emphasis on environmental upgrading as a competitiveness strategy (ITC, 2021). VSSOs and LMIE policymakers may diverge in their preferences regarding the institutional arrangements that discipline environmental sustainability and social inclusion.

Market dynamics may help VSSOs and policymakers navigate similar trade-offs and divergence. For example, it has been observed that increasing market demand for value-added sustainable products justifies LMIE governments and VSSOs to "reluctantly" enter a regime of complementarity governance over time. This results in a compromise between productivity and sustainability institutions to facilitate domestic firms' access to value-added markets for sustainable products, as observed in the Brazilian soybean, Indonesian palm oil, and Vietnamese pangasius aquaculture sectors (van der Ven & Barmes, 2023, p. 5162). Ultimately, striking such a compromise entails a national context that offers VSSOs relatively robust environmental stewardship and social protection institutions that effectively match the sustainability requirements enclosed in standards. In spite of potentially higher operational costs, the need to meet market demand for sustainable products will draw VSSOs toward countries where stronger institutions reduce the risks associated with green and ethical sourcing. Consequently:

Hypothesis 4: *We expect VSSO diffusion to be positively correlated with the strength of in-country environmental stewardship institutions.*

Hypothesis 5: *We expect VSSO diffusion to be positively correlated with the strength of in-country social protection institutions.*

Data, analytical strategy, and variables

Context of analysis

To test our hypotheses, we focus on the global agrifood sector. The geographical spreading of VSSOs shaped the last thirty years of efforts to mitigate the negative externalities of GVC agrifood production (Grabs, 2020; Meemken et al., 2021; Thorlakson et al., 2018). Today, 131 agrifood VSSOs certify the production of an estimated 7.9% of the global harvested area for eight tropical commodities—bananas, cocoa, coffee, cotton, oil palm, soybeans, sugarcane, and tea (ITC, 2023). This makes VSSOs the most realistic vehicle to mitigate deforestation in tropical areas, which is 90% associated with agricultural production activities (Pendrill et al., 2022). As such, institutional-focused efforts to promote agrifood VSSOs have been central in LMIEs' industrial agendas, for which agricultural production represents a crucial productive sector (De Marchi & Alford, 2022; Marques & Eberlein, 2021). The salience of the institutional–agrifood VSSO nexus to international business sustainability makes it an ideal case to test out hypotheses and develop our contributions.

Data sources

We test our hypotheses using a unique cross-sectional set of network data we collected between 2022 and 2023. Network data capture connections (or their lack thereof) among nodes, which can be either individuals, sub-organizational units, or organizations. The emergent structure of the connections linking two or more nodes enables understanding a phenomenon from the perspective of the social relationships that embed economic exchange (Cuypers et al., 2020; Kilduff & Brass, 2010). Network data have already been used in the past to investigate the structural features of the VSSO phenomenon (Fransen et al.,2020; Goritz et al., 2023). In this study, network data allow us to capture the global geographical presence of global VSSOs by means of tracing and mapping the countries in which each VSSO operates.

We extract our network data for this study from the ITC Standards Map (ITC SM) (ITC, 2025b). The ITC SM is an initiative led by the International Trade Centre, a joint agency of the United Nations Conference on Trade and Development (UNCTAD) and the World Trade Organization (WTO), which provides the world's most comprehensive and impartial compilation of VSSOs and their standards. It has been an important source of data for other relevant scholarship contributions on the topic of VSSOs (see, for example, Fiorini et al., 2019; Schleifer et al., 2022). The ITC SM currently offers a summary of 330 standards on its website. ITC works with the owners of the standards (VSSOs) to reveal detailed information about the underlying sustainability initiatives. These range from each VSSO's governance structure to their scope on products, industry, and geography. Given our context of analysis, we shortlisted 194 standards from the ITC SM that target the agrifood industry. This corresponds to 131 agrifood VSSOs owning the 194 standards (Appendix I). We used the information relative to the 131 VSSOs to build a geographical scope network of the global agrifood VSSO ecosystem.

Moreover, we use data extracted from ten established global datasets compiled by intergovernmental organizations, including the United Nations (UN), the World Bank, the International Labor Organization (ILO), the Food and Agriculture Organization (FAO), and the Organisation for Economic Co-operation and Development (OECD). The ten selected datasets offer publicly available country-level indicators measuring multiple dimensions of institutional development. We expand on our use of these datasets to operationalize our hypotheses in the section "Country-level institutional development indicators".

Geographical scope VSSO network

To map the geographic scope of the agrifood VSSO ecosystem, we first consolidated the raw data from the ITC SM into network data. Each standard lists its geographic scope, i.e., the countries of its product's origin and destination. We take the product origin as the relevant indicator of a standard's implementation in the domestic agrifood sector. For example, the standard Forest Stewardship Council®—FSC®—Chain of Custody, owned by the VSSO Forest Stewardship Council, lists 120 countries from which FSC-certified products originate. We have also consolidated each standard's geographic scope under its respective owners (the VSSOs). In total, we have found 199 countries listed as part of the VSSOs' geographic scope. Because of a lack of institutional indicator data required to test our hypotheses and the very scarce integration of domestic firms in GVCs, we removed small-island countries[2] and a selection of failed states[3] from our sample. As a result, we shortlisted 152 countries. At this point, we built the geo-scope network. We extracted and aggregated each VSSO's (and corresponding standard) geographic scope of the certified product's origin. The geographic scope network consists of VSSOs and countries as nodes. Edges from each of the 131 VSSOs are directed to their corresponding product origin countries. In this study,

[2] For the official list of small-island countries, please see: https://www.un.org/ohrlls/content/list-sids

[3] Afghanistan, Cuba, Iran, North Korea, Russia, Syria, and Venezuela.

the network is used only for visualization and to extract a network measure known as in-degree (discussed in the next section) as an indicator for VSSO geographical diffusion.

Dependent variable: VSSO diffusion

With VSSO diffusion, we refer to *the number of VSSOs operating in any given country at the time of data collection*. With diffusion, we thus capture VSSOs' geographic spread. In this study, VSSOs diffusion does not equate to the volume or intensity of their activities in a country. To quantify the degree of VSSO diffusion in a country, we count the number of VSSOs potentially operating in a country (based on the geographical scope listed by the VSSO for their product origins). This variable is derived from the number of incoming connections (known as *in-degree* in network science; Newman, 2018) in the geographical scope network, which is the number of edges we draw from the VSSO nodes to connect them to any given product origin country node, if the VSSOs operate in the country. At the aggregated level, the in-degree measure offers a screenshot of VSSO geographical diffusion worldwide as it counts the number of VSSOs that have established operations in any given country. Such an operationalization is consistent with existing intergovernmental organizations' reports that used the in-country VSSO count as a measure reflecting the breadth of transnational sustainability governance operating in that national context (see, for example, UNFSS, 2020; UNCTAD, 2022).

Correlation analysis

Correlation coefficients

To test our hypotheses, we run correlation tests between the VSSO diffusion indicator (which is the number of VSSOs operating in the country as per the in-degree value) and country-level institutional development indicators measuring the institutional dimensions that we have identified in our theory development and consolidated on the hypotheses. We adopt Pearson (r_p) and Spearman (r_s) correlation coefficients, which provide an overall indicator of correlation between two variables. As the two most used measures of correlation, Pearson is suitable for measuring the linear relationship between X and Y variables when they are continuously increasing (or decreasing), while Spearman (a non-parametric measure that only uses the rank of the value instead of the value itself) allows quantifying correlations between variables that are not necessarily continuously increasing, but tends upwards, nonetheless. Spearman also does not assume that the variables are normally distributed, unlike Pearson.

For a thorough analysis, we report both these correlation values and their corresponding p values, indicating statistical significance. However, we use the Spearman correlation coefficient as the primary correlation measure throughout the article due to its mentioned advantages. The correlation coefficient is denoted by r. The strength of the correlation coefficient is indicated descriptively by weak: $0 < r < 0.3$, moderate: $0.3 < r < 0.7$, and strong: $r > 0.7$ (adopted from Ratner, 2009).

Correlation measure with control variables

In addition, we use a semi-partial correlation measure to remove the effect of a given control variable Z that we suspect to influence X—only when measuring the correlation between X and Y. In our case, the VSSO Diffusion indicator (X) is moderately to strongly correlated with the size of the cropland area and the country's gross agricultural production value (Z)($r = 0.5$~0.7***, $p < 0.001$). From a conceptual standpoint, we could expect to see VSSOs proliferating more in countries with higher cropland areas and gross agricultural production value, which entails a broader agri-production base that VSSOs can seek to certify through standard compliance. This size effect thus needs to be controlled when measuring the correlation between VSSO diffusion in a country (X) and the institutional development indicator (Y). Hence, semi-partial correlation (a type of partial correlation that only removes the effect from one of the variables, either X or Y, instead of both) serves as an adjusted correlation measure (r^{adj}) by removing the effect of a control variable. This is done by deriving the residuals from linear regression between X and Z and using it (X_Z) to calculate an adjusted correlation measure between X_Z and Y (Kim, 2015). In this study, we use the country's Gross Agriculture Production Value (GAPV) as the control variable to remove the effect of the agricultural economy size on the number of VSSOs operating in the country. The GAPV is an indicator developed and measured by the Food and Agriculture Organization of the United Nations (FAO).

Pair-plots using quantiles

Moreover, the correlation coefficient only provides aggregate information, and we still do not know the exact shape of the bivariate distribution (how one set of values changes with another). To take a closer look at the two values (VSSO diffusion and institutional indicators), we plot the bivariate distribution and see how a country's institutional development indicators vary with the number of VSSOs operating in the country. When the correlation values are moderate, such as in our case, the bivariate distribution can be noisy. To avoid this, we plot the data using binned scatter plots. The binned scatter plots show the conditional mean and standard deviation (shaded region) of institutional indicators (y-axis) plotted against the equal-sized (approximately) bins

of VSSO diffusion indicator, i.e., the number of VSSOs in a product origin country (x-axis). We have chosen a bin size of eight (8), i.e., eight quantiles. Increasing x-axis values (and bins) consist of country groups with increasingly high numbers of VSSOs. It is important to note that, depending on the proportion of missing values for each institutional indicator, the number of countries in each group is not always equal. However, the eight quantiles, divided based on the indegree of all 152 countries, ensure that the same countries are present in each quantile of the pair plot, regardless of the institutional indicator under study.

Country-level institutional development indicators

The other variables for our correlation analyses consist of country-level measures of the institutional development dimensions we identified in the previous section. The institutional development indicators we choose to operationalize our hypotheses are listed and described in Table 1. All indicators are widely used measures developed by the World Bank, FAO, OECD, and ILO in connection with ongoing efforts to track progress against the UN SDGs. They elaborate on specific or recurrent data collection exercises. All indicators provide a quantification of domestic institutions' strength by either quantifying a specific output/outcome that connects to their action (e.g., Proportion of Land that is Degraded and Rural Access Index), assessing their quality through a more comprehensive evaluation that touches upon multiple facets of an institution (e.g., Trading Food Score and Access to Finance Score), or quantifying the resources institutions have available to pursue their public goals (e.g., Net Official Development Assistance Received).

Analysis

The results of our analysis provide robust support to the hypothesis that VSSO diffusion in LMIEs is associated with stronger domestic institutions. The correlation between VSSO diffusion and all indicators we use to operationalize country-level institutional development is statistically significant, except for the Net Official Development Assistance for Biodiversity (NODAB) and the Proportion of Land that is Degraded (PLD), which are indicators of environmental stewardship institutions' strength (Table 2). This suggests that the strength of producing countries' environmental stewardship has little or no correlation with VSSO diffusion. Correlation is particularly strong with trade, technical assistance, and access to finance institutions (Table 2). We offer a detailed visualization of the correlation between VSSO Diffusion and the selected institutional development indicators in Figs. 3–15.

VSSOs diffusion and trade institutions

VSSO diffusion has a moderate correlation with the country Trade Food Score and Rural Access Index, which has very strong statistical significance (Figs. 3 and 4). The correlation with the country's CPIA Trade Score is moderate ($r_s = 0.35 p < 0.05$) and statistically significant (Fig. 5). The correlation remains moderate and maintains significance also after controlling for the global agricultural production value (GAPV) (r_s^{adj}). These findings provide strong support for H1, confirming the argument latent in the literature that VSSOs are more likely to operate in countries with stronger trade institutions.

VSSO diffusion and technical assistance institutions

VSSO diffusion has a moderate correlation with the country's Statistical Capacity Score ($r_s = 0.51 p < 0.001$) and a moderate correlation with the CPIA Economic Management Score ($r_s = 0.38 p < 0.001$) (Table 2; Figs. 6 and 7). Values only slightly drop after adjusting for the control variable. The two indicators assess one country's institutional capacity to design and implement effective policies to assist domestic firms in upgrading production and capturing market opportunities. VSSO diffusion also has a weak negative correlation ($r_s = -0.24 p < 0.05$) with the Net Official Development Assistance Received (NODARP) by the producing countries and slightly increases ($r_s = -0.34 p < 0.001$) after control (Table 2; Fig. 8). NODARP measures the international capital that countries receive to fund technical assistance initiatives to foster firms' development and innovation. These results support H2, consolidating the argument that VSSOs diffuse more in countries with stronger institutions devoted to helping domestic firms build the know-how and infrastructure of economic development.

VSSO diffusion and access to finance institutions

The analysis finds that VSSO diffusion has a moderate correlation with the country's Access to Finance Score ($r_s = 0.53 p < 0.001$) and a moderate correlation with the Domestic Credit to Private Sector ($r_s = 0.43 p < 0.001$) (Figs. 9 and 10). The correlation values maintain statistical significance even after adjusting for the control variable GAPV, with the correlation with the Access to Finance Score only slightly dropping after control (Table 2). H3 thus finds support: VSSOs tend to be more present in countries with stronger financial institutions that enable domestic firms' access to reliable sources of financing.

Table 1 Institutional development indicators

Hypotheses	Indicator	Source	Rationale
Trade Institutions (H1)	Trading Food Score (TFS)	Enabling the Business of Agriculture Database (World Bank)	Institutional capacity to support and enable agricultural producers' organizations' trade integration (export) capabilities
	Rural Access Index (RAI)	SDGs Indicators (World Bank)	Institutional capacity to generate rural infrastructure for market access
	CPIA Trade Rating (CPIA-TR)	Country Policy and Institutional Assessment Indicators (World Bank)	Institutional capacity to support and enable national firms' trade integration (export) capacity
Technical Assistance Institutions (H2)	CPIA Economic Management Cluster Average (CPIA-EM)	Country Policy and Institutional Assessment Indicators (World Bank)	Institutional capacity to provide firms with effective technical assistance through economic analysis and proper policy management and implementation
	Net Official Development Assistance Received (NODARP)	World Development Indicators (World Bank)	Institutions' resource availability for the provision of technical assistance to firms
	Statistical Capacity Score (SCS)	World Development Indicators (World Bank)	Institutional capacity to provide firms with effective technical assistance through effective market intelligence and efficient management of development assistance capital
Financial Institutions (H3)	Accessing Finance Score (AFS)	Enabling the Business of Agriculture Database (World Bank)	Institutional capacity to enable an efficient and tailored financial market supplying funds for the upgrading of producers' organizations and agrifood firms
	Domestic Credit to Private Sector (DCTPS)	Global Financial Development Index (World Bank)	Institutional capacity to supply credit to private sector firms at large
Environmental Stewardship (H4)	Net Official Development Assistance for Biodiversity Received (NODAB)	Official Development Assistance Committee (OECD)	Institutions' resource availability for the provision of technical assistance for biodiversity restoration and conservation and other climate change adaptation goals
	Proportion of Agricultural Land that is Degraded (ALD)	UN Global SDGs Database	Performance that signals the country's institutions' capacity to responsibly operate as a steward of soil biodiversity
	CO2 Emissions from Agrifood Systems (CEAS)	FAOSTAT (FAO)	Performance that signals the country's institutions' capacity to steward the sustainability of agrifood production
Social Protection Institutions (H5)	Multidimensional Poverty Index (MPI)	World Bank	Institutional capacity to tackle multifaceted poverty issues
	Proportion of Children Engaged in Economic Activity (PCEE)	ILOSTAT—SDG Labour Market Indicators (ILO)	Institutional capacity to provide adequate protection to the rights of vulnerable groups

Table 2 Result summary: VSSO correlation significance by institutional indicator

Hypothesis	Indicator	VSSO	
		Correlation significance	Control model
H1	TFS	Moderate (***)	Same (***)
	RAI	Moderate (***)	Same (***)
	CPIA-TR	Moderate (*)	Same (*)
H2	SCS	Moderate (***)	Drops slightly (***)
	NODARP	Weak (*)	Increases slightly (***)
	CPIA-EM	Moderate (***)	Drops slightly (*)
H3	AFS	Moderate (***)	Drops slightly (**)
	DCTPS	Moderate (***)	Same (***)
H4	ALD	Very weak (-)	Same (-)
	CEAS	Moderate (***)	Drops to zero (-)
	NODAB	Weak (-)	Increases slightly (*)
H5	MPI	Moderate (***)	Same (***)
	PCEE	Weak to moderate (*)	Same (*)

VSSO proliferation and environmental stewardship institutions

The results provide limited support for H4. VSSO diffusion's correlation with two of the indicators we use to operationalize the environmental stewardship institutions (Development Assistance for Biodiversity and Agricultural Land Degradation) is not statistically significant, i.e., $p > 0.05$ (Table 2; Figs. 12 and 13). VSSO diffusion has a moderate correlation with CH4 Emissions from Agrifood Systems ($r_s = 0.53 p < 0.001$), but whose value drops to zero after adjusting for the control variable GAPV since the emission magnitude is strongly correlated with the control variable ($r_s = 0.84 p < 0.001$), which in turn is strongly correlated ($r_s = 0.83 p < 0.001$) with cropland area (Table 2; Fig. 11). We conclude that, differently from what we had theorized, the strength of domestic environmental stewardship institutions does not matter for VSSO diffusion.

VSSO diffusion and social protection institutions

The analysis finds that VSSO diffusion has a negative moderate correlation with the country's performance against the Multidimensional Poverty Index ($r_s = -0.39 p < 0.001$) and a negative weak-moderate correlation ($r_s = -0.3 p < 0.05$) with the Proportion of children engaged in Economic Activity. Both correlation values are statistically significant and remain so even after adjusting for the control variable (Table 2; Figs. 14 and 15). These results thus support H5 and its underlying argument that VSSOs are more present in countries with stronger social protection institutions, including poverty reduction policies and anti-child labor initiatives.

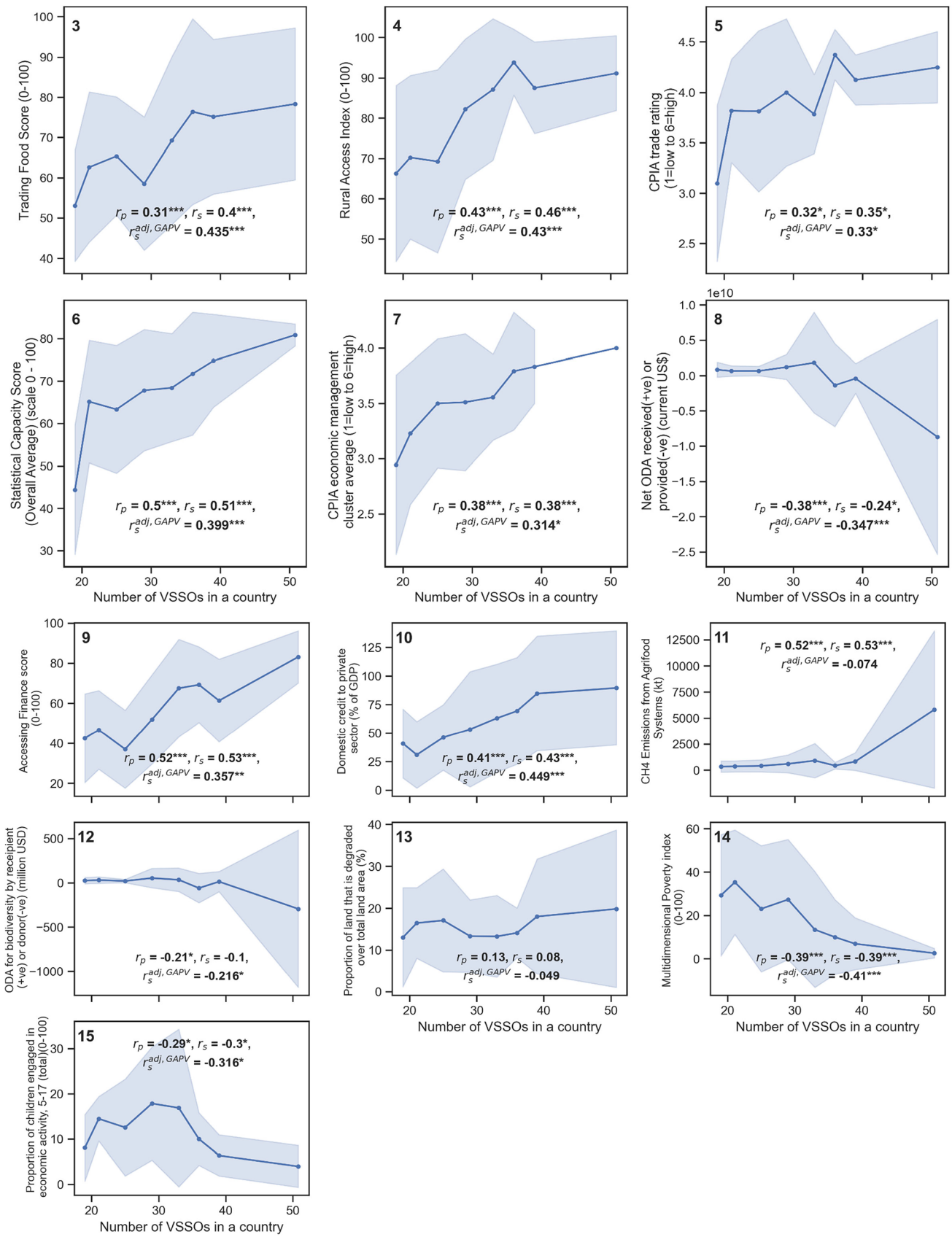
Discussion and conclusions

This study develops a synthesis, consolidates, and extends existing scholarly arguments on the relationship between producing countries' institutional development and the diffusion of VSSOs—an essential nexus for advancing sustainability in global value chains (Gereffi & Lee, 2016; Goerzen et al., 2021; Marx et al., 2024; Schleifer et al., 2022; UNCTAD, 2022). Taking stock of existing causal claims in product, country, and VSSO-specific case studies and conceptual work, our analysis confirms the importance of specific domestic institutions to the global diffusion of agrifood VSSOs by showing robust evidence of their correlation. We contribute a step toward the broader generalizability of insights about standard adoption in LMIEs and reconcile different literature streams by providing a granular overview of the type of institutions in the presence of which we observe a higher concentration of VSSOs. This is the first study to systematically examine the relationship between the geographical diffusion of a global population of VSSOs and institutional development across producing countries—independent of crop type, value chain structure, or standard-specific characteristics. In doing so, the study reveals macro-level patterns that cut across the diversity of VSSO initiatives globally.

Empirically, we find strong support for Hypotheses 1 through 3 and Hypothesis 5. More precisely, VSSO diffusion is significantly greater in countries where institutions that facilitate domestic firms' ability to adopt standards—such as trade support, technical assistance, financial access, and social protection—are relatively more developed. In contrast, we do not find support for Hypothesis 4, which posited a positive association between strong environmental stewardship institutions and VSSO diffusion. This null finding appears to reflect the ongoing ambiguity in the literature regarding the extent to which strong environmental regulation complements or potentially disincentivizes the expansion of private sustainability standards. Taken together, these results provide a foundation for the discussion that follows, where we consider their implications for research and policy on GVC upgrading, CSR and corporate sustainability strategy, and transnational private governance.

Implications for GVC-oriented policymaking

Our findings enable better-informed GVC-oriented policymaking (Pietrobelli et al., 2021). GVC-oriented policies leverage VSSO's stimulus to domestic firms' environmental


3
Trading Food Score (0-100)
r_p = 0.31***, r_s = 0.4***,
$r_s^{adj, GAPV}$ = 0.435***
4
Rural Access Index (0-100)
r_p = 0.43***, r_s = 0.46***,
$r_s^{adj, GAPV}$ = 0.43***
5
CPIA trade rating (1=low to 6=high)
r_p = 0.32*, r_s = 0.35*,
$r_s^{adj, GAPV}$ = 0.33*
6
Statistical Capacity Score (Overall Average) (scale 0 - 100)
r_p = 0.5***, r_s = 0.51***,
$r_s^{adj, GAPV}$ = 0.399***
7
CPIA economic management cluster average (1=low to 6=high)
r_p = 0.38***, r_s = 0.38***,
$r_s^{adj, GAPV}$ = 0.314*
8
1e10
Net ODA received(+ve) or provided(-ve) (current US$)
r_p = -0.38***, r_s = -0.24*,
$r_s^{adj, GAPV}$ = -0.347***
Number of VSSOs in a country
9
Accessing Finance score (0-100)
r_p = 0.52***, r_s = 0.53***,
$r_s^{adj, GAPV}$ = 0.357**
10
Domestic credit to private sector (% of GDP)
r_p = 0.41***, r_s = 0.43***,
$r_s^{adj, GAPV}$ = 0.449***
11
CH4 Emissions from Agrifood Systems (kt)
r_p = 0.52***, r_s = 0.53***,
$r_s^{adj, GAPV}$ = -0.074
12
ODA for biodiversity by receipient (+ve) or donor(-ve) (million USD)
r_p = -0.21*, r_s = -0.1,
$r_s^{adj, GAPV}$ = -0.216*
13
Proportion of land that is degraded over total land area (%)
r_p = 0.13, r_s = 0.08,
$r_s^{adj, GAPV}$ = -0.049
14
Multidimensional Poverty index (0-100)
r_p = -0.39***, r_s = -0.39***,
$r_s^{adj, GAPV}$ = -0.41***
15
Proportion of children engaged in economic activity, 5-17 (total)(0-100)
r_p = -0.29*, r_s = -0.3*,
$r_s^{adj, GAPV}$ = -0.316*
Number of VSSOs in a country

◂**Figs. 3–15** Binned scatter plot of VSSOs diffusion indicator (Number of VSSOs in a product origin country) and institutional indicators. Statistical significance of correlation: The binned scatter plots show the conditional mean (*blue dots*) and standard deviation (*shaded region*) of VSSO diffusion indicator (*y*-axis) plotted against the equal-sized (approximately) bins of institutional indicators (*x*-axis)

upgrading to combine inclusiveness and resilience outcomes with the economic benefits of integration in global trade (Alford & Phillips, 2018; Cashore et al., 2021; De Marchi & Alford, 2022; Marques & Eberlein, 2021). Creating or strengthening national institutions that perform clear developmental tasks is essential to achieve the desired upgrading goals (Fuentes & Pipkin, 2024; McDermott & Avendaño Ruiz, 2024; Ricks & Doner, 2021). This study provides empirical evidence of what institutions are associated with higher VSSO diffusion and thus could require strengthening by domestic governments and regional intergovernmental bodies to efficiently promote VSSO uptake in their economies. Our analysis shows that relatively stronger trade, technical assistance, access to finance, and social protection institutions in product-origin countries are correlated with a higher in-country diffusion of VSSOs. Stronger institutions in these areas comprise formal and informal policy, regulatory, technical, and financial arrangements that are more effective at addressing the specific needs of domestic firms that seek to upgrade and achieve standard compliance. We thus identify clear institutional development targets that LMIE policymakers should consider if seeking to promote VSSO diffusion as part of their policy goals and in response to value-capture opportunities in GVCs (Marques & Eberlein, 2021; van der Ven & Barmes, 2023).

Those targets look like, for example, regulatory reforms and the creation or strengthening of public agencies that facilitate agrifood export processes by decreasing red tape, administrative costs, processing times, and the number of intermediaries that separate firms from markets. Or, new or enhanced public or public–private programs involving universities, research centers, and other technical and capacity-building organizations that enhance firm-level technical assistance in production to enable firms' access to, re-configuration, and adoption of productive know-how enclosed in standards and environmental requirements applied to the production process. Another crucial institutional development is enhancing the financial system to unlock firms' access to agri-financing and investment products tailored to the productive cycle and the infrastructural investment needs of firms seeking to upgrade and meet VSSO requirements. Stronger social protection measures that secure fair labor conditions and workers' rights and entitlements also play a key role. In Table 3, we summarize some exemplary interventions that would fit similar goals and strengthen domestic institutions. These institutional development target areas should inform international development agencies and development banks' approaches to support the environmental and social sustainability of LMIE governments' trade integration efforts.

National efforts to strengthen these institutional dimensions and pave high roads to upgrade via VSSO compliance are especially relevant in light of the changing regulatory landscape for exporting companies confronting new types of due diligence legislation (Goerzen et al., 2025). LMIE suppliers face a rise in regulatory sustainability requirements to access key value-added markets, primarily in the European Union. The new regulatory requirements often go beyond VSSOs' sustainability requirements. They hold corporate actors to a higher standard when disciplining their chains (Wilhelm, 2024). MNCs are likely to shift the extra costs associated with such pressures on LMIE firms, burdening them with new requirements challenging their competitiveness and engagement with environmental performance improvements (ITC, 2024; Ponte, 2022). The resulting widening gap that LMIE suppliers face in participating in GVCs jeopardizes economic development projects centered around VSSO compliance. It threatens access to value-added markets and/or reduces the value suppliers can capture through their sustainable products. LMIE policymakers should thus further strengthen the institutions identified in this study to minimize costs and challenges for firms seeking VSSO compliance across agrifood subsectors. In that sense, institutional strengthening emerges as key for LMIEs to remain competitive as sustainable sourcing locations. Moreover, LMIEs should increasingly seek to complement support to meet VSSO requirements with additional assistance to meet new regulatory requirements beyond VSSO (Goerzen et al., 2025). Integration of VSSO compliance as a national regulatory requirement in specific sectors and/or geographies could represent a substantial measure in such a direction, if accompanied by investments and partnerships aimed at providing firms and producers with the resources and technical skills necessary to meet the novel regulatory burden.

VSSO diffusion and CSR location advantage

This study advances the understanding of VSSOs as a pillar of the CSR strategies of MNCs as lead firms in GVCs (Gereffi & Lee, 2016; Goerzen et al., 2021; Marques, 2017; Van Assche & Narula, 2023). We provide empirical evidence on which dimensions of producing countries' institutional development are associated with the diffusion of VSSOs when assessing the risks and costs associated with promoting standard adoption in support of sustainable sourcing goals. In doing so, we contribute to consolidating views that VSSOs serve as strategic tools for lead firms to secure location advantages in the sourcing of environmentally and

Table 3 VSSO-oriented institutional strengthening policy examples

Target institutions	Policy recommendation	Target actors	Problem addressed	Examples
Trade Support	Embed VSSO adoption in export promotion programs	Trade Ministries, Export Promotion Agencies	Low domestic incentives to VSSO adoption by producers	Gabon introduced Forest Stewardship Council adoption as an export requirement for domestic forestry sector
Technical Assistance	Develop firm-level trainings tailored to VSSO-specific technical requirements and deliver assistance via agencies embedded in sectoral ecosystem	Agricultural Extension Services, Ministries of Agriculture, Trade Agencies, Industry associations, Research Centers	Limited VSSO uptake due to disconnected technical assistance	Strategic partnership between Better Cotton Initiative (BCI) and Mozambican Cotton Institute included developing and strengthening technical assistance to domestic producers
Financial & Social Protection	Develop VSSO readiness funds via social protection schemes and private sector partnerships to provide grants, guarantees, or safety nets to ease standard compliance costs	Social Protection Ministries, Microfinance Institutions, Commercial Banks	Smallholder exclusion from VSSOs due to cost barriers	Creation of VSSO-linked insurance, savings, and financial training programs in the Ethiopian coffee sector
Trade Support and Technical Assistance	Encourage VSSOs' local adaptation and hybrid standards that reduce compliance gaps and offer intermediate steps to achieve VSSO compliance	Standards Authorities, Farmer Cooperatives, Research Centers, Competent Ministries, National Regulators	Lack of alignment and capability mismatch between local legal and socio-economic contexts and VSSO requirements	Introduction of the Indonesian Sustainable Palm Oil (ISPO) and Malaysian Sustainable Palm Oil (MSPO) standards in the palm oil sector in Indonesia and Malaysia

socially responsible products (Bartley, 2018; Ponte, 2020, 2022; Van Assche & Narula, 2023).

Our analysis disaggregates the institutional environment into multiple dimensions (trade support, technical assistance, finance, environmental stewardship, and social protection) and shows that not all institutions matter equally. Institutions that help lower firms' compliance costs and build absorptive capacity, particularly financial systems and social protection mechanisms, are more consistently associated with greater VSSO presence (De Marchi & Gereffi, 2023; Flankova et al., 2024). This adds nuance to research on institutional complementarities by identifying which state capacities may matter most to standards adoption and VSSO diffusion. Our findings also contribute to recent scholarship that conceptualizes VSSOs not only as governance mechanisms embedded in CSR strategies but also as agents that shape the spatial distribution of sustainability governance (Fransen, 2013; Marques et al., 2023; Schleifer, 2019). Rather than passively adapting to institutional conditions, VSSOs may be selectively engaging with countries whose regulatory environments align with their governance model, thereby co-producing the geography of global sustainability governance. This dynamic reinforces the idea that VSSOs operate in parallel with MNCs' broader sourcing strategies—targeting countries where institutional conditions reduce uncertainty and implementation costs (Goerzen & Van Assche, 2023).

The role of environmental institutions in sustainability governance

This study does not detect any statistically significant association between LMIEs country-level environmental stewardship institutions and the diffusion of VSSOs. Given the study's correlational design and potential confounding factors, this null finding should be interpreted as an absence of detectable association under our measures and sample, rather than as evidence of no relationship. An alternative interpretation is that diffusion may be more closely related to export competitiveness and buyer pressures than to broad institutional quality. A substantial body of work has signaled a convergence between VSSOs, LMIE governments, and LMIE firms around the goal of maximizing productivity and export competitiveness, often at the expense of ambitious environmental regulation (Lambin & Thorlakson, 2018; Marques & Eberlein, 2021). In this view, environmental upgrading goals may be diluted or deprioritized to ensure the commercial viability of certification schemes. We view this as a hypothesis for future research rather than a definitive corrective to studies suggesting that stronger domestic institutions facilitate VSSO adoption (Locke, 2013; Tashman et al., 2022).

The lack of association between environmental stewardship institutions and VSSO presence is also consistent with other critical perspectives on the limits of private environmental governance. Several scholars have questioned whether VSSOs meaningfully address institutional voids. Evidence indicates that VSSOs' private regulatory power and targets are often subordinated to the goals of their members' CSR strategies. VSSOs seek environmental outcomes with direct commercial relevance to lead firms, such as input efficiency or traceability, while neglecting broader ecological goals like biodiversity conservation or soil regeneration and overlooking promising but more costly approaches to configure sustainable sourcing (Grabs, 2020; Sinkovics et al., 2021; van der Ven, 2024). Empirical studies have shown that while certification may open access to value-added markets, it can also contribute to environmental downgrading, particularly in areas where standard requirements push land-use intensification or monoculture production (Krishnan et al., 2023). If VSSOs do not prioritize ambitious ecological outcomes, then the strength of environmental stewardship institutions is something irrelevant or damaging to their goals.

Recent work also suggests that the stringency of VSSOs plays a key role in shaping their institutional fit. Where VSSOs' environmental standards are highly demanding, the gap between VSSO expectations and local institutional capacity may disincentivize diffusion, particularly in countries with weak regulatory enforcement or low investment in environmental governance (Flankova et al., 2024; Tashman et al., 2022). In other words, environmental stewardship institutions that are too strong or too weak compared to the goals and stringency set in the VSSO would create 'compliance gaps' that hinder standard adoption. On this basis, our findings are sound with the view that VSSOs avoid institutional contexts where environmental policies are either too stringent or too underdeveloped to unlock the transformative role of VSSOs on the organization of production.

Taken together, these findings point to deeper institutional constraints on VSSO effectiveness. As others have noted, the success of private governance initiatives is contingent not only on the existence of domestic institutions but on their alignment with the commercial and governance logics of transnational standard-setters (Bartley, 2018; Locke, 2013). If environmental stewardship institutions are not significantly associated with the geography of VSSO diffusion, then it is reasonable to expect that environmental protection, while often emphasized, is not a core operational goal within the global VSSO ecosystem. Future research should engage with this thesis and deepen the understanding of such asymmetries.

An alternative explanation for our findings is that environmental institutions in many LMIEs remain too nascent to meaningfully interact with VSSO diffusion, particularly in the agrifood sector. In some cases, environmental governance may be oriented toward more industrial sectors

such as mining or manufacturing, with limited regulatory infrastructure targeting agricultural production. This may be especially true in LMIEs. However, this explanation is speculative and, as we outline below, requires further empirical investigation.

Limitations and future research

This study develops a cross-national framework to explore the association between distinct domains of institutional development and the diffusion of VSSOs across LMIEs. The findings offer robust support for several of the study's theoretical claims. At the same time, the scope and design of the analysis introduce a number of limitations—some methodological, others conceptual—that suggest fruitful avenues for future research. Addressing these limitations will require more granular, multi-level, and mixed-method approaches capable of capturing the nuanced and dynamic interplay between domestic institutions and transnational private governance.

To begin with, our methodological approach relies on correlation analyses amid the lack of panel data documenting global VSSO diffusion at the national and sub-national levels, and institutional strength evolution over time, which would allow for causality testing of the arguments we inferred from the existing literature. Future efforts to advance our understanding of the phenomenon would then pass through data collection exercises aimed at developing time series that enable more complex and granular hypothesis testing. For example, the availability of time series could allow for discontinuity and difference-in-difference designs. Collective efforts, building on the collaboration between academia, VSSOs, and policymakers, will be fundamental to making similar analyses feasible.

Second, our operationalization of diffusion relies on a binary indicator of VSSO presence, based on country-level data from the ITC Standards Map (ITC, 2025b). While this approach offers a useful comparative snapshot of where VSSOs are formally active, it does not capture the depth, scale, or intensity of standard implementation. A VSSO may be listed as operating in a given country despite limited certification activity or weak engagement with domestic firms. Prior research has shown that the existence of a standard does not guarantee meaningful uptake or regulatory impact (Bartley, 2018; Meemken, 2020). To address this potential concern, we conducted informal spot checks across a subset of countries and standards to verify the plausibility of the reported presence data. These checks did not reveal systematic discrepancies; however, we did not undertake a comprehensive audit of implementation levels. Future research should consider integrating macro-level diffusion data with firm-level adoption patterns or certification records to assess more precisely how VSSOs operate in practice.

Third, our focus on country-level institutional indicators provides a broad comparative lens but may mask substantial territorial variation. Institutional strength—particularly in areas such as environmental enforcement, financial access, or regulatory capacity—may differ across subnational units. This is especially true in politically decentralized or administratively uneven states, where VSSO engagement may cluster in certain provinces or regions while bypassing others (Fuentes & Pipkin, 2024; McDermott, 2014). A richer subnational analysis would shed light on how place-based governance structures shape the geography of standard diffusion.

Finally, because we model institutions as analytically distinct in order to estimate their individual effects, we do not capture potential interdependencies among them. In practice, however, these institutional elements are likely to interact. Trade support mechanisms, for example, may have limited impact without complementary technical assistance, while effective environmental regulation often relies on adequate administrative capacity and financial infrastructure. Of particular interest is the role of financial institutions, which are frequently overlooked in the sustainability governance literature but may play a critical enabling role when combined with other forms of institutional support. Also of mounting interest is the identification and role of institutions that could help GVC actors to address the increasing regulatory pressures and sustainability reporting obligations, which translate into higher operational costs of dispersed production (Goerzen et al., 2025; Wilhelm, 2024). We believe that these interdependencies merit closer analytical scrutiny. Future research could employ comparative or configurational methods to examine whether particular combinations—what might be considered 'institutional packages'—are especially conducive to VSSO engagement.

This study examined how domestic institutional development is associated with the diffusion of VSSOs in low- and middle-income economies. We find that VSSOs are more present in countries with stronger public institutions that reduce the costs, risks, and uncertainties of adoption. We identify five institutional domains—trade support, technical assistance, financial access, and social protection institutions- which are each positively associated with VSSO presence. Notably, financial institutions—often overlooked in sustainability governance—emerge as significantly correlated with VSSO diffusion. Surprisingly, we find no significant relationship between environmental stewardship institutions and VSSO diffusion, suggesting that the strength of institutions focused on environmental protection does not necessarily make a country more attractive for VSSO engagement. Our findings contribute to a more nuanced understanding of how transnational private governance scales across national contexts. Rather than filling

governance gaps, VSSOs appear to rely on and complement existing institutional infrastructures.

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Data availability The authors confirm that all data generated or analyzed during this study are included in the published article. More specifically, the institutional indicators we use to operationalize 'institutional strength' as our first correlation term are all part of publicly available datasets. We provide a detailed list of the indicators and their dataset name and location in Table 1. The data we use to obtain our second correlation term, "VSSO diffusion", are published as an online supplement to this article.

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