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Unlocking Global Markets: The Impact of International Standards Certification on Pakistani Firms' Export Performance*

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Abstract

We estimate the impact of international standards certification on the export performance of firms in a developing economy using a unique panel data from Pakistan's textile and apparel sector. To address endogeneity, we implement a novel instrumental variable strategy that leverages the prevalence of certified non-rival firms within the same district as an exogenous source of variation in certification adoption. We find that certification significantly increases the likelihood of exporting by 44 percentage points, raises export volumes by nearly ten times, and boosts annual export growth by 68 percent. We, then, explore the underlying mechanisms and find that certification facilitates product diversification, enhances knowledge networks, promotes both product and process innovation, and yields significant gains in labor productivity. However, certification does not lead to greater product complexity, suggesting that while it results in horizontal expansion and strengthens external linkages, it is not sufficient for vertical upgrading.

Keywords: ISO; standards certification; export; technological innovation; productivity.

JEL classification: L14, L15, F14, M21, O31, J24

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Introduction

In recent decades, developing countries have faced a paradox of globalization: while global trade volumes have expanded dramatically, many low- and middle-income countries have struggled to integrate effectively into international markets (Rodrik, 2018). Among the key obstacles are information frictions and institutional weaknesses that hinder firms' ability to signal quality, meet compliance standards, and establish credibility with foreign buyers. These barriers are particularly pronounced for firms in countries where domestic regulation is weak, product standards are poorly enforced, and trust in firm capabilities is low (Goedhuys & Sleuwaegen, 2013; Javorcik & Sawada, 2018). As a result, international standards certification has emerged as an important private solution to public failures, enabling firms to credibly demonstrate their adherence to globally recognized norms of quality, labor, and environmental compliance (Clougherty & Grajek, 2014; Terlaak & King, 2006).

Yet despite its increasing prevalence and policy relevance, we have limited evidence on whether international certification improves firm-level export performance in developing country settings. Most existing studies focus on production growth (Terlaak & King, 2006), sales and labor productivity (Goedhuys & Sleuwaegen, 2013), firm growth (Calza & Goedhuys, 2021), and innovation efficiency (Blind et al., 2017), but few directly evaluate export outcomes or adequately address the underlying issue of endogeneity. This endogeneity arises because while certification may enhance exports, firms with stronger export performance may also be more likely to seek certification. A second challenge is that certification affects firms through multiple channels. Internally, it may improve processes, quality control, and management systems. Externally, it may enhance reputation, reduce information asymmetries, and facilitate linkages with international buyers. These dual pathways imply multiple potential mechanisms through which certification can influence firm's export performance, complicating efforts to isolate the specific channels that drive export gains (Terlaak & King, 2006). A rigorous investigation of these mechanisms requires granular, firm-level data on products, production processes, innovation activities, and knowledge networks.

This paper fills these gaps by providing new evidence on the impact of international standards certification on firm export performance in a developing country. Using detailed panel data from textile and apparel firms in Pakistan between 2013 and 2018, we estimate the effect of certification

on three core outcomes: (i) the extensive margin (the likelihood of exporting), (ii) the intensive margin (the volume of exports), and (iii) the growth rate of exports. We address the endogeneity of certification adoption using an instrumental variable strategy that leverages spatial variation in the prevalence of certification among non-rival firms within the same district. This novel instrument captures exogenous peer exposure to certification practices without being mechanically linked to the focal firm's own export performance, satisfying both relevance and exclusion conditions.

Our empirical results reveal large and significant effects. Certification increases the likelihood of exporting by 44 percentage points, raises export volumes tenfold, and boosts annual export growth by 68 percent. These effects are statistically significant and economically meaningful, and exceed those reported in prior studies in the European context (e.g., Javorcik & Sawada, 2018). We also explore the mechanisms behind these effects. First, we find that certified firms diversify, producing a wider range of products, though they do not produce more complex ones. Second, certified firms engage more actively with external knowledge networks and invest significantly more in product and process innovation. Third, certified firms experience large gains in labor productivity—over fourfold higher output per worker compared to non-certified firms—especially among exporters.

Our study makes several contributions to the literature. First, we provide new evidence on the export-enhancing effects of international certification in a developing country— a setting characterized by weak institutions and limited regulatory capacity. The context of a developing country is particularly relevant for several reasons. To begin with, firms in these environments face significant informational asymmetries when engaging with buyers in developed countries. These asymmetries often stem from limited awareness of international quality, labor, and environmental standards, as well as insufficient knowledge of organizational practices and foreign market regulations— factors that can severely constrain market access. Second, institutional and governance structures in developing countries are typically weaker, increasing firms' reliance on external certification as a means of signaling compliance with global norms. Third, the enforcement of product and process standards tends to be less effective due to lower competition and weaker domestic quality requirements, reducing the credibility of firms in international markets. Finally, local certification systems, where they exist, are often less stringent or not globally recognized, further elevating the role of international certification as a prerequisite for

export success. These contextual features make the certification-export relationship particularly salient and policy-relevant in developing countries (Goedhuys & Sleuwaegen, 2013).

Second, we go beyond estimating the average export effects of certification by unpacking the specific channels through which certification influences firm performance. International standards certification can affect firms through two broad pathways—internal and external effects—each contributing to performance gains in distinct ways (Terlaak & King, 2006). Internally, certification facilitates learning and capability development by embedding codified knowledge about best practices into firm operations (Calza et al., 2019; Zoo et al., 2017). The process of complying with certification requirements often leads to improvements in organizational structure, production processes, managerial practices, and environmental standards. Externally, certification reduces information asymmetries between firms and potential buyers, thereby enhancing trust, lowering transaction costs, and improving market access (Clougherty & Grajek, 2014). By signaling compliance with globally recognized norms related to quality, safety, labor, and environmental standards, certification helps firms credibly convey product, process and organizational characteristics that are otherwise difficult to observe. This signaling function expands firms' access to new markets and facilitates entry into global value chains. By linking detailed survey data on firm capabilities, innovation behavior, and external partnerships with administrative export records, we focus on three mechanisms that are both theoretically grounded and observable in our data: (i) changes in firms' product space, including diversification and complexity; (ii) engagement with innovation and knowledge networks; and (iii) improvements in labor productivity.

Third, we contribute to broader debates on private standards and development. A growing literature views certification as a form of non-state governance that compensates for weak public institutions in developing countries (Clougherty & Grajek, 2014; Zoo et al., 2017). Our findings support this view: in settings where legal and regulatory frameworks are insufficient, certification can serve as a market signal and coordination device, enabling firms to build reputation and reduce transaction costs. However, we also highlight an important limitation of certification as an export promotion tool: while it increases access to international markets and enhances productivity, it does not necessarily induce vertical product upgrading. Certified firms expand the number of products they produce and innovate but do not innovate into the production of more complex or higher value-added goods. This suggests that certification is more effective at facilitating 'market entry' and

horizontal expansion than at catalyzing ‘structural transformation’ into more complex product space. For policymakers, this implies that certification programs should be complemented by targeted support for upgradation if the goal is to foster export sophistication.

Finally, the context of Pakistan provides a compelling setting for this analysis. As one of the world’s leading textile exporters, Pakistan has a substantial industrial base with global linkages, but its export-to-GDP ratio has declined over time, falling from 17 percent in 1992 to just 10 percent in 2023 (Economic Survey, 2024). Pakistani firms face persistent difficulties in meeting international standards, and several have suffered bans and buyer disengagement due to non-compliance (Nadvi, 2004). In response, a growing number of firms have adopted certifications such as ISO 9000, WRAP, Oeko-Tex, and BSCI. According to the ISO’s 2023 survey, over 4,000 firms in Pakistan held ISO 9000 or ISO 14001 certifications. The textile and apparel sector—accounting for 60 percent of total exports of a country—offers a highly relevant domain for assessing the impact of these certifications on export dynamics.

The remainder of the paper is organized as follows. Section 2 reviews the relevant literature on standards certification and firm performance, with a focus on developing countries. Section 3 describes the data and sampling methodology. Section 4 presents the empirical strategy and identification assumptions. Section 5 reports the main results on export outcomes, and Section 6 examines the underlying mechanisms. Section 7 concludes with a discussion of policy implications and directions for future research.

International certification and firm performance

International standards certifications

International standards certifications span a broad spectrum of domains, including quality management, environmental sustainability, labor conditions, and social accountability. While these standards vary in their specific focus and sectoral application, many share a common structure centered on procedural rigor, third-party verification, and continuous improvement mechanisms. The ISO 9000 family, introduced in 1987, is one of the most widely adopted sets of quality management standards globally. It provides a generic framework applicable across industries to ensure consistency in production processes and customer satisfaction.

In contrast, sector-specific certifications are designed to address the unique challenges of particular industries. In the textile and apparel sector, for example, the Oeko-Tex certification serves as a widely recognized benchmark for product safety, ensuring that harmful substances are not present at any stage of production—from raw materials such as yarn to finished garments. Among these, Oeko-Tex Standard 100 is especially prominent, certifying compliance with stringent international limits on chemical content in textiles.

Beyond quality and safety, a growing emphasis has been placed on ethical and socially responsible business practices. Socio-ethical certifications provide structured frameworks for improving labor conditions and promoting corporate social responsibility within global supply chains. The Supplier Ethical Data Exchange (Sedex) and the Business Social Compliance Initiative (BSCI), for instance, offer monitoring systems that help firms assess and improve social and labor standards. The SA8000 standard, developed by Social Accountability International in 1998, provides a more comprehensive framework focused on core labor rights, including the prohibition of child labor, the right to collective bargaining, and safe working conditions.

Similarly, Worldwide Responsible Accredited Production (WRAP) is a widely adopted certification in the textile and apparel industry that emphasizes ethical manufacturing. WRAP sets global benchmarks in legal compliance, worker safety, environmental management, and responsible sourcing. Together, these certifications not only serve as signals of compliance to international buyers but also promote improvements in firms' internal practices and their integration into ethically governed global value chains.

Certification and firm performance

A central concern in this literature is how firms in low-income settings overcome informational asymmetries, credibility deficits, and institutional weaknesses that limit their access to global markets. International standards certification has emerged as a key mechanism through which firms can signal compliance, reduce transaction costs, and meet the evolving expectations of global buyers (Terlaak & King, 2006; Clougherty & Grajek, 2014). Several studies have documented positive associations between certification and various firm outcomes, including sales growth, productivity, and innovation. For example, Goedhuys and Sleuwaegen (2013) find that international certification enhances sales and labor productivity in manufacturing firms in Africa.

Calza and Goedhuys (2021) show that certification is associated with higher firm growth in Vietnam, while Blind (2017) emphasizes the role of standards in supporting innovation efficiency. Certification has also been linked to process improvements, quality assurance, and internal organizational upgrading (Zoo et al., 2017; Calza et al., 2019). A smaller set of papers examines the causal effects of certification. Javorcik and Sawada (2018) employ a difference-in-differences approach with propensity score matching to show that ISO 9000 certification improves sales, exports, and employment among Slovenian firms. Similarly, Hansen and Trifković (2014) study food safety certification in Vietnam and find positive spillovers on quality and contract enforcement.

International certification enhances firm performance through two pathways- internal and external channels. Internally, certification promotes organizational upgrading by introducing codified procedures, encouraging process streamlining, and fostering a culture of continuous improvement. One of the primary ways certification influences internal operations is through the establishment of quality management systems that enhance productivity and operational efficiency. Compliance with global standards often requires firms to adopt new technologies, upgrade production systems, and invest in workforce skills, thereby stimulating innovation in both product and process domains (Autor et al., 2003; Hansen & Trifković, 2014; Trifković, 2017). In many cases, certification functions as a sunk investment that drives firms to further differentiate their offerings through innovation, enabling them to capture price premiums in global markets (Clerides et al., 1998). This push for technological and organizational upgrading is a key internal mechanism through which certification enhances firm capabilities.

Externally, certification facilitates market access by reducing information asymmetries between firms and global buyers, particularly in environments with weak regulatory institutions. In many industries, certification is a prerequisite for entry into high-value export markets—especially those with stringent regulatory standards such as the green trade barriers (He et al., 2015). By signaling compliance with international norms, certification acts as a credible signal that lowers transaction costs, improves buyer confidence, and supports more efficient trade relationships (Clougherty & Grajek, 2014; Goedhuys & Sleuwaegen, 2013). These reputational gains are especially important for firms in developing countries, where concerns over product quality and labor practices can be substantial (Javorcik & Sawada, 2018). Certified firms benefit from reduced buyer search costs

and enhanced credibility, enabling them to establish and sustain long-term commercial partnerships (Calza & Goedhuys, 2021).

Certification also supports firm performance through network expansion, exposing firms to new sources of knowledge, information, and market opportunities. By participating in certification-related ecosystems—such as industry associations, buyer forums, and audit systems—firms gain access to best practices, learning opportunities, and technical know-how (Conley & Udry, 2010; Javorcik & Sawada, 2018; Holzapfel & Wollni, 2014; Tomiura, 2007). These linkages can strengthen innovation capabilities and improve firms' strategic positioning in export markets. The expansion of informational networks not only facilitates entry into new markets but also increases firms' ability to adapt to shifting international standards and buyer demands.

However, the benefits of certification may be context-dependent. In sectors with long-established trade relationships, mature quality-control systems, or low information frictions, the marginal value of certification may be limited (Schuster & Maertens, 2015). In such cases, firms may already meet international expectations without requiring formal certification to signal their capabilities. Nevertheless, across a wide range of developing country contexts, the literature generally finds that certification improves firm performance by addressing information asymmetries, lowering entry barriers, and enhancing reputation. Firms that adopt international standards are better positioned to innovate, build global networks, and achieve sustainable export growth.

Data and survey

Our analysis is based on a unique firm-level panel dataset from two rounds of the Innovation Survey in Pakistan that we conducted in 2015 and 2019 (Wadho & Chaudhry, 2018; Wadho & Chaudhry, 2024). The surveys targeted textile and apparel manufacturers—the country's largest export sector—located in the provinces of Punjab and Sindh. The data include both survey responses and linked administrative records, allowing us to observe firms' certification status, export performance, innovation activity, and network linkages over time.

The first survey (2015) employed a stratified random sampling strategy based on the Pakistan Standard Industrial Classification (PSIC) codes for textile (Section 13) and apparel (Section 14) firms, covering all establishments with at least 10 employees. The sample was representative at

both the provincial and district levels and consisted of 614 firms, representing about 15 percent of the sampling frame. A total of 431 firms responded to the survey, yielding a response rate of 70%. 54 out of these firms did not provide sales data, limiting the final workable sample to 377 units. Non-response was primarily due to firm closure, not survey refusal, and was not systematically correlated with observable firm characteristics (Wadho et al., 2019).

The follow-up survey in 2019 successfully recontacted 377 of these firms, 50 of which had exited. To maintain representativeness, these were replaced with new firms randomly selected from the original district-level sampling frame. For this study, we focus on a balanced panel of 327 firms observed in both rounds. Both surveys were implemented through in-person interviews conducted by trained enumerators from the Bureaus of Statistics in Punjab and Sindh. Respondents were senior managers or executives with direct knowledge of firm operations.

The dataset combines survey-based data on innovation, product mix, networks, and certification with retrospective administrative data on firm performance over the previous three years, including exports, sales, and employment. This data included information on:

- *Certification*: Firms report whether they held any international standard certifications (e.g., ISO 9000, Oeko-Tex, WRAP, BSCI, SA-8000). These include quality, environmental, and labor-related standards relevant to global buyers in the textile and apparel industry.
- *Export performance*: For each year from 2013 to 2018, firms report whether they exported, the total value of exports (in PKR), and destination markets. From this, we construct:
 - *Extensive margin*: a binary indicator for whether the firm exported in year t .
 - *Intensive margin*: the log of export value in year t .
 - *Export growth*: the annual change in export value.
- *Markets*: Firms report all the markets where they sale their products and their main market. We use information from this module to construct *Non-rival* firms. This includes firms in the same sector (3-digit industry codes) but targeting different main markets, and firms in the upstream or downstream sectors
- *Innovation*: Firms report innovation activity along multiple dimensions. We capture:
 - *Product innovation*: value of new products introduced in the previous three years (log sales per worker in 2015 and 2018).
 - *Process innovation*: investment in new machinery (log per worker in 2015 and 2018).

- *Knowledge networks (breadth)*: number of market and institutional sources of information for technological innovation (foreign suppliers; local suppliers; foreign buyers; local buyers; competitors or other enterprises in the sector; consultants, commercial labs, or private R&D institutes; universities or other higher education institutions; government or public research institutes).
- *Knowledge networks (depth)*: =1 if a firm considered the source as highly important source of information and cooperation.
- *Product space*: We use data on the number of products to construct measures of diversity, concentration of sales in the main product (in percentage) to measure concentration, and match product codes to the Hidalgo-Hausmann product complexity index to measure the complexity.
- *Labor productivity*: Measured as total output (sales) per worker in each year (log).
- *Firm characteristics*: Controls include firm size (employment), age, foreign ownership, and industry (3-digit PSIC level).

Table 1 provides summary statistics for the sample with distribution between textiles and apparel sectors, averages of firm size, percentages of certified firms, and percentages of exporters across two sectors: textile and apparel.

Table 1: Basic statistics: averages for 2013-2018

	# firms	Firm size	Certification (%)	Exporting (%)
Total	327	347	40.52	46.18
Textile	262	272	34.7	38.17
Apparel	65	650	64.6	80.00

On average, 41% of firms held an international certification during the study period, and 46% exported. Apparel firms were larger and more export-oriented than textile firms: 65% of apparel firms were certified and 80% exported, compared to 35% and 38% respectively in textiles.

Table 2 presents the distribution of certified firms according to the type of international standards certification adopted. Among certified firms, the most common standards certification was ISO 9000, with nearly 73 percent of the certified firms adopting it, on average. ISO 9000 is a set of international standards that focuses on quality management systems. It provides a framework for organizations to ensure that they meet customer and regulatory requirements while continuously improving their processes (Javoric & Savada, 2018).

Table 2: Distribution of certified firms by type of certification

Certification type	Average 2013-2018
Share of firms with ISO 9000 (%)	72.83
Share of firms with Oeko-Tex (%)	27.55
Share of firms with WRAP (%)	21.13
Share of firms with Sedex (%)	21.51
Share of firms with BSCI (%)	20.75
Share of firms with SA-8000 (%)	12.45
Share of firms with Any other certification (%)	32.83

The certified firms also adopted sector-specific certifications such as Oeko-Tex (27 percent), which sets the benchmark for textile safety for the presence of harmful substances, from yarn to finished product, and World Responsible Accredited Production, WRAP (21 percent). The certified firms also adopted different socio-ethical compliance standards certifications, such as the Supplier Ethical Data Exchange, Sedex (21 percent), the Business Social Compliance Initiative, BSCI (21 percent), and Social Accountability International's SA-8000, which sets standards for a fair and decent business for workers (12 percent).

Empirical estimation

We aim to estimate the impact of international standards certification on firms' export performance. The core challenge is that certification is not randomly assigned: firms that pursue certification may differ systematically from those that do not, particularly in ways correlated with their export outcomes. For example, more productive or growth-oriented firms may be more likely to seek certification and also more likely to export. Conversely, firms might pursue certification precisely in response to export opportunities, introducing reverse causality. To address these endogeneity concerns, we employ a two-stage least squares (2SLS) estimation strategy using a novel instrumental variable.

Our baseline model relates export outcomes to certification status and firm characteristics:

$$Export_{it} = \alpha + \beta Certification_{it} + \gamma X_{it} + \rho_s + \tau_t + e_{it} \quad (1)$$

where:

- $Export_{it}$ is the export performance of firm i in year t , measured along three dimensions: (i) a binary indicator for whether the firm exports (extensive margin), (ii) the log of export volume (intensive margin), and (iii) the growth rate of exports.
- $Certification_{it}$ is a binary indicator equal to 1 if firm i holds an international certification in year t .
- X_{it} is a vector of time-varying firm characteristics including firm size (employment), firm age, and foreign ownership.
- ρ_s and τ_t denote 3-digit industry and year fixed effects, respectively.
- e_{it} is the error term, clustered at the district level to account for spatial correlation in certification and export behavior.

The coefficient of interest, β , captures the impact of certification on export outcomes. However, β may be biased due to omitted variables or reverse causality. Therefore, we proceed with an instrumental variables approach. Our identification strategy exploits variation in the certification behavior of non-rival firms in the same geographic area. Specifically, we construct an instrument defined as the proportion of non-rival firms in a firm's district that are certified in a given year. Non-rival firms are defined as firms that do not directly compete in the same product-market space. This includes (i) firms in the same sector (3-digit industry codes) but targeting different main markets, and (ii) firms in upstream or downstream sectors (e.g., textiles for apparel producers and vice versa).

Formally, the first stage of the 2SLS regression is:

$$Certification_{it} = \pi_0 + \pi_1 NonRivalCert_{dt} + \gamma X_{it} + \rho_s + \tau_t + e_{it} \quad (2)$$

where $NonRivalCert_{dt}$ is the share of non-rival firms in district d that are certified in year t . This instrument captures local peer effects in certification adoption that arise from shared knowledge, norms, and common exposure to certifying agencies.

We argue that certification behavior among non-rival firms within the same district is a strong predictor of a focal firm's own certification decision. The proposed instrument is relevant since firms learn about standards certification from their environment, for which both horizontal (within sector) and vertical (upstream and downstream sector) sources of information are important. The presence of certified firms within the same sector as well as in upstream or downstream sectors

facilitates access to information about the costs and benefits of certification as well as the procedures required for certification. The assumption regarding the local peer effects is grounded in several mechanisms. First, knowledge spillovers tend to be stronger within geographical areas because of family ties, social bonds, and business relationships between firm owners and managers. Second, firms in close geographic proximity often belong to the same chambers of commerce, trade and industry associations, or supplier networks, which facilitate information spillovers. Third, certification agencies and auditors tend to operate at the district level, so the presence of certified firms reduces logistical, informational and financial barriers to certification. Finally, managers may observe or learn from the experiences of neighboring firms with certification, influencing their own decisions.

The key identifying assumption is that certification by non-rival firms affects the export performance of the focal firm only through its influence on the focal firm's own certification decision. This assumption would be violated if certification by neighboring firms directly affected the focal firm's exports—e.g., through competition, spillovers in export demand, or collective reputational effects. We address this by excluding rival firms from the construction of the instrument. By limiting the peer group to non-rival firms—those in different product markets or vertical supply chain positions—we minimize the risk that the instrument is correlated with unobserved demand shocks or competition effects in the focal firm's export market. In other words, while rival firms' behavior could affect a firm's exports directly (e.g., via market crowding), non-rival firms' behavior is unlikely to do so except through certification spillovers.

Furthermore, we control for 3-digit industry and year fixed effects that account for sector-wide export demand trends. We cluster standard errors at the district level—the level at which the instrument varies—to account for correlated shocks and policy exposure within districts.

Results

Impact of certification on exports

In this section, we present our results. First, we examine the impact of certification on a firm's export performance, and then discuss the mechanisms generating these impacts. Table 3 shows the impact of international certification on firms' export performance. Columns 1-3 in Panel A present the panel regression results and columns 4-6 present the IV (2SLS) results. The regression

estimates in Columns (2-3) and (5-6) are for the subsample of exporters. Panel B presents the results for the first stage of IV (2SLS). Export performance is measured in three dimensions: i) the extensive margin, which is equal to 1 if a firm is an exporter in year t , and 0 otherwise; ii) the intensive margin which is export volume in year t , measured in log; and iii) export growth which is yearly growth in exports. All regressions include firm controls (size, age, foreign ownership), year and 3-digit industry fixed effects, and cluster standard errors at the district level.

Table 3: Impact of certification on exports

Variables	Panel Regression			IV (2SLS)		
	Extensive margin (1)	Intensive margin (2)	Export growth (3)	Extensive margin (4)	Intensive margin (5)	Export growth (6)
Panel A: Second Stage						
Certification	0.27*** (0.052)	2.07*** (0.427)	0.22*** (0.053)	0.44*** (0.131)	2.39*** (0.581)	0.52* (0.306)
Panel B: IV First Stage						
Non-Rival Certification				0.64*** (0.206)	0.57*** (0.163)	0.57*** (0.165)
<i>F</i> -statistic				215.7	128.2	103.4
Stock–Yogo (10% IV)				16.38		
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1962	906	755	1962	906	755

Notes: Columns 1-3 in Panel A present the panel regression results and columns 4-6 present the IV (2SLS) results. The regression estimates in Columns (2-3) and (5-6) are for the subsample of exporters. Panel B presents the results for the first stage of IV (2SLS). Export performance is measured in three dimensions: i) extensive margin, which is equal to 1 if a firm is an exporter in year t , and 0 otherwise; ii) intensive margin is export volume in year t , measured in log; and iii) export growth is yearly growth in exports. All columns include firm size, age, and foreign ownership as control variables, and industry and year fixed effects. The parentheses contain robust standard errors, clustered at the district level. ***, **, and * significant at the 1%, 5%, and 10% level, respectively.

The panel regression results (columns 1-3) show that a firm's adoption of international certification is positively and significantly associated with all three export outcomes. On average, certification increases the probability of exporting by 27 percentage points, raises export volumes by 2.07 log points, and increases annual export growth by 22 percentage points. These results provide suggestive evidence of a strong link between certification and export performance. However, as

discussed in Section 4, these estimates may be biased due to time-varying unobservables or reverse causality.

Columns 4–6 of Table 3 present the 2SLS estimates using the share of certified non-rival firms in the same district as an instrument for a firm’s certification status. The first-stage results, reported in Panel B, confirm the strength of the instrument: the coefficient on non-rival certification is large and significant across all specifications, with F-statistics ranging from 103 to 216—well above conventional thresholds for weak instrument concerns (Stock & Yogo, 2005).

The second-stage IV estimates confirm and amplify the panel results, indicating that certification has a causal and substantial effect on firm exports. Certification increases the likelihood of exporting by 44 percentage points (Column 4), a considerable shift relative to an average export rate of 46% in the sample. Among exporters, certification increases export volumes by 2.39 log points, equivalent to a nearly tenfold increase in average export value (Column 5). To illustrate the economic significance, consider a representative non-certified firm with an export volume of PKR 10 million. According to our IV estimates, certification is expected to increase its exports to approximately PKR 990 million. Certification raises annual export growth by 52 percentage points (Column 6), suggesting that certified firms not only enter export markets but also scale up exports rapidly over time. The fact that IV estimates are larger than the panel estimates suggests a downward bias in the fixed-effects model.

Taken together, these results provide strong evidence that international standards certification substantially improves export outcomes for firms in Pakistan’s textile and apparel sector. Certification facilitates both entry into export markets and subsequent export expansion. The strength and consistency of the IV results bolster our interpretation of certification as a binding constraint on export participation in weak institutional environments. These effects are large relative to estimates from other settings. For instance, Javorcik and Sawada (2018) find that ISO 9000 certification increased exports in Slovenia by 142%. The larger magnitudes we find likely reflect the more severe information frictions, weaker institutional environment, and greater signaling value of certification in Pakistan’s context.

Mechanisms

In the previous section, we reported a positive and significant impact of certification on a firm's likelihood of exporting and its exports. In this section, we investigate the channels through which international standards certification enhances firm export performance. As discussed in Section 2, the literature suggests two primary pathways: *internal effects*, including operational upgrading, innovation, and productivity gains (Calza et al., 2019; Blind et al., 2017); and *external effects*, including improved market access, enhanced reputation, and better integration into knowledge networks (Terlaak & King, 2006; Clougherty & Grajek, 2014). The two pathways result in several mechanisms that could lead to improved firm performance. We focus on three empirically testable mechanisms: (i) changes in firms' product space (diversification and complexity), (ii) innovation and knowledge linkages, and (iii) labor productivity.

Certification and product space

One plausible mechanism is that certification enables firms to diversify their product offerings to meet the requirements of international buyers, enter new market niches, or reduce their reliance on a single product line. This aligns with internal process improvements as well as external market access advantages. For instance, firms obtaining Oeko-Tex certification may expand from domestic-standard fabrics to export-quality, environmentally friendly fabrics.

However, certification may also lead to a contraction of products a firm offers. While certification may initially encourage product diversification, over time, firms might narrow their product offerings. One reason for this narrowing is that the ongoing costs and operational demands of maintaining certification—such as adhering to strict quality control measures and meeting compliance requirements—may drive firms to concentrate on their most profitable or strategically important products. Additionally, by focusing on a smaller range of products, firms can achieve economies of scale and allocate resources more effectively, ensuring sustained compliance with certification standards and enhancing their competitive advantage in foreign markets. Firms may also limit their range of product choices if they face a limited number of foreign buyers or if they want to establish a niche in international markets.

While the certification is likely to change the diversity and concentration of products offered, whether the adopting firms are expanding horizontally in the product space, or vertically with the offering of more complex products could potentially determine the long-term gains from the

certification. Certification signals compliance with global standards, allowing firms to diversify into niche markets with higher value-added product offerings.

In the following, we evaluate three dimensions of the product space: (i) Diversity, measured as the number of distinct products produced; (ii) Concentration, measured as the share of sales accounted for by the firm's main product; and (iii) Complexity, measured using the Hidalgo-Hausmann product complexity index (Hidalgo & Hausmann, 2009) for a firm's main product. Table 4 reports the results. All regressions include firm controls (size, age, foreign ownership), year and 3-digit industry fixed effects, and cluster standard errors at the district level.

Table 4: Impact of certification on a firm's product space

	Diversity (1)	Concentration (2)	Complexity (3)
Certification	0.17*** (0.046)	-14.2*** (5.125)	-0.00 (0.00)
Controls	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes
Observations	654	654	654

Notes: Columns 1-3 present the second stage IV2SLS results. The dependent variables are: i) diversity, measured as the total number of products produced by the firm; ii) concentration is the percentage share of the main product in total turnover; and iv) complexity is the product complexity index of the main product. All columns include firm size, age, and foreign ownership as control variables, and industry and year fixed effects. The parentheses contain robust standard errors, clustered at the district level. ***, **, and * significant at the 1%, 5%, and 10% level, respectively.

Results from our IV regressions (Table 4) show that certification increases product diversity by 0.17 additional products and reduces concentration by 14.2 percentage points, suggesting that certified firms broaden their production base. However, the effect on product complexity is statistically insignificant, indicating that certified firms expand horizontally—into new products of similar sophistication—rather than vertically into more complex, potentially higher value-added products. This finding is consistent with prior work showing that market access alone does not induce product upgrading (Jamil et al., 2022) in Pakistan. Certification helps firms meet baseline global standards, but does not necessarily incentivize upgradation or technological depth.

Certification and technological innovation

International standards certification may also stimulate firm innovation by exposing firms to global buyers, knowledge flows, and managerial discipline. It may also encourage firms to upgrade their capabilities to meet certification protocols. First, certified firms are better placed to build external knowledge networks. They often integrate into global supply chains, exposing them to advanced technologies and international best practices. Working with certified suppliers and partners encourages knowledge exchange and accelerates the adoption of new technologies. Second, many certifications align with regulatory and safety requirements, pushing firms to adopt new materials and automation. Compliance with standards like ISO 9001 or ISO 14001 encourages firms to update their current technologies or adopt new technologies to meet certification requirements. Finally, certification could also lead to enhanced R&D investments. Certification reduces uncertainty in product quality, that may make firms more confident in investing in R&D. Furthermore, certified firms may also have a greater chance of receiving government support, tax incentives, or access to R&D grants, boosting their innovation activities.

In the following, we examine the impact on four innovation-related outcomes: (i) Knowledge network breadth, measured by the number of distinct innovation partners (e.g., buyers, suppliers, consultants); (ii) Knowledge network depth, measured by the number of highly valued knowledge sources; (iii) Process innovation, proxied by investment in new machinery per worker (log); and (iv) Product innovation, proxied by the log of sales of new products per worker. These analyses are only performed for the subsample of firms engaged in any innovative activity in the base year. Table 5 reports the results. All regressions include firm controls (size, age, foreign ownership), year and 3-digit industry fixed effects, and cluster standard errors at the district level.

Table 6: Impact of certification on a firm's innovation

	Knowledge Breadth (1)	Knowledge Depth (2)	Invest. in Machinery (3)	Product innovation (4)
Certification	7.07*** (1.965)	1.2 (1.28)	4.48*** (1.03)	3.84*** (1.155)
Controls	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Observations	300	300	300	300

Notes: Columns 1-4 present the second stage IV (2SLS) results for the subsample of innovators. The dependent variables are: (1) knowledge breadth is total number of knowledge sources used by a firm for product and process innovation; (2) depth is total number of knowledge sources, rated the highest in degree of importance, used by a firm for product and process innovation; (3) investment in machinery per worker, log; (4) product innovation is measured as the sales of innovative products per worker (products new to market or firm), log. All columns include firm size, age, and foreign ownership as control variables, and industry and year fixed effects. The parentheses contain robust standard errors, clustered at the district level. ***, **, and * significant at the 1%, 5%, and 10% level, respectively.

As shown in Table 5, certification significantly improves a firm's innovation performance. First, certified firms significantly increase their knowledge breadth by 7 partners, suggesting expanded engagement with diverse external actors. However, knowledge network depth (column 2) does not increase significantly, implying that firms diversify rather than deepen their external linkages. Second, certified firms introduce new products and processes. Certified firms increase investment in machinery by 4.5 log points, or a roughly 87-fold increase. They achieve a significant increase in their sales of innovative products by 3.8 log points, or a 45-fold increase in innovative product sales per worker. These are substantial effects, indicating that certification is strongly associated with more intensive innovation inputs and outputs.

Certification and labor productivity

The adoption of international standards certification can raise a firm's labor productivity directly through compliance-led efficiency improvements and indirectly through innovation and product diversification. International standards such as ISO require firms to implement structured management systems that reduce variability in operations and improve efficiency. Streamlined processes reduce idle time, rework, and wastage, allowing workers to be more productive. Second, as shown in Table 5, certification acts as a precursor to technological upgrades, which can automate repetitive tasks and enable workers to shift to more skilled activities. Thus, technology complements labor, increasing output per worker. Furthermore, international standards often mandate employee training and competence development as part of the certification process. Well-trained employees are more efficient and better able to adapt to new technologies and processes.

The productivity impact of standards could be more pronounced in exporting firms, as it generates additional channels of impact. Certified firms are more likely to access international markets and

attract stable, high-volume customers. Stable and high-end demand enables economies of scale, facilitates better planning, and incentivizes greater utilization of labor capacity. In the following, we test for the impact of international standards certification on labor productivity. Table 6 reports the results where labor productivity is measured as output per worker. All regressions include firm controls (size, age, foreign ownership), year and 3-digit industry fixed effects, and cluster standard errors at the district level.

Table 6: Impact of certification on a firm's labor productivity		
	Labor Productivity (1)	Labor Productivity (2)
Certification	1.62*** (0.343)	1.91*** (0.306)
Controls	Yes	Yes
Industry fixed effect	Yes	Yes
Year fixed effect	Yes	Yes
Observations	1962	906

Notes: Columns 1-2 present the second stage IV (2SLS) results. The regression estimate in Column 1 is for the full sample, and in (2) is for the subsample of exporters. The dependent variable is labor productivity measured as output per worker, log. All columns include firm size, age, and foreign ownership as control variables, and industry and year fixed effects. The parentheses contain robust standard errors, clustered at the district level. ***, **, and * significant at the 1%, 5%, and 10% level, respectively.

IV estimates in Table 6 indicate that certified firms experience a 1.62 log point increase in productivity across the full sample (~400% gain), and a 1.91 log point increase among exporters (~575% gain), suggesting larger productivity effects where firms are exposed to more demanding global markets. These results are consistent with prior evidence that certification acts as a form of management upgrading or organizational discipline (Autor et al., 2003; Calza & Goedhuys, 2021). The greater effect among exporters reinforces the idea that certification is especially valuable when accompanied by integration into global value chains.

Our findings point to several complementary mechanisms through which certification enhances export performance. First, product space diversification improves export resilience and market reach. Second, innovation and knowledge network expansion enhance firms' responsiveness to global standards and buyer requirements. Third, productivity gains make firms more cost-competitive internationally. However, these effects are largely horizontal rather than vertical:

certification enables firms to meet baseline requirements and expand into new product lines, but not to move up the value chain in terms of product sophistication. This distinction has important policy implications. While certification clearly facilitates export growth and firm upgrading on several margins, it is not a silver bullet for structural transformation.

Conclusions

In order to increase their global market access, firms in low income countries adopt costly international standards to signal their quality and legitimacy. In this study, we test the impact of the adoption of these certification standards on a firm's export performance using a unique panel dataset from Pakistan's textile and apparel sector. We address endogeneity concerns through an instrumental variable strategy, leveraging the prevalence of certified non-rival firms within the same district as an exogenous determinant of certification adoption. We find that international standards certification significantly enhances firms' export performance. Certified firms are not only more likely to export, but they also achieve substantially higher export volumes and growth rates compared to non-certified firms. These strong impacts are arising through several channels. Certification fosters diversification in the product range the certified firms offer, broadened knowledge networks, introduction of new products and processes, and enhanced labor productivity.

These results have several important implications for policy. First, certification can be an effective policy lever for improving export outcomes in environments where traditional institutions (such as regulatory agencies, quality control systems, and trade promotion bodies) are weaker or underdeveloped. However, certification alone is insufficient to promote structural transformation. While it helps firms enter global markets, it does not appear to encourage them to produce more complex goods. If the policy objective is to increase not just the quantity of exports, but also their quality and sophistication, then certification should be complemented by policies that address deeper capability constraints. These may include R&D incentives, technology upgrading programs, and innovation-financing instruments.

Second, certification's effectiveness depends on firms' exposure to networks and knowledge flows. We find that certified firms build broader—but not deeper—knowledge networks. This suggests that policies aimed at connecting firms to experienced export buyers, lead firms in value

chains, or specialized service providers could enhance the returns to certification. Third, our results support the use of spatially targeted industrial policy. The strong peer effects we identify—where certification spreads through non-rival firms in the same district—suggest that local certification hubs or district-level initiatives, such as certification-related training or subsidizing certification costs, could act as effective focal points for scaling certification adoption.

Finally, our study reinforces the idea that private governance mechanisms, such as international standards certification, can partially substitute for weak or unrecognized public enforcement in developing countries. However, for certification to become a more transformative tool for economic upgrading, governments must play a more active role—not only in lowering barriers to adoption, but also in ensuring that firms simultaneously build the complementary capabilities needed to move up the value chain.

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