

Original Paper

Cross-Border E-Commerce Comprehensive Pilot Zones and Urban Export Product Quality: Evidence from China

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Abstract

This study examines whether and through what channels China's cross-border e-commerce (CBEC) comprehensive pilot zones (CPZs) raise the quality, rather than merely the volume, of city-level exports. Treating the staggered approval of CPZs since 2015 as a quasi-natural experiment, we build a panel of 282 prefecture-level cities over 2011-2023 and estimate a multi-period difference-in-differences model. Export product quality is recovered by the demand-residual approach using HS six-digit customs data. Results show that CPZ approval raises city-level export product quality by approximately 6.8% on average ($p < 0.01$), and the effect stabilizes by the third year after approval. Mechanism analysis indicates that the quality gain operates mainly through lower information and matching costs on digital platforms (about 42% of the total effect), followed by digital infrastructure accumulation (31%) and local innovation output (22%). Oaxaca-style decomposition reveals that about 81% of the effect is a within-product quality upgrade rather than a compositional shift toward higher-unit-value goods. The findings suggest that CPZs function as institutional enablers of high-quality trade, and that expanding pilot zones to inland cities should be paired with digital infrastructure, logistics and talent support.

Keywords

cross-border e-commerce, comprehensive pilot zones, export product quality, difference-in-differences, trade cost

1. Introduction

1.1 Background

China's foreign trade has entered a stage in which the central policy concern is no longer the quantity of exports but their quality, sophistication and value-added share. For three decades after the reform and

opening-up, Chinese export growth was driven by low labour costs, processing assembly and mass-produced manufactures. By the mid-2010s, however, that model had run into clear limits: rising domestic wages, growing trade frictions with the United States and Europe, and the need to absorb excess industrial capacity all pushed policymakers toward a new growth model. Since the 2018 Central Economic Work Conference, "promoting the high-quality development of foreign trade" has been a recurring policy objective, and the Fourteenth Five-Year Plan for the Development of Foreign Trade explicitly calls for moving Chinese exports up the global value chain and increasing the share of branded, differentiated and technology-intensive goods.

At the same time, the digital economy has become the most visible engine of trade growth. Cross-border e-commerce, in particular, grew at an annual rate above 15% between 2015 and 2024, far outpacing the roughly 6% growth of general trade. China became the world's largest CBEC retail trader, with cross-border imports and exports combined exceeding 2.3 trillion RMB in 2023. The rise of platforms such as Alibaba International, Shein, Temu, TikTok Shop, DHgate and Dunhuang has given small and medium-sized Chinese producers direct access to overseas consumers, bypassing the traditional layers of intermediaries that once dominated international distribution.

1.2 The CPZ Policy

A distinctive Chinese institutional response to this shift is the cross-border e-commerce comprehensive pilot zone (CBEC CPZ). The first CPZ was approved in Hangzhou in March 2015. The State Council then expanded the programme in seven batches: 12 cities in January 2016, 22 cities in July 2018, 24 cities in December 2019, 46 cities in April 2020, 27 cities in January 2022, and 33 cities in November 2022 (including the whole of Jiangsu, Guangdong and Zhejiang in certain clusters). By the end of 2022, 165 cities and four provincial-level regions were covered.

The choice of Hangzhou as the inaugural pilot is not accidental: Hangzhou is the headquarters of Alibaba, which had built the world's largest B2B cross-border platform (Alibaba.com) and the B2C AliExpress platform. The CPZ was designed to test whether the institutional environment around such platforms—customs, tax, payment, logistics—could be reformed at city scale so that the platform model could be replicated across China. The staggered rollout is also not accidental: it reflects a deliberate experimentalist approach characteristic of Chinese economic reform, in which successful local experiments are scaled up after evaluation. This makes the CPZ programme ideal for causal evaluation: the timing of approval is staggered, not universal, and the criteria for selection are publicly stated (export orientation, digital infrastructure, government capacity), which allows us to control for selection observables.

Within a CPZ, local authorities are authorised to experiment with integrated customs clearance, tax rebates on retail exports, cross-border payment settlement, foreign-exchange administration, logistics warehousing, seller credit support, and integrated online-offline public service platforms. The supervised customs codes "9610" (B2C direct export) and "9710" (B2B direct export) were designed precisely for CPZ operations. The policy is therefore not a simple cash subsidy; it is a coordinated

institutional reform that lowers both the fixed and variable costs of doing CBEC at the city level, and that creates a sandbox in which regulators and firms can jointly work out new procedures.

1.3 Research Questions and Motivation

A growing body of evidence shows that CPZs raise city export volume, attract digital firms and stimulate innovation [19,18,13]. However, volume growth is not the same as quality upgrading. A policy that lowers the fixed cost of exporting may mechanically expand the number of small, low-quality sellers and push down average quality, as Melitz [9] and the subsequent heterogeneous-firms literature would predict. Conversely, if the CPZ resolves information frictions and gives producers access to richer buyer feedback, it may push within-product quality upward. Whether the net effect is positive, negative or null is an empirical question with direct policy stakes.

This paper addresses three questions. First, does the staggered rollout of CPZs causally improve city-level export product quality? Second, which channels—trade-cost reduction, digital infrastructure agglomeration, or innovation—carry the effect? Third, which cities and industries benefit most, and what does that imply for the next round of inland expansion, given that many of the newest CPZs are located in central and western provinces?

1.4 Contributions

The paper makes three contributions. First, it shifts the dependent variable from export volume or technological sophistication toward a quality measure recovered from unit-value residuals, which is closer to the policy goal of "high-quality trade". As Shi [15] and Li, Jiang and Song [11] demonstrate, unit values and sophistication indices confound quality with costs, mark-ups and industrial structure; a direct demand-residual quality measure is needed.

Second, by using the staggered approval of CPZs across 282 cities over 2011-2023, it provides a city-level multi-period DID design that complements existing firm-level evidence (e.g. A-share panel studies covering 2011-2021) and speaks directly to place-based policy evaluation. City-level analysis is appropriate because the CPZ is a city-level policy that bundles infrastructure, regulation and public services, and because the question of interest is whether the local economy as a whole moves up the quality ladder.

Third, the paper explicitly tests three mediation channels and distinguishes a pure price/composition effect from genuine within-product quality upgrading via an Oaxaca decomposition. This addresses a key concern in earlier work that uses unit values as a proxy for quality.

The remainder of the paper is structured as follows. Section 2 reviews the literature on export quality measurement, digital trade costs and CPZ evaluation. Section 3 develops the theoretical mechanism and hypotheses. Section 4 describes data, variables and the empirical strategy. Section 5 reports baseline, robustness, heterogeneity and mechanism results. Section 6 discusses the findings. Section 7 concludes with policy implications.

2. Literature Review

2.1 *Measuring Export Product Quality*

How to measure export quality is a long-standing issue in international economics. Early studies used unit values-price per kilogram or per unit-as a direct proxy for quality, on the assumption that higher-priced goods embody more quality. This approach is simple but flawed: unit values confound quality with production costs, mark-ups, market power and exchange-rate movements. A Chinese T-shirt exported at a lower price than a Vietnamese T-shirt may be either lower quality or produced at lower cost, and unit values alone cannot distinguish the two.

Khandelwal [7] introduced a nested-logit demand framework that infers quality from the demand residual conditional on price: conditional on price, products with higher quantities sold are inferred to be higher quality. Using U.S. import data, he showed that quality ladders vary widely across industries and that richer countries tend to occupy higher rungs. Hallak and Schott [6] separated quality from price using trade-balance information, arguing that countries running persistent trade surpluses at given prices must be selling higher-quality goods. Feenstra and Romalis [4] developed a supply-and-demand decomposition that distinguishes consumer quality (willingness to pay) from producer quality (production cost), and showed that the two diverge substantially across country pairs.

In the Chinese context, Shi [15] applied the demand-residual method to Chinese industrial-firm and customs data and documented substantial within-industry quality heterogeneity. His central finding was that Chinese export quality had risen on average but with enormous dispersion across firms and industries. Shi, Wang and Li [16] used a nested-Logit framework to estimate the quality of Chinese exports over 2000-2011 and found that quality rose modestly but diverged sharply across sectors. Li, Jiang and Song [11] showed that the apparent "quality decline" of Chinese exports in the 2000s was largely explained by low-quality market entrants rather than by incumbent downgrading-an important distinction for policy because it means that entry barriers, not incumbent performance, were the source of the aggregate trend.

These studies together establish the measurement toolkit that the present paper adopts: demand-residual quality, normalised within product categories, and aggregated to the city level using export-value weights.

2.2 *Trade Costs, Digital Platforms and Quality*

A second strand of literature examines how trade frictions shape export quality. Melitz [9] predicts that a reduction in fixed export costs reallocates market share toward more productive firms, but the effect on average quality is theoretically ambiguous: new low-productivity entrants lower average quality, while the reallocation toward high-productivity incumbents raises it. The net effect depends on the shape of the productivity distribution and the elasticity of substitution.

More recent work emphasises that information frictions-rather than tariffs or transport costs-are the dominant barrier for small exporters. Lendle et al. [8], using eBay transaction data, showed that the well-known gravity equation's "distance effect" shrinks dramatically when buyers and sellers meet on a

digital platform, because platform review and search functions reduce the cost of discovering and trusting an unknown counterparty. Ahn, Khandelwal and Wei [1] showed that intermediaries play a large role in trade precisely because they resolve information asymmetries; digital platforms are essentially a scalable substitute for those intermediaries.

Goldfarb and Tucker [5] conceptualise digital economics as a drop in the cost of information, computation and communication. Applied to trade, this means that a platform-mediated exporter receives richer and faster signals about what overseas buyers actually want-through reviews, repeat purchases, search-term analytics and returns data. This feedback should disproportionately benefit quality-sensitive differentiation rather than pure price competition, because the producer can now observe which product features are valued and which are not.

2.3 Evaluating China's CBEC Pilot Zones

A fast-growing empirical literature evaluates the CPZ programme. Zhang et al. [19], using Chinese manufacturing firm data, found that CPZ establishment raised export technological sophistication, with stronger effects for firms in eastern China and in technology-intensive sectors. Their mechanism analysis pointed to lower trade costs and innovation as the main channels. Xu and Liu [18] showed that CPZs promoted "high-quality exports" as measured by sophistication and unit-value structures, and that the effect was mediated by industrial upgrading. Liu and Yao [13], applying a double-machine-learning model that is robust to selection on unobservables, confirmed a positive effect on industrial exports and found that the result is not driven by a few outlier cities.

Several other studies, indexed in CNKI and Wanfang, report that CPZs raise firm innovation (measured by patent applications), reduce supply-chain risk, and attract digital FDI. A separate literature on digital trade more broadly [12] shows that digital trade development raises export sophistication through industrial structure upgrading and innovation. Studies of the Broadband China pilot policy and of enterprise digital transformation more broadly show that digital infrastructure empowers green innovation and supply-chain financing, which are adjacent outcomes.

However, two gaps remain. First, most studies measure outcomes in terms of export volume, total factor productivity or technological sophistication rather than a demand-residual quality measure. As noted above, sophistication and unit values do not equal quality: a city may specialise in electronics exports (high sophistication) that are assembled at low quality, or it may export textiles (low sophistication) at high quality through niche branding. A direct demand-residual quality measure is needed to answer the policy question of whether exports are genuinely upgrading. Second, the mechanism literature has not fully separated the three channels (trade cost, digital agglomeration, innovation), and few studies explicitly test whether the effect is a within-product quality upgrade or a between-product composition shift. This paper addresses both gaps.

3. Theoretical Mechanism and Hypotheses

3.1 *The CPZ as an Institutional Reform*

A CPZ bundles four sets of reforms. First, customs and clearance integration: the "9610" and "9710" supervised codes allow small parcels to be cleared in batches rather than one by one, cutting clearance time from days to hours. Second, tax policy: retail exporters without input invoices benefit from the "no invoice, no tax" policy, and consolidated tax refund procedures reduce working-capital pressure. Third, cross-border payment and foreign-exchange facilitation: licensed payment institutions can settle directly in RMB or foreign currency, and individual cross-border e-commerce sellers can open specialised foreign-exchange accounts. Fourth, public service infrastructure: local governments fund overseas warehouses, seller training centres, credit-risk funds and integrated online service platforms. The net effect is a reduction in both the fixed cost of starting CBEC (registration, customs procedure learning, payment integration) and the variable cost of running it (per-parcel clearance, settlement fees, logistics), together with an improvement in the information environment of cross-border transactions through platform reputation and review systems.

3.2 *Three Channels Linking CPZs to Export Quality*

Channel 1: Trade-cost reduction and information matching. On a digital platform, a small Chinese seller can observe overseas buyers' search terms, reviews and repeat-purchase patterns almost in real time. This reduces the information asymmetry that otherwise forces small exporters to compete on price alone, because without feedback they cannot credibly signal quality to unknown buyers. Ma, He and Guo [14], studying quality certification on CBEC platforms, provide direct evidence that certification badges reduce adverse selection and allow higher-quality sellers to charge higher prices. Lower matching costs allow producers to identify quality-sensitive niche markets—for example, eco-friendly pet products, customised homeware or specialty food—and to invest in the features that buyers in those niches actually value. This predicts a positive effect on quality, concentrated in industries where differentiation is feasible and where buyer reviews are informative.

Channel 2: Digital infrastructure agglomeration. CPZs attract logistics firms, payment providers, customs brokers, cloud-service vendors and foreign-trade service companies into the same geographic area. This creates a thick market for complementary services and lowers the marginal cost of quality upgrading. For example, obtaining CE or FDA certification requires specialised consulting firms; running English customer service requires local language talent; deploying an overseas warehouse requires 3PL partners. Following Marshallian externalities, the agglomeration should raise average quality over and above the direct effect of the policy on individual firms, because each new entrant benefits from the services already present. This is analogous to the export-platform agglomeration documented by Roberts and Tybout [10] in the traditional exporting context, but here the agglomeration is in digital services rather than in manufacturing per se.

Channel 3: Innovation stimulus. Easier access to overseas buyers exposes domestic producers to foreign designs, technical standards and competition. This pressure to upgrade is a well-documented

learning-by-exporting channel [3], but in the CBEC setting the feedback loop is shorter and more granular than in traditional trade. A traditional exporter learns from a single importer once or twice a year; a CBEC seller sees thousands of customer reviews per month. This should produce faster product iteration—new designs, improved materials, better packaging—and therefore more patents, utility models and industrial designs directed at export products. CPZ cities should accordingly see more innovation output biased toward export-oriented industries.

3.3 Countervailing Forces

Not all forces point upward. The Melitz [9] entry effect implies that lower fixed export costs bring in marginal low-quality producers, which could pull average quality down. Similarly, if the CPZ attracts "cross-border e-commerce speculators" who list cheap, unbranded goods on multiple platforms, the city's export basket may shift toward low-quality high-volume goods. The net effect depends on whether the information-feedback and agglomeration channels dominate the entry-composition channel. This is an empirical question; the paper resolves it by decomposing within- and between-product effects.

3.4 Hypotheses

Combining the three channels, and assuming that the information and agglomeration effects dominate the Melitzian entry of low-quality marginal exporters, we posit:

H1 (Baseline): The establishment of a CBEC comprehensive pilot zone raises the export product quality of the host city, on average.

H2 (Mechanism): The positive effect operates through (a) lower trade and matching costs, (b) digital infrastructure agglomeration, and (c) local innovation output. The trade-cost channel is expected to dominate because the CPZ's most distinctive feature is the digital platform information environment rather than physical infrastructure.

H3 (Heterogeneity): The effect is stronger in cities with (i) a pre-existing manufacturing base, (ii) higher human capital and digital infrastructure, and (iii) eastern-coastal location; it is weaker or absent in purely resource-dependent inland cities that lack the absorptive capacity to convert CBEC access into quality upgrading.

4. Research Design

4.1 Data Sources and Sample

The sample covers 282 Chinese prefecture-level cities over 2011-2023. Four data sources are combined:

(1) Customs transaction data. Product-level export values and quantities at the HS six-digit level, by destination and year, are aggregated to the city-product-destination level to compute quality. The raw data cover approximately 9 million city-product-destination-year observations before cleaning.

(2) CPZ approval lists. The seven batches of State Council CPZ approvals (2015, 2016, 2018, 2019, 2020, 2022a, 2022b) are hand-collected from official State Council notices, giving a staggered

treatment year for each host city. The first treated city is Hangzhou (2015); the final batch includes cities in Hebei, Inner Mongolia, Gansu, Qinghai and Xinjiang, allowing us to observe treatment effects across very different regional contexts.

(3) City-year controls. GDP per capita, population, manufacturing share, FDI, internet users, education expenditure, road freight volume and number of patents are drawn from the China City Statistical Yearbook and the China Statistical Yearbook.

(4) Mechanism variables. City-level digital infrastructure (internet broadband users per 100 people), logistics density (road freight volume per square kilometre), and invention patent applications per capita are from the China City Statistical Yearbook and the National Intellectual Property Administration.

After cleaning-excluding cities with incomplete data over the full period, prefecture-level divisions with missing customs records, and years before 2011-the panel contains 3,666 city-year observations. Of these, 165 cities are treated at some point during the sample period, and 117 cities remain as controls throughout.

4.2 Measuring Export Product Quality

Following Khandelwal [7], Shi [15] and Shi, Wang and Li [16], we estimate quality by the demand-residual method. For a given product k exported from city c to destination d in year t , the demand equation is estimated with product, destination and year fixed effects. The estimated residual is the demand-based quality estimate. Intuitively, conditional on price, a product that sells more units must be of higher quality.

We then normalise quality across products to a $[0, 1]$ interval using min-max scaling within each product category, and aggregate to the city-year level using export-value weights. This yields a city-year quality index that is comparable across years and cities. We also compute an unweighted average as a robustness check.

4.3 Model Specification

We estimate a multi-period (staggered) DID model, where $Treat_{ct} = 1$ if city c has been approved as a CPZ by year t (and 0 otherwise), X_{ct} is the vector of city-year controls, city fixed effects absorb time-invariant city characteristics, and year fixed effects absorb common macroeconomic shocks. Standard errors are clustered at the city level to allow for serial correlation within cities.

The control variables include: GDP per capita (logged), population (logged), manufacturing share of GDP, FDI as a share of GDP, internet penetration rate, government R&D expenditure share, logistics infrastructure density (road freight volume per square kilometre), and human capital (share of university students in total population).

Table 1. Variable Definitions

Variable	Definition	Source
Quality_ct	City-year export quality index, demand-residual, export-value weighted	Author's calculation
Treat_ct	=1 if city c has been approved as CPZ by year t	State Council notices
ln GDPpc	Log of GDP per capita	China City Statistical Yearbook
ln Pop	Log of year-end population	China City Statistical Yearbook
Manuf_share	Manufacturing value-added / GDP	China City Statistical Yearbook
FDI_gdp	Utilised FDI / GDP	China City Statistical Yearbook
Internet	Broadband subscribers per 100 persons	China City Statistical Yearbook
RD_share	Government R&D expenditure / GDP	China City Statistical Yearbook
Logistics	Road freight volume per km ²	China City Statistical Yearbook
Humcap	University students / total population	China City Statistical Yearbook

4.4 Endogeneity Strategy

The staggered DID requires parallel pre-treatment trends. We conduct an event-study specification with dummies for each year relative to CPZ approval. Pre-treatment coefficients should be statistically indistinguishable from zero if the parallel-trends assumption holds.

Endogeneity concerns include: (i) cities with higher export quality may have been selected for CPZ status (selection bias); (ii) concurrent policies-broadband China pilots, national e-commerce demonstration cities, free-trade zones, and science-and-technology innovation zones-may confound the estimate; and (iii) reverse causality, in which cities with rising export quality self-select into applying for CPZ status. We address these by PSM-DID matching on pre-2015 covariates, exclusion of concurrent policies, 500-round placebo tests, and an instrumental variable based on 1984 postal-office density interacted with national CPZ rollout intensity.

5. Empirical Results

5.1 Baseline Results

Table 2 reports the baseline DID estimates. Column (1) includes only Treat, city and year fixed effects. Column (2) adds GDP per capita and population. Column (3) adds the full set of controls. Across all three specifications, Treat is positive and significant at the 1% level. In the full specification, the coefficient is 0.068, meaning that CPZ approval raises city export product quality by about 6.8% relative to the sample mean.

Table 2. Baseline DID Estimates

Variable	(1) Quality	(2) Quality	(3) Quality
Treat	0.079*** (0.018)	0.072*** (0.017)	0.068*** (0.016)
ln GDP per capita		0.041**	0.035**
ln Population		0.012	0.010
Manufacturing share			0.053**
FDI/GDP			0.021
Internet penetration			0.044***
R&D share			0.038**
Logistics density			0.027**
Human capital			0.031**
City FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
N	3,666	3,666	3,666
R ²	0.71	0.73	0.75

Notes: Standard errors clustered at city level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

The control variables behave as expected: internet penetration, R&D intensity, logistics density and human capital all enter positively and significantly, consistent with the literature on digital and infrastructure drivers of export quality [17,12]. FDI as a share of GDP is positive but insignificant, which may reflect that FDI in China has increasingly been directed toward domestic-market-oriented sectors rather than export platforms.

5.2 Parallel Trends and Dynamic Effects

The event-study estimates show no significant pre-trend: all lead coefficients ($k = -5$ to -1) are small and statistically indistinguishable from zero. Treatment effects begin to appear in the year of approval ($k = 0$, coefficient 0.021, $p < 0.1$), rise in the second year ($k = 1$, 0.052, $p < 0.05$), and stabilise around 0.07 by year three ($k = 2$, 0.071, $p < 0.01$), remaining stable through year five. The gradual take-up is

consistent with the fact that customs, tax and logistics reforms take one to two years to bed in, and that firms need time to onboard to platforms and adjust product offerings. The absence of a pre-trend supports the causal interpretation.

5.3 Robustness Checks

We run five robustness checks: (1) PSM-DID on matched pre-2015 covariates yields a Treat coefficient of 0.064 ($p < 0.01$), essentially unchanged from the baseline. (2) Excluding concurrent policies (free-trade zones, broadband China pilot cities, national e-commerce demonstration cities) raises the coefficient slightly to 0.073 ($p < 0.01$), suggesting that concurrent policies do not drive the result. (3) Placebo test with 500 random assignments is centred near zero (mean 0.001), and our estimated 0.068 lies in the far right tail. (4) Alternative quality measures using $\sigma = 4$ and $\sigma = 6$ give coefficients of 0.061 and 0.074 respectively, both significant. (5) Instrumental variable estimation with 1984 postal density yields a second-stage coefficient of 0.082 ($p < 0.01$), consistent with a causal interpretation.

5.4 Is it Quality or Composition?

A central concern is that the CPZ may simply shift the city's export basket toward higher-price categories rather than upgrade quality within products. To test this, we decompose the quality change into a between-product composition effect and a within-product quality effect using an Oaxaca-style decomposition. The within-product component accounts for approximately 81% of the total quality gain, while the between-product (composition) component accounts for only 19%. This confirms that the effect is predominantly a genuine within-product quality upgrade, not a switch in export mix.

5.5 Heterogeneity Analysis

We split the sample along three dimensions. By region: eastern cities show a Treat coefficient of 0.091 ($p < 0.01$); central cities 0.048 ($p < 0.05$); western cities 0.022 (statistically insignificant). The weaker inland effect is consistent with weaker digital infrastructure, thinner service markets and lower human capital. By industry type: following the OECD technology classification, the effect is largest for medium-technology manufacturing (0.083, $p < 0.01$), smaller for high-technology (0.051, $p < 0.05$), and insignificant for resource-intensive and low-technology industries. By city characteristics: the effect is more than twice as large in cities above the median on both pre-treatment internet penetration and human capital (0.102 vs. 0.041). This supports H3: the CPZ dividend depends on absorptive capacity.

5.6 Mechanism Tests

We test the three channels from Section 3 using a mediation framework. The mediator variables are: (i) trade cost, proxied by city-level average cross-border logistics cost per tonne-kilometre; (ii) digital infrastructure, measured by broadband subscribers per 100 people; and (iii) innovation, measured by invention patent applications per capita. The Sobel and bootstrap tests (with 1,000 bootstrap replications) show that all three channels are statistically significant, but their relative contributions differ: trade-cost channel accounts for roughly 42% of the total effect (indirect coefficient 0.029, $p < 0.01$); digital infrastructure channel accounts for about 31% (indirect coefficient 0.021, $p < 0.05$);

innovation channel accounts for about 22% (indirect coefficient 0.015, $p < 0.05$). The remaining 5% is a direct effect. The primacy of the trade-cost channel supports the view that the CPZ's biggest contribution is to resolve information and matching frictions rather than to act as a pure subsidy or infrastructure programme.

6. Discussion

The 6.8% quality gain associated with CPZ approval is economically meaningful. Over the sample period, city-level export quality rose by roughly 11% overall; the CPZ programme therefore accounts for more than half of that aggregate improvement in treated cities. This is a larger effect than earlier volume-focused studies would have predicted, and it is consistent with the Chinese government's framing of the CPZs as "high-quality trade" pilots rather than "export growth" pilots.

To put this in context, the 6.8% gain is comparable in magnitude to the effect of a one-standard-deviation increase in human capital (about 5%), and larger than the effect of FDI inflows (which is insignificant in our specification). The point is that a single institutional reform-bundling customs, tax and digital-platform support-can deliver a quality gain on the order of major educational or infrastructure investments, which is a high return for a place-based policy.

Three findings deserve emphasis. First, the effect is a within-product quality upgrade, not a composition switch. This matters because critics of place-based export policy often argue that subsidies merely reshuffle the export basket toward high-price goods without improving underlying product performance. Our decomposition does not support that critique in the CBEC setting: four-fifths of the effect comes from making existing products better, not from shifting to different products.

Second, the trade-cost channel dominates. This is in line with the recent trade literature that identifies information frictions, not tariffs, as the dominant modern trade barrier [8,14]. It also implies that the marginal value of future CPZ expansion is likely to come from further digital platform development, reputation mechanisms and overseas warehouse networks, rather than from additional customs clearance tweaks or tax concessions.

Third, the heterogeneity results reveal an equity-efficiency trade-off. Eastern, high-human-capital cities benefit most. If CPZ expansion is left to market logic, inland China will fall further behind in export quality even as its raw export volume grows. The policy response is not to withhold CPZ status from inland cities, but to bundle it with the complementary investments that allow the trade-cost and agglomeration channels to operate.

7. Conclusion and Policy Implications

Using the staggered approval of China's CBEC comprehensive pilot zones as a quasi-natural experiment, and a panel of 282 prefecture-level cities over 2011-2023, this paper shows that CPZ approval raises city-level export product quality by approximately 6.8%. The result survives PSM-DID, exclusion of concurrent policies, placebo tests, alternative quality measures and IV estimation. The

effect operates mainly through lower trade and matching costs on digital platforms, secondarily through digital infrastructure agglomeration, and tertiarily through local innovation. It is a within-product quality upgrade rather than a between-product composition shift, and it is strongest in eastern, manufacturing-intensive and high-human-capital cities.

Three policy implications follow. First, continue expanding CPZs, but pair approval with complementary inputs. Inland and western cities should receive parallel support for broadband infrastructure, logistics networks, vocational training in cross-border e-commerce operations, and English-language customer service talent. Without these complements, inland CPZs risk becoming volume-only zones that do not upgrade quality.

Second, prioritise information and reputation infrastructure. Because the trade-cost channel dominates, future policy should focus on platform-level quality certification, dispute resolution, cross-border credit reporting and overseas warehouse networks, rather than on further tariff or tax concessions. In an era of rising trade barriers and geopolitical uncertainty, reducing information frictions is a more robust source of comparative advantage than negotiating further tariff cuts.

Third, support medium-technology manufacturing. The effect is largest in medium-technology industries, where Chinese firms are close to the quality frontier and information feedback can translate quickly into product improvement. Industrial policy should target this tier—for example, home appliances, automotive parts, medical devices, specialty food and consumer electronics components—rather than spreading resources thinly across both low-technology commodity exports and already-brand-intensive high-technology sectors.

This study has several limitations. First, city-level quality is an aggregate that masks firm-level heterogeneity; future work using matched customs and industrial-firm data could reveal whether small or large firms benefit more. Second, the sample ends in 2023, so the long-run effects of the most recent CPZ batches are not yet observable. Third, the paper focuses on export quality and does not examine the employment, wage or environmental effects of the CPZ programme. Fourth, the quality measure relies on a calibrated elasticity of substitution; while robustness checks at $\sigma = 4$ and $\sigma = 6$ support the main conclusion, a fully estimated elasticity would be more precise. Future research can extend this work by using firm-level customs data, comparing CPZ effects across destination markets, and tracking the long-run effects of the most recent batch of inland CPZs.

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