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Export duration and export product quality of firms: evidence from China

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ABSTRACT

This study analyzes how export duration affects firms' export product quality. On the basis of Chinese firms' micro data, we find that export duration has a significantly positive effect on the export product quality of firms by promoting their productivity and innovation ability. This study shows that the effect of export duration on the product quality of firms is not only reflected in the stage when they enter the export market. After entering the export market, the extension of export duration is also conducive to the improvement of firms' product quality, supporting the wide presence of the effects of learning by exporting. Therefore, this study provides new empirical evidence to further understand the influence of export market on firms' product quality.

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Export duration; product quality; learning by exporting; innovation

1. Introduction

Export product quality, as an important embodiment of firms' core competitiveness in the international market, is related to firm survival in the export market (Eckel et al., 2015). Under a fierce market competition and high demand for product quality overseas, firms with higher product quality can often resist external shocks more strongly and survive in the export market more easily than those with lower product quality. Export product quality is a reflection of firm production capacity and also the result of firm export decision-making. Numerous studies have focused on the influence of firms' participation in the export market on their product quality. Relevant studies have shown that export firms have a positive premium in product quality compared with non-export firms; that is, the product quality of export firms is higher than that of non-export firms (Antoniades, 2015; Dinopoulos & Unel, 2013; Hallak & Sivadasan, 2013; Imbriani et al., 2015).

However, existing studies on the influence of firms' participation in the export market on their product quality have remained within the stage of analyzing the effect of firm transformation from non-export state to export state on their product quality (the focus is still in the comparison between export and non-export firms). Such an analytical perspective may not be comprehensive. The entry of firms into the export market is only

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the beginning. With the extension of firms' export duration, whether the rich export experience accumulated by firms can contribute to the improvement of their product quality is undoubtedly more important. Export duration measures the participation of firms in the export market from the time dimension and reflects their dynamic export behavior from the micro level. Shao et al. (2012) reported that the export duration of firms is the concentrated embodiment of their comprehensive international competitiveness and ability to deal with external shocks. Therefore, to accurately understand the effect of the export market on firms' product quality, exploring only the influence of their transformation from non-export to export state on their product quality may be insufficient. Firms that have entered the export market should also be taken as the research object, and the influence of the export duration of firms on their product quality should be given focus. On this basis, this study focuses on firms after entering the export market and analyzes how export duration will affect their export product quality. This research provides a new perspective for a more comprehensive understanding of the export market's influence on firms' product quality.

First, under the framework of the heterogeneity firm trade model, this study establishes a theoretical model to analyze the effect of export duration on firms' export product quality. Moreover, the current research clarifies the internal mechanism of export duration affecting firms' export product quality. Export duration will have a significantly positive influence on the export product quality of firms by promoting their productivity and innovation ability. The theoretical analysis is helpful to deepen our understanding of the effect of product quality upgrading caused by the increase in export duration. Second, on the basis of the micro dataset of Chinese firms, this study also conducts a detailed empirical test on the effect of export duration on the export product quality of Chinese firms and its mechanism. After a series of robustness tests, such as key index substitution, control for other policy changes, and heterogeneity analysis of different firm types, this study robustly verifies that the increase in export duration significantly promotes the improvement of export product quality of Chinese firms.

By analyzing the influence of export duration on the export product quality of Chinese firms, this study demonstrates that the effect of export on the product quality of firms is not only reflected in the stage when they enter the export market. After entering the export market, the extension of export duration is also conducive to the improvement of firms' product quality, supporting the wide existence of the effects of learning by exporting. Therefore, this research provides new empirical evidence from large developing countries for further understanding and comprehending the effect of the export market on firms' product quality.

This study contributes to the literature on the influence of export experience accumulation on firms' export performance. Carrère and Strauss-Kahn (2017) believed that export experience acquired from foreign markets increases the likelihood of long-term export success in subsequent markets because it helps reduce the uncertainty faced by firms in the export market. This phenomenon occurs through two main channels: learning by exporting (e.g., exporters learn of alternative ways to deal with customs regulations, logistics, banking, and international laws) and signaling (e.g., exporters can comply with foreign demand and be an unfailing supplier). Lawless (2013) and Wang and Zhao (2013) found that export experience promotes the expansion of export products by affecting export fixed and variable costs. Carrère and Strauss-Kahn (2017)

demonstrated that prior export experience obtained in non-Organisation for Economic Co-operation and Development (OECD) markets significantly increases the survival of pioneer exports toward OECD. Dutt et al. (0000) found that having previous export experience leads to a sharp increase in bilateral trade. From the firm-level perspective, Castagnino (2010) showed that past export experience increases the probability of firms entering a similar market in the future. Artopoulos et al. (2013) used the micro data of Argentinian firms as bases and found that prior export experience is essential for firms to acquire export knowledge and build new export business practices. Moreover, they found that such an experience improves the probability of firms' successful export to developed countries.

Studies have used the perspective of firms' "sequential export" as basis in analyzing the role of export experience accumulation in their long-term export behavior. Alborno et al. (2012), Esteve-Perez et al. (2013), and Eaton et al. (2021) reported that when new export firms first enter the export market, uncertainties exist in their profitability and understanding of the export market. Only by conducting an "experiment" export at the initial stage can they obtain additional accurate information on the export market. Therefore, new exporters usually tend to export only a few products when they initially enter the export market. Thereafter, firms grow into export markets and build market share. The sequential export behavior of firms has been verified in new export firms in many countries, such as Colombia (Eaton et al., 2021), France (Aeberhardt et al., 2014), Chile (Alvarez & López, 2008), Spain (Esteve-Perez et al., 2013), Argentina (Alborno et al., 2012), and China (Rodrigue & Tan, 2016). Under the sequential export of firms, the accumulation of export experience brought by the extension of firm export duration will considerably affect the choice and expansion of the firm export market. In the existing literature, in-depth analysis has been performed on how export experience affects the export performance of firms from multiple perspectives. Although export product quality is one of the most important export performances of firms, the existing literature has disregarded the effects of the accumulation of export experience on firms' export product quality. The present study discusses the influence of export duration on firms' export product quality from the theoretical and empirical levels. Accordingly, this research will enrich the existing literature on the microeconomic effects caused by the accumulation of firm export experience.

This study also contributes to the literature on the influencing factors of export product quality. Numerous studies have demonstrated that the higher the income level of the export destination countries, the higher the quality of products exported by firms to these countries (Brambilla & Porto, 2016; Crinò & Epifani, 2012; Manova & Zhang, 2012). Some studies have also shown that firms will export higher-quality products to more export destinations (Baldwin & Harrigan, 2011; Bastos & Silva, 2010; Curzi & Olper, 2012). Except for considering the effects of the characteristics of export destination countries on firms' export product quality, Hou et al. (2021) found that foreign entry deregulation positively affects firms export product quality. Sun et al. (2022) showed that regional trade agreements result in raising firms' export product quality. Dong et al. (2022) found that intellectual property rights protection contributes to firms' export product quality upgrading. Other studies have analyzed the effects of trade liberalization (Fan et al., 2015), foreign direct investment (Anwar & Sun, 2018), exchange rate fluctuations (Hu et al., 2021), and tax incentives (Kong &

Xiong, 2021) on export product quality. Furthermore, numerous studies have analyzed the influencing factors of firms' export product quality. However, although export duration is a concentrated reflection of firms' export dynamic behavior, the literature on its influence on firms' export product quality remains lacking. Although Chen and Shen (2015) studied the effects of export duration of different products on export product quality, they mainly focused on the product-level analysis and disregarded the firm-level perspective. By focusing on how export duration affects the export product quality of Chinese firms, the current study enriches our understanding of the influencing factors of firms' export product quality from the perspective of their export participation. In addition, this study expands the existing research perspective.

The remainder of this paper is organized as follows. Section 2 establishes a theoretical analysis framework for the analysis of the influence of export duration on firms' export product quality. Section 3 introduces the empirical model and data source. Section 4 presents the empirical results. Section 5 empirically examines the channels through which export duration affects firms' export product quality. Section 6 discusses the heterogeneous effects of export duration on the export product quality of different types of firm. Lastly, Section 7 presents the conclusions.

2. Theoretical framework

This section, under the framework of the heterogeneity firm trade model, discusses how export duration affects firms' export product quality. We formalize our theoretical framework by introducing the endogenous quality choice in Aghion et al. (2018) model. To simplify the analysis, we consider two symmetrical economies, and each economy only has one industry. Firms in the industry use a single factor input (i.e., labor) to produce differentiated products. We consider that domestic firms exporting to export market destination F compete with local firms producing in F .

Consumer preferences. L denotes the number of consumers in export market destination F . These consumers have preferences over all varieties available in F . The income of each consumer is normalized to 1. A continuum of differentiated varieties indexed by $i \in [0, M]$ exists, where M is the measure of available products. Supposing that demand for variety q_i is generated by a representative consumer in country F with the following utility function:

$$U(q_i, z_i) = \alpha q_i - \frac{\beta q_i^2}{2} + \gamma q_i z_i, \quad (1)$$

where $\alpha > 0, \beta > 0, \gamma > 0$, z_i denotes the quality of variety i .

The utility maximization of consumers can be expressed as follows:

$$\max_{q_i \geq 0} \int_0^M U(q_i, z_i) di \text{ s.t. } \int_0^M p_i q_i di = 1.$$

Consumers' inverse demand function can be obtained from the first-order condition:

$$p_i = \frac{\alpha - \beta q_i + \gamma z_i}{\lambda}, \quad (2)$$

where λ is the corresponding Lagrange multiplier, which is also equal to the marginal utility of income. In Equation (2), product price decreases with an increase of consumers' purchase quantity and increases with product quality.

Production. We assume a continuum of firms, in which each firm produces a differentiated product. Labor is the only factor input in the production process of these firms. We follow Antoniadou (2015) and Bellone et al. (2016) and assume that the labor input required for a firm to produce q units of output with quality z is as follows:

$$l = \frac{q}{\varphi} + \delta qz + \theta z^2, \quad (3)$$

where φ denotes firm productivity and $\theta > 0$ is a parameter. The first term is directly from Melitz and Ottaviano (2008) and determines the variable cost of production ($1/\varphi$). The second term accounts for the fact that quality upgrades raise the marginal cost of production. The parameter $\delta > 0$ measures the cost of quality adoption in the production process. The third term accounts for the fixed cost of quality upgrading that is invariant to the output. We follow Antoniadou (2015) and assume that quality comes from innovation, which increases with the level of quality upgrade but not with quantity. Parameter θ is a key parameter; it can determine firm-specific differences in the ability to innovate or in the technology of innovation for quality upgrade. The higher the firm innovation ability for quality upgrade, the smaller parameter θ will be.

We assume that a firm's productivity is a function of its export duration χ . In general, enterprises may face markedly intense international competition in the export market, and they can obtain access to the most advanced production technology and management mode. Firms' participation in the export market provides convenience for them to obtain learning opportunities and spillover effects of advanced technology from their foreign counterparts. The existence of the effect of learning by exporting will directly or indirectly promote the improvement of firm productivity (De Loecker, 2013; Greenaway & Kneller, 2007). The longer the export duration, the greater the export experience and learning by exporting effect the firm will accumulate. Yang and Mallick (2010) found that firms improve their production efficiency after entering the export market, especially in the second year after their entry. To this end, we assume that a firm's productivity increases with the extension of its export duration. That is, $\partial\varphi(\chi)/\partial\chi > 0$.

Moreover, we assume that the innovation ability of firms for quality upgrade is a function of export duration χ . Foreign consumers have significantly stringent requirements on product quality and standards. Export firms need to learn constantly; improve their process flow, technical standards, and machinery and equipment; and retrain workers to perform technological innovation to ensure the product quality of firms. Therefore, firms' participation in the export market can significantly improve their innovation level, which has been verified by the existing literature, including Acemoglu (2012), Antoniadou (2015), Bellone et al. (2016), and Aghion et al. (2018). With the

increase in export duration, firms will become increasingly familiar with the export market environment. The accumulated rich export experience will undoubtedly enable firms to have considerable advantages in meeting diverse consumer needs and product innovation for quality upgrade. Rakhman (2010) found that firms with longer export duration can better adjust their business model according to market demand changes. Therefore, we further assume that the innovation ability of firms for quality upgrade will improve with the increase in export duration. That is, $\partial\theta(\chi)/\partial\chi < 0$.

We follow Melitz and Ottaviano (2008) and assume that each firm incurs a per-unit trade cost when selling its product to export market destination F . In particular, the delivered cost of a unit with cost $1/\varphi + \delta z$ to destination F is $\tau(1/\varphi + \delta z)$, where $\tau > 1$. For simplicity, we do not model any fixed export costs.

Optimal product quality of firms. According to the preceding setting, the profit function of the firm producing q units of products with quality z in the export market destination F is as follows:

$$\pi(q, z) = L \left[p(q, z) - \frac{\tau}{\varphi} - \tau\delta z \right] q - \theta z^2. \quad (4)$$

The firm initially selects the output to maximize the profit, and the optimal output can be easily derived from the first-order condition of Equation (4) as follows: $q = \frac{\alpha - \lambda \frac{\tau}{\varphi} + \gamma z + \delta \tau \lambda z}{2\beta}$. Substituting the optimal output of the firm into Equation (4) yields the following equation:

$$\pi(z) = \frac{L \left(\alpha - \lambda \frac{\tau}{\varphi} + \gamma z + \delta \tau \lambda z \right)^2}{4\beta\lambda} - \theta z^2. \quad (5)$$

Thereafter, the firm selects product quality z to maximize the profit. The optimal product quality can be easily derived from the first-order condition of Equation (5) as follows:

$$z = \frac{L(\gamma + \delta\tau\lambda) \left(\alpha - \lambda \frac{\tau}{\varphi} \right)}{4\beta\lambda\theta - (\gamma + \delta\tau\lambda)^2 L}. \quad (6)$$

As we assume that the productivity and innovation ability of a firm are a function of its export duration χ , the optimal product quality of this firm is also a function of its export duration χ , which can be expressed as follows:

$$z(\chi) = \frac{L(\gamma + \delta\tau\lambda) \left(\alpha - \lambda \frac{\tau}{\varphi(\chi)} \right)}{4\beta\lambda\theta(\chi) - (\gamma + \delta\tau\lambda)^2 L}. \quad (7)$$

As a firm's productivity and innovation ability increases with the extension of its export duration (i.e., $\partial\varphi(\chi)/\partial\chi > 0$ and $\partial\theta(\chi)/\partial\chi < 0$), Equation (7) shows that the optimal export product quality of a firm will improve with the increase in export

duration (i.e., $\partial z(\chi)/\partial \chi > 0$). Therefore, the theoretical framework shows that the longer the export duration, the higher the export product quality. That is, export duration will have a significantly positive effect on firms' export product quality by promoting their productivity and innovation ability.

3. Empirical model and data

3.1. Empirical model setting

Given that the current product quality of firms is likely to depend on firms' product quality in the previous period, we set the following dynamic panel model to explore the influence of the export duration on firms' export product quality:

$$\ln(\text{quality}_{it}) = \beta_1 \ln(\text{quality}_{it-1}) + \beta_2 \text{Duration}_{it} + \delta X_{it} + \nu_i + \gamma_t + \varepsilon_{it}, \quad (8)$$

where subscripts i and t represent the firm and year, respectively; the explained variable quality_{it} is the export product quality of firm i in period t ; and Duration_{it} measures the export duration of firm i in period t . Moreover, X_{it} is a set of other control variables. Following Yue (2023), we introduced the following control variables into Equation (8), including: ① firm size (*Size*), which is measured by the logarithm of the number of employees; ② factor intensity (*KI*), which is measured by the logarithm of the ratio of capital to labor; ③ average wage (*Wage*), which is measured as the logarithm of the ratio of total wages payable to the number of employees; ④ firm age (*Age*), which is measured as the logarithm of the difference between the current and establishment year of firms; ⑤ government subsidy (*Subsidy*), which is measured as the ratio of subsidies that firms obtain from the government to firm sales; and ⑥ industry concentration (*HHI*), which is measured by the Herfindahl – Hirschman index. Lastly, γ_t denotes the year-specific fixed effects, ν_i denotes the firm-specific fixed effects, and ε_{it} denotes the random disturbance term. We focus on the estimation coefficient β_2 , which measures the effect of the export duration on firms' export product quality.

Firm export duration (*Duration*) is the core explanatory variable in this study. We follow Besedeš and Prusa (2006) and define the export duration of a firm as the length of time from entering to exiting the export market. However, we need to focus on the following two issues when constructing the measurement index of firm export duration. First, some firms may have multiple export duration periods. For example, if a firm enters the foreign export market in a certain year, it may stop exporting to the foreign market after a certain period. After a few years, the firm may re-enter the export market. The relevant literature has referred to this situation as “multiple spells.” According to Besedeš and Prusa (2006), although some firms have multiple spells in the sample period, the practice of treating the first spell of firms as their only spell in the sample period will not have a substantive effect on the distribution of firms' spell lengths in the given period. Therefore, the current study calculates the export duration of a firm only according to its first spell. Second, left truncation may exist in the data. The sample period of the data used in this study is 2000–2007. The export status of some firms outside the sample

period is impossible to determine accurately. For example, for firms that have exported before 2000, their specific export duration cannot be assessed. If this problem is not considered, then the export duration of firms that have exported before 2000 will be significantly underestimated. To avoid the interference of left-truncated data on the subsequent empirical results, we remove the left-truncated observations in the subsequent regression.

3.2. Estimation of firms' export product quality

This study follows the method of Fan et al. (2015) to estimate firms' export product quality. In particular, we initially assume that the utility function of representative consumer in country j has the following CES utility function:

$$C_j = \left(\int_{\omega \in \Omega_j} [z(\omega)c_j(\omega)]^{(\sigma-1)/\sigma} d\omega \right)^{\sigma/(\sigma-1)}, \quad (9)$$

where $z(\omega)$ denotes the quality of product ω , Ω_i denotes the collection of consumer products in country j , and σ denotes the substitution elasticity between products. Through this setting, we link product quality with consumer utility and assume that higher-quality products bring higher utility to consumers, which is consistent with Sun and Anwar (2022). If the two products have the same price but different quality, then consumers will increase the consumption share of high-quality products and reduce the consumption share of low-quality products to maximize utility. On the basis of the principle of maximizing the utility of consumers, the demand function of representative consumers in country j for product ω is as follows:

$$c_j(\omega) = [z(\omega)]^{\sigma-1} (p(\omega))^{-\sigma} P_j^{\sigma-1} Y_j, \quad (10)$$

where $p_j(\omega)$ is the price of product ω , P_j is the price index of country j , and Y_j is the total expenditure of country j .

On the basis of Equation (10), we further define $c_{g\omega jt}$, $p_{g\omega jt}$, and $z_{g\omega jt}$ as the product quantity, product price, and product quality, respectively, of firm g exporting HS6 code product ω to destination country j in year t . The quantity of products exported by firm g to destination country j in year t can be expressed as follows:

$$c_{g\omega jt} = z_{g\omega jt}^{\sigma-1} p_{g\omega jt}^{-\sigma} P_{jt}^{\sigma-1} Y_{jt}. \quad (11)$$

By taking the logarithms on both sides of Equation (11), we can obtain the following equation:

$$\ln c_{g\omega jt} + \sigma \ln p_{g\omega jt} = \rho_\omega + \eta_{jt} + \varepsilon_{g\omega jt}, \quad (12)$$

where the product fixed effect (ρ_ω) can control the difference in price and quantity between different product types. The country-year fixed effect (η_{jt}) can control the price

Table 1. Summary statistics of the main variables.

Variable	Observations	p5	Mean	Median	p95	SD
quality	125462	0.238	0.464	0.458	0.701	0.142
Duration	125462	1.000	2.531	2.000	6.000	1.705
Size	125462	3.689	5.529	5.476	7.587	1.176
KI	125339	1.547	3.865	3.898	6.097	1.392
Age	123338	0.094	0.647	0.732	1.156	0.367
Wage	125395	1.910	2.855	2.817	3.969	0.645
Subsidy	125462	0.000	0.002	0.000	0.006	0.081
HHI	125462	0.026	0.036	0.032	0.069	0.013

index (P_{jt}) and total expenditure (Y_{jt}) of the destination country. By estimating Equation. (12), we can obtain firms' export product quality as follows:

$$quality_{g\omega jt} = \hat{z}_{g\omega jt} = \frac{\hat{\epsilon}_{g\omega jt}}{\sigma - 1}. \quad (13)$$

By using Equation (13) and combining with the substitution elasticity of products, we can estimate firms' export product quality. Anderson and Van Wincoop (2004) found that the value of substitution elasticity (σ) between different products is generally between 5 and 10. The current study calculates firms' export product quality by taking σ as 5. In the later robustness test, we also recalculate firms' export product quality by taking σ as 10. We follow Broda and Weinstein (2006) and also consider the possible differences in the substitution elasticity of different products. Accordingly, we further calculate the substitution elasticity values of different product categories on the HS2 bit code and re-estimate firms' export product quality. For further details, please see the robustness test in the empirical analysis.

By standardizing the product quality calculated based on Equation (13), we can obtain the standardized index of firms' export product quality as follows:

$$quality_{g\omega jt} = \frac{quality_{g\omega jt} - \min(quality_{g\omega jt})}{\max(quality_{g\omega jt}) - \min(quality_{g\omega jt})}.$$

The standardized product quality is between [0,1], and no unit exists. It can be aggregated at different levels, which enables comparison and analysis across periods and cross-sections. On this basis, the weighted average product quality at the firm level can be obtained by taking the export volume of firm as the weight.

3.3. Data

The data draw on the following two panel datasets: firm-level production data and transaction-level product trade data. Firm-level production data are obtained from the Chinese Industrial Enterprises Database (CIED), which covers all state-owned industrial firms and those of other ownership types with sales above RMB 5 million. We follow Yu (2015) and initially clean up and screen the original CIED data, including removing samples with missing variables, samples with below eight

Table 2. Statistics of spell length – number of firms.

Spell length in year	Full sample	SOEs	Private firms	Foreign firms	Processing trade firms	General trade firms
1	46195	4370	17866	23959	25619	20576
2	29738	2199	10160	17379	18983	10755
3	19828	1320	6086	12422	13547	6281
4	12123	796	3410	7917	8455	3668
5	7773	464	1986	5323	5557	2216
6	5113	277	1171	3665	3693	1420
7	3177	138	656	2383	2341	836
8	1515	51	301	1163	1219	296

The classification standards for SOEs, private firms, foreign firms, processing trade firms, and general trade firms can be found in the relevant content of [section 6](#).

employees as they fall under a different legal regime, as mentioned in Brandt et al. (2012), and samples that violate accounting common sense (e.g., total assets less than the net fixed assets and paid-in capital below or equal to zero). Transaction-level product trade data are obtained from the China Customs Import and Export Database (CCIED), which is compiled by the General Administration of Customs of China. CCIED includes all merchandise transactions passing through the Chinese customs. This database counts the content of firm name, 10-digit firm code, address, phone number, zip code, HS8-digit product code, product-level quantity of trade, dollar value of trade, price, unit, trade state (export or import), source countries of imports, destination countries of exports, and type of trade.

Table 3. Benchmark regression results.

	(1)	(2)	(3)	(4)
	System GMM		First-differenced GMM	
L. ln(quality)	0.6983*** (0.0696)	0.4900*** (0.1497)	0.5115*** (0.1464)	0.4026*** (0.1316)
Duration	0.0044*** (0.0013)	0.0096*** (0.0031)	0.0093*** (0.0031)	0.0113** (0.0052)
Size		0.0073*** (0.0025)	0.0067*** (0.0023)	−0.0882 (0.0573)
KI		−0.0105** (0.0046)	−0.0101** (0.0046)	−0.0035 (0.0173)
Wage		0.0033 (0.0029)	0.0036 (0.0030)	−0.1094** (0.0485)
Age		−0.0278*** (0.0094)	−0.0265*** (0.0091)	0.0046 (0.0232)
Subsidy		0.0034 (0.0032)	0.0035 (0.0034)	−0.1637 (0.7182)
HHI			0.4739** (0.1996)	−0.2744 (0.3408)
Firm FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
AR(1)	0.000	0.000	0.000	0.000
AR(2)	0.001	0.042	0.032	0.082
AR(3)	0.838	0.813	0.800	0.505
Hansen Test	0.352	0.148	0.143	0.216
Observations	68,242	68,055	68,055	38,960

(1) AR(1), AR(2), and AR(3) are the *P* values of the first-, second- and third-order serial correlation tests (AB test) of the residuals of the difference equation, respectively. The null hypothesis is that no sequence correlation of residuals exists. (2) The Hansen test row contains the *P* values of the over-identification test of the instrumental variables. The null hypothesis is that no over-identification occurs in IVs. (3) FEs: Fixed effects. (4) Estimated standard errors are in parentheses; Coefficients are significant at *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$. The same applies to subsequent tables.

We initially aggregate the monthly data of CCIED into the annual data. Thereafter, we calculate the export duration of firms and estimate firms' export product quality¹ based on Equation (13). We follow Yu (2015) and Xiang et al. (2017) and use firms' Chinese name, zip code, and the last seven numbers of the phone number of firms to merge the product quality data and firm-level production data. Lastly, the current study compiles a firm-level dataset for the 2000–2007 period. Table 1 presents a summary statistics of the main variables used in our regressions. Table 2 presents a statistics of spell length in year.

4. Empirical results

4.1. Benchmark regression results

Table 3 presents the estimating results of Equation (8) based on the micro datasets of Chinese firms. Given that the regression equation in Equation (8) is a dynamic panel model (the explanatory variable contains the lag term of the explained variable), we cannot use OLS to directly estimate Equation (8). Moreover, a reverse causality may exist between the export product quality of firms and export duration (export duration can affect the export product quality of firms; firms with high product quality may export longer in the international market). To solve the endogeneity, this study uses the system GMM estimation method proposed by Blundell and Bond (1998) for dynamic panels, in which lags of the variables are used as instruments (i.e., Blundell – Bond system GMM estimation) to estimate Equation (8). In Column (1) of Table 3, we directly regress the export product quality of firms on the export duration without adding any control variables. In Column (2), five firm-level control variables (i.e., firm size, factor intensity, average wage, firm age, and government subsidy) are added into the regression. In Column (3), we also add the industry-level control variable *HHI*. The estimated coefficients of the one-period lagged product quality are significantly positive. This result indicates that firms' export product quality in the previous period will have a significantly positive effect on that in the current period. Moreover, the estimated coefficients of export duration are significantly positive, indicating that the increase in export duration will promote firms' export product quality. Although the inclusion of the control variables changes the size of the estimated coefficient of export duration, the sign and significance of the estimated coefficient have not changed. Thus, the positive effect of export duration on firms' export product quality does not change relatively with the inclusion of the control variables. According to the regression results in Column (3), the estimated coefficient of export duration is 0.0093 and passed the significance test of 1%. For each additional year increase in export duration, firms' export product quality increases by 0.93%.

In Columns (1)–(3) of Table 3, we mainly employ the Blundell – Bond system GMM estimation method to estimate Equation (8). In Column (4) of Table 3, as

¹Before estimating the quality of export products, we used the conversion table provided by the Department of Social and Economic Affairs of United Nations to convert the HS codes of all products during the sample period to the HS2002 version.

Table 4. Results of the robustness tests.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Alternative variable measurement		Alternative IV estimation	Excluding the influence of China's accession to the WTO	Excluding the effects of other policy changes	Controlling for firms' entry and exit		
L. ln(quantity)	0.7740*** (0.1918)							
L. ln(quantitysig)		0.7633*** (0.1707)						
L. ln(quantity)			0.9331*** (0.0399)	0.5258*** (0.1455)	0.5032*** (0.0770)	0.5310*** (0.1459)	0.5579*** (0.1399)	0.6807*** (0.0850)
Duration	0.0082*** (0.0031)	0.0078** (0.0032)	0.0128*** (0.0045)	0.0089*** (0.0031)	0.0082*** (0.0021)	0.0080*** (0.0028)	0.0089*** (0.0031)	0.0118* (0.0068)
Output_tariff					0.0031*** (0.0007)			
Input_tariff					−0.0028*** (0.0008)			
SOE_Reform						−0.3009*** (0.1063)		
Foreign_R							0.0291*** (0.0101)	
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR(1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR(2)	0.006	0.009	0.000	0.028	0.323	0.028	0.018	0.002
AR(3)	0.544	0.670	0.987	0.795	−	0.789	0.815	0.590
Hansen Test	0.398	0.253	0.493	0.168	0.103	0.114	0.132	0.184
Observations	68,041	68,040	68055	61,633	24,620	68,055	68,053	17,733

quality10 denotes firms' export product quality which is calculated by taking σ as 10 based on Equation (13); *quality sig* denotes firms' export product quality which is calculated based on the substitution elasticity values of different product categories on HS2 bit code.

a robustness test, we also use the first-differenced GMM estimation method² to estimate Equation (8). The estimation results still show that export duration has a significantly positive influence on the export product quality of firms.

Given that this study mainly employs the Blundell – Bond system GMM estimation method, we need to focus substantially on the effectiveness of instrumental variables. When using the GMM estimation method, the sequence correlation test of difference model residuals and over-identification test of instrumental variables (IVs) must be performed. The sequence correlation test of residuals mainly uses the n-order residual sequence of difference equation to construct the corresponding statistics to test the effectiveness of IVs. The Arellano – Bond autocorrelation test (AB test) is commonly used to test whether a sequence correlation exists in the residuals of difference models. Its null hypothesis is that no sequence correlation of residuals exists. Meanwhile, the Hansen test is commonly used to test whether over-identification of IVs emerges. Its null hypothesis is that no over-identification occurs in IVs. The AB test results of the regression equation in Table 2 reveal that first- and second-order exist, while no third-order serial correlation problems are present for the residuals of each difference equation. Therefore, the third- or higher-order lagged terms can be used as IVs (Brown & Petersen, 2009). The Hansen test results show that the null hypothesis cannot be rejected even at the 10% significance level, indicating that IVs used in GMM are effective and over-identification is not a problem. Therefore, the AB and Hansen test results show that IVs used in the Blundell – Bond system GMM estimation are appropriate.

Overall, the regression results in Table 3 show that the increase in the export duration will promote firms' export product quality. This result is consistent with the conclusion in the theoretical analysis section.

4.2. Robustness tests

Using different product substitution elasticity values to estimate firms' export product quality. In the previous analysis, we calculate firms' export product quality by taking the product substitution elasticity (σ) as 5 based on Equation (13). Anderson and Van Wincoop (2004) indicated that the value of substitution elasticity (σ) between different products is generally between 5 and 10. First, as a robustness test, we calculate firms' export product quality by taking σ as 10 based on Equation (13) and re-estimate Equation (8). The result in Column (1) of Table 4 shows that the estimated coefficient of export duration remains significantly positive. Second, considering that the substitution elasticity between different products may be different, we follow Broda and Weinstein (2006) and also calculate the substitution elasticity values of different product categories on the HS2 bit code and re-calculate firms' export product quality. With this newly calculated product quality, we re-estimate Equation (8). The result in Column (2) of Table 4 shows that export duration still has a positive effect on the export product quality of firms. Therefore, even if we use different product substitution elasticity values to

²The first-differenced GMM method only estimates differential equations, whereas the Blundell – Bond system GMM method estimates differential and horizontal equations. Compared with the first-differenced GMM method, the Blundell – Bond system GMM method can better avoid the problem of weak instrumental variables. Therefore, this study will mainly employ the system GMM method to estimate Equation. (8).

estimate firms' export product quality, the previous benchmark regression results are robust.

Alternative IV estimation. In the previous regression, considering that a reverse causality may occur between the export product quality of firms and export duration, this study mainly employs the Blundell – Bond system GMM estimation method, which uses lags of the variables as IVs to estimate the dynamic panel model shown in Equation (8). However, the export product quality of firms and export duration may also be affected by other factors. The lags of export duration may not be a good IV. Therefore, this section will construct an alternative IV to re-estimate Equation (8). We follow Fisman and Svensson (2007) and construct the industry-level mean of the export duration as alternative IV. We specifically use the mean of the export duration of all firms in each industry except itself as the IV of the export duration variable to re-estimate Equation (8). The corresponding results are shown in Column (3) of Table 4. The estimated coefficient of the export duration is still significantly positive, similar to the previous benchmark regression results. The alternative IV regression results also show that the export duration significantly promotes firms' export product quality. Thus, the previous benchmark regression results are robust.

Excluding the influence of China's accession to the World Trade Organization. The sample period of this study is from 2000 to 2007, when China formally joined the World Trade Organization (WTO) at the end of 2001. Trade liberalization in China was further accelerated thereafter. However, a reduction in import tariff resulting from trade liberalization significantly increased firms' export product quality (Fan et al., 2015), thereby possibly affecting previous analysis results. For robustness, this study attempts to use various methods to exclude the influence of China's accession to WTO on the previous regression results. First, we only select data in 2002 and later years to construct a post-WTO accession subsample. We re-estimate Equation (8) with the post-WTO accession subsample. The results in Column (4) of Table 4 show that the estimated coefficient of the export duration remains significantly positive, which is similar to the previous benchmark regression results. Second, we follow Yu (2015) and further match CIED and CCIED with tariff data³ and construct the firm-level output and input tariffs to measure the degree of trade liberalization faced by firms. We re-estimate Equation (8) by adding firm-level output and input tariffs as control variables. The results in Column (5) of Table 4 show that the estimated coefficient of the export duration remains significantly positive. This result indicates that the positive effect of export duration on firms' export product quality remains significant even if firm-level tariffs are controlled. Overall, the estimated results in Columns (4) and (5) of Table 4 show that the previous results are less likely to be affected by China's WTO accession.

Excluding the effects of other policy changes. During the sample period, two important policies deserve our attention. First, China has implemented significant reforms in state-owned enterprises (SOEs), including privatizing or merging small and large SOEs. Previous results may have been attributed to the potential effects of SOE reforms. To address this issue, we further add the control variable government ownership into Equation (8). Government ownership (*SOE_R*) is measured by the proportion of state-owned capital to total capital at the industry level. The estimation results in Column

³The product-level tariff data come from the Shanghai WTO Affairs Center.

(6) of Table 4 show that the estimated coefficient of the export duration still remains significantly positive. Second, China relaxed the regulations of FDI during the sample period. The relaxation of FDI regulations has an important effect on firm performance, including R&D investment and export performance (Lu et al., 2017). Previous results may have been attributed to the relaxation of FDI regulation. To address this issue, we further add the control variable foreign capital ownership (*Foreign_R*) into Equation (8). *Foreign_R* is measured by the logarithm of foreign-owned capital at the industry level. The estimation results in Column (7) of Table 4 show that the export duration still has a significantly positive effect on the export product quality of firms. These results indicate that the promotion effect of export duration on firms' export product quality is not substantially affected by SOE reforms and the relaxation of FDI regulations.

Controlling for the influences of firms' entry and exit. During the sample period, many firms only appear once or twice in the sample. That is, numerous entry and exit behaviors of firms occur in the sample. The frequent entry and exit behaviors of firms, especially the short-term existence of firms, may affect the previous estimation results. In particular, this study mainly employs the Blundell – Bond system GMM estimation method, where the short-term existence of firms may further aggravate the bias of regression results. To address this concern, we only retain firms that have existed for numerous years in the sample to re-estimate Equation (8). The estimation results in Column (8) of Table 4 are similar to previous benchmark regression results, which once again shows that the increase in export duration will promote firms' export product quality.

5. Influencing mechanism analysis

Previous empirical analysis reveals that the increase in export duration has a positive effect on firms' export product quality. However, the theoretical analysis in Section 2 shows that improving the productivity and innovation ability of firms is important for

Table 5. Influencing mechanism analysis.

Dependent Variable	(1) ln(quality)	(2) TFP	(3) ln(quality)	(4) New_P	(5) ln(quality)
L. TFP		0.0959*** (0.0128)			
L. New_P				0.2220*** (0.0632)	
L. ln(quality)	0.5115*** (0.1464)		0.7051*** (0.0687)		0.7037*** (0.0691)
Duration	0.0093*** (0.0031)	0.0059*** (0.0019)	0.0055*** (0.0017)	0.0115* (0.0069)	0.0057*** (0.0017)
TFP			0.0157*** (0.0061)		
New_P					0.0091* (0.0048)
Control variables	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes
AR(1)	0.000	0.000	0.000	0.011	0.000
AR(2)	0.032	0.264	0.001	0.705	0.001
AR(3)	0.800	–	0.868	–	0.851
Hansen Test	0.143	0.161	0.365	0.158	0.352
Observations	68,055	68,078	68,055	67,385	67,810

export duration to affect their export product quality. We examine whether export duration promotes the increase in firms' productivity and innovation ability.

To analyze the channels of export duration affecting firms' export product quality, we estimate the following mediation effect models using their productivity and innovation ability as mediators.

$$\ln(\text{quality}_{it}) = \beta_1 \ln(\text{quality}_{it-1}) + \beta_2 \text{Duration}_{it} + \delta X_{it} + u_i + \gamma_t + \varepsilon_{it}, \quad (14)$$

$$\text{Mediator}_{it} = a_1 \text{Mediator}_{it-1} + a_2 \text{Duration}_{it} + \delta X_{it} + u_i + \gamma_t + \varepsilon_{it}, \quad (15)$$

$$\begin{aligned} \ln(\text{quality}_{it}) = & b_1 \ln(\text{quality}_{it-1}) + b_2 \text{Duration}_{it} + b_3 \text{Mediator}_{it} + \delta X_{it} + u_i + \gamma_t \\ & + \varepsilon_{it}, \end{aligned} \quad (16)$$

where Mediator_{it} denotes the mediator variables (i.e., productivity and innovation ability of firms). The meanings of other variables are the same as presented in Section 3. This study uses the logarithm of firms' total factor productivity (TFP) and output value of new products (New_P) to measure the productivity and innovation ability of firms, respectively. To obtain firms' total factor productivity, we use the semi-parameter estimation method (ACF method) developed by Akerberg et al. (2015) to estimate firms' production function.

Table 5 presents the estimation results of Equations (14)–(16). Column (1) presents the estimation results of Equation (14), which is the benchmark regression results shown in Column (3) of Table 3. The estimated coefficient of export duration is 0.0093 and passed the significance test of 1%. In Column (2), we use firms' total factor productivity (TFP) as the dependent variable and estimate the effect of export duration on their total factor productivity. The estimation results show that export duration significantly promotes the improvement of firms' TFP . In Column(3), we estimate Equation (16) using firms' TFP as mediator. The estimated coefficient of TFP is significantly positive, indicating that the improvement of firms' TFP is conducive to the improvement of their export product quality. Furthermore, the estimated coefficient of export duration

Table 6. Heterogeneity analysis.

	(1)	(2)	(3)	(4)	(5)
	Processing trade	General trade	Foreign firms	Private firms	SOEs
L. $\ln(\text{quality})$	0.6557*** (0.2026)	0.5154*** (0.0859)	0.6351*** (0.1423)	0.1431** (0.0723)	0.9121*** (0.1563)
Duration	0.0010 (0.0033)	0.0209* (0.0126)	0.0075*** (0.0029)	0.0153*** (0.0028)	0.0072 (0.0050)
Control variables	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes
AR(1)	0.000	0.000	0.000	0.000	0.000
AR(2)	0.017	0.027	0.013	0.802	0.622
AR(3)	0.180	0.361	0.933	—	—
Hansen Test	0.363	0.113	0.130	0.347	0.410
Observations	46,948	21,107	43,596	19,946	4,513

is 0.0055 after including the mediator (*TFP*) in Column (3), which is smaller than that in Column (1). This finding suggests that the improvement of firms' *TFP* is an important channel for export duration to affect their export product quality.

In Column (4), we use firms' output value of new products (*New_P*) as the dependent variable and estimate the effect of export duration on their innovation ability. The estimation results reveal that export duration significantly promotes the improvement of firms' *New_P*. In Column (5), we further estimate Equation (16) using firms' *New_P* as mediator. The estimated coefficient of firms' *New_P* is significantly positive, indicating that the improvement of their innovation ability is conducive to the improvement of their export product quality. The estimated coefficient of export duration is 0.0057 after the inclusion of the mediator (*New_P*) in Column (5), which is also smaller than that in Column (1). This finding suggests that the improvement of firms' innovation ability is also an important channel for the export duration to affect firms' export product quality.

Overall, the estimation results in Table 5 are consistent with the conclusion in the previous theoretical analysis. That is, the increase in export duration will significantly promote firms' productivity and innovation ability and then have a significantly positive effect on their export product quality. That is, improving the productivity and innovation ability of firms is important for export duration to affect their export product quality.

6. Heterogeneous effect of export duration on the export product quality of different types of firm

6.1. Different types of trade mode

Most developing countries have abundant cheap labor resources and are relatively short of capital in the early development stage. Therefore, they generally opt to develop the processing trade vigorously. Processing trade can help solve numerous employment problems and also compensate for the lack of domestic capital. Thus, the Chinese government has implemented many preferential policies to promote the development of processing trade since the reform and opening-up. Processing trade has developed rapidly in China and has become an important part of its foreign trade (Yu, 2015). To investigate the differential influence of export duration on the export product quality of firms with different trade modes, we divide the sample firms into general and processing

Table 7. Heterogeneity analysis.

	(1)	(2)	(3)	(4)	(5)	(6)
	Coastal	Non-coastal	Small	Large	Capital-intensive	Labor-intensive
L. ln(quality)	0.4656*** (0.1298)	0.7536*** (0.1231)	0.4991* (0.2635)	0.3550* (0.1835)	0.7769*** (0.0634)	0.7947*** (0.0833)
Duration	0.0105*** (0.0029)	0.0149 (0.0371)	0.0060 (0.0046)	0.0115*** (0.0044)	0.0190*** (0.0067)	0.0047** (0.0024)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
AR(1)	0.000	0.000	0.008	0.001	0.000	0.000
AR(2)	0.024	0.651	0.277	0.087	0.002	0.001
AR(3)	0.911	—	—	0.957	0.171	0.158
Hansen Test	0.319	0.560	0.160	0.347	0.754	0.651
Observations	61,977	6,078	31,567	36,488	35,081	32,974

trade firms and re-estimate Equation (8). The estimation results in Columns (1) and (2) of Table 6 show that export duration significantly promotes the export product quality of general trade firms but does not have a significant effect on the export product quality of processing trade firms. This result is consistent with our expectations. Processing trade firms generally import raw materials or intermediate products. Thereafter, they use China's cheap labor force for processing and assembly and finally export them. This characteristic of processing trade may cause export duration to have a minimal effect on the export product quality of processing trade firms through the productivity and innovation ability channels.

6.2. Different types of ownership

China's unique institutional setting makes the ownership structure an important factor affecting the performance of Chinese firms (Hu & Liu, 2014). To analyze whether a difference exists in the effect of export duration on the export product quality of firms with different ownership types, we divide all firms into SOEs, private firms, and foreign firms according to the proportion of registered capital and re-estimate Equation (8). The results in Columns (3)–(5) of Table 6 show that export duration does not have a significant effect on the export product quality of SOEs. Export duration has a greater positive effect on the export product quality of private firms than that of foreign firms. The possible main reasons are as follows. SOEs can often obtain more preferential policies and government support (Lu & Yu, 2015), thereby resulting in the lack of internal incentives for improving productivity and innovation ability. Conversely, private firms usually face immense competitive pressure, and only by continuously improving productivity and innovation ability can they survive in the fierce market. Therefore, private firms may manifest higher effects of learning by exporting. The effect of export duration on the export product quality of private firms will be relatively more significant.

6.3. Different types of region

Given the different natural endowment conditions and historical reasons, significant differences exist in regional economic development and opening-up among China's various regions. In comparison with non-coastal regions, eastern coastal regions have been at the forefront of the country's opening-up by virtue of convenient transportation conditions and good infrastructure construction. The difference in economic development and openness among regions is likely to cause a difference in the influence of export duration on firms' export product quality in various regions. Therefore, we initially divide all provinces into eastern coastal and non-coastal regions according to whether they are adjacent to the sea. Thereafter, we use the subsamples composed of firms in these regions to re-estimate Equation (8). The estimation results in Columns (1) and (2) of Table 7 show that export duration significantly promotes the export product quality of firms in coastal regions but does not have a significant effect on that of firms in non-coastal regions. This result may be related to the fact that most export firms converge in the eastern coastal regions owing to convenient transportation conditions and good infrastructure construction. Moreover, market competition is considerably fierce. Agglomeration and competition effects may make firms in coastal

regions focus considerably on improving product quality through innovation. This finding may cause export duration to have a significant effect on the export product quality of firms in coastal regions through the productivity and innovation ability channels.

6.4. Different types of firm scale

Large-scale firms often have a bargaining power in the factor and product markets and use more advanced production technology, thereby enabling them to produce higher-quality products (Kugler & Verhoogen, 2012). The effect of export duration on firms' export product quality with different sizes may also vary significantly. To this end, we take the median of firm size in the sample as the critical value to divide the sample into large- and small-scale firms and re-estimate Equation (8). The estimation results in Columns (3) and (4) of Table 7 demonstrate that the increase in export duration promotes the export product quality of large-scale firms but does not have a significant effect on that of small-scale firms. The possible reason is that compared with small-scale firms, large-scale firms often have advanced production technology and equipment and have a strong ability to adapt to the international market. Therefore, large-scale firms are often able to update their products according to feedback information from the international product market and show the higher effects of learning by exporting. By contrast, small-scale firms may have difficulty updating their products in a short time even if they obtain feedback from the international product market. The effect of export duration on the export product quality of large-scale firms will be relatively more significant.

6.5. Different types of factor intensity

Given that firms with different factor intensities have various characteristics, especially in production technology and operation management, the effects of export duration on the export product quality of firms with different factor intensities may also differ. Therefore, taking the median of firm factor intensity in the sample as the critical value, we divide the sample into two subsamples: labor-intensive firm group with low capital – labor ratio and the capital-intensive firm group with high capital – labor ratio. We use the two subsamples to re-estimate Equation (8). The results in Columns (5) and (6) of Table 7 show that export duration has a greater positive effect on the export product quality of capital-intensive firms. The possible reason is that compared with labor-intensive firms, capital-intensive firms usually tend to focus more on their R&D investment and technological upgrading. Therefore, with the increase in export duration, obtaining the direct or indirect improvement of productivity and innovation ability from the effects of learning by exporting may be easier for capital-intensive firms. Export duration has a relatively greater positive effect on the export product quality of capital-intensive firms through the productivity and innovation ability channels.

7. Conclusions

This study analyzes how export duration affects firms' export product quality from the theoretical and empirical levels. First, under the framework of the heterogeneity firm trade

model, we clarify the internal mechanism of export duration affecting firms' export product quality. Second, on the basis of the micro data of Chinese firms from 2000 to 2007, we construct a dynamic panel model to empirically test the conclusions of the theoretical analysis. The theoretical analysis shows that export duration will have a significantly positive effect on firms' export product quality by promoting their productivity and innovation ability. Meanwhile, the empirical analysis demonstrates that the increase in export duration significantly promotes the export product quality of Chinese firms, which remains true after a series of robustness tests, such as the substitution of key indicators and exclusion of the effects of related policy changes. Improving the productivity and innovation ability of firms is important for export duration to affect their export product quality. This finding is consistent with the conclusion of the theoretical analysis. Lastly, significant heterogeneity exists in the influence of export duration on the export product quality of different types of firm. Export duration mainly promotes the export product quality of general trade firms, private firms, firms in coastal regions, large-scale firms, and capital-intensive firms.

This study enriches the literature on the influencing factors of firms' export product quality from the perspective of the accumulation of export experience and also has important policy implications. First, this study indicates that improving export duration can promote firms' export product quality, providing them with a feasible idea to change the traditional mode of obtaining competitiveness by relying on low prices and to condense the international competitiveness by relying on product quality. Policy makers should actively encourage export firms to exert continuous effort to cultivate the export market, constantly deepen existing export trade relations, and develop new export trade relations. Through the extension of the duration of export trade relations, firms can improve production efficiency and innovation ability more from the effects of learning by exporting, thereby improving export product quality. Undoubtedly, this finding is significant to the improvement of the competitiveness of a country's firms in the international market and the welfare income in the global value chain. Second, the increase in export duration has a different effect on the export product quality of various types of firms. Significant heterogeneity exists as well. Therefore, when formulating and adjusting the corresponding policies to promote export firms to cultivate the export market continuously, the government should place considerable importance to the differential influence of export duration on the export product quality of different types of firm, improve the accuracy of policy implementation, and develop the effect of corresponding policies.

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