# Domestic Demand Upgrading, Product Mix Adjustment, and Export Competition Strategy

Ting Pei, Xuefeng Qian*

This paper incorporates non-homothetic preferences and the product quality ladder assumption into a model of heterogeneous multi-product firms from the perspective of scale and quality to investigate the differential impact of domestic demand upgrading on firm resource reallocation and export strategies. The theory suggests that, compared to basic products, emerging products possess higher prices and superior quality. Therefore, in response to the expansion of the domestic demand scale, firms concentrate on producing and exporting basic products, adopting a cost-competitive strategy of "small profits but quick turnover" in exports. Conversely, upgrading the domestic demand structure incentivizes firms to produce and export a greater variety of emerging products, pursuing a quality-competitive strategy of "high quality at a premium price." Further analysis of the impact mechanisms has revealed that demand scale expansion intensifies market competition and reduces export costs, prompting firms to narrow their export scope and gain price advantages in exports. By contrast, demand structure upgrading alleviates market competition and enhances export quality, enabling surviving firms to introduce more high-quality emerging product variety and achieve export quality advantages. Using Chinese firm-level microdata from 2000 to 2014, this paper empirically validates the above propositions. Against the backdrop of the world entering a new period of turbulence and transformation, this study provides micro-level evidence and policy implications for leveraging the scale and structural advantages of domestic demand to promote stable and quality-enhanced exports.

**Keywords:** non-homothetic preferences, domestic demand upgrading, multi-product firm, export, competition strategy

## 1. Introduction

Since the twenty-first century, China's labor supply growth has slowed, leading to the gradual erosion of the comparative advantage in labor that supported its low-end manufacturing exports. Simultaneously, the continuous rise in Chinese residents' disposable income has driven domestic demand to contribute to over 90% of China's

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GDP growth annually, with consumption expenditure accounting for an average of 50% of this contribution. This vast domestic demand provides momentum for local firms to cultivate higher-level competitive advantages in foreign trade, shifting the export model from a labor driven to domestic demand driven (Ouyang and Tang, 2022). Against this backdrop, the report of the 20th National Congress of the Communist Party of China emphasized adhering to the theme of high-quality development and organically combining the implementation of an expanded domestic demand strategy with the deepening of supply-side structural reforms. Furthermore, the "Outline of the Strategic Plan for Expanding Domestic Demand (2022–2035)" explicitly proposed giving full play to the driving role of domestic demand, building a more robust domestic market, and promoting the stable, healthy, and sustainable development of China's economy. Against this background, this paper builds on the advantages of the domestic market and, within a unified framework from the perspective of scale and structure, seeks to clarify the theoretical logic of "domestic demand upgrading—adjustment of local firms' export portfolios—endogenous evolution of competitive advantages—export strategy selection." The study aims to develop a novel trade model rooted in domestic market dynamics, offering new theoretical perspectives for maintaining export stability and improving export structure under China's new development paradigm.

Research closely related to this paper falls into two categories. The first examines how domestic demand influences firms' export behavior. After differences in the income elasticity of demand across industries were revealed, Markusen (2013) discovered that consumer demand exhibits non-homothetic preferences, meaning that the proportion of consumer demand does not increase equally with income. When consumers' non-homothetic preferences change, the domestic demand structure shaped by income levels and distribution patterns also shifts accordingly. This subsequently affects firms' export structure transformation (Matsuyama, 2019), productivity levels (Hsu *et al*., 2023), and export patterns (Matsuyama, 2015; Li *et al*., 2020). To empirically test the impact of demand structure on exports, Caron *et al*. (2014, 2020) creatively measured the income elasticity of demand under non-homothetic preferences using the CRIE function, thereby reflecting the demand structure of heterogeneous consumers. Another strand of literature focuses on two mechanisms that affect firms' export portfolio adjustments. The first is the competition mechanism (Mayer *et al*., 2014, 2021), where intensified market competition in destination countries leads firms to concentrate on producing and exporting core products while reducing marginal products, thereby enhancing their core export competitiveness. The second is the cannibalization effect (Hottman *et al*., 2014; Macedoni, 2022), which suggests that adjustments to firms' product portfolios are constrained by the sales volume of existing products. The introduction of new product varieties may reduce the sales of original products, creating an inverted U-shaped relationship between multi-

product firms' export scope and market share that limits the expansion of their export range.

Research on domestic demand and export trade primarily focuses on either firm-level or industry-level analysis, overlooking the typical reality of multi-product firms. Within the framework of multi-product firms, firms can simultaneously produce and export multiple product varieties, with these products entering the production process in a specific sequence. This characteristic may lead to novel conclusions regarding firm export decision-making. Building on this logic, this paper integrates consumers' non-homothetic preferences with heterogeneous firms by introducing the assumption of within-firm product quality ladders within a multi-product firm framework. It decomposes aggregate demand into demand scale and demand structure to analyze how domestic demand affects firms' export product portfolios while examining the underlying mechanisms and corresponding strategies.

This study makes the following innovative contributions: First, it utilizes the Stone–Geary utility function to decompose aggregate domestic demand into demand scale and demand structure, thereby extending the conclusions about the home market effect from a single-perspective analysis. Second, by accounting for the typical characteristics of multi-product exporters, the study observes firms' internal export portfolio adjustments and resource reallocation behaviors in response to different types of demand upgrading within a general equilibrium framework. This supplements the literature on the endogenous determination of firms' export scope. Finally, building upon theoretical model specifications, the study estimates the income elasticity of demand across different products within Chinese firms by utilizing annual firm-product-destination trade data. This approach extends the measurement methodology of demand structure indicators within the multi-product firm framework.

The remainder of this paper is structured as follows: Section 2 constructs a general equilibrium theoretical model and presents some theoretical propositions. Section 3 describes the model specification, data sources, and variable measurement. Section 4 reports the baseline regression results. Section 5 describes the mechanism tests. Section 6 discusses domestic demand upgrading and firms' export competition strategies. Finally, Section 7 concludes with policy implications.

## 2. Theoretical Model

We develop a general equilibrium model based on a heterogeneous multi-product firm framework under monopolistic competition. The model incorporates both consumer non-homothetic preferences on the demand side and the product quality ladder hypothesis on the production side to analyze how domestic demand expansion, including both scale expansion and structure upgrading, affects firms' export product portfolios. The theoretical framework assumes a world consisting of $I$ countries

engaged in final goods trade, where *i* denotes the exporting country and *j* represents the importing country. For the detailed derivation, please refer to the Appendix on the Journal's website.

*2.1. Consumer Behavior*

Assume that country *j* consists of $L_j$ consumers, where the representative consumer exhibits non-homothetic preferences:

$$U^c{}_j = \sum_{i=1}^{I} \int_{\omega \in \Omega_{ij}} ln(q^c{}_{ij}(\omega) + q_0) d\omega, \tag{1}$$

where $q_0 > 0$, $\Omega_j = \sum_{i=1}^{I} \Omega_{ij}$, and $q^c{}_{ij}(\omega)$ represent the demand of consumers in country *j* for product $\omega$ from country *i*. Incorporating the consumer's budget constraint, we derive the aggregate demand of country *j*'s consumers for product $\omega$ from country *i* as follows:

$$q_{ij}(\omega) = L_j q^c{}_{ij}(\omega) = L_j q_0 \left(\frac{\hat{p}_j}{p_{ij}(\omega)} - 1\right). \tag{2}$$

Since marginal utility is bounded at any consumption level, when $q^c{}_{ij}(\omega) = 0$, there exists a choke price $p_{ij}(\omega) = \hat{p}_j$. Consumer preferences and budget constraints determine that $\hat{p}_j$ is given by the following equation:

$$\hat{p}_j = \frac{y_j}{q_0 N_j} + \overline{p}_j, \tag{3}$$

where $y_j$ represents the income of consumers in country *j*, $N_j$ denotes the total variety of products demanded by consumers in country *j*, $P_j$ is the aggregate price index of products in country *j*, and $\overline{p}_j = P_j / N_j$ stands for the average price of products in country *j*.

$$N_j = \sum_{i=1}^{I} N_{ij}, \tag{4}$$

$$P_j = \sum_{i=1}^{I} \int_{\omega \in \Omega_{ij}} p_{ij}(\omega) d\omega, \tag{5}$$

where $N_{ij}=\int_{\omega\in\Omega_{ij}} d\omega$. From Equation (3), we observe that as income grows, consumers purchase more emerging products to expand their consumption basket, leading to an increase in the choke price. Combining Equations (2) and (3), we derive the income elasticity of demand:

$$\eta_{ij}(\omega)=\frac{\hat{p}_j-\overline{p}_j}{\hat{p}_j-p_{ij}(\omega)}, \tag{6}$$

where $\eta_{ij}(\omega)>1$ indicates luxury goods and $0<\eta_{ij}(\omega)<1$ represents necessity goods. As income rises, consumer demand shifts from necessities to luxuries, that is, toward products with higher income elasticity of demand. When products with higher income elasticity dominate an industry, this manifests through both the industry's aggregate income elasticity of demand and consumers' choke price increasing. This paper identifies this dynamic process as demand structure upgrading.

### *2.2. Producer Behavior*

Labor serves as the sole production factor supplied infinitely in competitive markets. Each worker in country *j* provides one unit of inelastic labor, with wages $w_j$ equal to income $y_j$. Under the monopolistic competition framework, firms produce multiple products following an ascending quality ladder $\omega$. Thus, each firm possesses core competitiveness in producing basic products at cost *c*, while potentially introducing new product varieties through additional cost investments during production (Mayer *et al*., 2014; Macedoni, 2022). Basic products serve as core offerings that meet consumers' fundamental needs. As consumer income rises, firms invest additional customization costs to develop emerging products that satisfy higher-level personalized demands. Assume firm *c*'s unit labor requirement for producing product $\omega$ takes the following form:

$$v(c,\omega)=c\omega^{\theta}, \tag{7}$$

where $\theta\geq 0$ represents the elasticity of firm marginal cost with respect to product scope. Assuming that the product quality ladder increases with firm marginal cost, $\omega'>\omega$ indicates that product $\omega'$ has higher quality than $\omega$. Specifically, basic products with the lowest marginal cost occupy the bottom quality ladder—i.e., where $\omega=1$. As marginal cost increases, product quality rises accordingly, with emerging products bearing the highest marginal cost reaching the top quality ladder—i.e., where $\omega=\delta_{ij}(c)$. Here, $\delta_{ij}(c)$ denotes the product scope of firm *c* from country *i* exporting to country *j*. Let $\tau_{ij}\geq 1$ represent the iceberg trade cost from country *i* to country *j*.

The variable cost for firm *c* in country *i* to export product $\omega$ to country *j* is given by $f_{ij}(c,\omega) = \tau_{ij} y_i v(c,\omega)$.

Let $\hat{v}_{ij} = sup\{v : \pi_{ij}(v) > 0\}$ denote the threshold cost for firms in country *i* exporting to country *j*. Following the profit maximization principle, we derive the optimal export price, quantity, and profit for products from country *i* to country *j* as follows:

$$q_{ij}(v) = L_j q_0 [(\frac{\hat{v}_{ij}}{v})^{\frac{1}{2}} - 1], \tag{8}$$

$$p_{ij}(v) = \tau_{ij} y_i (\hat{v}_{ij} v)^{\frac{1}{2}}, \tag{9}$$

$$\pi_{ij}(v) = L_j q_0 \tau_{ij} y_i v [(\frac{\hat{v}_{ij}}{v})^{\frac{1}{2}} - 1]^2. \tag{10}$$

Under the given optimal export quantity condition, we take the first-order partial derivative with respect to the firm's export scope $\delta_{ij}(c)$. The analysis reveals that firms expand their range of emerging products until the marginal output of their last product variety reaches zero:

$$q_{ij}(\delta_{ij}(c)) = 0. \tag{11}$$

### *2.3. Scope of Export Products of Firms*

Let $\hat{c}_{ij}$ denote the threshold cost for exporting basic products. When $v(c,\omega) > \hat{c}_{ij}$, firms cannot export basic products; when $v(c,\omega) > \hat{v}_{ij}$, firms cannot export at all, thus establishing the export threshold cost as $\hat{v}_{ij} = \hat{c}_{ij}$. Only when $v(c,\omega) \le \hat{c}_{ij} \Leftrightarrow c \le \hat{c}_{ij}\omega^{-\theta}$ does exporting the $\omega$-th emerging product yield positive profits. Therefore, the export product scope for firm *c* satisfies the following equation:

$$\delta_{ij}(c) = \begin{cases} 0 & , c > \hat{c}_{ij} \\ max\{\omega \,|\, c \le \hat{c}_{ij}\omega^{-\theta}\} & , c \le \hat{c}_{ij} \end{cases}. \tag{12}$$

### *2.4. Market Equilibrium*

Assuming potential entrants pay a fixed entry cost $f_e$ (measured in labor units) to access the market and draw their competitiveness from distribution $G(c) = (c / c_{\mathrm{m}})^k$

with $k \geq 1$. Given the mass of potential entrants $M_i$ in country *i*, the number of firms exporting from *i* to *j* is determined by the following equation:

$$M_{ij} = M_i G(\hat{c}_{ij}). \tag{13}$$

Let $\delta_{ij}$ represent the average product scope of firms exporting from country *i* to country *j*. The total product varieties $N_{ij}$ exported from country *i* to country *j* are then given by the following equation:

$$N_{ij} = \delta_{ij} M_i G(\hat{c}_{ij}). \tag{14}$$

According to Equation (5), the overall product price index of country *j* can be expressed as follows:

$$P_j = \sum_{i=1}^{I} M_i \int_0^{\delta_{ij}} \int_0^{\hat{c}_{ij}\omega^{-\theta}} p_{ij}(v(c,\omega)) dG(c) d\omega. \tag{15}$$

Considering the free entry condition for firms, where the expected profit $\pi_i$ of country *i*'s firms in destination country *j* equals the market entry cost $y_i f_e$, this relationship can be formally expressed as follow:

$$\pi_i = \sum_{j=1}^{I} \int_0^{\delta_{ij}} \int_0^{\hat{c}_{ij}\omega^{-\theta}} \pi_{ij}(v(c,\omega)) dG(c) d\omega = y_i f_e. \tag{16}$$

Let $R_{ij}$ represent the total expenditure of consumers in country *j* on products from country *i*:

$$R_{ij} = M_i \int_0^{\delta_{ij}} \int_0^{\hat{c}_{ij}\omega^{-\theta}} p_{ij}(c,\omega) q_{ij}(c,\omega) dG(c) d\omega. \tag{17}$$

Accordingly, we obtain the share of country *i*'s exports to country *j* in its total exports:

$$s_{ij} = \frac{R_{ij}}{\sum_{j=1}^{I} R_{ij}}. \tag{18}$$

Finally, assuming consumers in country *i* allocate all income to purchasing final

goods (both domestic and foreign), and incorporating the trade balance condition ($\sum_{j=1}^{I} R_{ij} = \sum_{j=1}^{I} R_{ji}$), the market clearing condition can be expressed as follows:

$$L_i y_i = \sum_{j=1}^{I} R_{ij}. \tag{19}$$

*2.5. Model Prediction: Multinational Symmetric Scenario*

To simplify the analysis, we assume a world consisting of *n* symmetric countries, each endowed with labor force *L*, where worker wages equal consumer income *y*, and trade costs are denoted as $\tau$, with subscript *x* indicating exports.

2.5.1. Domestic Demand Upgrading and Firms' Production Threshold Costs

Let the inverse of the average firm-level income elasticity of demand be denoted as $\mathrm{H} = \int_0^{\delta_x} \int_0^{\hat{c}_x \omega^{-\theta}} \frac{1}{\eta(c,\omega)} dG(c) d\omega$, where a decrease in $\mathrm{H}$ represents demand structure upgrading. Defining the domestic threshold cost for basic products as $\hat{c} = \tau \hat{c}_x$ and combining Equations (3), (8), (9), (16), and (18) with the income elasticity of demand yields the following reformulated expression:

$$\hat{c} = \frac{(1+k)(1+2k) f_e}{q_0} \frac{1}{L} \frac{1}{\mathrm{H}}. \tag{20}$$

The critical cost of basic products is determined by three factors: (1) exogenous parameters *k*, $f_e$, and $q_0$; (2) an increase in *L*, i.e., the expansion of the domestic demand scale, leads to a decline in $\hat{c}$; and (3) a decrease in H, i.e., the upgrading of the domestic demand structure, results in an increase in $\hat{c}$. This paper proposes the following:

Definition 1: Domestic demand upgrading encompasses both scale expansion and structural upgrading. Scale expansion implies an increase in the total demand for any given product by consumers, while structural upgrading indicates a shift in consumer demand from basic products to emerging products.

2.5.2. Upgrading of Domestic Demand and Adjusting Firms' Export Portfolios

Following Arkolakis *et al*. (2021), in the multi-product firm framework, the

adjustment of export portfolios stems from changes in export scope and sales volume of specific exported products. According to Equation (12), a firm's export scope can be re-expressed as follow:

$$\delta_x(c)=\begin{cases}0, & c>\hat{c}/\tau\\ max\{\omega\,|\,c\le\omega^{-\theta}\hat{c}/\tau\}, & c\le\hat{c}/\tau\end{cases}. \tag{21}$$

It follows that the expansion (upgrading) of the domestic demand scale (structure) prompts firms to reduce (expand) their export scope. To more clearly illustrate how domestic demand upgrading affects firms' export portfolio adjustments, let the relative export ratio between different products be denoted as $\tilde{q}_x=q_x(c,\omega')/q_x(c,\omega)$. Here, product $\omega'$ has a higher marginal cost and quality ladder than product $\omega$, where $\omega$ is basic product and $\omega'$ is an emerging product. Combining Equation (8), we take the first-order partial derivative of $\tilde{q}_x$:

$$\frac{\partial\tilde{q}_x}{\partial\hat{c}}=\frac{(\frac{1}{\omega})^{\frac{\theta}{2}}-(\frac{1}{\omega'})^{\frac{\theta}{2}}}{2\hat{c}^{\frac{1}{2}}c^{\frac{1}{2}}(\hat{c}^{\frac{1}{2}}c^{-\frac{1}{2}}\omega^{-\frac{\theta}{2}}-1)^2}>0\cdot \tag{22}$$

According to Equations (20) and (22), in response to the expansion of the domestic demand scale, firms concentrate on production and export basic products. For higher-quality emerging products, which are difficult to reduce in cost in the short term, firms cut back on such products, thereby narrowing their export scope. Meanwhile, the upgrading of the domestic demand structure raises consumers' choke prices, leading them to purchase more emerging products. To meet consumers' higher-level demands, firms focus on producing and exporting more emerging products, thereby securing higher profits and expanding their export scope. This paper proposes the following:

Proposition 1: Domestic demand upgrading induces firms to adjust their export product portfolios. For demand scale expansion, firms concentrate on production and export basic products while reducing the variety of emerging products, which narrows their export scope. For demand structure upgrading, firms introduce a greater variety of emerging products, which expands their export scope.

### 2.5.3. Market Competition Mechanism

Following Mayer *et al*. (2021), intensified market competition indicates an increase in the number of firms in the export market or a decline in firms' pricing power, while the opposite signifies weakened competition. Incorporating the free entry condition,

we derive the equilibrium number of exporting firms as follows:

$$M_x = \frac{1+2k}{q_0} n^{\frac{2}{\theta k}} (1-\theta k)^{\frac{1}{\theta k}} c_m^{\ k} \frac{1}{\hat{c}}. \tag{23}$$

According to Equations (20) and (23), the expansion of domestic demand scale intensifies market competition, inducing a large number of firms to enter the market and leading to an increase in the equilibrium number of exporting firms. To cope with heightened market competition, exporting firms reduce their product scope. Conversely, domestic demand structure upgrading alleviates market competition, forcing less competitive firms to exit the market and enabling surviving firms to expand their export product scope.

Based on Equation (3), the price elasticity of demand for a firm's export products is as follows:

$$\varepsilon_x(c,\omega) = \frac{\hat{c}}{\hat{c} - v_x(c,\omega)}. \tag{24}$$

Given the unit labor demand for a firm's export products, the expansion of domestic demand scale (structural upgrading) increases (decreases) the demand price elasticity for any of the firm's export products, thereby reducing (raising) the cost markup of its exports and weakening (strengthening) the firm's export pricing power. Based on this, the study proposes the following:

Proposition 2: Domestic demand upgrading influences market competition, leading firms to adjust their export product portfolios. The expansion of demand scale attracts a surge of new firms into the export market, intensifying competition and prompting firms to reduce their export scope and prices. By contrast, demand structure upgrading drives some firms to exit the market, reducing the number of exporting firms while enhancing the export scope and pricing power of the remaining firms.

### 2.5.4. Export Quality Mechanism

Since export quality cannot be directly measured, this study adopts firms' unit export cost and export value (Aw *et al*., 2019) to test the impact of domestic demand upgrading on export quality. Let the unit export cost be denoted as $\overline{C}_x = C_x / Q$ and the unit price as $\overline{P}_x = E_x / Q_x$, where $Q_x$ represents the average export scale of firms, $C_x$ denotes the average export cost, and $E_x$ signifies the average export revenue. Based on Equations (9) and (10), the following equations can be derived:

$$\bar{C}_x = \frac{k(2k-1)}{(1+k)(1+2k)} y\hat{c}, \tag{25}$$

$$\bar{P}_x = \frac{2k-1}{1+2k} y\hat{c}. \tag{26}$$

Combining Equations (20), (25), and (26), it can be concluded that the domestic demand scale reduces firms' average export costs and prices. From this perspective, scale expansion lowers export quality, leading firms to focus on exporting low-quality basic products. By contrast, domestic demand structure upgrading enhances firms' export quality, incentivizing them to export more high-quality emerging product varieties. This study proposes the following:

Proposition 3: Domestic demand upgrading influences firms' export product portfolios by affecting export quality. The expansion of the domestic demand scale inhibits firms' export quality upgrading, leading them to concentrate on exporting lower-cost basic products to gain price competitiveness in exports. Conversely, demand structure upgrading incentivizes firms to improve export quality, prompting them to introduce more high-quality emerging products to achieve quality advantages in exports.

## 3. Research Design

### *3.1. Model Setting*

Proposition 1 states that domestic demand structure upgrading (scale expansion) leads to expansion (contraction) in firms' export scope. Therefore, based on the theoretical model in Equation (21), and drawing upon the log-linear gravity model for a single exporting country from Kim *et al*. (2017) and Ma and Fang (2021), we construct the following regression model:

$$\ln scope_{idt} = \alpha_0 + \alpha_1 \ln struc_{ikt} + \alpha_2 X_{it} + \alpha_3 X_{dt} + \nu_k + \nu_t + \varepsilon_{idt}, \tag{27}$$

$$\ln scope_{idt} = \beta_0 + \beta_1 \ln scale_{idt} + \beta_2 X_{it} + \beta_3 X_{dt} + \nu_k + \nu_t + \varepsilon_{idt}. \tag{28}$$

In the model, the subscript $i$ denotes firms, $k$ represents HS 6-digit products, $d$ indicates destination markets, and $t$ signifies the year. The dependent variable in the model shown above is the natural logarithm of the quantity of product $k$ exported by Chinese firm $i$ to destination country $d$, i.e., the log of firms' export scope ($\ln scope_{idt}$). Whereas $\ln struc_{ikt}$ represents the demand income elasticity at the firm-product-year

level, reflecting the demand structure, $\ln scale_{idt}$ denotes the demand scale indicator at the firm-destination-year level. $X_{it}$ and $X_{dt}$ are control variables at the firm-year and destination-year levels, respectively; $v_k$ and $v_i$ represent product fixed effects and year fixed effects, and $\varepsilon_{idt}$ is the error term.

Following the theoretical model in Equation (22), we categorize products within firms into basic products $k_1$ and emerging products $k_2$ based on export quality and calculate the product portfolio skewness $\ln skew_{ik_1k_2dt}$ for each firm's export destination. Using $\ln skew_{ik_1k_2dt}$ as the explained variable, with $\ln struc_{ikt}$ and $\ln scale_{idt}$ as core explanatory variables, we construct the regression model by incorporating control variables and fixed effects:

$$\ln skew_{ik_1k_2dt} = \gamma_0 + \gamma_1 \ln struc_{ikt} + \gamma_2 X_{it} + \gamma_3 X_{dt} + v_k + v_t + \varepsilon_{ikdt}, \tag{29}$$

$$\ln skew_{ik_1k_2dt} = \mu_0 + \mu_1 \ln scale_{idt} + \mu_2 X_{it} + \mu_3 X_{dt} + v_k + v_t + \varepsilon_{ikdt}. \tag{30}$$

### *3.2. Indicator Description*

#### 3.2.1. Demand Structure

This study measures demand structure by estimating firm-product level demand income elasticities (Caron *et al*., 2014). Based on the trade value equation at the firm-product-destination level and following the methodology in Equation (13) of Li *et al*. (2020), we first compute annual cross-product demand income elasticities. These elasticities are then decomposed into firm-product level demand income elasticities.

#### 3.2.2. Demand Scale

To mitigate the potential influence of dynamic adjustments of firms' export market shares on demand scale expansion (Qiu and Yu, 2014; Mayer *et al*., 2021), this study constructs a relatively exogenous firm-destination-year level demand scale indicator. Here, $sales_{ikd0}$ represents the initial export value of product $k$ exported by Chinese firms to destination $d$ during the sample period, while $pop_t$ denotes China's population size in year $t$:

$$scale_{idt} = \sum_k \frac{sales_{ikd0}}{\sum_k sales_{ikd0}} \times pop_t. \tag{31}$$

3.2.3. Firm Export Product Portfolio Skewness

For each firm's exports to various destination countries, product varieties are sorted in ascending order based on export product quality. Here, $value_{ik_1dt}$ denotes the sales value of product $k_1$ (emerging products) exported by firm $i$ to destination $d$ in year $t$, where $k_1$ represents the firm's highest-quality export product. Similarly, $value_{ik_2dt}$ indicates the sales value of product $k_2$ (basic products) exported by firm $i$ to destination $d$ in year $t$, where $k_2$ represents the firm's second-highest-quality export product:

$$skew_{ik_1k_2dt} = \frac{value_{ik_1dt}}{value_{ik_2dt}}. \tag{32}$$

3.2.4. Export Product Quality

This study adopts the methodology of Khandelwal *et al*. (2013), utilizing HS 3-digit substitution elasticity coefficients from Broda *et al*. (2017) to estimate firm-product-destination level export product quality through a residual approach based on a fixed effects model.

3.2.5. Control Variables

At the firm level, the control variables include firm size (ln*size*), taking the natural logarithm of total assets each year; firm age (ln*age*), taking the natural logarithm of that the current year minus the year of establishment plus 1; financing scale (ln*fin*), taking the natural logarithm of the ratio of total liabilities to total assets; profitability (ln*pro*), taking the natural logarithm of the ratio of operating profit to operating revenue; and the ratio of fixed assets to total (*cap*), taking the natural logarithm of the ratio of fixed assets to total assets. Drawing on classic empirical studies of the gravity model, this study selects the following destination-level control variables: the natural logarithm of geographical distance (ln*dist*), the natural logarithm of per capita GDP (ln*gdp*), total factor productivity (*tfp*), whether the destination belongs to the same regional trade agreement (*rta*), whether it shares a common language (*comlang*), and whether it shares a border (*contig*).

*3.3. Data Sources*

This study examines data on Chinese export firms between 2000 and 2014 that were primarily sourced from the China Industrial Firm Database, the China Customs Database, World Bank's WITS, Penn World Table 10.0, and CEPII's GeoDist Database. The customs

data were cleaned as follows: Loss-making samples were removed; product codes were uniformly converted to the HS1996 classification; customs data were aggregated to the firm-product (HS6-digit code)-destination level; export prices for each product were derived by dividing export value by export quantity; and following the method of Tian and Yu (2014), customs export data were matched with industrial firm data. To calculate the income elasticity of demand, customs import data were matched with customs export data using "firm name + product + year" as the key. The final dataset covers exports from 56,357 firms to 217 countries (regions) between 2000 and 2014, encompassing 3,831 product categories, with a total sample size of 2,129,377 observations.

## 4. Empirical Test Results

Table 1 shows the impact of domestic demand upgrading on firms' export product portfolios. Columns (1) and (2) present regression results for firms' export scope, while columns (3) and (4) report results for the skewness of firms' export product portfolios. Consistent with Proposition 1, the results show that demand structure upgrading (demand scale expansion) promotes diversified (specialized) exports, significantly increasing the proportion of emerging (core) products in firms' export output. Under the single-product firm framework, a country with sufficiently large domestic market demand for a specific product can leverage economies of scale to foster a specialized division of labor and export competitiveness, making the country a net exporter of that product (Krugman, 1980). This paper extends the single-product firm framework to multi-product firms and incorporates the product quality ladder. The findings reveal that demand structure upgrading in a country implies higher reservation prices for the same product among consumers, leading them to incorporate more emerging products into their consumption baskets. The improvement in demand quality incentivizes firms to establish and develop new trade linkages, thereby expanding exports along an extensive margin. Conversely, demand scale expansion signifies an increase in market capacity, prompting firms to consolidate existing trade relationships while reducing some emerging products, resulting in contraction of their export scope. We also conducted six sets of robustness tests, and all results are consistent with the benchmark regression results. Please refer to the Appendix online for the details.

Table 1. Benchmark Regression Results

| Variable | ln*scope* | | ln*skew* | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Panel A: Demand structure test | | | | |
| ln*struc* | 0.5252*** | 0.3315*** | 0.3977*** | 0.3398*** |
| | (0.0081) | (0.0069) | (0.0471) | (0.0491) |

| Variable | ln*scope* | | ln*skew* | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Sample size | 1758021 | 1640526 | 1171852 | 1102108 |
| Adj $R^2$ | 0.3429 | 0.4966 | 0.0335 | 0.0329 |
| Panel B: Demand scale test | | | | |
| ln*scale* | –0.0609*** | –0.0328*** | –0.0400*** | –0.0362*** |
| | (0.0004) | (0.0004) | (0.0024) | (0.0025) |
| Sample size | 1762987 | 1645067 | 1174603 | 1104642 |
| Adj $R^2$ | 0.3498 | 0.4995 | 0.0338 | 0.0332 |
| Destination control variables | No | Yes | No | Yes |
| Firm control variables | Yes | Yes | Yes | Yes |
| Fixed effects | Yes | Yes | Yes | Yes |

Note: The values in parentheses represent robust standard errors. Fixed effects indicate product fixed effects and year fixed effects. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The same applies to subsequent tables.

## 5. Mechanism Analysis

The upgrading of demand structure and the expansion of demand scale mainly promote the adjustment of firms' export product portfolios through market competition and the quality mechanism of export products. Therefore, this study tests whether the upgrading of domestic demand significantly affects market competition and the quality of export products.

### *5.1. Competition Mechanism*

Proposition 2 states that domestic demand upgrading alters market competition intensity by influencing the number of exporting firms and their pricing power. First, using the logarithm of the number of Chinese firms $i$ entering export market $d$ in year $t$ (ln*firm*) as the explained variable, the expansion of demand scale (or upgrading of demand structure) drives some firms to enter (exit) the export market, leading to an increase (decrease) in the number of exporting firms and intensifying (alleviating) market competition. Second, using the logarithm of the price (ln*price*) of product $k$ exported by firm $i$ to destination country $d$ in year $t$ as the explained variable, with reference to the research of Liu *et al*. (2023), it is argued that firms' export pricing is influenced by intra-firm product ranking variables. Specifically, the quality ladder

of a firm's export products is treated as the ranking variable. All products exported by a firm to a given destination are ranked in terms of export quality to derive the product quality ladder variable ln*ladder*, where a higher ln*ladder* indicates a higher position on the firm's product quality ladder. The regression model is constructed using demand variables, the product quality ladder, and their interaction terms as explanatory variables while controlling for country, product, and year fixed effects.

Table 2 presents the competitive effects of domestic demand upgrading. Columns (1) and (2) present the regression results of domestic demand upgrading on the number of exporting firms, while columns (3) and (4) incorporate the interaction term of domestic demand and product quality ladder to assess the impact of domestic demand upgrading on the export pricing of multi-product firms. The results show that domestic demand structure upgrading (demand scale expansion) mitigates (intensifies) market competition, reduces (increases) the number of exporting firms, and raises (lowers) export product prices. Moreover, the price-increasing (price-reducing) effect is more pronounced for products positioned higher (lower) on the quality ladder. This is primarily because demand structure upgrading drives some low-quality firms to exit the market while high-quality firms expand their market share, thereby raising the overall price level of products. By contrast, demand scale expansion induces a large number of new firms to enter the export market, making consumers increasingly "sensitive" to price changes, which leads to a decline in export prices, particularly for basic products with higher substitutability.

Table 2. Competition Mechanism

| Variable | ln*firm* | | ln*price* | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Panel A: Demand structure test | | | | |
| ln*struc* | –0.5342*** | –0.5707*** | 0.6628*** | 0.6555*** |
| | (0.0108) | (0.0112) | (0.0169) | (0.0175) |
| ln*struc*×ln*ladder* | | | 0.4554*** | 0.4553*** |
| | | | (0.0015) | (0.0015) |
| Sample size | 1758021 | 1640526 | 1758021 | 1640526 |
| Adj $R^2$ | 0.3665 | 0.3626 | 0.5989 | 0.5935 |
| Panel B: Demand scale test | | | | |
| ln*scale* | 0.0052*** | 0.0041*** | –0.0217*** | –0.0211*** |
| | (0.0006) | (0.0007) | (0.0010) | (0.0010) |
| ln*scale*×ln*ladder* | | | 0.0242*** | 0.0242*** |
| | | | (0.0001) | (0.0001) |

| Variable | ln*firm* | | ln*price* | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Sample size | 1762987 | 1645067 | 1762987 | 1645067 |
| Adj $R^2$ | 0.3683 | 0.3643 | 0.6012 | 0.5958 |
| Destination control variables | No | Yes | No | Yes |
| Firm control variables | Yes | Yes | Yes | Yes |
| Fixed effects | Yes | Yes | Yes | Yes |

### *5.2. Export Quality Mechanism*

To test Proposition 3, following Fan *et al*. (2022)'s approach, this study sets the explained variable as export product quality (ln*quality*) and incorporates the interaction term of product quality ladder and demand variables in the regression. Table 3 reports the regression results of domestic demand upgrading on export quality, with fixed effects consistent with the competition mechanism. The results show that the coefficients for demand structure upgrading are significantly positive and that the interaction term coefficients are also significantly positive, indicating that the quality-upgrading effect induced by demand structure upgrading is influenced by the product quality ladder. The closer a product is to emerging products, the more pronounced its quality-upgrading effect becomes. Correspondingly, after including all control variables and fixed effects, the regression coefficient for demand scale expansion is significantly negative, whereas the interaction term coefficient is significantly positive. This indicates that the quality-dampening effect induced by demand scale expansion is also influenced by the product quality ladder; the closer a product is to basic products, the more pronounced its quality-dampening effect becomes. Therefore, after accounting for the intra-firm product quality ladder, demand structure upgrading (demand scale expansion) demonstrates a significant promoting (inhibiting) effect on firms' export product quality, with this impact being more pronounced for emerging products (basic products).

Table 3. Export Quality Mechanism

| Variable | ln*quality* | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Panel A: Demand structure test | | | | |
| ln*struc* | 12.8873*** | 9.7643*** | 8.0885*** | 8.3778*** |
| | (0.2330) | (0.2303) | (0.2538) | (0.2651) |

| Variable | ln*quality* | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| ln*struc*×ln*ladder* | | 3.0266*** | 3.3131*** | 3.3242*** |
| | | (0.0179) | (0.0215) | (0.0222) |
| Sample size | 2098481 | 2098481 | 1757968 | 1640507 |
| Adj $R^2$ | 0.0001 | 0.0200 | 0.0269 | 0.0274 |
| Panel B: Demand scale test | | | | |
| ln*scale* | 0.0660*** | 0.0086 | –0.0829*** | –0.0698*** |
| | (0.0131) | (0.0130) | (0.0145) | (0.0148) |
| ln*scale*×ln*ladder* | | 0.1548*** | 0.1715*** | 0.1722*** |
| | | (0.0009) | (0.0011) | (0.0011) |
| Sample size | 2104651 | 2104651 | 1762933 | 1645047 |
| Adj $R^2$ | –0.0018 | 0.0183 | 0.0256 | 0.0259 |
| Destination control variables | No | No | No | Yes |
| Firm control variables | No | No | Yes | Yes |
| Fixed effects | Yes | Yes | Yes | Yes |

## 6. Expansion Analysis: Domestic Demand Upgrading and Firm Export Competition Strategy

Different types of domestic demand upgrading lead firms to adopt distinct export strategies. Following Eckel *et al*. (2015), this study categorizes firms' export competition strategies into quality competition strategies and cost competition strategies. When a firm's export quality ladder shows a positive correlation with export sales value, it is identified as implementing a quality competition strategy; conversely, when a firm's export quality ladder shows a negative correlation with export sales value, it is classified as adopting a cost competition strategy. To test the impact of domestic demand upgrading on firms' export competition strategies, this study employs firms' export competition strategy ($stra_i$) as the explained variable, with $\ln struc_{ikt}$ and $\ln scale_{idt}$ serving as core explanatory variables. Control variables and industry fixed effects are incorporated to construct a binary logit regression model:

$$\mathrm{P}(stra_i = 1) = \Lambda(\beta_0 + \beta_1 \ln struc_{ikt} + \beta_2 X_{it} + \beta_3 X_{dt} + v_j + \varepsilon_i), \tag{33}$$

$$\mathrm{P}(stra_i = 1) = \Lambda(\gamma_0 + \gamma_1 \ln scale_{idt} + \gamma_2 X_{it} + \gamma_3 X_{dt} + v_j + \varepsilon_i), \tag{34}$$

where $\Lambda(\bullet)$ represents the cumulative distribution function of the logistic distribution, $stra_i$ denotes the export competition strategy adopted by firm $i$ ($stra_i = 1$ indicates a quality competition strategy, whereas $stra_i = 0$ represents a cost competition strategy), and $v_j$ denotes industry fixed effects. Table 4 presents the regression results for the impact of domestic demand upgrading on firms' export competition strategies, with all reported coefficients being marginal effects. The results show that the estimated coefficients of demand structure upgrading on firms' export competition strategies are all positive, indicating that a country's demand structure upgrading motivates multi-product exporters to adopt quality competition strategies. The estimated coefficients of demand scale expansion are all negative, indicating that the expansion of demand scale suppresses export firms from adopting quality competition strategies; in other words, the expansion of demand scale encourages export firms to adopt cost competition strategies. Thus, to respond to demand structure upgrading, firms expand their export market share through quality competition strategies, charging higher product prices and exporting more differentiated, higher-quality products. To address the competitive effects brought about by demand scale expansion, exporting firms adopt cost competition strategies to charge lower prices and export more homogeneous, lower-cost products. These empirical findings further validate the theoretical propositions of this study.

Table 4. Firms' Export Strategies

| Variable | *stra* | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Panel A: Demand structure test | | | | |
| ln*struc* | 0.0247*** | 0.0211*** | 0.0048** | 0.0035* |
| | (0.0017) | (0.0017) | (0.0019) | (0.0020) |
| Sample size | 2098682 | 2098663 | 1758153 | 1640660 |
| Panel B: Demand scale test | | | | |
| ln*scale* | –0.0809*** | –0.0798*** | –0.0689*** | –0.0686*** |
| | (0.0004) | (0.0004) | (0.0005) | (0.0005) |
| Sample size | 2104901 | 2104884 | 1763152 | 1645236 |
| Destination control variables | No | No | No | Yes |
| Firm control variables | No | No | Yes | Yes |
| Fixed effects | No | Yes | Yes | Yes |

## 7. Conclusion and Policy Implications

This study builds upon China's domestic market demand advantages by examining how both the scale and structural dimensions of domestic demand serve as endogenous drivers of Chinese firms' export growth. Theoretically, it introduces non-homothetic preferences on the demand side and incorporates the product quality ladder hypothesis on the supply side to construct a general equilibrium model where domestic demand expansion and upgrading drive firm exports. Empirically, the research utilizes China's Industrial Firm Database, Customs Database, and product tariff data to test and extend relevant theoretical propositions. The study finds that (1) domestic demand structure upgrading alleviates market competition and improves export quality, incentivizing firms to adopt quality competition strategies and expand export scope; (2) demand scale expansion intensifies market competition, driving firms to utilize price competition strategies focused on producing and exporting basic products while reducing the production and exports of emerging products; and (3) the price-increasing and quality-upgrading effects induced by demand structure upgrading are more pronounced for emerging products, whereas the price-reducing and quality-dampening effects caused by demand scale expansion are more evident for basic products. Based on these findings, this study has several policy implications, which are discussed below.

### *7.1. Leverage the Dual Advantages of Domestic Demand's Scale and Structure to Achieve Stable Export Growth and Quality Improvement*

From the perspective of scale advantage, domestic demand expansion enhances productivity, optimizes resource allocation, and reduces export prices. China's massive market provides an ideal testing ground for new technologies, business models, and operational approaches, enabling firms to rapidly industrialize and scale innovations through economies of scale, creating fundamental conditions for high-quality economic development. From a structural advantage perspective, domestic demand upgrading expands product variety, optimizes export structure, and fosters high-level innovation. Demand structure upgrading generates personalized, differentiated, and quality-driven consumption needs, compelling firms to enhance independent innovation capabilities and drive innovation in production structures and organizational models, thereby achieving high-quality development through innovation-driven strategies.

### *7.2. Formulate Differentiated Export Competition Strategies to Leverage the Mediating Role of Multi-Product Firms in Export Growth*

On the one hand, multi-product firms can utilize scale advantages to consolidate

existing trade relationships and maintain stable export expansion. On the other hand, by increasing investment intensity, these firms can continuously develop new products, business models, and operational approaches, thereby establishing novel trade connections. Consequently, when facing external market shocks, multi-product firms can adopt differentiated competition strategies to minimize the negative impact of external economic uncertainty on exports. Specifically, in response to demand structure upgrading, firms should align with consumption upgrading trends by expanding their product scope and raising prices through quality competition strategies. For demand scale expansion, firms should rapidly scale up production to increase export volume while appropriately narrowing product range and reducing prices via cost competition approaches.

### *7.3. Optimize Regional Industrial Opening Patterns to Promote Comprehensive and Differentiated Opening Up*

Due to the different natures of various industries, product heterogeneity has a significant impact on firms' exports. For instance, demand structure upgrading produces more pronounced export scope expansion and quality improvement effects in heterogeneous industries, whereas demand scale expansion generates stronger export volume growth and price reduction effects in homogeneous industries. To advance high-standard opening up, regions and industries must leverage their comparative advantages to deepen modern industrial system development and regional coordinated development, thereby optimizing regional industrial opening layouts.

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