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DETERMINANTS OF CHINA'S GREEN TEA EXPORTS TO EU: AN EMPIRICAL ANALYSIS

Master Thesis

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I have written this Master Thesis independently. Any ideas or data taken from other authors or other sources have been fully referenced.

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Introduction

This study starts from the closed-loop perspective of the upstream supply chain (such as tea farmers and enterprises) to the end market consumers (such as EU buyers), and uses trade data, structural variables and survey data to construct an analysis model of export determinants that combines theory with practice. The academic significance of this study lies in combining the traditional research on agricultural product exports with digital economy indicators and innovatively taking consumers' online search trends (such as Google trends) as explanatory variables to explore the connection between information accessibility and export performance. The data sources can be found in Section 3.3 of Chapter 3.

The primary objective of this study is to analyze the key factors influencing China's green tea exports to the European Union (EU) between 2001 and 2023. By integrating trend analysis, consumer perception surveys, and an extended gravity model, this research aims to offer a comprehensive and data-driven understanding of the dynamics behind China's green tea export performance. Specifically, the study pursues the following goals:

- To identify the main economic and consumer-related variables that have shaped the export trends of Chinese green tea to the EU over the past two decades.
- To evaluate the impact of digital economy indicators, such as online search interest, on the demand and visibility of China's green tea in EU markets.
- To investigate consumer awareness and attitudes in the EU, based on original survey data, focusing on barriers such as labeling, EU pesticide residue standard certification, and brand recognition.
- To construct and empirically test an extended gravity model, incorporating both traditional trade determinants and newly relevant factors.
- To provide actionable, evidence-based policy recommendations aimed at improving the competitiveness, compliance, and market penetration of Chinese green tea in the EU.

From a practical standpoint, this research provides valuable insights for optimizing China's green tea export structure and improving its global brand image. It

also highlights the role of digital marketing in promoting healthy agricultural products globally, offering practical guidance for tea farmers, industry practitioners, and policymakers. The structure of this paper is organized as follows.

- Chapter 1 introduces the research background and objective, overall framework.
- Chapter 2 reviews previous relevant literature on green tea's value, global tea trade trends, and China-EU trade relations.
- Chapter 3 introduces the research methods, the theory framework, and data sources.
- Chapter 4 evaluates the key factors influencing China's green tea exports to the EU through three analytical approaches: trend analysis, questionnaire survey, and empirical model.
- Chapter 5 summarizes the key findings, proposes policy recommendations for China's green tea exports to EU. Finally discusses the study's strengths and limitations

Keywords: Green tea, China-EU green tea trade, export determinants, digital economy.
Research Classification Codes: H186.

Chapter 1. Research Background

Tea is the most popular beverage worldwide after water. Tea has become a commodity in the trade between China and the West since the early 17th century. Around the 1720s, tea surpassed silk to become the most important commodity in China-West trade and quickly became a daily necessity for people in the West. At one point, tea was once the West and China's largest export item. Between 1868 and 1894, just 27 years, China's tea exports amounted to over 900 million taels of silver[1] (Lin, 2019). Although Chinese tea experienced a revival in the 1990s, the fate of Chinese tea has changed because of competition. When it comes to competing with foreign beverage companies like Lipton, the Chinese tea industry is at a disadvantage (Sigley, 2015). In the 1990s, China adjusted the tea product structure by increasing output of green tea and oolong tea while reducing black tea production (CCTV, 2005). Since 2000, China's tea exports have been steadily rising. This growth increased after China joined the WTO, boosting confidence among tea farmers and the broader tea industry.

The outbreak of the COVID-19 pandemic in 2020 triggered global attention to health and wellness topics, online interaction has also become more frequent. People are enthusiastic about online shopping and communicating about the performance of products. Tea, as a healthy drink people enjoy daily, became even more popular. Consumers around the world began to appreciate the value of green tea. The sales volume in China's domestic tea market has soared, which has enabled tea farmers and tea-related industries to see new opportunities. And they intended to take this opportunity to boost tea exports. However, contrary to expectations, both the export volume and the total export value of Chinese tea have been declining year by year since the outbreak of COVID-19.

According to the Tea Import and Export Trade Analysis Report of China published by the Tea Industry Committee of the China Association for the Promotion of International Agricultural Cooperation (CAPIAC), China's tea exports to the

[1] During the mid-to-late Ming Dynasty, silver became China's dominant currency through international trade and the *Single Whip Reform* (1581), establishing a bimetallic system alongside copper coin.

European Union (EU) in 2023 amounted to 43,700 tons, reflecting a year-on-year decline of 14.51%. The export value stood at 174 million USD, marking a decrease of 6.60%, with the average price per kilogram at 3.99 USD, down by 9.26%. Among these exports, green tea made up the largest share at 30,700 tons, accounting for 70.26% of the total. Although the European Union is not China's largest tea trading partner, it remains one of the world's most significant tea import markets, characterized by a large population base, high consumption level, and strong receptiveness to healthy food products. The author, residing in the EU, has observed the growing presence of tea brands from Kenya, Sri Lanka, Japan and other countries in offline retail channels.

The author has worked at a Chinese tea company and collaborated with tea farmers, local workshops, businesses, and government agencies. The author has learned from this experience that the tea industry faces many challenges. First, there is a serious labor shortage among tea farmers. The green tea harvest period usually falls within one or two weeks around the Qingming Festival[2], but the lack of tea pickers often means high-quality leaves miss their optimal harvesting window. Second, low purchase price and the physically demanding nature of the work discourage younger generations from entering tea farming. While machine harvesting improves efficiency, it damages the tea leaves, making them unsuitable for the premium market. Thirdly, due to the differences in educational levels and entertainment methods, few tea farmers can directly communicate with consumers through social media and online sales. It is also very difficult for small and medium-sized tea enterprises to enter overseas markets. Fourth, most tea farmers choose to sell their raw tea leaves at low price to big companies or government-backed buyers. Fourth, exports are heavily impacted by frequent adjustments to pesticide residue standards. Since the tea-growing season often doesn’t align with the timing of these regulatory updates, a lot of tea suddenly fails to meet the new standards, leading many farmers and businesses to abandon export channels

[2] *Qingming Festival* (around April 4–6 each year) marks an important seasonal transition in China. Many farmers plan agricultural activities around this period, following the traditional Chinese lunisolar calendar**,** which aligns planting and harvesting with seasonal changes.

altogether. While global demand for green tea is rising, China's tea export continue to decline.

In the first half of 2020, there were 15 EU notifications about substandard tea, 6 of those were from China. The remaining cases came from Japan, Turkey, Georgia and other countries. Pesticide residue in Asian teas continues to be a major issue affecting exports. The countries that issued the alerts included Germany, France, Portugal, Poland, Belgium, Estonia, Hungary, and Denmark (Zhejiang CCPIT, 2020).

Chapter 2. Literature Review

Research on global tea demand and its health benefits has revealed a few key insights. Shehata et al. (2004) analyzed the factors influencing the development of the tea industry using a questionnaire survey and discovered that global demand for tea would continue to rise, due to the beneficial properties of tea itself. Based on their findings, they recommended that tea producers focus on improving product quality and marketing strategies, offering practical ways to promote tea more effectively. When searching by the keyword “green tea,” nearly all results pertain to its health benefits. Chacko et al. (2010) studied the health advantages of green tea against various diseases, including different types of cancer, heart diseases, and liver disorders. Many of these beneficial effects are linked to its catechins in green tea. Regular consumption of tea catechins helps prevent obesity and type II diabetes caused by high-fat diets, while also reducing the risk of coronary heart disease. Green tea is popular all over the world because of its antioxidant properties and health benefits, which include cholesterol reduction and metabolism boosting. Green tea and its extracts, such as tea polyphenols, are often used in functional foods and beverages. Green tea demand has surged in European and North American markets, particularly for ready-to-drink (RTD) and organic green tea products. Product innovations, such as RTD tea, flavored tea, and functional tea, are expected to drive market growth. Organic farming and other sustainable practices will be critical to the industry’s future. (Hicks, 2009)

In terms of international trade and competitiveness, Wang, Huang and Liu (2020) used sample data from the WITS database linked by UN Comtrade to calculate the international market share, interindustry trade index, explicit comparative advantage index, and product export price of Chinese tea based on the theory of international competitiveness. Then compared and analyzed the calculation results with the world's major tea exporting countries, found that China’s tea industry shares both the advantages and disadvantages like those of other tea exporting countries. XU (2018) used the international market power measurement method to measure and assess China's tea exports' international market power measurement methods to evaluate China’s tea export strength from 2006 to 2016. The findings showed that China's tea

export market possesses a certain level of market power. Since 2000, China's green tea exports have grown steadily, ranking first in both trade value and export volume. However, in recent years, the overall scale of China's green tea exports has decreased, accompanied by falling export prices and declining international influence. To address these challenges, China's tea industry needs to implement supply-side structural reforms, focus on improving product quality, and expanding trade distribution channels (Zheng, 2024). Shen and Zhou (2019) argued that building strong tea brands is a keyway to achieve higher quality and better pricing for agricultural products. It’s a natural response to evolving consumer demands, a powerful tool for promoting standardized production, and an important path toward boosting the international competitiveness of agricultural goods. Zhou (2020) calculated the import and export volume, trade volume, trade balance, export unit price, trade growth rate, market share, trade competitiveness index, and revealed comparative advantage index of Chinese tea from 2008 to 2018, as well as examined the characteristics of Chinese tea's foreign trade. Porter's Diamond Model was used to assess the international competitiveness of Chinese tea. The conclusion is that, while China's tea trade is massive in scale, the benefits are unclear.

Regional case studies include Sri Lanka, India, Indonesia, Bangladesh, Japan. Sachitra and Bandara (2016) employed both quantitative analysis and the diamond model approach to examine the key factors of international competitiveness in Sri Lanka's tea industry. The empirical results showed that the factor conditions, such as resources, labor had the most significant impact on Sri Lanka's tea industry competitiveness. Xia and Wu (2019) described the tea industries in Sri Lanka and India. examining how the green ecological effect, cluster driving effect, and market internationalization have contributed to as the growth of the tea industry. Both two countries have greatly benefited from strict production standards and brand recognition. Talukdar (2017) used revealed comparative advantage analysis and found that domestic tea prices in India were higher than world prices, suggesting India should develop value-added tea products and graded teas to enhance market competitiveness through production cost reduction.

Suprihatini and Rohayati's (2005) CMS analysis revealed that Indonesia's tea export growth lagged global trends due to limitations in its product structure. Munandar (2001) ran regression analysis and calculated Indonesia's revealed comparative advantage index (RCA) for tea, concluding that the main factors influencing Indonesian tea exports are inflation, wage income, trade liberalization, exchange rate, and so on. Green tea has a larger international market share than black tea. Noman (2020) employed ARIMA model to analyze and forecast the export potential of Bangladesh's tea trade. As Bangladesh's second largest export-oriented cash crop, tea has significantly played a major role in rural poverty, created substantial employment opportunities, and stimulated the development of Bangladesh's export sector. Yamaura (2011) employed the gravity model to investigate the green tea import market in the United States considering the impact of international trade liberalization policies on green tea trade. The study found that, in the case of green tea, distance and language barrier between the exporting country and the United States are less significant. Free trade agreements are critical in shaping the green tea trade.

According to Lin (2019), even though facing similar trade environments for green tea exports, Japan's green tea exports to the United States outperformed China's in both volume and price within just over a decade, from 1875 to 1887. This shift was prompted by three major factors. First, the Japanese government provided strong support and guidance for the country's tea exports, which helped increase competitiveness in international markets. Second, Japan's tea industry actively researched the weaknesses of Chinese tea and devised targeted strategies to strengthen its competitive advantage. Finally, Japan had lower production and export costs compared with China, which further strengthen its position in the global tea trade.

Trade barriers and policy responses are majors restricting constraining the tea industry development and global tea trade. Gu (2017) explored the impact of technical trade barriers (TBT) on China's export trade from both the government and business perspectives to identify countermeasures. Import restrictions are a type of technical barrier to trade. They are characterized by being dual-natured, widespread, compliance-heavy, and often confidential. Both external and internal factors influence China's

position, external factors include the protection of national interests and trade barriers. while internal issues include an imbalanced trade structure, industrial inefficiencies, and disruptions in export order. As a result, the government should implement an effective system and mechanism, while businesses should improve their product quality. Yue et al. (2010) found that the EU's new food safety regulations significantly impacted major tea-exporting countries worldwide. These measures restricted market access opportunities and led to export declines in affected developing countries. However, China's tea exports to the EU showed more resilience than expected, with the decline occurring at a slower pace than initially projected.

In 2006, China exported 17,600 tons of tea to the EU, valued at 45.14 million USD, representing a 9.3% and 33.8% increase over the previous year. The EU has strict pesticide residue testing standards for imported tea, but Chinese tea companies have gradually adapted to meet these technical requirements, which has led to a steady recovery in export trends. The demand for organic green tea and functional tea products in the EU market has also pushed Chinese green tea producers to shift their focus toward higher value-added products. (Liu, Zhang, Hu, Yan, 2010)

Based on the reviewed literature, the factors influencing tea exports can be broadly grouped into the following categories:

- Economic factors such as GDP levels of trading partners, price competitiveness, and market share.
- Logistical and geographical factors, including physical distance, inflation, and transport costs.
- Institutional and regulatory factors, like FTAs, pesticide regulations, and TBTs.
- Cultural and branding factors, such as consumer preferences, labeling, certification, and brand recognition.
- Sustainability, including demand for organic products.

A variety of influencing factors are covered in the literature, but few studies have looked quantitatively at how the digital economy's variables—like social media

presence or online search trends—affect tea exports. By adding these variables to an extended gravity model, this study aims to close that gap and offer a fresh viewpoint on export performance.

Selected the factors that were found to influence tea export performance are summarized in the following table:

Table 2.1

Summary of Key Literature on Factors Influencing Tea Exports

Author	Year	Region	Method	Key Export Factors
Wang et al.	2020	China	Trade indices, RCA	GDP, price, comparative advantage
Munandar	2001	Indonesia	Regression RCA	Inflation, wages, exchange rates
Yue et al.	2010	Global/EU	Case study	Regulatory compliance, food safety
Yamaura	2011	US	Gravity model	Distance, FTA, language
Shen& Zhou	2019	China	Theoretical	Branding, consumer preferences
Xia& Wu	2019	India/Sri Lanka	Comparative	Ecological effects, cluster effects, branding awareness
Hicks	2009	Global	Market analysis	Organic demand, product innovation, healthy food
This Study	2025	China-EU	Survey, extended gravity model	Digital economy indicators, brand awareness, trade trend

In summary, this chapter provides a solid theoretical foundation for identifying the multidimensional drivers of green tea exports to the EU. The following chapters will use these insights to empirically assess the significance of these factors using an extended gravity model, supported by consumer survey data and field observations.

Chapter 3. Research Framework and Methodology

3.1 Research Design and Methodology

This study uses a multi-method approach combining trend analysis, consumer behavior research, and econometric modeling to evaluate the key factors influencing China's green tea exports to the EU market. The research framework includes (1) descriptive analysis based on UN trade databases; (2) demand-side market perception analysis through questionnaire surveys and (3) extended gravity model specification and empirical estimation.

In addition, the author has been working in Fujian Province and Jiangxi Province, the major tea-producing areas in China from 2020 to 2022, maintaining long-term engagement with tea farmers, local enterprises, and regulatory authorities. During critical harvest periods (March-May), the author resided in tea-growing areas, participating in and observing daily operations. In this study, when explaining the setting of model variables and understanding the behaviors of consumers and supply subjects, some insights obtained from this participatory observation are partially quoted to enhance the reality of the analysis results, but it is not carried out as an independent qualitative study.

3.2 Descriptive Analysis

3.2.1 Export Trend Analysis

This part provides a comprehensive descriptive analysis of the trends in China's green tea exports to the 27 EU countries from 2001 to 2023. It serves three main purposes:

First, it helps validate overall trends. By reviewing historical data to identify the trend and phase-specific characteristics of China's green tea exports during the study period. This serves as a reality check for subsequent econometric analysis—any model or hypothesis should align with actual trends, and the findings in this section strengthen the credibility of the regression results in the next sections. Second, it offers theoretical justification for variable selection. The observed patterns inform which factors should be included in the quantitative model. Third, it provides real-world context for study

hypotheses. By clarifying the practical drivers behind export growth or decline (e.g., policy shifts, market changes), this section grounds the paper's assumptions in empirical evidence. The analysis thus bridges historical trends with theoretical frameworks, ensuring the study remains both data-driven and conceptually sound.

The dataset used in this study consists of China's green tea export volumes and values to the 27 EU countries over 23 years analyzed separately for two packaging categories: packages under 3 kg (code 090210) and exceeding 3 kg (code 090220), resulting a total of 1,242 data points. Additionally, export trends were examined for the EU as an aggregated whole.

The data processing and visualization were carried out using Python 3.10 in the Google Colaboratory environment. Compared to Excel, Python offers greater flexibility and efficiency in handling large datasets and automating repetitive tasks. Python is especially useful when working with multi-year panel data across multiple countries, as in this case.

For the convenience of overall understanding, the following is an introduction to the relevant background of China's green tea exports and its influence.

Table 3.1

The export value and export volume of green tea in China from 2015 to 2023

Year	Export Value (Billion USD)	Year-on-year growth in export value (%)	Export volume (thousand tons)	Year-on-year growth in export volume (%)
2015	1.04		275.4	
2016	1.091	4.96	273.8	-0.59
2017	1.163	6.63	297.3	8.6
2018	1.25	7.44	305.9	2.86
2019	1.37	9.56	306.7	0.29
2020	1.417	3.46	296.9	-3.19
2021	1.488	4.97	312.3	5.16
2022	1.394	-6.28	313.9	0.52
2023	1.18	-15.32	309.4	-1.44

Source: Tea Industry Committee of China Association for the Promotion of International Agriculture Cooperation

As shown in Table 3.1, the export data for green tea demonstrates notable changes between 2015 and 2023. The sales volume in China's domestic tea market has soared, which has enabled tea farmers and tea-related industries to see new opportunities. And they intended to take this opportunity to boost tea exports. However, contrary to expectations, both the export volume and the total export value of Chinese tea have been declining year by year.

Table 3.2

Market Share of Tea Sales Channels

Year	Offline (%)	Online (%)
2017	97.2	2.8
2018	95.6	4.4
2019	94.1	5.9
2020	91.8	8.2
2021	89.6	10.4
2022	90.3	9.7
2023	91.3	8.7
2024	90.4	9.6
2025	89.1	10.9
2026	88.6	11.5
2027	88.2	11.8
2028	88.2	11.8

Data Source: Statista.com

Moreover, in today’s digital age, consumer perceptions of tea are increasingly shaped by social media and online content. Table 3.2 shows that online sales have been growing rapidly. During the COVID-19, online sales saw a significant rise, jumping from 5.9% to 8.2%.

Table 3.3

10 Highest Quality Tea Brands in 2024

Brand	Country	Score
Harney and Sons	U.S.	9
PG tips	UK	8
Taylors of Harrogate	UK	8

Lipton	UK	7
Fortnum& Mason	UK	7
Vahdam	India	6
Twinings	UK	5
Tazo	U.S.	5
Tea Forte	UK	4
Celetial Seasonings	U.S.	3
Tetley	India	3
Stash Tea	U.S.	2
Bigelow Tea	U.S.	2
Yogi Tea	U.S.	2
Dilmah	India	2

Data source: Insider Monkey

Inside Monkey used a consensus-based ranking method, gathering data from reliable sources and forums like Quora and Reddit (e.g., r/tea, r/Ask Reddit). Each brand earned 1 point per mention, and the top 15 tea brands of 2024 were ranked by total scores in ascending order. None of the global top 15 tea companies are from China.

3.2.2 Survey Analysis

To build a more grounded empirical model and identify relevant explanatory variables, this study conducted a consumer survey focused on European awareness and preferences toward Chinese green tea. The survey covered consumption habits, purchasing channels, non-price factors such as certifications and label language, perceptions of technical trade barriers, and attitudes toward brand and origin labeling.

The questionnaire was created using Google Forms by the author, written in English, and designed with mandatory fields for all questions to ensure full completeness and data quality. The survey was distributed via two main channels: (1) through the researcher's personal network, and (2) through group chats and organizations previously joined by the author, such as university student unions,

Erasmus program traineeship teams, and professional communities across EU countries. The age range of respondents is between 20 and 60.

A total of 236 responses were collected, 234 valid questionnaires were retained for analysis. All questions must be answered, and submission was restricted to one per participant. The questionnaire did not include age or gender as demographic variables. Respondents were only asked to indicate their country of residence instead. This decision was based on the observation that green tea in the EU is a low-cost and widely accessible product, consumed across gender and age groups without significant demographic segmentation. Therefore, the study placed more emphasis on awareness, perception, and non-price factors. The questionnaire included three main sections:

- Basic Information: country of residence, whether the respondent regularly drinks green tea.
- Consumption Behavior: types of tea consumed, purchasing channels, sources of product information.
- Perception and Attitude: awareness of Chinese green tea, attention to labeling and certifications, brand familiarity.

The full questionnaire is provided in the appendix and served as an important foundation for the construction of model variables and the formulation of policy recommendations.

3.3 Empirical Approach

The Gravity Model serves as the primary theoretical framework for this study. Ravenstein in 1885 explained patterns of human migration, the gravity model has become a widely used tool in geography, regional science, and economics, particularly for studying flows such as migration, trade, and transportation. In 1962, Dutch economist Jan Tinbergen applied the gravity model to international trade for the first time. He proposed that trade flows between two countries are directly proportional to the size of their economies, as measured by GDP, and inversely proportional to the distance between them. Although the model's theory was relatively, it performed well

in predicting trade pattern. Bergstrand (1985) further expanded the structure of the gravity model by incorporating microeconomic foundations within a general equilibrium framework. He argued that while traditional gravity models include the economic size and geographic distance between countries, they often overlook crucial factors such as prices and exchange rates, leading to potential model misspecification. In his generalized gravity model, he included variables such as export and import unit value indexes, GDP deflators, and bilateral exchange rates to better capture product differentiation across countries and variations in trade conditions. Additionally, Bergstrand introduced institutional dummy variables (e.g., EEC and EFTA) to reflect the effects of preferential trade arrangements. Empirical results demonstrated that these extended variables significantly improve the explanation of bilateral trade flows. Anderson and van Wincoop (2003) introduced an improved gravity model based on Multilateral Trade Resistance (MTR), which considers the relative barriers between trading partners and the global market. It is extensively used in the study of regional trade agreements and tariff effects.

Overall, the gravity model remains one of the most widely used approaches in trade economics. It helps identify the key variables that influence trade between countries or regions. This model is relatively simple to understand, data-friendly, and empirically robust.

Trade flows between countries *i* and *j* are also influenced by their respective trade relationships with other partners, in other words, bilateral trade friction alone might not fully explain the impact of trade barriers on trade volume. The Gravity Model's explanatory variable is the average effective distance between each country and its trading partners. It estimates bilateral trade flows between two countries using the distance between them and their respective economic sizes.

The equation for the trade gravity model is as follows:

$$F_{ij} = G \times \frac{(M_I^{\alpha} \times M_I^{\beta})}{D_{ij}^{\theta}} \tag{3.1}$$

Equation (3.1) is also known as the Standard Gravity Equation. In this equation, F_{ij} indicates the trade flow from country i to country j ; M_I^{α} and M_I^{β} represents the

domestic incomes of the two countries, typically measured by their Gross Domestic Product (GDP); D_{ij}^{θ} represents the distance between the two countries, serving as a proxy for transportation costs; and G is a proportional constant. The parameters α, β and θ show the elasticities of total bilateral trade in relation to GDP and distance. In its linear form, the equation for the trade Gravity Model is expressed as follows:

$$\ln(T_{ij}) = \alpha + \beta_1 \ln(Y_i) + \beta_2 \ln(Y_j) + \beta_3 \ln(d_{ij}) + \varepsilon_{ij} \quad (3.2)$$

In this Equation (3.2), the economic sizes of economies i and j serve as attractive forces, while the distance between them acts as a repulsive force, reflecting trade resistance- or trade costs- on the international level. Economic size is usually measured using GDP, per capita income, and population. These reflect the export country's supply capacity and the import country's demand potential. The interaction between attractive forces and repulsive forces jointly determines trade flows between two economies. This study treats the European Union as a single, unified market.

The empirical analysis in this study utilizes time-series data with a relatively small sample size. Consequently, the author chose the ARDL (Autoregressive Distributed Lag) model to explore both long-term and short-term relationships among variables, while also taking their dynamic adjustment into account. To make sure the results are reliable, robustness analysis check was also carried out after the main analysis. The data analysis was conducted using EViews 12 Student Version.

3.3 Variables and Data

This study extends the Gravity Model based on the characteristics of China's tea trade by adding additional explanatory variables. The variables used in this study are consistent with those discussed in the literature review (Chapter 2). Prior research has extensively examined market size, geographic distance, and non-price elements (e.g., Wang et al., 2020; Shen & Zhou, 2019; Yamaura, 2011). Building on this foundation, the current model includes digital economy indicators, such as online search interest, that have been validated through survey responses to better reflect current consumer behavior.

The dependent variable is China's green tea export value, noted as EXP_p. The explanatory variables include:

- China's GDP, $CGDP_P$
- The GDP of EU, $EGDP_P$
- Bilateral transportation cost, BTC_p
- The population of the European importing country, POE_p
- Technical barriers to tea trade, TBT_p
- Whether the importing country has a trade agreement with China, FTA_p,
- Online search popularity, OLS_p,
- China's green tea production, PRO_p.

The definitions of the model variables are presented in Table 3.4.

Table 3.4

Variable Meaning and Expected Symbol

Variables	Meaning	Data Source	Excepted Symbol
EXP	The tea export trade value (USD) from China in year p.	United Nations Comtrade Database	
CGDP	China's Gross Domestic Product (GDP) in year p	World Bank	+
EGDP	The Gross Domestic Product (GDP) of EU in year p.	World Bank	+
BTC	The distance travelled is multiplied by the average international oil price in year p.	Statistical Yearbook of World Energy 2023	-
POE	The population size EU in year p.	World Bank	+
TBT	A dummy variable: assigned a value of 1 if EU implemented a significant pesticide residue regulation in year p, otherwise 0.	The update of pesticide residue Event Study	-
FTA	A dummy variable: assigned a value of 1 if EU signed a free trade agreement with	China–EU Cooperation Events Study	+

	China in year p, otherwise 0.		
OLS	The Online search index of "green tea" in year p.	Google Trends	+
PRO	China's tea production in year p.	China National Bureau of Statistics.	+

The extended Gravity Equation constructed in this study is as follows:

$$\ln(EXP_p) = \alpha + \beta_1 \ln(CGDP_P) + \beta_2 \ln(EGDP_p) + \beta_3 \ln(BTC_p) + \beta_4 \ln(POE_p) + \beta_5 \ln(TBT_p) + \beta_6 \ln(FTA_p) + \beta_7 \ln(OLS_p) + \beta_8 \ln(PRO_p) + \varepsilon_{ij} \quad (3.3)$$

The dependent variable is China's green tea export trade value, which is the most direct indicator of the tea market's development. GDP is one of the explanatory variables used to assess a country's economic situation. The exporting country's GDP reflects its export supply capacity, whereas the importing country's GDP represents consumer purchasing power. The data comes from the World Bank database. Similarly, the more tea China produces, the greater its supply capabilities. And the larger the population of the importing country, the higher the demand for tea.

For Trade Agreement Relationship, the value is 0 before the agreement is signed and 1 after. Bilateral FTAs help effectively lower trade barriers, promote the growth of bilateral tea trade. Although China and the EU have not officially signed a Free Trade Agreement, several other forms of cooperation have effectively contributed to the development of bilateral trade. One notable example is the EU–China Agreement on Geographical Indications, which came into effect in 2021. Under this agreement, both sides mutually recognized 100 geographical indication (GI) products. For China, this includes renowned teas such as West Lake Longjing tea and Anxi Tieguanyin tea. In addition to the GI agreement, other initiatives such as the China–EU Green Partnership and the China–EU Digital Dialogue have also played important roles in facilitating trade, enhancing regulatory alignment, and fostering mutual understanding in emerging sectors.

Technical barriers to Trade (TBT) and bilateral transportation costs (BTC) are generally regarded as key constraint factors in actual export operations, based on the author's practical observations and existing literature, this paper still uses them as

variables to participate in the modeling. In accordance with the revised pesticide residue standards, a binary annual variable was constructed, taking the value of 1 for post-update years and 0 otherwise.

The study uses a segmented calculation method to better represent the true cost of shipping in the EU, which is a vast and complex region with numerous transportation options. Transport distances were determined using typical routes: approximately 18,000 km for maritime shipping from Shanghai Port (China) to Rotterdam Port (Netherlands) through the Malacca Strait and Suez Canal. Around 10,000 km for the China-Europe Railway Express between Xi'an (China) and Duisburg (Germany). For air freight, roughly 9,000 km from Shanghai Pudong International Airport to Frankfurt Airport (Germany). The average transport distance was calculated separately for each period using a weighted average based on duration (9 years for 2002–2010 and 12 years for 2011–2022), The bilateral transportation cost is multiplied by the annual oil price. The oil price is calculated by taking the average of Dubai crude, Brent crude, and West Texas Intermediate (WTI) crude oil prices.

The data sources include the General Administration of Customs of China, the UN Comtrade database, the Food and Agriculture Organization of the United Nations (FAO), Tea Industry Committee of China Association for the Promotion of International Agriculture Cooperation, the World Bank, China’s National Bureau of Statistics, the International Trade Centre (ITC), European Food Safety Authority (EFSA). Energy Institute.

Chapter 4. Empirical Observations

4.1 Descriptive Analysis

4.1.1 Trends in China's Green Tea Exports

From 2001 to 2023, China's green tea exports to the 27 EU countries have shown a strong upward trend overall. The figure below shows the overall trends in export quantities and trade values for both small and large packaged tea to the EU. The changing trends of small-packaged (blue) and large-packaged (cyan) green tea export quantities (left axis, kg) and trade values (red and orange, right axis, USD) are displayed. It can be observed that the total export quantity curve generally followed an upward trajectory, with periods of slowed growth or declines during 2008-2009, 2015-2016, and 2020, corresponding to external economic or policy shocks. Most other years maintained a growth trend.

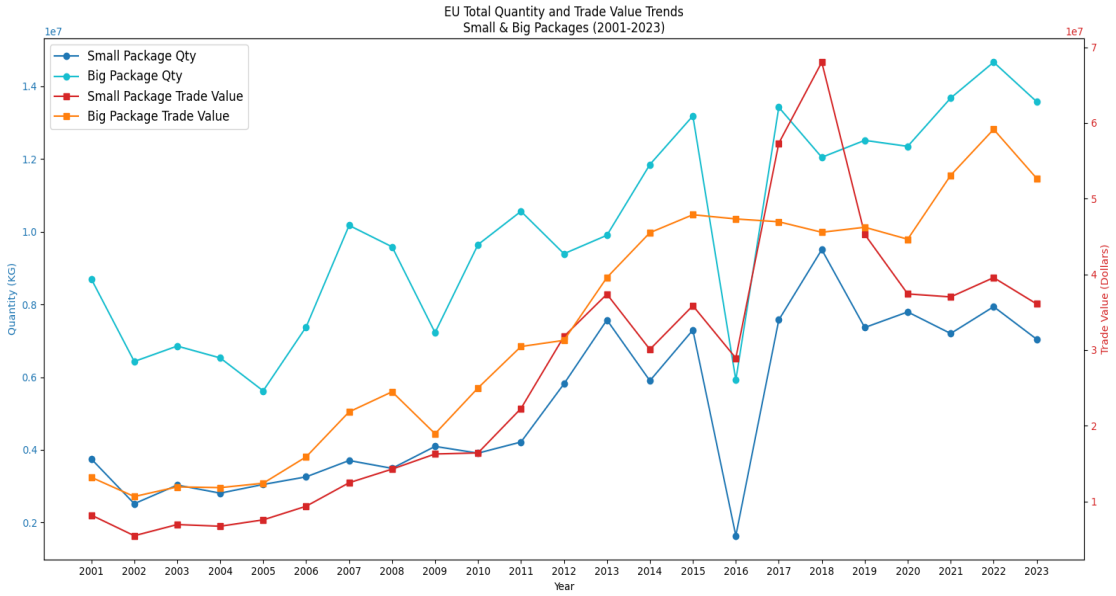

Figure 4.1 Trends in China's Green Tea Exports to the EU (2001-2023)

Data source: UN Comtrade database

In the early 2000s, both the quantity and value of green tea exports from China to the EU were relatively low. Between 2001 and 2007, exports experienced gradual growth with some fluctuations, reflecting both growing EU consumer interest in Chinese green tea and Chinese producers' initial efforts to access EU retail markets. The 2008 global financial crisis may trigger an EU economic downturn that suppressed consumer spending, leading to slowed export growth during 2008-2009. Recovery

began around 2010 alongside the EU's economic rebound and rising health-conscious tea consumption trends. China's Belt and Road Initiative, announced in 2013, further strengthened trade ties, and the launch of the China–Europe Railway Express in mid-2015 improved transport efficiency. The 2016 export decline likely stemmed from China's currency exchange rate reforms affecting competitiveness and Brexit-related market uncertainties. The COVID-19 pandemic in 2020 severely disrupted global trade for three years, causing European port congestion and logistics challenges until gradual normalization occurred.

The figure below illustrates the trends in China's big-packaged green tea exports to major EU countries from 2001 to 2023.

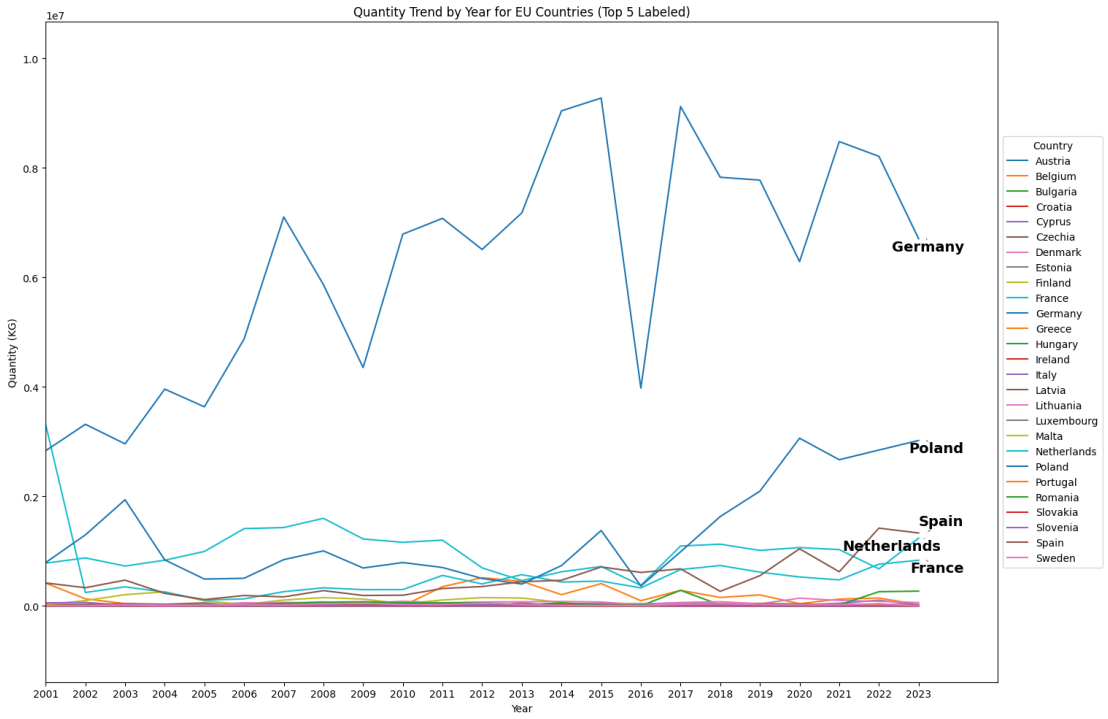

Figure 4.2 Trends in China's Green Tea (>3kg) Export Volume to the EU (2001-2023)

Data source: UN Comtrade database

The data shows that Germany maintained significantly higher import volumes than any other EU country, with notable peaks during 2013-2015 and 2017-2018. Poland has emerged as a major importer in recent years demonstrates its rapid import growth after 2015, with particularly dramatic increases from 2018 onward that surpassed traditional markets like France and the Netherlands. Poland's rise stems from two key factors: growing domestic tea consumption and its strategic position as a land

gateway for Chinese tea entering the EU via the China-Europe Railway Express under the Belt and Road Initiative. Many Chinese tea companies have recently chosen Poland as their EU distribution hub, further boosting its import statistics. Spain also showed strong growth momentum in the late 2010s, with a clear upward trend after 2015. This growth may reflect rising awareness among Spanish consumers about the health benefits of green tea, along with Spain's role in re-exporting to Latin American markets, helping it becomes one of the top green tea importers in the EU by 2020. The Netherlands and France have more stable import markets. As a transit trade hub, the Netherlands experienced moderate growth in the mid-2000s before stabilizing at consistent import levels. France maintained consistent growth in Chinese green tea imports, reaching record highs just before 2020.

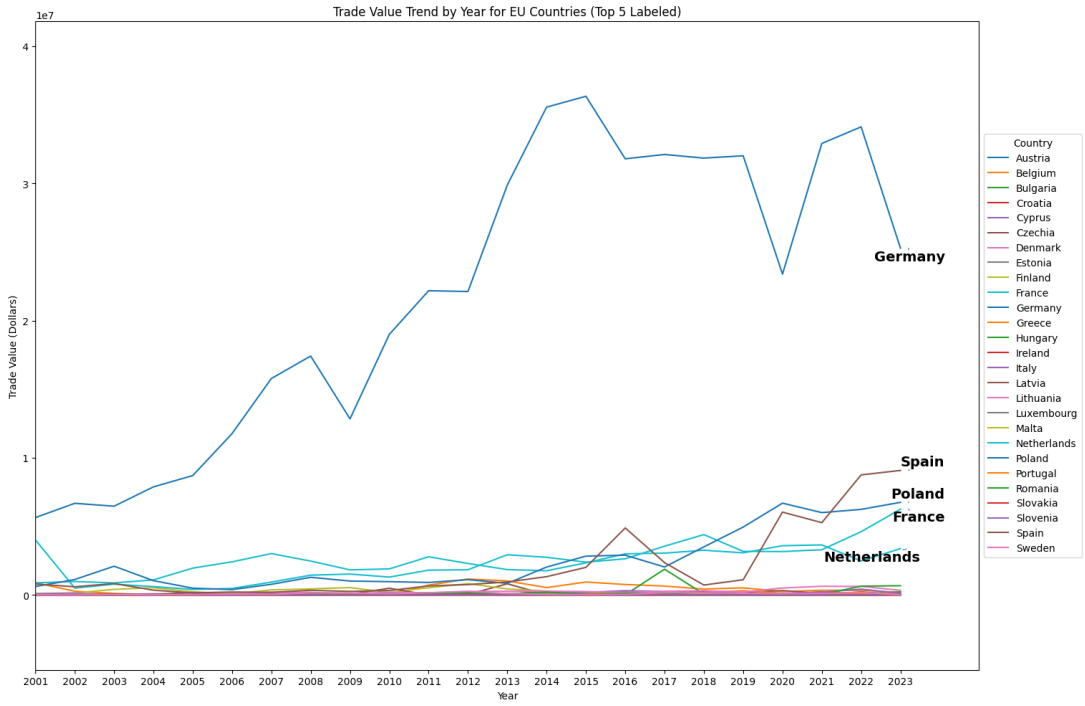

Figure 4.3 Trends in China's Green Tea (>3kg) Export Value to the EU (2001-2023)

Data source: UN Comtrade database

The figure 4.3 shows that the top five countries in terms of green tea export value align with those for export volume, though with some ranking differences. These variations may stem from cost reductions afforded by port accessibility. For instance, while the Netherlands imports a greater quantity of Chinese green tea than France, its corresponding import value is lower. Notably, while traditional tea-consuming

countries like the UK are no longer part of the EU, their market influence has been partially absorbed by other countries, both the Netherlands and Poland have assumed greater distribution roles following Brexit.

China's exports of small-packaged green tea to the EU countries exhibited an overall trend of initial fluctuations followed by growth during 2001-2023, with several distinct phase changes observed throughout this period, as illustrated in Figure 4.4.

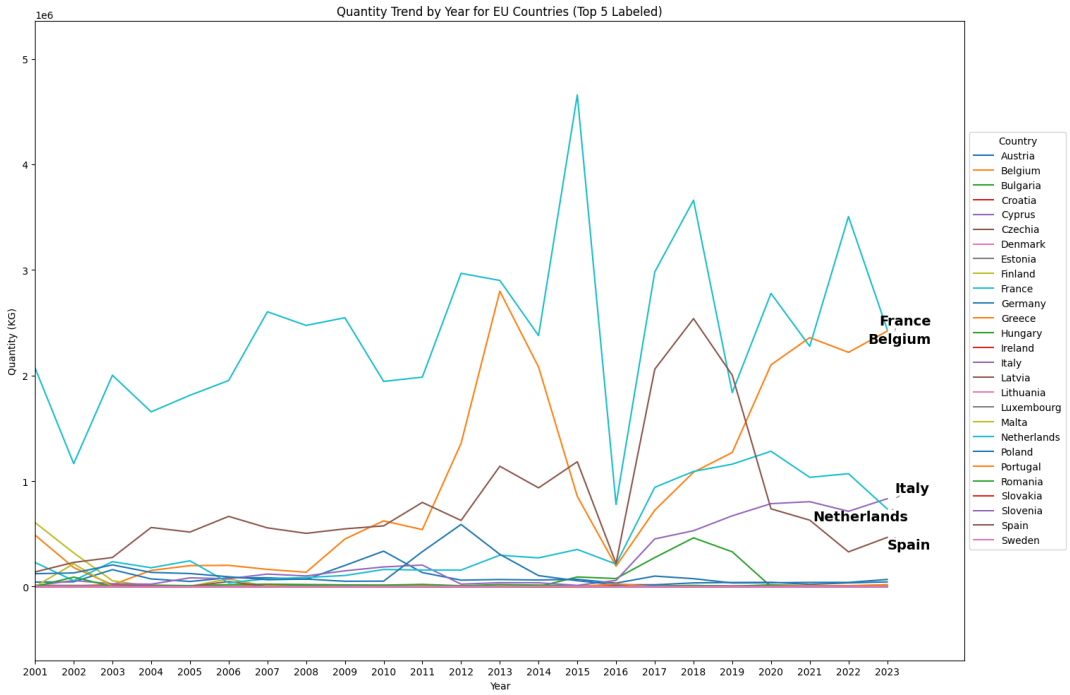

Figure 4.4 Trends in China's Green Tea (⩽3kg) Export Volume to the EU (2001-2023)

Data source: UN Comtrade database

The figure shows that top five importers of small-packaged green tea were France, Belgium, Italy, Netherlands and Spain. Unlike big-packaged tea imports, Germany and Poland， these two major green tea importers were absent from this ranking, indicating their preference for importing loose-leaf tea for subsequent blending and resale.

The overall trend of small-packaged green tea imports mirrors that of the EU's total import pattern, suggesting similar influencing factors. While the trade value trajectory generally followed the quantity trend, it also reflected unit price variations. In earlier years, the price per kilogram was relatively low. Around 2010, the average

unit price of small-packaged exports increased, causing the trade value growth rate to outpace quantity growth. See Figure 4.5.

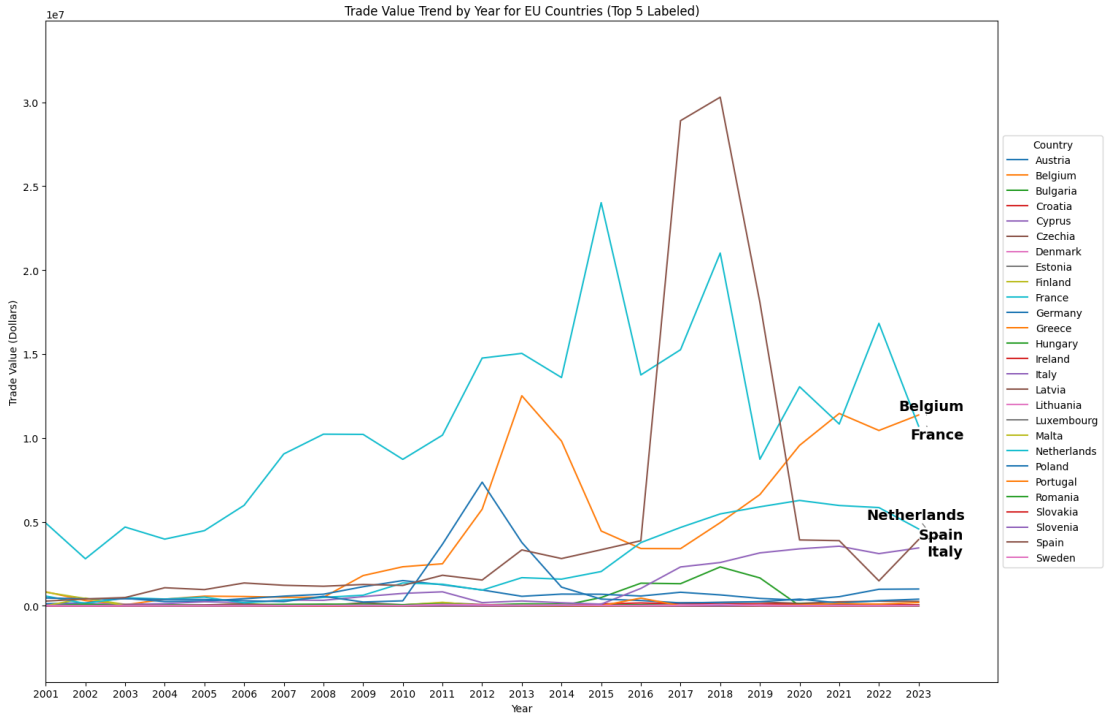

Figure 4.5 Trends in China's Green Tea (⩽3kg) Export Value to the EU (2001-2023)

Data source: UN Comtrade database

Overall, China's green tea exports to the EU grew steadily in both volume and value from 2001 to 2023, though the growth rates varied across different periods. This reflects the distinct market positioning of EU countries. Some, like Germany, the Netherlands, Poland focuses on re-export and processing, while others, like France, Spain, Belgium target end consumers directly. This market structure evolved continuously throughout 2001-2023 with changing trade environments and consumption trends, yet China's green tea substantially expanded its market coverage in the EU overall. Behind this trend are not only changes in supply and demand but also the influence of EU trade policies, regulatory standards, and shifts in global market competition.

4.1.2 Questionnaire and Findings

To gain deeper insights into consumer awareness, preferences and potential barriers in the target market, the author conducted a questionnaire survey titled

"Perception and Consumption of Chinese Green Tea in the EU" in 2025. The main goal of the survey is to assess whether EU consumers' awareness and acceptance of Chinese green tea align with the trade trends, to evaluate how digital media influences brand promotion, and to provide behavioral insights that support the definition of key explanatory variables in the empirical analysis, such as online search interest and perceived technical barriers.

This section presents an analysis of survey results obtained using the questionnaire described in the previous chapter. All data were collected using an English-language Google Form distributed via social media and online groups, yielding 234 valid responses from various EU countries. Section 3.2.2 contains detailed information on the questionnaire design and respondent selection.

The respondents came from various regions, covering all EU member states. The top three countries in terms of the number of respondents are Estonia, Poland and Belgium respectively. This is somewhat related to the author's living location and working relationship. However, this location information refers to the EU country where the respondents have lived, not their nationalities. The survey revealed that 63.7% of participants reported "occasionally" drinking tea while 33.8% identified as "frequently" drinking tea, with only 2.6% never drinking tea. Notably, 63.7% of respondents indicated they had tried green tea before, suggesting that green tea has established a relatively broad market penetration across the EU. Both general tea consumption and green tea drinking habits show that green tea has successfully captured a lot of tea-drinking population in EU.

In response to the question "What comes to your mind when you think of green tea?", the most common responses were "matcha" (72.2%) and "green tea products" (66.7%), followed by "health benefits" and "everyday beverage." This shows that while green tea is widely associated with health, matcha as a symbol of Japanese culture dominates consumer recognition. That suggests Chinese green tea still faces challenges in terms of cultural identity and brand awareness. As for origin preferences, 67.5% of respondents favored Chinese-origin green tea, ahead of Japan (54.7%) and Vietnam (14.1%). This indicates a strong recognition of China as the original source of green

tea. While Japanese green tea may be more familiar to many EU consumers, China still maintains a competitive edge due to its historical and geographic link to the product.

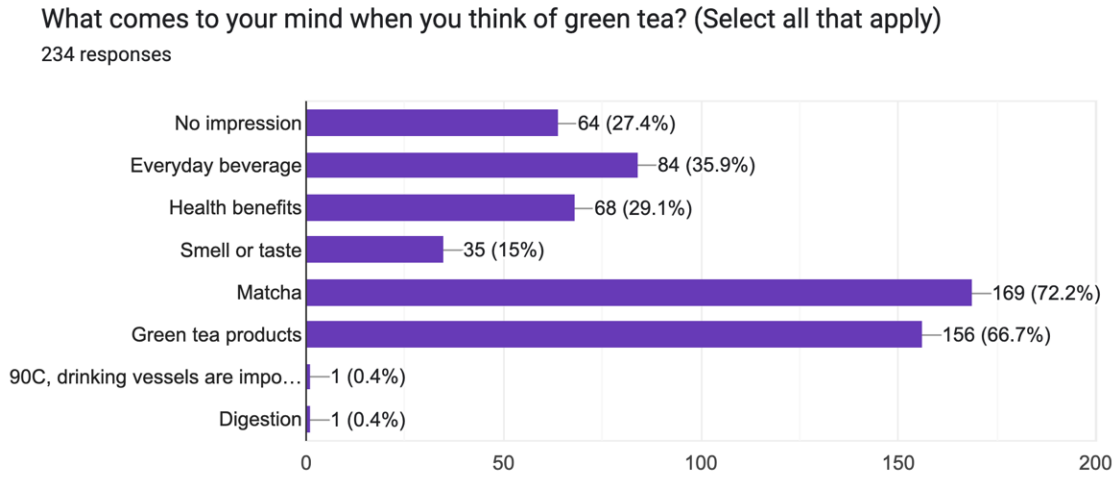

Figure 4.6 Respondents' Associations with "Green Tea" (Multiple Responses)

Source: Author's survey "Perception and Consumption of Chinese Green Tea in the EU", 2025.

Although China is the origin of green tea, 59.4% of respondents reported never having heard of or purchased Chinese green tea brands, revealing big gaps in international brand awareness. On the other hand, 68.4% acknowledged encountering green tea information or advertisements, highlighting digital media's key role in consumer education. Green tea advertising appeared most frequently on Chinese platforms like Xiaohongshu (54.7%), followed closely by TikTok (the international version of China's Douyin) at 49.1%. Chinese consumers cannot access platforms like Facebook or Instagram; Chinese social media is still accessible globally and has a large international user base. TikTok is currently one of the most popular social media platforms worldwide. This paradox, high ad exposure but low brand recognition, suggests current promotional efforts need to be strengthened strategically to turn visibility into meaningful brand awareness. The data reveals a key issue: while platform reach is already there, brand building is still falling short.

When asked about China's internet restrictions affect the internationalization of Chinese green tea brands, 48.3% of respondents believed it had "strongly affect". This

indicates that a sizable portion of consumers do see online visibility as a critical factor in brand expansion.

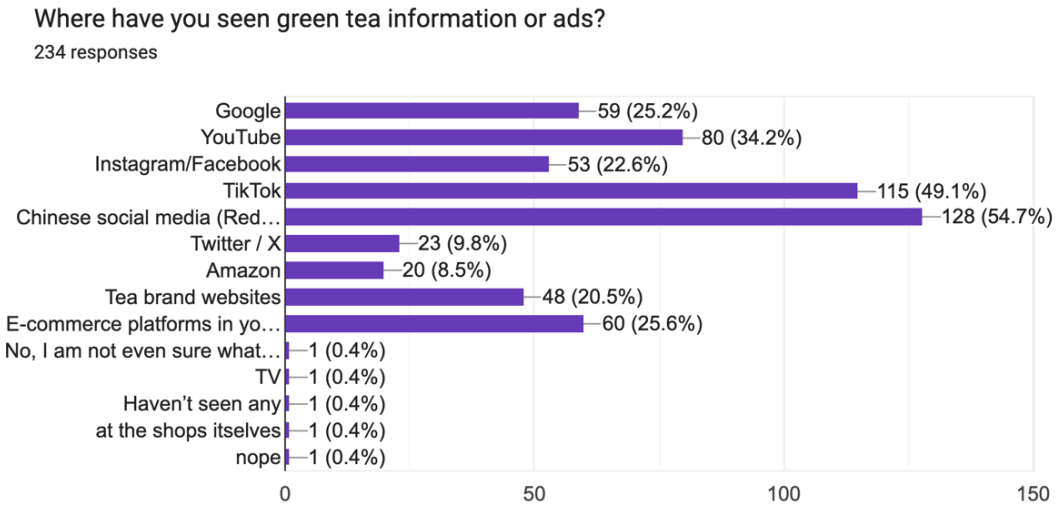

Figure 4.7 Channels Where Respondents Have Seen Green Tea Information or Advertisements (Multiple Responses)

Source: same as figure 4.6

Consumers showed a clear preference for small packaging such as tea bags and tins, accounting for 56.4% of responses, significantly higher than the 13.2% preference for bulk packaging, indicating that retail consumers tend to favor standardized and convenient packaging formats. Among the factors influencing purchasing decisions, the top four were brand awareness (64.1%), price (52.6%), organic/sustainable certification (47.9%), and taste or quality (37.2%). This suggests that for Chinese green tea to enhance its competitiveness in the EU market, efforts should focus on three key areas: brand building, certification systems such as EU organic certification, and cost performance.

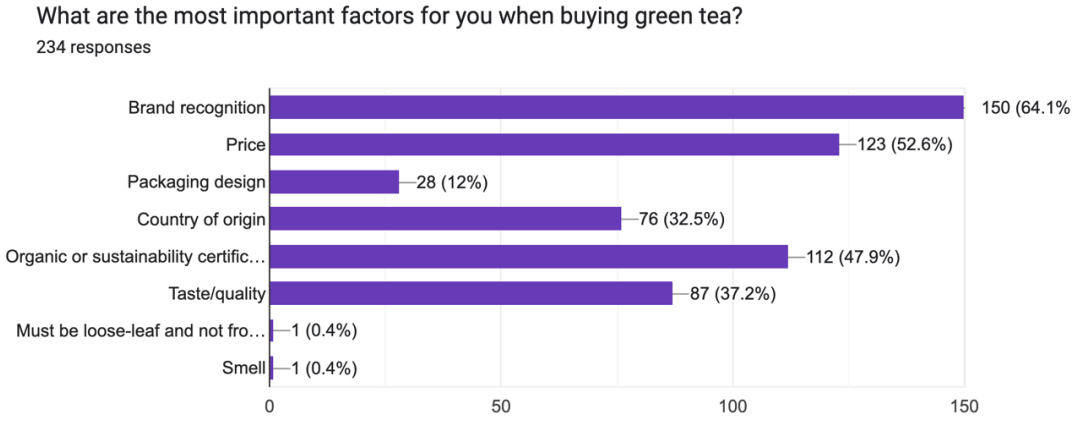

Figure 4.8 Key Factors Considered by Respondents When Purchasing Green Tea (Multiple Responses)

Source: same as figure 4.6

When asked "Would you be willing to try Chinese green tea brands tailored to your local market?", 56.8% of respondents answered "yes", while 32.5% indicated "maybe", with only about 10% expressed No. This suggests there is strong market potential for Chinese tea brands to expand internationally. Consumer feedback revealed that even among willing customers, many ultimately abandon purchases due to information barriers.

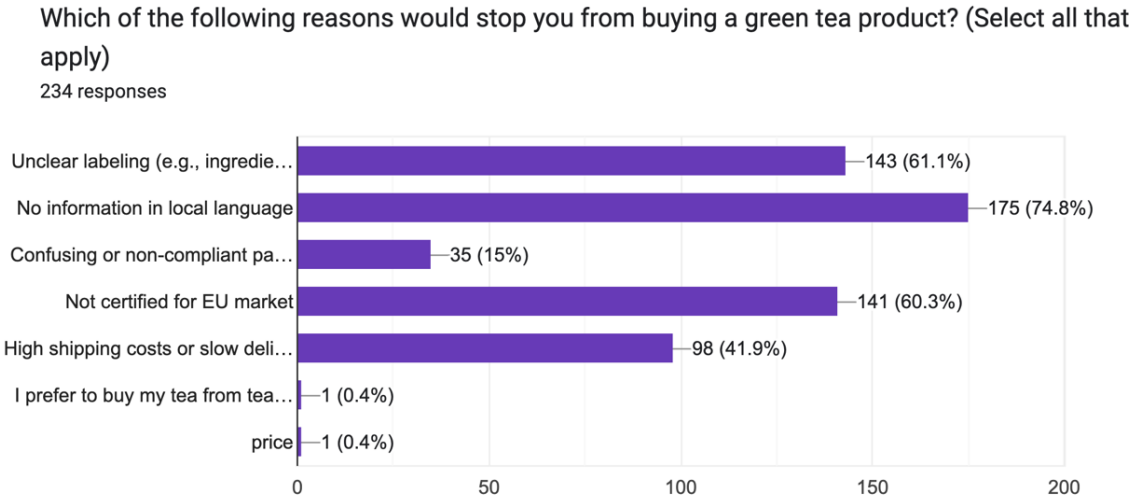

Figure 4.9 Key Barriers That Would Discourage Respondents from Buying Green Tea (Multiple Responses)

Source: same as figure 4.6

4.2 Empirical Analysis

As previously stated in Chapter 3 (Equation 3.2), the standard gravity model serves as the theoretical foundation for this empirical analysis. In this study, the model is extended to include variables such as bilateral transport costs, population of the importing country, presence of a free trade agreement (FTA), technical trade barriers (TBT), online search interest, and China's green tea production. The empirical specification is presented below. The empirical analysis consists of the following key parts: unit root test, ARDL model estimation and cointegration test, analysis of long-

term influencing factors, short-term dynamics and error correction model, and robustness and diagnostic tests.

This study first used ordinary least squares (OLS) regression to conduct a preliminary analysis of factors influencing China's green tea exports to the EU market. The overall regression model demonstrated high level of goodness-of-fit, with an R^2 of 0.9973 and adjusted R^2 of 0.9951, indicating the model's strong explanatory power for variations in China's green tea export values. The F-statistic of 456.89 ($p < 0.01$) confirming the overall significance of the model. Additionally, the Durbin-Watson statistic is 2.47, approaching the ideal value of 2, ruled out serious autocorrelation issues.

Regarding explanatory variables, China's GDP (LNCGDP) and the online search index (LNOLS) showed statistically significant positive effects at the 5% level. This suggests that domestic economic growth and increased consumer attention to green tea contribute to export expansion. Green tea production (LNPRO) is marginally significant at the 10% level, potentially reflecting production capacity's partial role in driving exports. On the other hand, EUGDP (LNEGDP), transportation costs (LNBTC), energy prices (LNPOE), technical trade barriers (TBT), and free trade agreements (FTA) failed to achieve statistical significance in this model, implying either indeterminate effects on tea exports during the sample period or possible lagged effects mediated through other variables. These OLS results provided preliminary evidence for subsequent ARDL cointegration modeling help uncover some potential mechanisms for certain variables' effects.

4.2.1 Unit Root Test

This study conducts stationarity tests on all variables using the Augmented Dickey-Fuller (ADF) test. The results show that China's green tea export value (EXP01), EU GDP (EGDP), and online search index (OLS) are stationary at level. Variables such as transportation cost (BTC), green tea production (PRO), technical barriers to trade (TBT), and free trade agreements (FTA) are non-stationary at level but become stationary after first differencing. This means these variables follow an I (1) process

and satisfy the prerequisite conditions for ARDL model specification. The EU population (POE) and China's GDP (CGDP) achieve stationarity only after second differencing. Since variables requiring second-order differencing cannot be included in the ARDL model, both the EU population (POE) and China's GDP (CGDP) are excluded from this stage of the analysis.

4.2.2 ARDL Model Estimation and Cointegration Test

This study employs EViews to construct an ARDL model, with the optimal lag length selected based on the Akaike Information Criterion (AIC). The Bounds Test for cointegration yields an F-statistic of 11.43959, which significantly exceeds the upper-bound critical values at all significance levels for I (1) variables (the 1% upper-bound critical value is 5.691). This result leads to a rejection of the null hypothesis and confirms there is a stable cointegration relationship among the variables.

4.2.3 Analysis of Long-term Influencing Factors

The ARDL Bounds Test is used to determine whether a long-run equilibrium relationship between the variables.

Table 4.1

F-Bounds Test for Cointegration

Test Statistic	Value
F-statistic	11.43959
k (regressors)	6
Sample size	18

Source: author’s calculations.

Table 4.2

Critical values for finite sample (n = 35):

Significance	I (0)	I (1)
10%	2.254	3.388
5%	2.685	3.96
1%	3.713	5.326

Source: author’s calculations

The calculated F-statistic is 11.43959, which significantly exceeds the upper bound critical values at all conventional significance levels for a finite sample (e.g., 5% I (1) critical value = 3.96 for n=35). As a result, the null hypothesis of "no level relationship" is strongly rejected. This confirms the existence of a valid long-run cointegration relationship between China's green tea exports and economic, production, and demand-related factors.

The long-run equation table blow presents the specific relationships between each variable and China's green tea export value (LNEXP01).

Table 4.3

Long-Run Coefficients (Levels Equation)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEGDP	0.712544	0.186279	3.825153	0.0123
LNOLS	0.247465	0.057170	4.328658	0.0075
LNBTC	-0.038510	0.050741	-0.758957	0.4821
LNPRO	1.102756	0.050856	21.89526	0.0000
TBT	-0.071661	0.057628	-1.241767	0.2694
FTA	-0.007836	0.032710	-0.239562	0.8202
C	6.086076	1.723605	3.531220	0.0167

Source: author's calculations

The long-run equation (simplified) is:

$$EC = \ln(EXP_p) - 0.7125\ln(EGDP_p) + 0.2475\ln(OLS_p) - 0.0385\ln BTC + 1.1028\ln(PRO_p) - 0.0716TBT - 0.0861FTA + 6.0861 \quad (4.1)$$

The long-run estimation results of the ARDL model shows that China's green tea exports (LNEXP) have a statistically significant positive relationships with the following variables: EU's GDP (LNEGDP), online search popularity (LNOLS), and China's green tea production (LNPRO). These findings suggest the following:

- The growth of EU's GDP enhances the consumption capacity of the EU consumer, thereby promoting Chinese green tea exports.
- The Google search interest index for green tea (OLS) significantly boosts exports, suggesting that the more consumers are paying attention, the greater potential

demand for Chinese export value exports.

- China's green tea production demonstrates a significant positive impact on export value, indicating that expanded production capacity provides a solid supply foundation for exports.
- Other variables, including transportation costs (BTC), technical trade barriers (TBT), and free trade agreements (FTA), do not show significant long-term effects. This may be due to their complex influence mechanisms or potential lagged policy effects.

4.2.4 Short-term Dynamics and Error Correction Model

Table 4.6

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.720778	3.553808	2.172537	0.0819
LEXP01(-1)	-1.268597	0.285230	-4.447633	0.0067
LNEGDP*	0.903931	0.202125	4.472104	0.0066
LNOLS (-1)	0.313934	0.111001	2.822806	0.0368
LNBTC (-1)	-0.048854	0.062432	-0.782509	0.4693
LNPRO (-1)	1.398953	0.316660	4.417893	0.0069
TBT (-1)	-0.009782	0.062218	-1.450907	0.2044
FTA (-1)	-0.009941	0.041933	-0.237067	0.8220
D(LNOLS)	-0.433809	0.170527	-2.543937	0.0516
D(LNBTC)	-0.081692	0.044730	-1.826328	0.1274
D(LNPRO)	1.972023	0.443121	4.450308	0.0067
D(TBT)	-0.032880	0.032664	-1.006618	0.3603
D(FTA)	-0.039268	0.019466	-2.018234	0.0996

Note. *Variable interpreted as Z=Z (-1) +D(Z)

Source: author’s calculations

The results of the conditional error correction regression show that several significant short-term dynamics influence China's green tea exports to EU. The error correction term (ECT), represented by the lagged value of the dependent variable LEXP01(-1), is statistically significant and negative (-1.268597, p = 0.0067). This indicates that the model has a valid mechanism for correcting deviations from long-run equilibrium at a fast adjustment rate.

Among the lagged independent variables, the GDP of EU (LNEGDP (-1)) has a significant positive impact on exports (0.903931, p = 0.0066), implying that higher past income levels in EU are associated with higher export volumes. Similarly, the Google search interest index for green tea (LNOLS (-1)) has a positive and significant effect (0.313914, p =0.0368), implying that prior public interest in green tea is associated with exports growth.

Green tea production (LNPRO (-1)) is highly significant (1.3990, p = 0.0069), implying that China's production capacity plays an important short-term role in increasing exports. In contrast, the lagged values of bilateral transportation costs (LNBTC), technical barriers to trade (TBT), and free trade agreements (FTA) are not statistically significant in the short term.

Among the contemporaneous first-difference variables, the change in current green tea production (D(LNPRO)) has a strong and significant positive influence (1.9720, p = 0.0067), meanwhile the immediate change in Google search interest index (D(LNOLS)) is marginally significant but negative (-0.4381, p = 0.0516), potentially reflecting short-term volatility or hype effects. The coefficients for D(TBT) and D(FTA) remain insignificant, though D(FTA) is marginally significant at the 10% level (p = 0.0996).

4.2.5 Robustness and Diagnostic Tests

The Breusch-Godfrey LM test was used to determine whether the residuals from the ARDL model show serial correlation. The results showed an F-statistic of 0.055059 (p = 0.8260) and the R-squared of 0.244400 (p = 0.6210), both not statistically significant at any standard level. The null hypothesis "no serial correlation" cannot be

rejected, implying that the residuals are free of autocorrelation. Therefore, the model passes the serial correlation diagnostic test.

To determine whether the ARDL model has heteroskedasticity, the Breusch-Pagan-Godfrey test was used. The results showed an F-statistic of 0.783426 (p = 0.6642), the R-squared showed an F-statistic of 11.75048 (p = 0.4659), and the scaled explained sum of squares 0.887253 (p=1.0000). Since all test statistics are not statistically significant at conventional levels, we cannot reject the null hypothesis of homoskedasticity. As a result, the model is not heteroskedastic, confirming that the residual variance is stable. The Jarque-Bera test was used to check whether the residuals from the ARDL model are normally distributed. The test produces a Jarque-Bera statistic of 1.979138, with a p-value of 0.371327. Since the p-value is significantly higher than the 0.05 threshold, the null hypothesis of normal distribution cannot be rejected. This means the residuals are normally distributed, which satisfies one of the key assumptions of classical regression analysis.

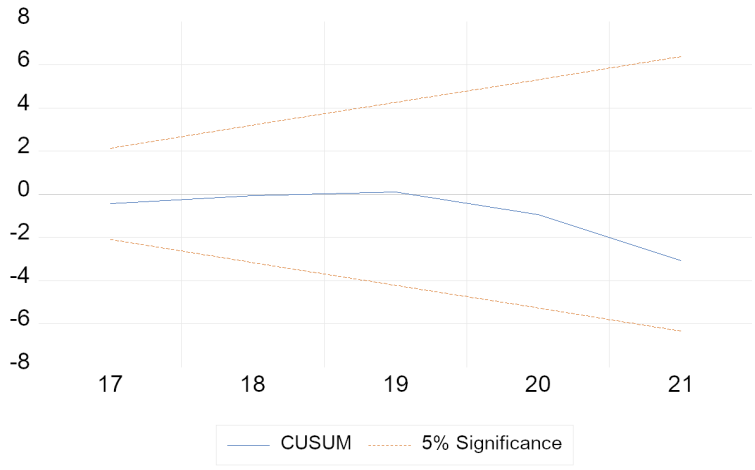

Figure 4.3 CUSUM Stability Diagram

Source: author's calculations

The CUSUM stability test demonstrates that the cumulative sum of recursive residuals remains well within the 5% significance level throughout the sample period. This confirms the model's structural stability over time.

Finally, the ARDL model passes all key diagnostic tests, indicating that the empirical findings are reliable and robust.

Chapter 5. Conclusion and Recommendation

5.1 Conclusion

This study explored the multiple factors influencing China's green tea exports to the 27 EU member states. By combining macro-level trade data, micro-level consumer survey results, and the author's firsthand experience in the tea industry, it constructs a comprehensive and multi-dimensional analytical framework.

The descriptive statistics and export trend charts show a general upward trajectory in China's green tea exports to the EU between 2001 and 2023, with particularly notable growth over the past decade. This reflects a consistent rise in EU market demand for Chinese green tea. At the same time, the consumer survey indicates that EU residents generally hold a positive perception of green tea, recognizing its health benefits and showing a relatively high level of acceptance.

The empirical results show a strong positive correlation between EU GDP and the volume of green tea imported from China, highlighting that consumer purchasing power and growing awareness of sustainable, green consumption are key drivers of export growth. A positive correlation is also observed between China's green tea production and export volume, however, based on feedback from tea farmers and industry professionals, the dominance of low value-added, homogeneous products in the export structure continues to limit further value growth. In addition, online search popularity shows a positive relationship with export performance, confirming a connection between online attraction and actual trade outcomes.

Technical trade barriers and transportation costs are not statistically significant in the regression results. However, accurately quantifying updates to EU pesticide residue standards is extremely difficult, which may have influenced the data's reliability. Many of these standards apply broadly to product categories such as food or plants, and it is unclear how much they directly affect green tea as a subcategory. Nonetheless, based on the literature reviewed in Chapter 2 and the author's field experience in tea cultivation and commercial operations, these factors are likely to have a significant impact on actual export practices. For example, the mismatch between updated pesticide regulations and the tea cultivation cycle often places disproportionate risk on

farmers. Similarly, high transportation costs limit the potential of Chinese tea in premium markets. Even if these variables aren't statistically significant, they still represent major practical barriers to export willingness and capacity，therefore deserve serious attention in policy recommendations.

5.2 Recommendations

To improve the export performance and global competitiveness of Chinese green tea in the EU market, this study proposes some policy recommendations.

Since the end of 2023, the Chinese government has implemented visa-free entry for citizens of several EU countries, including France, Germany, Italy, Spain, Netherlands, Estonia and has extended transit visa access to nationals of all EU member states. These measures have created unprecedented opportunities for China-EU trade and cultural exchange. First, the Chinese government could organize tea culture exchange programs by inviting EU-based distributors, food and wellness influencers (KOLs), and other stakeholders to visit China. These visits should include guided tours of tea plantations and processing facilities to deepen participants' understanding of Chinese tea quality and cultural heritage. Second, China could promote its existing domestic tea-picking tourism experiences to EU travelers. Third, on high-frequency China–EU flight routes, airlines could collaborate to offer Chinese tea samples on board, along with promotional materials that highlight tea culture as part of the inflight service and advertising.

In 2024, the United States initiated measures to restrict TikTok, many Western users started shifting to other Chinese social media platforms including Xiaohongshu (Red Note). This shift contributed to a notable increase of global users on Xiaohongshu. In response, several Chinese apps quickly launched built-in auto-translation features within a week, enabling seamless communication between Chinese users and international audiences.

Based on this trend, it is recommended that Chinese tea brands establish multilingual social media accounts specifically targeting the European market. These accounts should be operated by dedicated teams capable of producing culturally

relevant and linguistically adapted content, thereby enhancing the visibility and accessibility of Chinese tea culture.

To address the frequent changes in the EU's pesticide residue standards for tea, and the mismatch between regulatory updates and the agricultural cycles of tea cultivation, this study recommends setting up an early warning system for tea exports. The platform would publish a report every quarter, highlighting high-risk pesticide substances and alert thresholds. Major tea-producing regions in China already have big data centers for tea. This could be connected to those existing facilities to give tea farmers, exporters, and regulators timely and accurate information. It would help lower compliance risks, support evidence-based decision-making, and make the whole industry more responsive to changes in international regulations.

To address the current issue of limited brand recognition for Chinese tea, it's recommended to create a joint China-EU label specifically for high-quality green tea products that meet EU standards. This label would serve as a mark of quality and compliance, helping build consumer trust and make product stand out in the European market. Additionally, China can draw inspiration from Japan's successful promotion of matcha by prioritizing the international marketing of geographically indicated products such as West Lake Longjing and Anji Baicha, to strengthen origin recognition and cultural value.

Transportation costs remain one of main barriers to Chinese green tea exports. With the regular operation of the China–Europe Railway Express and the growing number of direct flight routes between China and EU countries, there is increasing potential to improve supply chain efficiency. It is recommended to promote integrated export models that combine tea products with cross-border e-commerce. Specifically, enterprises should be encouraged to adopt unified logistics channels and set up dedicated green tea export warehouses in cross-border e-commerce pilot zones like Yiwu and Xiamen. These specialized hubs can streamline customs procedures, reduce logistics costs, and improve delivery speed, thereby boosting the competitiveness of high-value green tea products in the EU market.

5.3 Research Limitations

Although the sample period of 21 years may seem relatively short, this study remains methodologically valid for several reasons. First, the availability of data fundamentally shapes the research scope. China's accession to the WTO in 2002 marked its formal integration into the international trade system, kicking off the institutionalization and marketization of green tea exports. Data from earlier years is either unavailable or not comparable, so starting from 2002 is a practical and reasonable choice. Second, despite limited observations, the ARDL model remains effective for estimating long-run relationships, owing to its strength in dealing with time series data with mixed integration orders, which is supported by unit root and cointegration tests that confirm result robustness. Third, the chosen timeframe (2002-2022) covers multiple full business cycles and major global policy shifts, such as the post-WTO transition period, the 2008 financial crisis, and the COVID-19 pandemic. This ensures data continuity and representativeness, allowing the study to capture a wide range of structural economic conditions, which enhances the generalizability of the findings. The model's diagnostic tests (serial correlation, heteroskedasticity, normality, and stability) confirm the empirical framework's reliability under these time constraints.

While this study uses the ARDL model to examine the determinants of China's green tea exports to Europe from 2002 to 2022, several limitations should be considered. First, although exchange rate variables are widely recognized as important in export trade research, the lack of consistent annual data in this case means a key external economic factor may have been left out. This omission represents a notable gap. Second, the transportation cost variable faces measurement challenges due to imprecise shipping modality proportions, estimated port distances, and volatile oil prices. These issues limit its ability to accurately reflect the true dynamics of export costs. Third, Policy variables such as technical trade barriers and free trade agreements are difficult to quantify, which can introduce estimation biases. In addition, structural disruptions such as Brexit, migration crises, and the COVID-19 pandemic during the study period may have jeopardized the stability of fundamental macroeconomic variables such as EU GDP and population, potentially influencing model results. These limitations

suggest that the result should be interpreted with caution, while also pointing to important areas for methodological improvements in future research.

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Appendix

Perception and Consumption of Chinese Green Tea in the EU

Q1. Which EU country do you currently or previously live in?

Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden.

Q2. Do you have a habit of drinking tea?

Never
Occasionally
Frequently

Q3. What comes to your mind when you think of green tea?

No impression
Everyday beverage
Health benefits
Smell or taste
Matcha
Green tea products
Other (please specify)

Q4. Have you ever tried green tea?

Yes
No

Q5. Which origin of green tea do you prefer to buy?

China
Japan
Vietnam
Taiwan
India
Kenya
Sri Lanka
Indonesia
Turkey
Other

Q6. What are the most important factors for you when buying green tea?

Brand recognition
Price
Packing design
Country of origin
Organic/sustainability certification
Taste and quality
Other

Q7. Have you ever bought or heard of a Chinese green tea brand?

Yes

No

Q8. Have you ever searched for information about green tea or seen green tea ads online?

Yes

No

Q9. Where have you seen green tea information or ads?

Google

YouTube

Facebook/Instagram

TikTok

Chinese social media (Red note, Weibo, Douyin…)

Twitter/ X

Amazon

Tea brand websites

e-commerce platforms in your region

Other

Q10. Would you be willing to try Chinese green tea brands tailored to your local market?

Yes

No

Maybe

Q11. Do you think China's internet restrictions affect the internationalization of Chinese green tea brands?

Strongly affect

Somewhat affect

No impact/ not sure

Q12. Which of the following reasons would stop you from buying Chinese green tea?

Unclear labeling (e.g., ingredients, expiration, instructions)

Lack of information in local language

Confusing or non-compliant packaging

Not certified for EU market

High shipping costs or slow delivery

Other

Q13. What kind of packaging do you prefer when buying green tea?

Small packaging (e.g. tea bags, tins)

Large packages (e.g., loose leaf, family-size)

No preference

Résumé

Hiina rohelise tee eksporti Euroopa Liitu määravad tegurid: empiiriline analüüs

Shuang Qi

Käesolev uurimus keskendub Hiina rohelise tee ekspordile Euroopa Liidu turule ning hindab süstemaatiliselt mitmemõõtmelisi tegureid, mis mõjutavad selle ekspordi dünaamikat. Uurimistöö tugineb ÜRO kaubandusandmebaasi aastatel 2001–2023 kogutud andmete trendianalüüsile, tarbijaküsitlusele (234 kehtivat vastust) ning laiendatud gravitatsioonimudelile. Analüüsi tulemused näitavad, et Hiina rohelise tee eksport EL-i on järk-järgult kasvanud. Tarbijaküsitlusest ilmnes, et EL-i tarbijad suhtuvad rohelisse teesse üldiselt positiivselt, kuid seisavad silmitsi takistustega, nagu puudulik märgistus, madal brändituntus ja sertifikaatide puudumine. Empriline analüüs näitab, et EL-i SKT inimese kohta korreleerub positiivselt Hiina rohelise tee ekspordimahuga ning ka digitaalsed näitajad (nt otsingutrendid) avaldavad statistiliselt olulist mõju. Kuigi tee tootmismaht on seotud ekspordiga, piiravad ekspordipotentsiaali ületootmine ja madal lisandväärtus. Kaubandustõkked ja transpordikulud ei osutunud küll statistiliselt oluliseks, kuid autor, tuginedes oma pikaajalisele tööpraktikale Hiina teetööstuses, rõhutab nende rolli tegelike ekspordiplaanide kujundamisel. Uuring lõpeb rea rakendatavate poliitikasoovitustega, sealhulgas viisapoliitika kasutamine Hiina-EL suhtluse edendamiseks, digiplatvormide kasutamine brändi tuntuse tõstmiseks, pestitsiidijäägi hoiatusmehhanismide loomine ja logistikakanalite optimeerimine. Käesolev töö pakub empiirilist ja praktilist tuge Hiina teetööstuse rahvusvahelistumiseks.

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