The Influencing Factors of Tobacco Trade Flow Between China and RCEP Countries

Jinghua Jin, Lecture
Mingcai Shao, MA
Jinghua Jin, Lecture in Industrial economy and free trade zone, School of Economics and Management, Yantai University, Yantai, Shandong, China. Mingcai Shao, MA in International trade flows, School of Economics and Management, Yantai University, Yantai, Shandong, China. Correspondence: Jinghua Jin; jjhclass@163.com

Abstract: Against the background of the establishment of RCEP, and based on the trade data from 2002 to 2018, this paper studies the current situation of tobacco trade in China, builds a trade gravity model, and analyzes the correlation between China's tobacco trade flows with its RCEP partners. Different factors include economic, demographic, geographical and tariff factors. According to the results of the research, RCEP member states can take advantage of population and geographical distance to strengthen mutual influence and penetration of tobacco culture, upgrade logistics infrastructure, and make targeted concessions on tobacco tariff rates to promote the development of tobacco trade within the region.

Keywords: Regional Economic Partnership; Trade flows; Gravitation model of trade; tobacco

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INTRODUCTION

In today's economic and trade context, the number of regional free trade organizations (FTA) is increasing, which has become the future trend of trade. In 2012, ASEAN initiated the Regional Comprehensive Economic Partnership (RCEP), a regional economic integration organization led by the East Asia and Pacific region. Since 2013, it has taken eight years, including 19 high-level meetings and 28 rounds of formal consultations. On November 5th of 2020, the Fourth RCEP Leaders' Meeting was held and the RCEP was officially signed. Prior to RCEP, the largest free trade area in Asia was the Association of Southeast Asian Nations Free Trade Area. The establishment of RCEP has broken through Asia in the region, united Australia and New Zealand, and created the East Asia-Pacific trade circle. Therefore, the establishment of the RCEP aims to expand and deepen the economic integration of the participating countries, enhance the economic partnership among the member countries and promote the development of regional trade on the basis of the existing trade pattern. It will also help improve living standards, increase employment and investment opportunities, and facilitate trade in all countries. In addition, RCEP has not only promoted the integration of different regional systems, but also promoted the formation of the Asian market, and promoted the new establishment of the world multilateral trading system.

As one of the 15 member states, China has played an important role in promoting the establishment of the RCEP. This has helped to expand China's foreign trade and stimulate China's economic development as well. Since the implementation of China's reform and opening up policy, China's foreign trade has been

developing continuously. The scope of trade has been extended to the whole world. The trade modes are various, covering all 22 trade categories, and the volume of trade has also been increasing.In the context of the formal signing of RCEP, this paper introduces tariff explanatory variables to tobacco trade between China and RCEP partners, and attempts to study the economic impacts of the influencing factors from the perspective of gravity model.

China's tobacco industry adopts a management system of unified leadership and monopoly. China has a total of 2.707 million tobacco-related enterprises, led by 339,000 enterprises in Guangdong province, followed by Zhejiang and Jiangsu. From 2015 to 2020, the total profit of Industrial enterprises in China's tobacco products industry showed a trend of first declining and then rising, with the lowest value being 91.08 billion yuan in 2018. By 2019, the total profit of the industry was 92.25 billion yuan, with a year-on-year growth of 1.3%. By the end of 2020, the total profit of industrial enterprises in China's tobacco products industry was 140.92 billion yuan, up 33.3% year on year[1].

China is the world's largest tobacco market, with less room for growth in overseas markets than in the domestic market. At present, the overall global tobacco market is declining, and four multinational tobacco companies, including Philip Moore International, British American Tobacco, Japan Tobacco and Imperial Brands, continue to monopolize about 70% of the global cigarette market except China. Over the past five years, the biggest decline in sales has been in Russia, while the biggest declines have been in eastern Europe, Latin America and Oceania, with growth in some markets in Asia Pacific, the Middle East and Africa. In addition to the U.S. and the market dominated by the big four multinational tobacco companies, some 18 million boxes of cigarette sales are still scattered among 14 other national tobacco companies around the world.

	2015	2016	2017	2018	2019
Import Value	1351.5	1377.5	1326.8	1408.6	1419.7
Export Value	1863.5	1727.7	1762.7	1758.8	1904.8

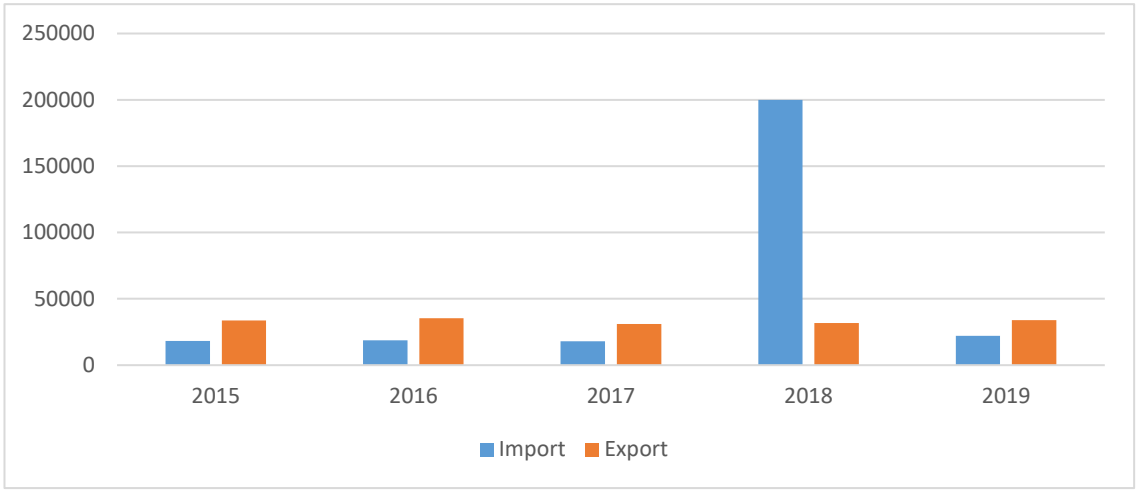
Table 1
Import and Export Value of Tobacco and Its Products in China (Million dollars)

Data source: China customs

Table 1 shows the import and export of tobacco, from 2015 to 2019, the import and export volume of tobacco and its products in China was relatively stable, showing a trade deficit. In 2019, China's total import and export trade of tobacco and its products was us $3.324 billion. The trade deficit widened to $485 million, with exports worth $1.42 billion and imports worth $1.905 billion.

As Figure 1 shows, since China's tobacco industry promoted supply-side reform and centralized inventory clearing, the industry has entered a trough since 2015. In 2019, China's tobacco production increased slightly to 2.36 trillion, up 1.22 percent year on year. In 2020, due to the impact of the epidemic, the production of all production factories was somewhat stagnant. But as a rigid demand industry, China's tobacco production showed a trend of growth in 2020 with the resumption of production and the gradual return of the national logistics system later on.

Figure 1
The Import and Export Volume of Tobacco-Made Cigarettes in China
(Unit: ton)



Data source: China Unicoms

LITERATURE REVIEW

The concept of the gravitational equation was derived from Newton's law of universal gravitation, which was introduced to trade by Tinbergen (1962) and Poyhonen (1963). They separately tested and analyzed bilateral trade trends using a gravitational model and came to the same conclusion: the size of bilateral trade between two countries is positively correlated with the size of their economies, and the distance between two countries restricts trade. On their basis, Berstrand (1989) changed the per capita income into the population number index, which made the data more convenient and improved the accuracy of the data and promoted the application. With the spread of trade gravity models, scholars added explanatory variables needed by their own research on the basis of the original model, and derived different gravity models. In China, Shi Chaoxing, Gu Haiying, Qin Xiangdong and Gu Kejian have systematically summarized and summarized the application of trade gravity model.

Since RCEP was put forward, it has attracted the attention of many scholars, and their analysis directions are also different. At present, the main directions can be divided into: the study of trade influencing factors by using different models, the comparison between RCEP and other Asia-Pacific free trade agreements, and the different factors affecting the economic effects of each RCEP member country.

For example, Zhou Shudong and Zheng Jian (2018)[2] used the stochastic frontier gravity model to study the trade potential between China and its RCEP partners, and further analyzed its influencing factors. Zhao Liang and Chen Shumei (2014)[3] adopted the basic trade gravity model to study and analyze different influencing factors of goods trade flow, and made an empirical analysis of factors such as goods export flow and GDP, and reached the conclusion that the growth rate of goods trade between China and other member countries was not high. Li Xinxing et al.[4] studied and analyzed the future development prospect and potential impact of RCEP based on the GTAP model, mainly analyzing the impact of India's accession on the respective welfare level and future income of China and India, as well as the impact of China's industrial structure upgrading in the future. Chen Shumei and Ni Juhu[5] also took use of the

GTAP model to study the changes in the economic benefits of member countries in the region when RCEP was completed, and put forward relevant policy suggestions from the national and industrial aspects.

Yu Miaojie and Jiang Haiwei (2021)[6] summarized and analyzed the trade trends and characteristics between China and CPTPP member countries, compared and analyzed the differences between CPTPP and RCEP, further analyzed the impact of the two on China's trade, and put forward relevant policy suggestions. Gao Jingyun and Chen Shumei (2017)[7] made a comparative analysis of the impact of TPP, TTIP and RCEP on China's economy, and concluded that RCEP could weaken the negative impact of TPP and TTIP to a certain extent, and put forward policy suggestions such as timely acceleration of industrial structure adjustment. Wang Lingdong (2021)[8] also analyzed the comparison of rules of origin between RCEP and other regional agreements, mainly compared and analyzed the differences between RCEP and the EU, USMCA and TPP, and then explored the impact of RCEP agreement on China.

Che Jinliang (2019)[9], when exploring the influencing factors of China's bilateral trade based on the gravity model, assigned value to whether China joined the trade preference agreement or not, and introduced land area and two dummy variables, OECD and ASEAN, on the basis of the traditional three basic variables of GDP, population and geographical distance. Fu Xiumei (2014)[10] used gravity model to study the trade potential of agricultural products in RCEP region, and added the factor of free trade zone construction on the basis of traditional variables, and put forward suggestions on agricultural trade between China and RCEP partner countries. Qin Bingtao et al. (2020)[11] analyzed the influence of RCEP on trade potential and efficiency, focusing on the influence of whether countries have free trade agreement, tariff level and monetary freedom.

RESEARCH MODEL

Variable Selection

The selection of variables in the current trade gravity model are country distance, population, and gross domestic product. In this paper, tariff variables are added on the basis of traditional variables of trade gravity model. Analyze the impact of per capita GDP, population, geographical distance and tariffs on tobacco trade flows after the establishment of RCEP.

Model Establishment

The basic form of the trade gravity model is:

$$Yij = A\,(Xixj)/Dij \quad (1)$$

Where a is a constant, Yij represents the bilateral tobacco trade volume between country i and country j, Xi and Xj respectively represent the GDP of two countries, and Dij is the geographical distance between countries.

Equation (1) is a nonlinear trade gravity equation. In the process of using the trade gravity model, its linear form is generally adopted, that is, the logarithmic treatment of the equation is performed:

$$LnYij = a + \ln Xi + \ln Xj + \ln Dij \quad (2)$$

According to the theory of trade gravity model, the following equation is constructed on the basis of linear equation (2) :

$$\ln SUMijt = \alpha + \beta_1 \times \ln PGGijt + \beta_2 \times \ln PEEijt + \beta_3 \times \ln DINijt + \beta_4 \times \ln TAFijt + uijt \quad (3)$$

Where i represents China, j represents the country studied, and t represents the year. PGG is the per capita GDP of country i multiplied by that of country j, and PEE is the population of country i multiplied by that of country j. lnDINijt means the geographical distance between two countries (or regions) in year t after taking the natural logarithm. While the geographical distance of ASEAN countries is averaged by the geographical distance of each country to Beijing. lnTAFijt stands for the bound tariff rate level of the two countries (or regions) in year t after taking the natural logarithm. More explanations of the variables can be found in table 2.

The following assumptions are made for the above trade gravity equation (3) :

$$\ln SUM_{ijt} = \alpha + \beta_1 \times \ln PGG_{ijt} + \beta_2 \times \ln PEE_{ijt} - \beta_3 \times \ln DIN_{ijt} - \beta_4 \times \ln TAF_{ijt} + u_{ijt}$$

Therefore, this paper proposes the following hypotheses: the coefficient signs of variables PGG and PEE are positive, that is, they are positively correlated with the tobacco trade volume. The coefficient signs of variables DIN and TAF are negative, that is, they are negatively correlated with the tobacco trade volume.

Table 2
Variables Selection

Variable	Implication	Theoretical Explanations	Data Sources
lnSUMijt	The natural logarithm of the trade volume between the two countries in year t	The trade volume between countries is an indicator that reflects the scale of foreign trade of a country in a certain period.The volume of trade is influenced by a combination of many factors.	World Bank Database, China Statistical Yearbook
lnPGGijt	In year t, China's GDP per capita is multiplied by that country's GDP per capita	GDP reflects the economic development of a country. The higher the level of economic development, the stronger the potential of foreign trade, and vice versa.	International Monetary Fund database, United Nations MBS data
lnDINijt	The geographical distance between two countries (or regions) in year t after taking the natural logarithm	The geographical distance between the two countries refers to the distance from one country to Beijing, the capital of China	Google map
lnPEEijt	The geographical distance between two countries (or regions) in year t after taking the natural logarithm	As for imports, a country with a large population has a large market size and a large demand for imports. For export, a country has a large population, sufficient labor force, relatively perfect industrial structure and a wide range of export categories. And vice versa.	IMF database
lnTAFijt	The bound tariff rate level of the two countries (or regions) in year t after taking the natural logarithm	The level of tax on imported goods directly affects the quantity of imported goods, and the level of tariff subsidy on export goods also affects the quantity of export goods.quantity of imports, and the level of tariff subsidies on export goods	World Bank database

Panel Data Selection

Panel data is a combination of time series data and cross-section data, which can avoid the shortcoming of time series data in multi-collinearity, provide more information and variation, reduce collinearity and improve estimation efficiency. This paper selects panel data from 2002 to 2018, mainly including per capita GDP, population size, geographical distance and tariff level of ASEAN, Japan and Korea, New Zealand and Australia. Currently, there is no uniform tariff among member countries. Under RCEP, China will implement five tariff schedules with Japan, Korea, Australia, New Zealand and the 10 ASEAN countries. In this paper, bound tariff rate is selected. Bound tariff rate refers to the tariff rate determined through WTO negotiations。In the participating countries of RCEP studied in this paper, the bound tariff rate covers more than 90% of all products, which is highly representative. Since Laos was included in the World Trade

Organization in 2014, it lacks the bound tax rate before 2014. Linear interpolation processing is made for this situation. The influence of tariff on trade flow will increase with the gradual reduction of tariff barriers.

DATA ANALYSIS

Sample Descriptive Statistics

Descriptive statistics are made for the selected samples, as shown in the following table. As can be seen from Table 2, the sample size of all the samples is 85, and the sample mean of each variable is between 2.5 and 18.47, which is within the maximum value range, indicating good reliability of the data.

In addition, the difference between the maximum and minimum values and the difference between the standard deviation values are small, indicating that the spatial variation of the data is small and the distribution is relatively concentrated.

Table 3
Descriptive Statistics of Related Variables

Variable	Sample observation	Mean value	Standard deviation	Minimum value	Maximum value
lnPGG	85	18.47	1.11	15.57	20.14
lnPEE	85	11.14	1.66	8.53	13.71
lnSUM	85	15.91	1.57	11.85	17.89
lnDIN	85	8.22	0.92	6.86	9.31
lnTAF	85	2.5	0.56	1.12	3.36

Model Test

Unit Root Test of Panel Data

Unit root test aims to test the stability of the variable and whether the result has the condition of false regression.In the unit root test, LLC, IPS and other tests are generally used for long panel data, while HT test is used for short panel data.In this paper, 16 years of data from 2002 to 2018 were selected as short panel data, so HT test was adopted.

Table 4
HT Test Results

Variable	Test value	Zstatistical magnitude	P Value	Result
lnSUM	-0.5422	-3.5232	0.0002	stable
lnPGG	-0.3766	-2.2839	0.0112	stable
lnPEE	-0.683	-4.5767	0	stable
lnDIN	-1.1568	-8.123	0	stable
lnTAF	-0.1411	-1.8211	0.0102	stable

As shown in Table 4, all variables passed the unit root test with a significance level of at least 5%. According to the results of HT test, each variable is stable and there will be no multi-collinearity and pseudo regression.

The Chow Test

Chow test, also known as Zou test, can test whether the linear regression coefficients of two different sets of data are equal and determine

whether structural changes exist. Zou test null hypothesis H0: the normal distribution of independent identically distributed residuals with unknown variance.If the null hypothesis is rejected, it means that the fixed effect or random effect model should be constructed. If the null hypothesis is not rejected, it means that the mixed effect model should be constructed. Table 5 shows the Chow test statistics and their values respectively.

Table 5
Statistics Construction Process

Process	Variable	Value
Sum of squares of residuals of mixed regression	rss_r	19.7741
Log-likelihood function values of mixed regression	ll_r	-58.633
The sum of squares of residuals in a bimodal effect model	rss_u2	11.0371
Log-likelihood functions for double fixed effects models	ll_u2	-33.851
Residual squares and degrees of freedom of a double-fixed effect model	df_u2	64
Individual number	N2	17
Length of time	T2	5
Chow tests the statistic F1	[(rss_r-rss_u2)/(N2-1+T2-1)]/(rss_u2/df_u2)	2.53313
5% significance level threshold F2	F(N2-1+T2-1,df_u2,0.05)	1.73674

Table 6
Random Effects Regression Results

Value	Coefficient	Standard Deviation	T Value	P Value	95% Level of Significance	
lnPGG	0.6729122	0.0576294	11.68	0.000	0.5599606	0.785863
lnPEE	0.7159206	0.0445033	16.09	0.000	0.6286957	0.803145
lnDIN	-0.546408	0.0698401	-7.82	0.000	-0.682404	-0.409524
lnTAF	-0.343618	0.1308065	-2.63	0.000	-0.4684263	0.2443259
Cons	0.21681	1.502823	0.14	0.000	-2.925798	2.96516
Statistical Magnitude						
F(4,80)	188.33		R^2-between	0.9308		
Prob>F	0.0000		R^2-overall	0.9040		

Random Effects Model Regression Results

Using STATA15 data processing software, random effect regression was performed on the samples, and the regression results were listed in Table 6.

Extract the coefficients in Table 6 and get the

trade gravity equation:

$$lnSUMijt=0.67\times lnPGGijt+0.72\times lnPEEijt - 0.55\times lnDINijt-0.34\times lnTAFijt+0.22$$

Results and Analysis

Model Significance Analysis

In the goodness of fit test, the closer the value of $R^2$is to 1, the better the coincidence degree between the regression line and the observed value is. From the perspective of statistics in Table 6, the goodness of fit is more than 0.9, which implies 90% of the information of the explained variable can be explained. Table 6 also shows that P value is zero, and F statistic passes the test at the significance level of 1%, indicating that the linear relationship between explanatory variable and explained variable is significant, and the overall explanatory level is good. All the coefficients pass the T test at the significance level of 1%, this means that the coefficient estimation is accurate.

Variable Coefficient Analysis

First of all, according to the variable coefficient of the empirical results in table 6, the coefficient of per capita GDP is 0.67, and the coefficient symbol is positive, which is the same as the predicted result. It indicates that the economic development level of a country is positively correlated with the trade scale. When per capita GDP increases by 1%, the trade volume increases by 0.67% correspondingly. The per capita GDP of a country can reflect the overall economic development of the country. The higher the per capita GDP, the higher the level of economic development. In accordance with relatively more complete industrial structure together with better living standard and consumption level of the population. As a result, the market is more active with strong demand and consumption power. Among the RCEP members, Japan and Korea have higher per capita GDP and corresponding higher trade levels.

Secondly, as shown in Table 6, the coefficient of population factor is 0.72, which is positively correlated. This is the same as the predicted result, and the close degree is higher than that of other factors. If a country's population increases by 1%, its trade volume increases by 0.72%. As mentioned above, the size of the population will affect the market size, demand, consumption level and industrial structure of a country or region. Japan and Korea are geographically close to China, and both are island countries. Taking Japan and Korea as an example, we compare and analyze the impact of population size on trade without considering the influence of other factors. Japan has an average population of 127 million, while Korea has an average population of 49 million. In terms of tobacco sales, tobacco sales to Japan and Korea in 2019, Japan tobacco sales of $26.9 billion, Korea tobacco sales of $13.2 billion, the difference between the two countries is closely related to demographic factors. In addition, China is a large country with a large population as well as market demand, so it is a big exporter to its partner countries. Therefore, China remains the main consumer market in China's trade with RCEP partners.

Thirdly, the coefficient of geographical distance factor is -0.55 in Table 6, which is negatively correlated with trade flows. The geographical distance between countries will increase the transportation cost of trade, and further more, restrict the scale of trade. Geographic distance also limits the kinds of products that can be imported or exported. For example, in the trade between China and New Zealand, the distance between the two countries is 11041.03 kilometers, while China mainly exports vegetables and fruits to New Zealand, which puts forward high requirements in terms of transportation technology and timeliness.

Fourth, Table 6 shows that the coefficient of tariff rate factor is -0.34, which is negatively correlated. This in line with the previous prediction. Tariff rates have always been an important factor affecting trade volume. High tariffs mean large trade costs, which will restrict the scale of trade and trade liberalization. Nowadays, world tobacco control activities promoting continuously, cigarette paperback influence in deepening, the traditional

tobacco sales falling, the new type of harm reduction products development momentum, the remarkable improvement in tobacco leaves a glut on the market, several big tobacco companies strategic emphasis to harm reduction products, new results appear differentiation, under new world tobacco industry structure changes. The establishment of RCEP has made an important decision on tariffs. It will gradually reduce tariffs and adopt a zero-tariff policy, which can avoid the vicious competition between countries due to tariffs to a certain extent. It will also promote the development of tobacco trade between China and ASEAN, Japan, Korea, Australia and New Zealand.

CONCLUSIONS AND DISCUSSION

Tobacco trade flows between the two countries are influenced by the country's economic development, population size, geographical distance and tariff rates. Trade scale is directly proportional to the level of national economic development and population scale, and inversely proportional to geographical distance and tariff rate. The geographical distance between countries includes cultural distance and geographical distance. Cultural distance between countries, including religious beliefs and customs, also has an important impact on trade. Cultural differences will limit the diversity of trade and affect the liberalization of trade. The geographical distance between countries affects the convenience of trade. The farther the distance between countries, the higher the transportation cost of trade, and may even limit the import and export of some goods. Tobacco storage has temperature, humidity, insecticidal and fire protection requirements. The highly automated production of tobacco production enterprises requires tobacco circulation enterprises to connect with them with the functions of real-time, accurate, tracking and controllable, which requires tobacco logistics to develop in the direction of highly information and automation. Therefore, it is necessary to improve the level of infrastructure construction and give certain policy and financial support to the construction of modern logistics. Throug h the construction of modern logistics facilities, build up the bridge and link of trade, break the regional restrictions, reduce the cost of transportation and warehousing. Accelerate the development of big data, artificial intelligence and other places to provide technical support for the development of modern logistics.

In 2019, the World Health Organization (WHO) released the seventh Edition of the World Tobacco Epidemic Report, which focuses on strengthening smoking cessation services. The United States has made great efforts to curb the use of e-cigarettes among young people, and more countries have strengthened regulations on e-cigarettes. In terms of traditional tobacco products, the number of smokers in the world remained stable, while cigarette sales slightly decreased. Cigarette markets in Japan, Korea and other places, which were heavily impacted by new tobacco products, gradually returned to stability, and the decline of tobacco sales narrowed. Tobacco sales in some emerging markets still increased, and non-cigarette categories maintained growth. In terms of new tobacco products, heated cigarettes continue to grow, and the consumption is still mainly concentrated in Japan, Korea, Russia and other places. Feimin International occupies an absolute dominant position. British American Tobacco has a good growth momentum, while Japan Tobacco and Imperial Brands are obviously lagging behind. E-cigarettes continue to grow, but the growth rate of e-cigarettes in the United States has slowed significantly, affecting the growth of the entire e-cigarette category.

The global tobacco market was worth more than 932 billion dollars in 2020 and is expected to grow at an annual rate of 1.8% from 2021 to 2028. Despite the fact that the tobacco industry has faced tougher regulations and changes in consumer health awareness over the past few years, top tobacco companies remain among the highest paid companies in the world and the largest taxpayers in the world[12]. There are more than 1 billion adult smokers worldwide, and total global tobacco production reached 8.2 million tons in

2018 and is expected to reach around 9.1 million tons by 2024. Total tobacco sales in 2018 were about 814 billion dollars. More than 700 billion dollars of that comes from sales of traditional cigarettes, with 5.3 billion cigarettes consumed each year. In recent decades, tobacco demand has shifted from developed regions such as North America and Europe to countries such as Asia and Africa.

RCEP member countries can take advantage of the advantages of population and geographical distance to strengthen mutual influence and penetration of tobacco culture, and make targeted concessions on tobacco tariff rates to promote the development of tobacco trade in the region. For example, member states can further expand the marketing channels of internal tobacco trade, raise external barriers, and appropriately restrain the entry of foreign competitors, so as to realize a virtuous cycle of production and consumption in the region. In addition, member states should strengthen the brand building of the tobacco industry and realize the international division of labor and value chain optimization within the region.

Author Declaration

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