International Trade Barriers and Countermeasures of Chinese Medicinal Materials Based on Big Data

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Abstract. With the development of global big data and trade liberalization, tariff barriers are gradually weakened, while technical trade barriers, mainly in the form of technical regulations, standards, and conformity assessment procedures, are constantly strengthening. Affected by this, in recent years, my country's traditional Chinese medicine industry has also suffered technical trade barriers from various countries, and the export of Chinese medicine has been seriously affected. In this regard, the purpose of this article is to study the international trade barriers and countermeasures of Chinese herbal medicines based on big data. This article first expounds the meaning of technical barriers to trade in traditional Chinese medicines, and classifies them according to the form and substance of technical barriers to trade in traditional Chinese medicines. The experimental results indicate that an anti-technical trade barrier service system for the Chinese medicine industry must be established as soon as possible. The industry association must give full play to its communication and coordination role, reduce the number of Chinese medicinal materials rejected by foreign countries to less than 31 batches, and provide suggestions for the government and enterprises. Innovative ability, establish the concept of quality management, and face the technical trade barriers of traditional Chinese medicine with a positive attitude.

Keywords: Big Data Analysis Technology, International Trade of Chinese Medicinal Materials, Barriers and Countermeasures, Data Mining Algorithm

1. Introduction
With the rapid development of global big data, international trade barriers have become more and more serious in recent years. A considerable number of my country's export products have been blocked, and various industries have suffered unprecedented technical trade barriers [1-2]. The Chinese medicine industry has also suffered severe restrictions on technical trade measures from various countries, and the export of Chinese medicine has been severely affected [3-4]. Our country is a large traditional Chinese medicine country with unique advantages in terms of Chinese herbal medicine
resources, Chinese medicine theory, labor prices, but China's share of the international Chinese medicine market is only about left and right. An important reason for this situation is the problem of foreign technical trade barriers \[5-6\]. Faced with the numerous technical trade barriers set up by foreign countries, especially developed countries, on traditional Chinese medicine, my country is actively taking measures \[7\].

At present, with the continuous development of trade liberalization, using big data and other related technologies, many domestic and foreign scholars and experts have conducted related research on international trade \[8\]. In foreign countries, Kageyama built an algorithmic trading model system through the use of multiple probability formulas, and used a large amount of stock data to test the algorithmic trading system to empirically demonstrate the feasibility of the quantitative trading model \[9\]. In China, Fei Zhang analyzed and studied a large number of quantitative trading models and strategies at home and abroad, combined with their own learning, work experience and theoretical knowledge, absorbed the advantages of these quantitative trading models, developed a new set of quantitative trading models, and proved them through actual demonstrations. The practicality of the model \[10\].

Based on the big data perspective, this paper studies the international trade barriers and countermeasures of Chinese medicinal materials. This article first expounds the meaning of technical trade barriers to traditional Chinese medicine, and summarizes the main technical trade barriers that Chinese traditional medicines in my country face when they enter the international market. This article puts forward the principles and strategies for dealing with technical trade barriers of traditional Chinese medicine based on the existing problems. We should learn from the successful listing experience at home and abroad, update the business philosophy, gradually move towards the first-class national standards, increase research and development, ensure quality, strengthen information collection, put a right attitude, and adopt a positive attitude to deal with technical trade barriers.

2. Technical Research on the International Trade Barriers and Countermeasures of Chinese Medicinal Materials Based on Big Data

2.1. Big Data Analysis Technology

As the core process of big data information processing, data analysis is very rich in research. Generally, the data processing process can be summarized into four steps, namely data collection, data import and preprocessing, statistical analysis, and data mining. Each step involves some commonly used processing modes and core algorithms.

(1) Data dimensionality reduction processing

The complexity of current data continues to increase, and the demand for processing high-dimensional data is greatly increased. While the increase in data dimensions describes data characteristics from more aspects, the uneven data quality in each dimension sometimes affects the performance and results of data analysis.

(2) Analysis of missing value ratio

This method believes that a large number of missing values in a certain dimension of the data means that the usefulness of the information in this dimension is low. After the degree of missing exceeds a certain range, even if data rearrangement or data cleaning methods are used for it, data information cannot be effectively supplemented. Therefore, a threshold for the missing proportion can be specified. The dimensions whose missing degree exceeds this threshold are discarded. The selection of the threshold should refer to the overall lack of data in each dimension, and avoid using too high a threshold to filter out too many attributes and affect analysis.

(3) Low variance filtering

This method believes that data attributes with small degree of data change and limited fluctuation range contain less data information and can be selected to be removed. The index to determine the degree of data change uses the normalized data variance. The reason why the data needs to be normalized is because the value range of the data will affect the variance of the data, so the data can be
normalized and compared.

(4) High correlation filtering
The high-correlation filtering method believes that the trend of changes between the attributes with higher correlation is roughly the same, and the information they contain is also relatively similar. The correlation between data dimensions can be obtained by calculating correlation coefficients for different dimensions of data. It should be noted that the calculation of the correlation coefficient also requires normalization of the data. A core attribute can be reserved between multiple attribute dimensions with strong correlation for analysis and calculation.

2.2. Barriers and Countermeasures
By summarizing the technical trade barriers encountered by traditional Chinese medicines in the international market, according to the substance, this article divides the technical trade barriers of traditional Chinese medicines into two major security barriers and green barriers.

(1) Security barriers
Security barriers refer to measures that are directly or indirectly taken to restrict or even prohibit trade on the grounds of protecting personal health and national security. First, traditional Chinese medicine faces the same safety barriers as other consumer products. Because most of the relevant technical standards are demanding, and the companies do not fully understand the relevant standards and regulations, Chinese traditional Chinese medicine products often can only be sighed.

(2) Green barriers
Green barriers refer to measures that restrict or even prohibit trade directly or indirectly in order to protect the environment and protect the lives and health of animals and plants. Traditional Chinese medicine comes mostly from animals and plants, and is greatly affected by green barriers. Moreover, Chinese companies have weak environmental awareness. Green barriers have a huge impact on the export of Chinese medicine.

2.3. Data Mining Algorithm
When using big data analysis technology to analyze barriers and strategies, it is necessary to reorganize and integrate information from multiple databases or other data sources, and provide a unified user interface for a certain topic application at the upper level. With the support of Probit model, the query, analysis and decision-making of strategy data can be completed directly. The related algorithm is as follows.

Suppose y is a dichotomous variable with a value of 0 or 1, and the value of y is related to x. Then the probability of the value of y depends on x, denoted as:
\[ p(y = 1|x) = \pi(x) \]

Assumption:
\[ \pi(x) = \phi\left(\alpha + \sum_{k=1}^{K} \beta_k x_k\right) \]

By finding the inverse function of the standard cumulative normal distribution function, we can get:
\[ \phi^{-1}(\pi(x)) = \alpha + \sum_{k=1}^{K} \beta_k x_k \]

Where \( \alpha, \beta \) is the parameter, \( \phi() \) is the standard normal cumulative distribution function. For all possible values of x and \( \beta, \pi(x) \) is always between 0 and 1.

Let s be the training sample data set, and the category identification attribute in s has m independent values, that is, m classes are defined, i=1, ..., m, \( R_i \) is the subset of the data set s.
belonging to the $C_i$ class, and the number of tuples in the subset $R_i$ is expressed by $r_i$. The expected information amount of set $s$ in classification can be given by the following formula.

$$I(r_1, r_2, \ldots, r_m) = -\sum_{i=1}^{m} P_i \log_2 (P_i)$$

(4)

Where $P_i$ indicates the probability that any sample belongs to $C_i$ class, $P_i = r_i / |S|$, where $|S|$ is the number of tuples in the training sample data set.

If $S_{ij}$ indicates the number of tuples belonging to $S_j$ class in subset $C_i$, the entropy of attribute $A$ for classification $C_i(i = 1, 2, \ldots, m)$ can be calculated by the following formula.

$$E(A) = \sum_{j=1}^{m} \frac{S_{ij} + \cdots + S_{mj}}{|S|} f(S_{ij}, \cdots, S_{mj})$$

(5)

3. Experimental Research on the International Trade Barriers and Countermeasures of Chinese Medicinal Materials Based on Big Data

3.1. Experimental Data

This article selects the relevant Chinese medicinal materials trade website as the research object. In order to ensure the validity and representativeness of the research, we conduct relevant verifications. This article takes foreign FDA rejected products as an example. The batches of Chinese medicine products rejected from January 2003 to February 2008: 36 batches in 2003, 31 batches in 2004, 77 batches in 2005, 51 batches in 2006, 62 batches in 2007, 57 batches in 2008. Among the batches of TCM products rejected by the FDA, 158 batches of proprietary Chinese medicines, 21 batches of Chinese medicinal materials, and 76 batches of others.

3.2. Experimental Process

This article uses big data statistics and analysis on the Chinese herbal medicine trade website, and uses theoretical models to analyze the impact of TCM technical trade barriers on international market equilibrium, TCM technical trade barriers restricted countries and TCM technical trade barriers restricted countries. And draw line graphs and histograms based on relevant data, analyze the impact of Chinese medicinal materials international trade barriers on Chinese medicinal materials, and then propose relevant strategies.

4. Experimental Analysis of International Trade Barriers and Countermeasures for Chinese Medicinal Materials Based on Big Data

4.1. Impact of Chinese Medicinal Materials Trade Barriers on the Equilibrium of the International Market

In the short term, technical barriers to trade in traditional Chinese medicine are very rigid. As long as the products of the restricted country do not meet the requirements of the restricted country, it is impossible to enter the market of the restricted country. The restricted country is a developing country and is subject to production technology. From a long-term perspective, countries with technical barriers to trade in traditional Chinese medicine are subject to technological improvement, which increases their production costs, shifts the supply curve to the left, and forms a new equilibrium price and quantity. As shown in Figure 1 and Figure 2.
In Figure 1, $D$ is the import demand curve and $S$ is the export supply curve. The reduced supply elasticity makes the supply curve change from $S$ to $S_1$ or even $S_2$. The equilibrium output decreases from $Q$ to $Q_1$ or $Q_2$, and the equilibrium price keeps rising.

In Figure 2, $D$ is the import demand curve and $S$ is the export supply curve. The left shift of the supply curve is from $S_1$ to $S_2$. The corresponding equilibrium output $Q_1$ drops to $Q_2$ and the equilibrium price is also rising.

Through the analysis of the above two situations, it is concluded that technical trade barriers restrict trade flows and affect the export volume of restricted countries. The loss of restricted countries is related to the elasticity of import demand for traditional Chinese medicines in restricted countries. The greater the loss, the greater the loss. At present, the main markets for Chinese medicine exports are...
Asia, the European Union and the United States. Since Chinese medicine is currently replaceable in foreign countries, it is not very important for consumers. The market scope small, so the demand elasticity is greater. Compared with the European Union and the United States, the history of the use of Chinese medicine in the Asian market has been more than 1,000 years, and the demand elasticity is relatively small.

4.2. Big data Analysis of The Impact of Chinese Herbal Medicine Trade Barriers on My Country's Chinese Medicine Industry
In order to overcome technical barriers to trade in Chinese medicine exports, companies must invest more funds in advance. Small companies that are not strong and lack financial support will increase export costs. Because they cannot afford the export costs, they have to withdraw from the international market, or cannot meet the mandatory standards of exporting countries, they have to withdraw from the market. Take the US FDA rejected products as an example, as shown in Table 1 and Figure 3.

| Years | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|-------|------|------|------|------|------|------|
| Product batch number | 36   | 31   | 77   | 51   | 62   | 57   |

**Figure 3.** Number of batches rejected by the FDA
It can be seen from the survey data that from 2003 to 2008, the number of Chinese medicines rejected by the FDA fluctuated, and the total number of rejected Chinese medicines increased. Most of the rejected Chinese medicines are 154 in the form of Chinese patent medicines, while the others are 98. On the one hand, Chinese patent medicines are easily rejected for export due to their complex ingredients and unclear mechanism.

5. Conclusions
Based on big data, this paper studies the international trade barriers and countermeasures of Chinese herbal medicines. This chapter firstly analyzes the impact of TCM technical trade barriers on the international market equilibrium, TCM technical trade barriers restricted countries and restricted countries through theoretical models, and then expounds the positive and negative effects of TCM
technical trade barriers on my country's traditional Chinese medicine industry. And according to the content and reasons of technical trade barriers suffered by traditional Chinese medicine, combined with the actual situation of our country, we propose specific countermeasures. Cultural propaganda and other industry associations guide companies to adopt international standards, strengthen their role as an information hub, and other companies to increase R&D efforts, strengthen information collection, strengthen environmental awareness, and adopt what a major country should have, and be brave to cross trade barriers.

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