



# A New Modeling and Analysis Approach of Overseas Tax Reform Requirements

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**Abstract.** Along with the explosive development of the Internet, the domestic consumer's consumption level unceasing enhancement, more and more to pursue high quality life, in order to meet the needs of their own and vanity and living out of a way of shopping - overseas procurement agent. Because of the explosive growth of overseas procurement agent, there are also many problems, so it is very important to standardize law and institutionalize the overseas procurement agent behaviors. Based on overseas procurement agent tax reform the necessity of the implementation of the new deal as the research subject, firstly describes the present situation of overseas procurement agent at home and abroad, mainly through the analysis of existing problems for overseas procurement agent behavior and overseas procurement agent tax reform the superiority of the new deal implementation and influence, clearly put forward the necessity of overseas procurement agent tax reform new deal implementation. Second, to overseas procurement agent problem which caused by the tax reform after implementation of the new deal to make further analysis, and cross-border electricity enterprise itself from the government management and so on different levels and a new modeling and analysis method for foreign tax reform demand is established. Finally, the simulation results show the effectiveness of the method.

**Keywords:** Overseas procurement agent · Tax reform new deal · Cross-border

## 1 Introduction

With the booming development of the international market, the living standards of domestic consumers are constantly improving. To meet their own needs and vanity, “overseas purchasing” has emerged as a shopping method. In April 2016, China implemented a new tax policy on cross-border e-commerce retail imports [1]. Overseas purchasing tax is a kind of tax levied on overseas purchasing behavior [3]. Since the introduction of the new policy, many goods that are not supported by direct mail to China can now be directly mailed without transshipment, so that consumers can purchase them more directly and enjoy all after-sales services.

R. Doernberg proposed a tax scheme on cross-border e-commerce from the perspective of tax jurisdiction. He advocated that the business income of cross-border e-commerce should be taxed with reference to the investment income. Blair Hergman proposed to separate e-commerce sellers into smaller sellers, and exempted enterprises with annual income less than \$500,000 from Sales Tax [2]. Ning Lizhen (2017) believes that there are many problems in existing cross-border e-commerce, and relevant regulatory policies are not formulated and implemented in a timely manner, resulting in poor product quality and infringement of consumers' rights and interests. F. Mengyan (2016) proposed the impact of the tax reform on cross-border e-commerce enterprises after the implementation of the new policy, as well as its future development direction. Yang Yuanjian (2014) proposed the necessity of taxation on e-commerce from three aspects. Li Mengzhe (2016) analyzed the difficulties faced by individuals, enterprises and government agencies, and proposed to increase product categories and improve service quality for cross-border e-commerce, while regulators should strictly implement regulations and build a comprehensive information system, so as to better cope with the new environment brought by the new policy.

Overseas purchasing refers to that individuals post information through WeChat, Weibo or e-commerce platforms like Taobao to buy foreign products for domestic consumers [3]. With the development of the Internet, domestic consumers can learn about and buy foreign goods through online platforms. And with the increase of people's disposable income, many people pay more and more attention to and pursue high-quality goods to meet their own life and the sense of enjoyment it brings. Therefore, in order to meet their own needs and vanity of a form of shopping - overseas purchasing. This model relies on the rapid development of various electronic network platforms based on the Internet, while overseas purchasing has gradually become a full-time job for some people. Therefore, we need to establish a model to describe the overseas tax strategy.

## 2 Modeling Method for New Tax Reform

**Comparison of the Old and New Policies.** Before the tax reform and new policy, in order to vigorously develop the cross-border e-commerce industry, the country mainly implemented the postal tax policy, and levied the postal tax for individual purchasing on behalf of individuals. At that time, the cross-border e-commerce tax was also levied according to the postal tax.

After the tax reform policy, China will implement the cross-border e-commerce retail import tax policy. The specific contents of the policy are as follows: (1) the change of the postal tax policy is to raise the limit of a single transaction from 1000 yuan to 2000 yuan (800 yuan in Hong Kong, Macao and Taiwan) [3]; (2) set the annual limit of individual trading volume as 20,000 yuan. Within the limit of the trading volume, the tariff rate shall be zero. A single transaction exceeding a single limit value, a single transaction exceeding an individual's annual limit value after accumulation, and a single indivisible commodity whose customs value exceeds the limit value of 2000 yuan will be taxed in full according to the general trade method [1].

The classification of postal and postal taxes has also changed from the original four categories to three categories. The categories before the adjustment include: 10%, 20%, 30% and 50%, while the categories after the adjustment include: 15%, 30% and 60%. Only the categories and tax rates are adjusted, and the 50-yuan tax exemption

remains unchanged [4]. As can be seen from Table 1, although the tax reform and new policies are mainly introduced for cross-border e-commerce, increasing the pressure on small and medium-sized enterprises of cross-border e-commerce, from the perspective of long-term development, it is conducive to the future development of cross-border e-commerce industry. And for the individual purchase, this tax reform New Deal may be a small benefit. As the following table shows:

**Table 1.** Comparison of tariff items before and after the adjustment of postal tariff and cross-border e-commerce retail

Commodity category	Price	Tax rate changes		
		Line post tax		Cross-border e-commerce tax
		Before tax reform	After tax reform	After tax reform
Daily necessities, food, etc.	Less than 500 yuan	Tax rate of 10% Less than 50 yuan is exempted	15%	VAT: 70% of 17% levy
	More than 500 yuan	Tax rate of 10%	15%	VAT: 70% of 17% levy
Cosmetics	Less than 100 yuan	Tax rate of 50% Less than 50 yuan is exempted	60%	VAT: 70% of 17% levy Consumption tax: 70% of 30% Value added tax: the sum of customs duty and consumption tax multiplied by 17% Consolidated tax: about 52.51%
	More than 100 yuan	Tax rate of 50%	60%	VAT: 70% of 17% levy Consumption tax: 70% of 30% Value added tax: the sum of customs duty and consumption tax multiplied by 17% Consolidated tax: about 52.51%
Skin care cosmetics, personal care	Less than 100 yuan	Tax rate of 50% Less than 50 yuan is exempted	30%	VAT: 70% of 17% levy
	More than 100 yuan	Tax rate of 50%	30%	VAT: 70% of 17% levy
Light luxury clothing, bedding fabrics, electrical appliances	Less than 250 yuan	Tax rate of 20% Less than 50 yuan is exempted	30%	VAT: 70% of 17% levy
	More than 250 yuan	Tax rate of 20%	30%	VAT: 70% of 17% levy

**Advantages of Overseas Purchasing Tax Reform.** Purchased overseas tax reform after the implementation of the New Deal, small cross-border e-commerce platform and individual purchased overseas gradually lose their respective advantages, making large cross-border e-commerce situation, to form the benign competition between businesses and greatly struck in order to obtain profits dividend not only attaches importance to product quality and after-sales service of act as purchasing agency. The implementation of the new policy is conducive to the stable development of large cross-border e-commerce enterprises, and standardizes the consumer market in the overseas purchasing industry.

We use linear regression analysis to model the problem as follows:

$$\hat{Y} = a + bx \tag{1}$$

where  $x$  and  $\hat{Y}$  denotes the independent and dependent variables, respectively;  $a$  and  $b$  are parameters of linear regression equation with one variable. We can obtain the following formula:

$$\begin{cases} a = \left( \sum_{i=1}^n Y_i/n \right) - b \left( \sum_{i=1}^n X_i/n \right) \\ b = \frac{n \sum_{i=1}^n X_i Y_i - \sum_{i=1}^n X_i \sum_{i=1}^n Y_i}{n \sum_{i=1}^n X_i^2 - \left( \sum_{i=1}^n X_i \right)^2} \end{cases} \tag{2}$$

For the convenience of calculation, we make the following definitions:

$$\begin{cases} S_{xx} = \sum_{i=1}^n (X_i - \bar{X})^2 = \sum_{i=1}^n X_i^2 - \left( \sum_{i=1}^n X_i \right)^2 / n \\ S_{yy} = \sum_{i=1}^n (Y_i - \bar{Y})^2 = \sum_{i=1}^n Y_i^2 - \left( \sum_{i=1}^n Y_i \right)^2 / n \\ S_{xy} = \sum_{i=1}^n (X_i - \bar{X})(Y_i - \bar{Y}) = \sum_{i=1}^n X_i Y_i - \left( \sum_{i=1}^n X_i \right) \left( \sum_{i=1}^n Y_i / n \right) \end{cases} \tag{3}$$

where  $\bar{X} = \frac{\sum_{i=1}^n X_i}{n}$ ,  $\bar{Y} = \frac{\sum_{i=1}^n Y_i}{n}$ , based on the definition of  $a, b$  we can get the solution as follows:

$$\begin{cases} a = \bar{Y} - b\bar{X} \\ b = S_{xy}/S_{xx} \end{cases} \tag{4}$$

AB is introduced into the equation  $\hat{Y} = a + bx$ . As long as  $x$  is given, the  $\hat{Y}$  value can be predicted. The above cases are suitable for linear model. But for nonlinear models, curves are needed for modeling. The least square method is a kind of mathematical optimization technology. It finds the best function matching of data by minimizing the sum of squares of errors. Using the least square method, unknown data can be easily obtained, and the square sum of the errors between the obtained data and the actual data is minimized.

Given the function  $y = f(x)$  and the function values  $y_1, y_2, \dots, y_n$  at points  $x_1, x_2, \dots, x_n$  are given.

The polynomial  $p(x) = a_0 + a_1x + a_2x^2 + \dots + a_nx^k$  makes

$$\min = \sum_{i=1}^k (p(x_i) - y_i)^2 \tag{5}$$

In order to obtain a value of load condition, the right side of equation  $a_i (i = 0, 1, 2, \dots, k)$  to find the partial derivative, the result is  $k + 1$  equations

$$\begin{aligned} -2 \sum_{i=1}^n [y - (a_0 + a_1x + \dots + a_kx^k)] &= 0 \\ -2 \sum_{i=1}^n [y - (a_0 + a_1x + \dots + a_kx^k)]x &= 0 \\ \dots \\ -2 \sum_{i=1}^n [y - (a_0 + a_1x + \dots + a_kx^k)]x^k &= 0 \end{aligned} \tag{6}$$

By sorting out the equations, the following results are obtained

$$\left\{ \begin{aligned} na_0 + \left(\sum_{i=1}^k x_i\right)a_1 + \dots + \left(\sum_{i=1}^k x_i^k\right)a_k &= \sum_{i=1}^k y_i \\ \left(\sum_{i=1}^k x_i\right)a_1 + \left(\sum_{i=1}^k x_i^2\right)a_2 \dots + \left(\sum_{i=1}^k x_i^{k+1}\right)a_k &= \sum_{i=1}^k x_i y_i \\ \left(\sum_{i=1}^k x_i^k\right)a_1 + \left(\sum_{i=1}^k x_i^{k+1}\right)a_2 \dots + \left(\sum_{i=1}^k x_i^{2k}\right)a_k &= \sum_{i=1}^k x_i^k y_i \end{aligned} \right. \tag{7}$$

The following equation can be obtained:

$$\begin{bmatrix} n & \sum_{i=1}^n x_i & \dots & \sum_{i=1}^n x_i^k \\ \sum_{i=1}^n x_i & \sum_{i=1}^n x_i^2 & \dots & \sum_{i=1}^n x_i^{k+1} \\ \vdots & \vdots & \ddots & \vdots \\ \sum_{i=1}^n x_i^k & \sum_{i=1}^n x_i^{k+1} & \dots & \sum_{i=1}^n x_i^{2k} \end{bmatrix} \begin{bmatrix} a_0 \\ a_1 \\ \vdots \\ a_k \end{bmatrix} = \begin{bmatrix} \sum_{i=1}^n y_i \\ \sum_{i=1}^n x_i y_i \\ \vdots \\ \sum_{i=1}^n x_i^k y_i \end{bmatrix} \tag{8}$$

A nonlinear fitting equation can be obtained by the above method.

We can see from the above relationship. The higher the price of goods, the lower the tax rate charged. On the contrary, the lower the price of imported goods, the higher the tax rate. Through the simulation of the model, we can determine the tax rate of import goods at different prices.

### 3 Problem Statements and Analysis Method

There are many imperfections in the tax policy of overseas procurement. Especially after the implementation of the new policy, the workload of customs officers will increase and the pressure will increase. Moreover, relevant tax laws and regulations have not been formulated and improved in time, and the implementation efficiency is not high. With the implementation of the new tax reform, the cost of goods purchased overseas will also increase, and the price of goods will also rise, which may lead to the imbalance of consumers' psychology and reduce the amount of goods purchased. Therefore, to regain the confidence of consumers, cross-border enterprises need to improve the quality of their products and their services.

One of the main development drivers of overseas purchasing is the relatively low price of goods abroad compared with that at home. The attention to commodity price indicates that the consumption of domestic consumers is still in a stage of emphasizing commodity price. So once the implementation of overseas purchasing tax reform New Deal, foreign commodity prices imported to the domestic will increase accordingly. Personal overseas purchasing and overseas purchasing platforms import goods of the same quality from abroad compared with the goods of domestic import brand agency physical stores, in terms of price, there is no difference between the two. At the same time, domestic consumers also pay attention to the type and quality of goods, they go abroad to improve their living standards and satisfy their inner vanity. Therefore, once the tax reform of overseas purchasing is implemented, the increased tax costs of cross-border e-commerce enterprises will eventually be passed on to consumers through product prices [7]. In order not to lose money, the enterprises have to increase the price of their products, which will eventually lead to the reduction of consumers' purchase, but will not have a great impact on the domestic retail of consumer goods. Therefore, in the short term, it will only restrain consumers' consumption of cross-border online goods and limit their behavior of overseas purchasing.

$$y = f(x) + \varepsilon \quad (9)$$

where  $\varepsilon$  is the error term satisfying Gaussian distribution. After that, the least square method is still used to obtain the best model curve.

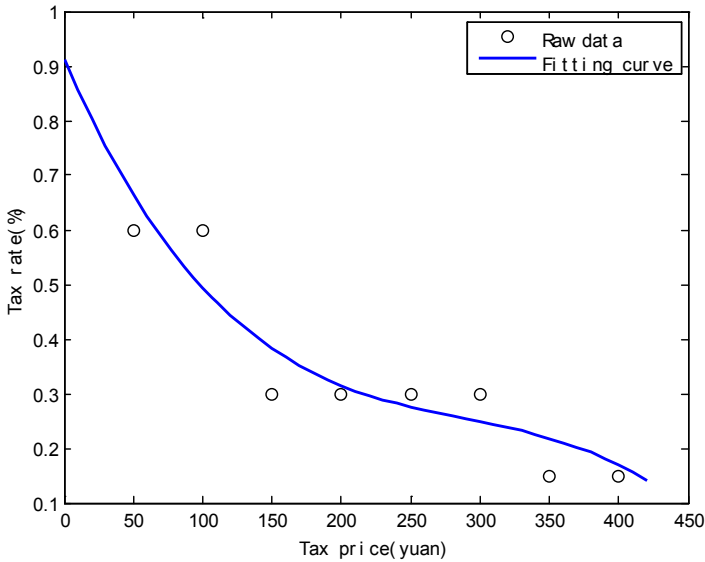
Define and standardize the rules after the new tax reform. The implementation of the new policy will inevitably contradict the old policy, that is, the implementation of the new policy needs to constantly formulate other rules to supplement. The new tax reform policy for overseas purchasing agents is quite different from the original postal tax policy in terms of taxation, supervision and industry norms, which requires a relatively smooth transition period and timely formulation of detailed regulations to supplement, so as to facilitate the understanding of customs staff and consumers and ensure the correct implementation of the new tax reform policy. However, the new policy was announced in the form of a “notice” [10], and no official document was issued, nor specific operation and implementation rules of the customs were formulated. In addition, the limit value of imported goods and the starting time of the limit are not clearly specified, and the treatment of goods beyond the limit is not specified. If the detailed rules of relevant regulations are not issued, it may lead to different understandings in the collection of customs in different places, resulting in inconsistent basis for collection, and ultimately leading to inconsistent implementation methods.

Optimize the import supervision mode and improve the efficiency of customs enforcement. Customs import regulations at present stage, mainly through artificial means of regulation in the form of mail, parcels of entry, such as at a reasonable number (mainly for personal use) standard, and the number of reasonable strong subjectivity exists in the judgment, therefore, will appear different customs officers on the same piece of imported items may appear different results. Therefore, to avoid the above situation, it is necessary to optimize the import supervision mode, so as to reduce the working pressure of customs officers and improve the efficiency of customs enforcement. First, we need to change the traditional way of supervision from manual supervision to equipment supervision. We can introduce advanced technology or equipment from abroad, or conduct independent research and development. Connected with the equipment through the internal network of the customs, parcel post can be tracked from entry, port of arrival, unloading, inspection and a series of other links, providing information records, so as to reduce the pressure on the customs staff and improve the working efficiency of the customs [13]. The second is to the New Deal reform, the first to vigorously publicize the latest policy knowledge, the second to the relevant staff for professional training, improve work efficiency, to avoid staff on the relevant business of ambiguity, error.

A new regression model was established by adding Poisson distribution to the right side of model 3. In Eq. (9)  $\varepsilon$  is the error term satisfying Poisson distribution.

## 4 Simulation Experiments and Analysis

Now we validate our method via a simulation experiment. Fig. 1 plots the impact of overseas purchasing tax reform new policy compared with existing policies. We can see that after adding the error with Gaussian distribution, the curve of the model has changed slightly. However, it can be seen that the overall curve trend has not changed significantly. However, there is a higher tax rate for high price goods and higher tax rate for low-cost goods. This also shows that in order to protect state-owned enterprises, China adopts a higher tax rate policy for low-cost imported goods. Therefore, the tax rate can be adjusted according to the simulation diagram.

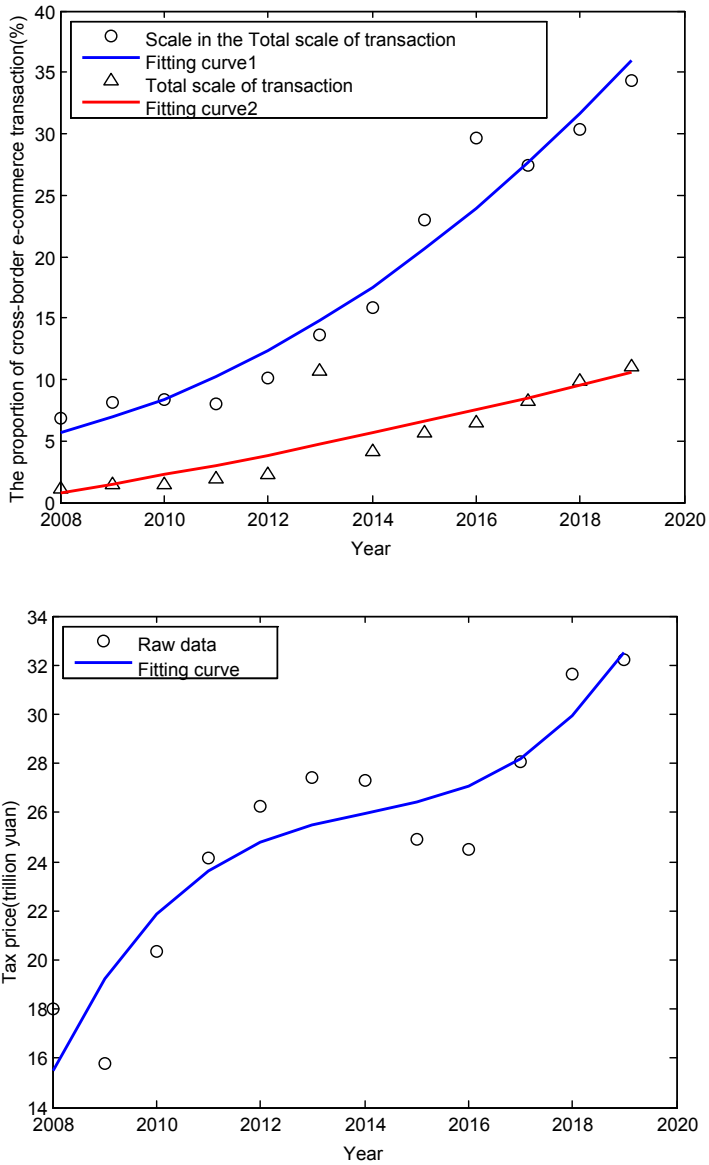


**Fig. 1.** Impact of overseas purchasing tax reform new policy compared with existing policies.

In Fig. 2, we simulate and analyze the error data with exponential distribution. Figure 2 shows the impact of overseas purchasing tax reform and new policy on national tax revenue. In Fig. 2 (a), it can be seen that there are obvious changes in the data, the overall trend of the model curve obtained does not change significantly. On the whole, the trade volume of import and export shows a trend of increasing year by year, and the growth rate is higher and higher, which corresponds to the current situation of China's good economic development. It shows that the model is suitable for the actual development. And Fig. 2 (b) shows that the current proportion of e-commerce is further expanding. With the rapid development of Internet companies and the rapid development of Internet companies, e-commerce has been developing rapidly. This also proves that the model can describe the current development trend. Cross platform e-commerce has a large scale, and can provide better support for international trade, can provide more tax. The above results can be used to provide the basis for future tax policy-making.

Figure 3 plots the impact of overseas purchasing tax reform and new policies on household consumption. In Fig. 3, we simulate and analyze the error data with exponential distribution. It can be seen that although there are obvious changes in the data, the overall trend of the model curve obtained does not change significantly. On the whole, the trade volume of import and export shows a trend of increasing year by year, and the growth rate is higher and higher, which corresponds to the current situation of China's good economic development. It shows that the model is suitable for the actual development. And figure B shows that the current proportion of e-commerce is further expanding. With the rapid development of Internet companies and the rapid development of Internet companies, e-commerce has been developing rapidly. This also proves that the model can describe the current development trend. Cross platform e-commerce has

a large scale, and can provide better support for international trade, can provide more tax. The above results can be used to provide the basis for future tax policy-making.



**Fig. 2.** Impact of overseas purchasing tax reform and new policy on national tax revenue.

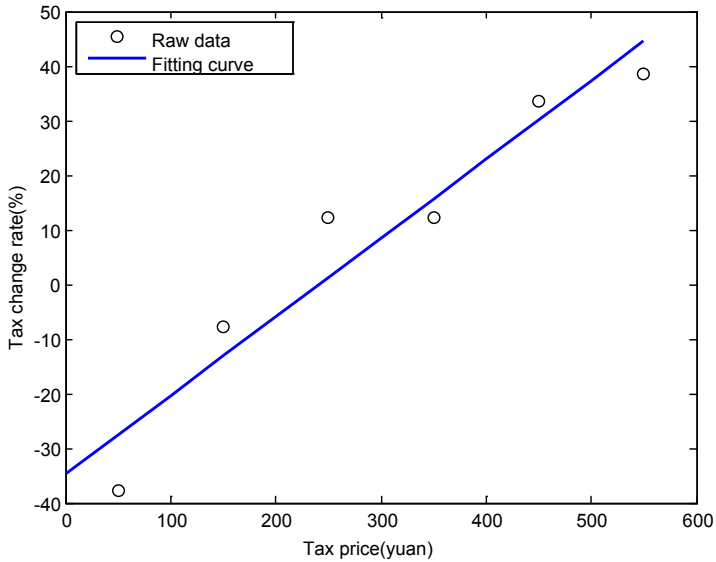


Fig. 3. Impact of overseas purchasing tax reform and new policies on household consumption.

## 5 Conclusion

With the vigorous development of the international market, the living standards of domestic consumers are constantly improving, and domestic products can no longer meet the needs of consumers. In order to meet their own needs and vanity, “overseas procurement” came into being. Before and after the introduction of the new tax policy, the main purpose of this reform is to levy personal tax on postal industry. At that time, cross-border e-commerce tax was also levied according to postal tax. After the introduction of tax reform policy, China will implement cross-border e-commerce retail import tax policy. Through the analysis of tax data in recent years, we construct three different simulation models. The three models describe three different aspects. Through simulation, the first one describes the relationship between different types of import and export commodities and different import and export price and tax rates. The second result is a description of the current changes in international trade. The third is the impact of changes in tax policies. The three models through simulation experiment have good prediction ability. It is a new modeling and analysis method for the demand of foreign tax system reform. Based on this, this paper provides suggestions on tax policy.

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