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Research on Levying of Extending VAT Tax of Transportation Industry Based on Fuzzy TOPSIS

Wei Du*

Taiyuan Institute of Technology, Department of Economics and Management, Taiyuan, 030008, China

Abstract: In this paper, we endorsed expending in VAT should be implemented step by step. Then we select the transportation industry as the breakthrough point, by combining qualitative analysis and quantitative analysis methods and analyze tax pass-through effect, enterprise behavior effect and resource allocation effect between sales tax and VAT. It is made some correction based on the traditional measurement indicators and analyzed the current situation of our transportation industry's tax burden, description the necessity of changing transportation industry form business tax to VAT and the feasibility of this change. It is analyzed the taxpayer identity, tax rate and tax preference after the reform in the basis of TOPSIS. On the basis of simulation and transportation industry characteristics, we get a logical VAT rate. We analyze the economic effects and financial income because of transportation industry business tax into VAT.

Keywords: Book-tax differences, business tax into VAT, fuzzy TOPSIS, the value added tax (VAT), transportation industry.

1. INTRODUCTION

VAT is engaged in the sale of goods or provision of processing, repairs and replacement services and the importation of goods made by units and individuals based on value added levied as a tax system. Tax Theory was born in the United States, as early as the end of World War I, Professor Adams of Yale University, Wilhelm as government consultant and businessman, Dr. Million Simmons put forward the idea of value-added tax, which is the sprout of value-added Tax ideas. After World War II, France is the world's first country to implement VAT, the financial officials in France, Maurice .Laurel proposed to replace business tax with the idea of value-added tax in 1946, France officially adopted the value-added tax system in 1948. According to the World Bank, the world's 130 countries and regions have implemented VAT. 80 years of the 20th century China introduced VAT as a pilot work. Until December 13, 1993, the State Council issued Decree 134, the "Provisional Regulations of People's Republic of China value-added tax" [1]. On December 25, the Ministry of Finance issued the "People's Republic of China' Provisional Regulations on Value Added Tax Rules for the Implementation", and both at the same time take a nationwide implementation on January 1, 1994 [2, 3].

In 1994, China implemented the tax reform, tax sharing between national tax and local tax. At that time, double main taxes both income tax and turnover tax was established by the State Administration of Taxation. When the value-added taxation transformation reform realized the cut of tax in 1994, equation were broken in the two taxes. Because of the tax unbalance, it retards the adjustment of industry structure. So VAT expanding circumference is needed [4].

*Address correspondence to this author at the Taiyuan Institute of Technology, Department of Economics and Management, Taiyuan, 030008, China; Tel: 13754888811; E-mail: dw6124@163.com;

In 2009, our VAT changed from production type to consumption type, although it's an important step in the tax reform process, this transition still failed in breaking the two parallel pattern, VAT levied on a relatively narrow range resulted in repeated tax and VAT deduction chain fracture, how to expand the scope of VAT, to further improve the VAT tax will be the core problem of optimizing our future tax system [5].

Most scholars think that the expansion of VAT should be implemented step by step, first of all, put transportation industry and construction industry which the nature of production process [6] or production processes extends into the scope of VAT revenue, then gradually extended to the whole service industry, finally realizes the good and service integration.

The current tax system of china is types which include both value added tax and business tax [7]. Though it has played an important role in the promotion of economic development, at the same time, it distorted economic development to a certain extent by the way of double taxation. Therefore, the domestic scholars generally believe that we should expand the scope of value-added tax.

2. THE BACKGROUND OF LEVYING OF EXTENDING VAT TAX IN CHINA

Since the establishment of China's value-added tax, it has undergone several major adjustments to change. In 1984 the value-added tax was introduced in China by the second step "tax for profit". In first of all, taxes on certain industrial products In accordance with the difference. Specific tariff lines as follows: Machinery and machine parts, Automobile, Motor vessel, Bearing, Agricultural machinery and spare parts, Billet, Steel, Bicycle, Sewing machine, Fan, Dyeing silk, Western medicine. In 1994, China carried out a comprehensive reform of tax system. New VAT has changed into price of foreign tax. Tax base includes all of production,

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marketing, wholesale, retail of tangible movable products. In this reform, a standard VAT system has established, but also left some problems like fixed assets can not offset and scope of taxation does not cover all goods and service.

In the case of the two tax working, business tax as the tax base in accordance with the total turnover, does not have the features of the deduction belong to VAT resulted in double taxation. This point affect the deepening social division of labor and mass production and industrial restructuring, hindered the growth of service industries. Therefore we must further deepen the reform, expand the scope of VAT. Reform would encounter many difficulties; include tax increase, tax rate setting, financial system etc. In order to steadily promote the reform, should be step by step, planned for expanding the scope of VAT. First step, Value-added tax levied on closely linked with industrial production industry like transportation, storage. At the same time should be improve related measures, regulate financial distribution system, lay down scientific and reasonable statutory value-added and standard deduction.

In January 1, 2012, Shanghai took the lead the expanding the scope of value-added tax based on the success of the reform of Shanghai. From August 1, 2012 to the end of the year, eight provinces (municipality directly under the central government) Included Beijing, Tianjin, Jiangsu, Zhejiang and others started the reform of value-added tax. According to the statistics from the reform area, the vast majority of the corporate in the reform area had a great reduction in the tax burden. But there are some corporate whose tax burden are larger than before. Most of the corporate whose tax burden becomes larger are traffic transportation enterprises and financial lease of fixed assets of enterprises.

As one of the reformed industry, transportation industry had a small addition in the tax burden in the whole, but there is also some transportation company that had a great reduction in tax burden. On the one hand, transportation company can not gain enough the input tax of value added tax by purchase goods and services, that leading the company had to pay more tax. On the other hand, the purchase of transportation instrument and facility made the tax burden of Transportation Company into a cycle that some time the company's tax burden is large and the other time the company's tax burden is small. Moreover, the reform process also reflected some problems in the categories of taxes, income distribution, tax collection and administration. According to the actual situation, our country should gradually solve these problems in the future reform, creating a good tax environment for economic development.

The VAT transformation policy greatly impacted transportation industries especially those capital-intensive enterprises on their finance as they will enjoy more value-added tax preference. Manufacturing and other enterprises usually have large investment in fixed assets investment. Before this policy transformation, enterprise has greater tax burden as it has a large ratio of non-deductible buying-in fixed assets. After the transformation, enterprises are allowed to discount the buying-in VAT of their newly purchased fixed assets, therefore, the enterprises spends less in their purchase of fixed asset such as machinery and equipment. Because the VAT reduced local fiscal revenue, the central and local financial management system, will also change accordingly, that fiscal relationship problem, the equalization of fiscal transfer payment will have to solve the central and local governments more effective at the same time, attention should be paid to the local tax system reconstruction, the smooth progress of reform in the protection of local interests the situation. Levy tax changes also caused the collection and management of change, so enterprises as a rational economic person and national tax authorities will have a non-cooperative game. As the enterprise in the face of VAT, it should also take effective management measures to make themselves in a favorable position in the process of reform.

3. THE FRAMEWORK OF TOPSIS MODEL

TOPSIS (Technique for Order Preference Similarity to Solution, the ideal solution Ideal by approximation) method is a relatively simple risk assessment methods. The basic principle is: to sort the possible optimal value and the worst value, and then calculate the distance between the evaluation object and the optimal value (the ideal solution) and the worst value (negative ideal solution) separately, obtain the relative closeness extent of the evaluation object and the optimal value (ideal solution), as a basis for the evaluation of the pros and cons. Advantages of TOPSIS evaluation method is that the distribution of data, the number of samples and targets are not limited, the calculation process is not very complicated, this method has an application range as wide as AHP. The disadvantage is that you need to determine the weight, with a certain degree of subjectivity and arbitrariness, while the determination of ideal solution and negative ideal solution is largely affected by evaluation conditions, besides this approach will also result in information duplication between the relationships of evaluation indicators.

These days, most decision making problems are involved optimization of more than one single objective. In many cases, decision makers are faced with various criteria, which are also in conflict with each other. Multi-Attribute Decision Makings, also called Multi-Criteria Evaluation, assume that the decision space is discrete. Although there is no optimal solution for this problem but with a limited set of options, the aim is selecting the best option based on multiple attributes.

Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method is also one of those useful multi-criteria decision making method for surveying issues in real world raised by Hwang & Yoon (1981) for the first time. This method was also suggested by Jahanshahlo *et al.* They described it as:

Let $A_1, A_2, \ldots, A_m$ be m alternatives, which are supposed to be ranked by k decision makers based on n criteria ($C_1, C_2, \ldots, C_n$). Let X_{ij} be the rating score of A_i associated with j^{th} criteria and is defined as $x_{ij} \in [x_{ij}^l, x_{ij}^u]$. Weights of criteria are defined as $w_1, w_2, \ldots, w_n$, where w_j is the weight of C_j. We can define an MADM problem with interval numbers briefly in a decision making matrix.

In TOPSIS method with interval numbers we have to normalize decision making matrix as we show it below:

$$\tilde{a}_{ij}^{l} = \frac{x_{ij}^{l}}{\sqrt{\sum_{j=1}^{m}\left[\left(x_{ij}^{l}\right)^2+\left(x_{ij}^{u}\right)^2\right]}}, \quad (1)$$

$i = 1, 2, ..., n,\ j = 1, 2, ..., m$

$$\tilde{a}_{ij}^{u} = \frac{x_{ij}^{u}}{\sqrt{\sum_{j=1}^{m}\left[\left(x_{ij}^{l}\right)^2+\left(x_{ij}^{u}\right)^2\right]}}, \quad (2)$$

$i = 1, 2, ..., n,\ j = 1, 2, ..., m$

Now $[x_{ij}^{l}, x_{ij}^{u}]$ are normalized and the calculated domain $[a_{ij}^{l}, a_{ij}^{u}]$ belongs to [0, 1]. Because of the differences in importance of each criterion, in the next step we will calculate weighted normalized decision matrix with interval numbers as below:

$$\tilde{v}_{ij}^{l} = w_j \tilde{a}_{ij}^{l}, i = 1, 2, ..., n,\ j = 1, 2, ..., m \quad (3)$$

$$\tilde{v}_{ij}^{u} = w_j \tilde{a}_{ij}^{u}, i = 1, 2, ..., n,\ j = 1, 2, ..., m \quad (4)$$

where w_i is the weight of the i^{th} criterion and $\sum w_i = 1$.

Fuzzy set is an extended form of classic set introduced by Zadeh. In a classic set, each element has two values. In other words, an element either belongs to a set or not. If an element becomes a member of set A, its related value is equal to 1, and zero, otherwise. However, fuzzy theory is attributing a number between [0, 1] to each x from X.

A Convex Fuzzy Set: The "A" fuzzy set is convex if and only if for each $x_1, x_2 \in X$ and each $\lambda \in [0,1]$, we have

$$\mu_A\left[\lambda x_1 + (1-\lambda)x_2\right] \geq \min\left[\mu_A(x_1), \mu_A(x_2)\right] \quad (5)$$

4. THE IMPACT ON FINANCIAL STATEMENT OF THE TRANSPORTATION INDUSTRY

VAT transformation will affect the fixed assets entry value and will further affect the amount of fixed assets and accumulated depreciation in the balance sheet.

a) Fixed assets. Fixed assets are important assets of the enterprises, so their value changes will create impact on the internal structure of enterprise total assets and the changes of relevant items on the balance sheet: for instance, original value of fixed assets, accumulated depreciation and net value of fixed assets. Before the VAT transformation, according to the Accounting Standards for Business Enterprises-Fixed Assets, the cost of a purchased fixed assets including: the purchase price, value added tax, import tax and other relevant taxes, as well as any directly attributable expenditures for bringing the assets to working condition for its intended use, such as site preparation costs, delivery and handling costs, installation costs such as installation costs and professional fees and so on.

Fixed assets original value=purchase price + VAT + import tax and other related taxes + any directly attributable expenditures. After the VAT transformation, companies are allowed to deduct the VAT of newly purchased equipment, so that the cost of purchased fixed assets does not include VAT buying-in tax.

Fixed assets original value=purchase price + import tax and other related taxes + any directly attributable expenditures.

As seen from the above equation, if original amount of investment is unchanged, then the value of new increased fixed assets excludes the value-added tax incurred during taxpayer buying-in fixed assets, therefore, the new fixed assets entry value (original value) will be reduced accordingly.

Amount of fixed assets reduced = the deductible buying-in amount A X VAT rate t

b) Accumulated depreciation and net value of fixed assets. The decrease of the entry value of new increased fixed assets (original value) will reduce the depreciation amount (accumulated depreciation). That is, the original value, net value and accumulated depreciation of fixed assets in the balance sheet will all decline. Suppose the enterprise adopts the straight-line depreciation approach, then:

Reduce the amount of accumulated depreciation = deductible buying-in amount A X VAT rate t –deductible buying-in amount A X VAT rate t =depreciation period n.

VAT transformation affect the entry value of fixed assets, depreciation, tax for urban maintenance and construction and additional tax burden for education. Therefore, it impacts on the total profit, enterprise income tax and net profit on the income statement. (Of course, since depreciation expenses are charged to various costs and expenses, this will also affect costs and expenses, such as administrative items and cost of sold items.

c) Total profit. Profit is the comprehensive reflection of the enterprise's operation achievement. It is also an important part of enterprise accounting. The total profit is calculated as follows: initial investment and a series of other consequential expenses is discounted from all revenue of enterprise, then add or minus nonrecurring receipts and expenditures and investment income. According to the Accounting Standards for Business Enterprises--Fixed assets, depreciation of a fixed asset shall be provided monthly, and depending on the purpose for which the fixed asset is used, it shall either be included as part of the cost of related asset or recognized in profit or loss for the current period. Thus, the depreciation amount of a fixed asset directly impacts the profit of enterprise for the current period. In the year of investment, the value-added tax of a new increased fixed asset is one-time discounted in full. This resulted in significant increase of profit by a big margin for the current year. However, the profit for the subsequent years will not be impacted by value-added tax. At the same time, tax for urban maintenance and construction and additional tax burden for education are charged to the related cost items in the current period. Due to the reduced burden on urban maintenance and construction tax and additional tax for education, the enterprises thus increase their total profits.

Enterprise total profits increase value = deductible buying-in amount A X value added tax rate t—depreciation period n + deductible buying - in amount A X VAT rate t x (urban maintenance and construction tax rate + additional tax for education rate).

5. THE ANALYSIS OF SIMLATION DATA ON VAT'S IMPACT ON THE TRANSPORTATION INDUSTRY

Through the purchase of fixed assets investment in the equipment, and value-added tax rate (usually 17%), to calculate the amount of deductible input tax of fixed assets:

The amount of deductible input tax of fixed assets= investment on fixed asset purchase of machinery and equipment - (1+VAT rate) X VAT rate deductible amount of the fixed assets Input tax of enterprises is after the transformation of VAT the enterprise's less amount of the VAT. Of course, indicators can also be used to calculate the value-added tax compared the impact of the VAT. The effective tax rate in our calculation of value-added tax generally refers to the ratio between the period when the tax amount and the current sales revenue that:

The effective tax rate=amount of VAT tax/taxable sales. In the above formula, taxable sales include not only the financial revenue, but also as outside cost of a sales price, in doing theoretical research, because when collecting the data in addition to the price can not be accurately calculated, so, when calculating the effective VAT tax rate, we can directly use sales as taxable sales, that is:

The effective tax rate=VAT tax paid/Sales

Urban construction tax and education surtax tax based on the taxpayer's the sum of the three actually paid taxes: value added tax, consumption tax and business tax. Under the consumption type VAT, input VAT tax contained in the current taxpayer's purchasing fixed assets can be offset in the current output tax, reduce the current actually paid tax, if the taxpayer's other business situation is not changed, then the current actually paid three tax will reduce, then the current burden of urban construction tax and education surtax payable will correspondingly reduce. Urban maintenance and construction tax rate is 7%, surcharge for education tax rate is 3%, the city construction tax and education surcharge decrease=the amount of deductible input VAT of fixed assets X (7%+3%)

Corporate VAT tax is taxable income multiplied by the VAT tax rate. After the transformation of VAT, input tax of fixed assets can be deducted, and thus reduce the recorded value of fixed assets, if the depreciation policy will not change, there will be a corresponding reduction in the amount of depreciation each year, and because the reduction of urban construction tax and education surtax, if other conditions remain unchanged, VAT tax increase. Equipment purchases in the first year impact on income taxes as follows: Increase in income tax amount = (amounts reduce of annual depreciation of fixed assets+ amount of urban construction tax and education surcharge Decrease) X tax rate.

The tax rate is set to 10%. The 64 sub kinds of typical economy index in transportation are chosen as the observing sample. The index changes in the same researching period can be seen from Fig. (**1**).

The tax rate is set to 13%. The 64 sub kinds of typical economy index in transportation are chosen as the observing sample. The index changes in the same researching period can be seen from Fig. (**2**).

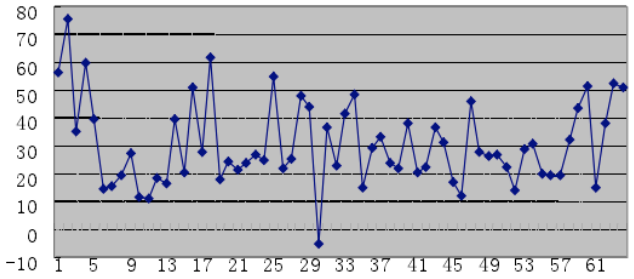

Fig. (1). The index changes at tax rate 10%.

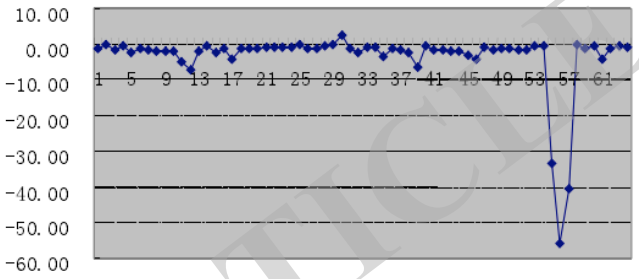

Fig. (2). The index changes at tax rate 13%.

From Fig. (**1**) and (**2**), it can be seen that in Fig. (**2**), the difference between each index is smaller than Fig. (**1**). After comparison, it can be drawn that we should choose 13% to ensure the economy in transportation industry increase smoothly.

The tax rate is set to 17%. The 64 sub kinds of typical economy index in transportation are chosen as the observing sample. The comparison of index changes in the same researching period can be seen from Fig. (**3**). From the comparison, it can been drawn that in the same period, the NPV is higher at the tax rate of 17% than 13%. From the simulation result, we may conclude that 17% tax rate is suitable for transportation industry.

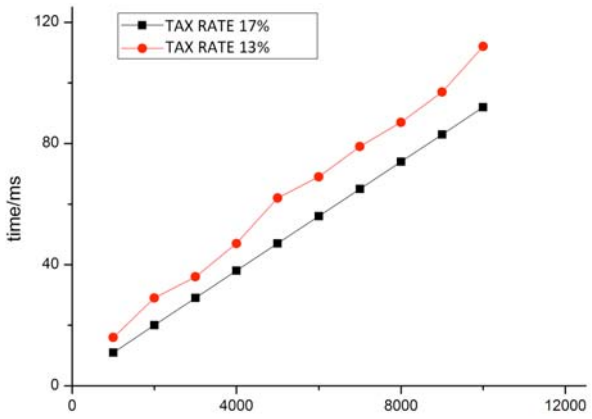

Fig. (3). Two-dimensional eight shape model.

There is no doubt that the implementation of this reform will further broaden the VAT tax base in our country. This reform is helpful to fully exert the advantage "tax neutrality" of VAT and reduce the tax burden on various industries, especially in service industry. This reform will be in favor of ensuing integrity of the credit chain and decreasing the difference of tax burden lying in various industries and various

enterprises. At last, the reform of expanding the scope of VAT will promote rapid and healthy development of service trades and promote industrial structure adjustment, optimizing and upgrade and accelerant transformation of economic development patterns.

CONCLUSION

The turnover tax is the main body of China's current tax system, and VAT is the main body of the turnover tax. China's first large tax is VAT. VAT has played a pivotal role in eliminating of double taxation and in promoting the efficient allocation of resources and in raising state revenues. With the continuous development of China's economy, the drawbacks of the VAT system are increasingly exposed. In 2009, China completed a nationwide VAT from production-based to consumption-based. According to the economy impact of extending VAT to the transportation industry, we endorsed expending in VAT should be implemented step by step. It is analyzed the taxpayer identity, tax rate and tax preference after the reform in the basis of TOPSIS. In this paper supposed three tax rate 10%, 13 % and 17%, we select the most desirable rate. On the other hand, give some countermeasures and suggestions, suggesting local taxation authority manage taxpayers in the beginning of reform, distribute revenue between local and central, when the time is ripe, reform Business Tax and VAT parallel; to further promote the reform of local tax system, such as promoting the reform of resource tax, to promote real estate tax reform, the environmental tax, broaden the local tax revenue to decrease resistance from local government. On the basis of simulation and transportation industry characteristics, we get a logical VAT rate.

CONFLICT OF INTEREST

The author confirms that this article content has no conflict of interest.

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