

## Theoretic Analysis of Gaming in Tax-planning

<sup>1</sup> Hua Qin, <sup>2</sup> Rao Haiqin

<sup>1</sup> University of Shanghai For Science and Technology, Shang Hai, China

<sup>2</sup> University of Shanghai For Science and Technology, Shang Hai, China

<sup>1</sup> [guoyanyunyan0702@126.com](mailto:guoyanyunyan0702@126.com)

<sup>2</sup> [Raohqin@163.com](mailto:Raohqin@163.com)

**Abstract** –In this thesis, I disserted game theory and tax-planning, and analyzed gaming process in tax-planning: in a business, between businesses, and between business and tax-authority, and put forward some police suggestions against problems in gaming process of tax-planning.

**Keywords** –Tax-planning Gaming Business Tax-Authority

### 1.Reality in Practice

In practice, many businesses deduced tax payable amount by using leaks in tax laws and tax preference, the authority reduce companies' using laws leaks by completing and improving tax-discount policies, and gaming between business and authority was seen. In the gaming, tax-planning of businesses influenced all other benefit-related parties and gaming between businesses is seen.

### 2.Gaming in Tax-Planning

Tax-planning is a business planning activity to deal with production, business operation and investment, financial activities by choosing profit-optimization tax plan according to tax laws and regulation and guidance of tax policies. As part of financial management of a business, tax-planning was increasingly important and is more concerned. The goal of a business is to optimize profit which is directly related to the burden of tax, so tax-planning goes through whole business operation.

Game theory works on decision of mutual affected parties of decision making when making decision and equilibrium problem. Primary basis is pursuing personal benefit of rational economic persons, means, before making decision, they plan and compare costs and ways to minimize cost and maximize yield, and choose the best. Basic factors of game theory include: gaming player, information, activities and strategy useful to the player and result and payment of gaming.

In tax-planning, the basic factors are as follow: (1) the player in tax-planning, including tax-authorities of each level as taxing persons and individuals, businesses and units as taxed persons;(2) activities in tax-planning, decision making parameter collection in tax distribution of tax-planner, such as which kind of taxing policies should be established, how to tax and administrate and what's the way of supervision, how should a tax-payer

enhance financial management, in which way should the payer handle tax declaration, and how to pay.(3) Strategy in tax-planning, which is taxing rules under nowadays circumstance, such as Tax Law, Coperation Law of People's Republic of China; (4) information in tax-planning, of tax charging and financial management knowledge of tax-payer, taxing regulation and rules and financial circumstance of the company and characteristics and discipline of both taxing and taxed parties;(5) yields in tax planning, the utility yield in tax-planning of the gaming player; (6) Result of Tax-planning, means the result reached by tax-planning of both parties, such as the goal of taxing reached by the tax authorities and less payment or delay to pay of the tax-payer.

### 3.Gaming Analysis in Tax-Planning

#### 3.1.Gaming Analysis on Transfer Pricing in a Business

Tax-planning is in three ways: (1) Transfer from one way to another; (2) Transfer from one bag to another; (3) Transfer from one tax period to another.

Inner pricing transfer of a company refers to that, one department or sub-company as a sale party sell raw material, spares, products, or service to the other department or sub-company as purchase party in an inner price. It belongs to second kind of tax-planning, that is from one pocket to another. A business could utilize differentiation of tax rates between different departments or differentiation of profit balance in different department or part of a company to make tax-plan, to optimize its business.

Assume that headquarter A and sub-company B of a business, A has a high tax rate, and B has a low tax-rate; A could sell products to B in a lower price; and B sells products to A in a high price. Tax-planning in these two companies could be explained by static gaming of perfect

information in gaming theory, the analysis is as below:

Tax rate for A is 33%, and 15% for B. B sell products, whose cost is RMB 100,000, market priced RMB 150,000, to A at the price of RMB 200,000, and A sell it out at price of RMB 250,000. We can calculate as below:

(1) Selling at price of RMB 150,000: EIT of A=(25-20)×33%=1.65(Ten Thousand), EIT of B=(15-10)×15%=0.75(Ten Thousand), Total EIT of the company=1.65+0.75=2.4(Ten Thousand)

(2) Selling at inner price of RMB 200,000: EIT of A=(25-20)×33%=1.65(Ten Thousand), EIT of B=(20-10)×15%=1.5(Ten Thousand), Total EIT of the company=1.65+1.5=3.15(Ten Thousand). Tax payable less caused by price transfer is RMB9000.

**Table1** . Gaming analysis on transfer pricing in a business

	Pricing Transfer for B		No Pricing Transfer for B	
Pricing Transfer for A	1.65	1.5	3.3	0.75
No Pricing Transfer for A	3.3	0.75	3.3	0.75

We can establish a gaming model: at top left of the metric is 3.15, top right is 4.8, bottom left is 4.8, and bottom right is 4.8. A is tax amount of the headquarter and B is tax amount of sub-company. In the metric, we find that, B's tax amount is less without pricing transfer, A's amount is less with pricing transfer; if A choose pricing transfer but B don't, they fail to cooperate and the transaction fails, the both could only choose transaction at market price, A could not be benefited from pricing transfer. But pricing transfer benefit the whole company and gain RMB 9000 from it. B should align in the company and optimize the benefit through pricing transfer.

Company should make profit decision, investment decision and financing decision in a strategic way, and should plan in advance according to the nature of the company and lower tax burden by balancing tax burden in every parts of the company, through allover adjusting, strategy development and investment extending and separating and transfer of business in the view of the whole company. The transaction and investment relationship is complex, tax transfer could lower overall tax burden.

### 3.2. Gaming Analysis between Businesses

All businesses in the market are of equal status, which is betrayed by economic relation mainly as equivalent exchange and equal in competition. All businesses in the market should be prudent on economic decision when pursuing benefit and facing the nature of "survival of the fittest" and brutality in the market. Businesses should upgrade quality of the products and service and lower economic costs at the same time, so as to occupy more market shares and to get advantage in competition.

Assuming there are two businesses in the market of completely same nature, namely X, Y, which both facing same tax-planning situation in perfect information. If X chooses making tax-planning, but Y don't, X will gain

extra benefit from the planning, which could be used to invest in the market or lower price to gain advantage and occupy market share of Y. The advantage of making tax-planning is obvious. We can also find that in the model analyzed as below.

The model: Player (1) is business X, and player 2 is business Y; strategy is planning tax or not planning tax, and the proportion of planning for X is P, and that for Y is q. Assuming net profit of the business without planning is R, tax-planning costs C, extra benefit is T, and T>C; if one makes tax-planning and one don't, market share occupied is S. The benefit of both businesses is listed as below:

**Table2** . Gaming analysis between businesses

	Y Planning q	Y No planning (1-q)
X Planning P	(R+T-C,R+T-C)	(R+T-C+S,R-S)
X No planning 1-p	(R-S,R+T-C+S)	(R,R)

Expected Revenue of business A with tax-planning is:  $E(X1)=(R+T-C)q+(R+T-C+S)(1-q)=-Sq+R+T-C+S$

Expected Revenue of business A with no tax-planning is:  $E(X2)=(R-S)q+R(1-q)=-Sq+R$

Obviously,  $E(X1)>E(X2)$ , means no matter Y making planning or don't, X has obvious strategy advantage to make tax-planning.

Expected Revenue of business Y with tax-planning is:  $E(Y1)=(R+T-C)p+(R+T-C+S)(1-p)=-Sp+R+T-C+S$

Expected Revenue of business B with no tax-planning is:  $E(Y2)=(R-S)p+R(1-p)=-Sp+R$

Obviously,  $E(Y1)>E(Y2)$ , means no matter X making planning or don't, Y has obvious strategy advantage to make tax-planning.

So, the combination of strategy, (planning, planning), is not only a mix strategic Nash-Equilibrium solution but also an advantage mix strategic Nash-Equilibrium solution. At the same time, tax-planning benefits the businesses themselves and the whole system. Rational business should choose tax-planning to lower costs and enhance competitive power, to make advantage in drastic market competition.

### 3.3. Analysis on Gaming between Business and Authority

□ Assuming two choices for authority and business: the former taxes and provides tax-discount, the later pays tax and makes tax-planning. All the players have complete information. Assume total yield of economy activities G, tax payable I, cost of tax-planning for a business is H,  $I>H$ ; cost of taxing by the authority is E, and benefit of taxing-exempt to the whole society is F. So if authority chooses taxing, the yield is (I-E), and if the authority chooses tax-exempt, total yield will be F.

If the authority makes no tax preference, its yield is (I-E); if provide tax-exempt, the yield is F. If  $(I-E)<F$ , then the gaming ends; if not, the authority chooses taxing, and

the tax-payer makes tax-planning under the framework of temporary tax law system. If the business has to pay tax, its yield gained is (G-I). If the business makes tax-planning to reduce tax amount, then its yield is (G-H). The result is when no tax-exempt is provided, the dominate strategy for business is making tax-planning, and the authority responses to tax-planning. If the authority taxes according to tax laws, the company will utilize legal ways to avoid, then the authority taxes nothing, and its yield is -E. If the authority provides tax-exempt, total benefit for the whole society is F. So, the better strategy for the authority is providing tax-exempt when business chooses tax-planning.

□ We assume that tax-payer makes legal tax-planning in analysis above, but the legality should also be approved by the authority, and which also meets deviation in administration enforcement. Commonly, legal tax-planning meets some conflicts and barriers with local authority, the authority may consider the planning as evading or malicious avoidance, and punish it.

Model framework: player (1) is business, player (2) is the authority; strategy: making tax-planning and no tax-planning for business; inspection and no inspection for the authority. The proportion of tax-planning for the business is p, and of no planning is 1-p; inspection proportion for the authority is k, and no inspection proportion is 1-k; under inspection, tax-planning proportion for business of regarded as legal is Q, and the proportion regarded as illegal is 1-Q. Assuming that, yield of business is S, and tax amount is Ts, then the income after tax is S-Ts, and cost of tax-planning is Ct; considered as evading, business should pay tax Ts and penalty Ct'; cost for authority of inspection is Ci. Then we can get:

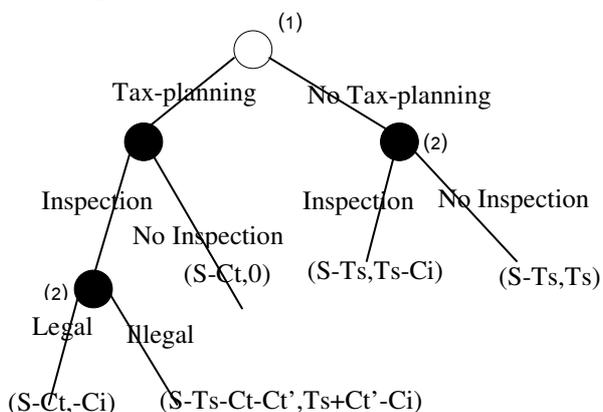


Figure 1. Game tree between business and authority

Table 3 . Gaming analysis between business and authority

	Inspection k	No Inspection 1-k
Tax-planning p	$[Q(S-Ct)+(1-Q)(S-Ts-Ct-Ct')-CiQ+(Ts+Ct'-Ci)(1-Q)]$	$(S-Ct,0)$

No Tax-planning	(S-Ts,Ts-Ci)	(S-Ts,Ts)
Solution of the Model		

In the above payment metric, when Q is a larger value or Ct' is a smaller amount, no matter which strategy the authority chooses, the better strategy for business is tax-planning; and whatever strategy business chooses, better strategy for the authority is no-inspection, means (Tax-planning, No-inspection) is equilibrium when k is a larger value or Ct' is a smaller value.

When Q is a smaller value or Ct' is a larger value, better strategy for business is no-tax-planning when the authority chooses inspection; better strategy for business is tax-planning when the authority chooses no-inspection; and better strategy for the authority is no-inspection when business chooses no-tax-planning; and better strategy for the authority is inspection when business chooses tax-planning. In conclusion, when Q is a smaller value or Ct' is a larger value, the model has no pure strategic Nash Equilibrium, but has a Mixed Strategic Nash Equilibrium.

In the Mixed Strategy Nash Equilibrium, under conditions assumed as above, yield expectation for business is:

$$U(1, k, Q) = [Q(S - Ct) + (1 - Q)(Y - Ts - Ct - Ct')]k + (S - Ct)(1 - k) = [Q(S - Ct) + (1 - Q)(S - Ts - Ct - Ct') - (S - Ct)]k + S - Ct = (1 - Q)(-Ts - Ct')k + S - Ct$$

$$U(0, k, Q) = (S - Ts)k + (S - Ts)(1 - k) = S - Ts$$

Using pay the equivalent method,  $U(1, k, Q) = U(0, k, Q)$ , optimal condition for business is:

$$k^* = (Ts - Ct) / [(1 - Q)(Ts + Ct')]$$

To get Mixed Strategy Nash Equilibrium of business, we should compute expected yield for the authority. Under the former conditions, expected yield for the authority is:

$$U(p, 1, Q) = -CiQ + (1 - Q)(Ts - Ci + Ct')p + (Ts - Ci)(1 - p) = [- (Ts + Ct')Q + Ct']p + Ts - Ci$$

$$U(p, 0, Q) = T(1 - p) = Ts - Tsp$$

Using pay the equivalent method  $U(p, 1, Q) = U(p, 0, Q)$ , optimal condition for the authority is:

$$p^* = Ci / [(1 - Q)(Ct' + Ts)]$$

With analysis as above, Mixed Strategy Nash Equilibrium for the authority and business is:

$$k^* = (Ts - Ct) / [(1 - Q)(Ts + Ct')], p^* = Ci / [(1 - Q)(Ct' + Ts)]$$

The proportion of inspection for the authority is k\*, and the proportion of tax-planning for business is p\*.

If  $k < k^*$ , best strategy for business is tax-planning; if  $k > k^*$ , best strategy for business is no-tax-planning; if  $k = k^*$ , business could choose both ways to optimize its benefit. Seen as above, what influence the strategy of business is k\*, and parameter which determine k\* will also influence the strategy of business:

□ Influence of tax-planning cost Ct. The larger the value of Ct, the less the yield of business will be, and the proportion of tax-planning will also be smaller.

□proportion of tax-planning regarded as legal  $Q$ . If other factors stays constant, the larger the value of  $Q$ , the smaller  $1-Q$  will be, and  $k^*$  will also be larger, the business will be more likely choose tax-planning. The larger  $Q$  is, the authority will have larger proportion to consider tax-planning legal, so business could not worry about penalty from authority, and will get extra benefit from tax-planning.

□Influence of penalty  $C_t'$  for tax-evasion by authority. When all other factors keep constant, the more the authority charge for tax-evasion,  $k^*$  will be smaller. If the penalty is larger, the proportion of tax-planning regarded as illegal will be larger, the cost for tax-planning will also be larger, business will less likely choose tax-planning.

If tax-planning for business  $p < p^*$ , best strategy for the authority is no-inspection; and if  $p > p^*$ , the authority should choose inspection. If  $p = p^*$ , the expectation of both choices, and the authority could choose both inspection and no-inspection. Whether to inspect or not, mainly depend on  $p^*$ . As below, these factors affect value of  $p^*$ , will also influence the choice of the authority.

□Influence of inspection cost  $C_i$ . The larger  $C_i$ 's value is, the smaller the yield after inspection is, the smaller the proportion to inspect will be.

□proportion of tax-planning regarded as legal  $Q$ . If other factors stays constant, the larger the value of  $Q$ , the smaller  $1-Q$  will be, and  $k^*$  will also be larger, the business will be more likely choose tax-planning. The larger  $Q$  is, the authority will have larger proportion to consider tax-planning legal, so business more likely to choose tax-planning, the larger the proportion to inspect will be.

□Influence of penalty  $C_t'$  for tax-evasion by authority. When all other factors keep constant, the more the authority charge for tax-evasion,  $p^*$  will be smaller. If the penalty is larger, the proportion of tax-planning regarded as illegal will be larger, the cost for tax-planning will also be larger, business will less likely choose tax-planning, the smaller the proportion to inspect will be.

## **4.Suggestions for Complementing Tax-planning**

### **4.1.Complementing Taxing Laws**

Drafting tax laws and regulations, the nation should take situation of business, sustainable growth of tax source into consideration. From the situation of this period in our county, we should put forward a basic tax law, which is brief, transparent, and easy to implement, to complement common law regulations, to reduce tax law leaks and to reform taxing regulation.

### **4.2.Enhancing Tax-planning Propaganda, Establishing Correct Tax-planning Idea**

Successful tax-planning benefits business directly, and will higher management level of business; and also will help to improve industrial adjusting, to realize further development of productivity and to promote sustainable development of national economy and flourishing of social economy. So law view and tax idea should be enhanced.

### **4.3.Cultivating Tax-planning Worker, Establishing Tax-Agent System**

As developing of the economy, the taxing system should also get in national track, and the demand to tax-planning will also be expanded. While normalizing tax agent organization, we should provide good circumstance for agent organization, to strengthen their power, and the authority should restraint the qualification of the planner critically and enhance management, provide further training and education.

### **4.4.Enhancing Penalty for Illegal Activities, Normalizing Taxing Activities**

We should enhance penalty to tax evasion and taxing officials' corruption, through inner and outer supervision system. A system of taxing quality and implementing of scientific should be complete to normalize, irritating the activities of tax officials; at the same time, the supervision of media should be perfectly used to make content, method and program of taxing more open and clear, to reduce black case work, and to promote taxing according to laws.

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