

Analysis of Moral Risk and Reverse Selection in Tobacco Regulation

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Abstract—Due to the particularity of regulation of tobacco industry, Chinese tobacco monopoly Bureau (Company) is prone to moral hazard and reverse selection under the asymmetric information. This paper analyzes causes and effects of moral hazard and adverse selection through the information economics model, and puts forward targeted policy suggestions to improve efficiency and ensure the stability of tobacco industry.

Keywords—Tobacco Industry Regulation; Tobacco Monopoly Bureau (Company); Moral Risk; Reverse Selection

I. INTRODUCTION

China has been implementing the state tobacco monopoly system, which is currently the world's only one of the two tobacco monopoly system implementation. The tobacco monopoly of the People's Republic of China entered into force on January 1st, 1992, which is "unified leadership, vertical management, monopoly" of management system for tobacco industry. Administrative department of national tobacco was set up under the state council(State Tobacco Monopoly Administration, STMA), which is responsible for the nationwide tobacco monopoly, including tobacco monopoly bureau of provincial, local (city) and county level, and for the jurisdiction tobacco monopoly. The purchasing price of leaf tobacco is decided by pricing authorities under the state council in conjunction with the department of tobacco monopoly administration under the state council, which is in accordance with principles of classification and pricing. The main body of the regulation of tobacco industry in China is the State Tobacco Monopoly Bureau (Company) and the local tobacco monopoly Bureau (Company). The National Tobacco Monopoly Bureau (Company) is also equivalent to the Chinese National Tobacco Corporation, which is one agency of two brands. The former is an administrative agency and the latter has a corporate nature. Vertical and segmented management patterns have led to local protectionism. At the same time, due to the existence of monopoly profits, employees have always had high wages and high benefits. However, business model and the lack of incentives have led to moral hazard and adverse selection in the local tobacco monopoly bureaus (Company) under asymmetric information conditions.

II. MORAL HAZARD IN THE TOBACCO MONOPOLY BUREAU(COMPANY)

In the context of information asymmetry, we consider the different situations of employees within the Tobacco Monopoly Bureau (Company). Assuming that employees of the Tobacco Monopoly Bureau (Company) are rational, the Tobacco Monopoly Bureau (Company) is risk-neutral, the employees are risk-averse, and there are only two employees. One is high effort and the other is low effort (lazy). Set as employee 1 and employee 2, its output is q_1 and q_2 . Due to efforts to make it negative, the utility function of employee 1 is $U(w, e) = \sqrt{w} - e^2$ and employee 2 is $U(w, e) = \sqrt{w}$, where W is mainly wages and their retention utility is $\underline{U}$. In order to simplify the model, the interest function of establishment of the Tobacco Monopoly Bureau (Company) is: $B(x, e) = x - w, x = q_1 + q_2$

Under symmetrical information, different wages can be paid for different employees. That is, $(e^2 + \underline{U})^2$ pay for high effort, $\underline{U}^2$ pay for low effort. However, the equal pay system must be implemented according to different levels for the Tobacco Monopoly Bureau (Company). And individual performance is not known, which creates information asymmetry. For a rapidly developing tobacco monopoly Bureau (Company), it is impossible to require employees to be in a state of low effort and therefore only need to consider the situation when the tobacco monopoly Bureau (Company) requires high effort. If it is the result of high effort, the Tobacco Monopoly Bureau (Company) will pay wages of w_1 , and the result of low efforts is wages of w_2 . Obviously, $w_1 > w_2$. The probability of high effort results is $2/3$. Optimal planning problem for the construction is:

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$$\text{Max}_{(w1, w2)} \frac{2}{3}(x - w1) + \frac{1}{3}(x - w2)$$

$$\text{s.t.} \frac{2}{3}\sqrt{w1} + \frac{1}{3}\sqrt{w2} - e^2 \geq \underline{U},$$

$$\frac{2}{3}\sqrt{w1} + \frac{1}{3}\sqrt{w2} - e^2 \geq \frac{2}{3}\sqrt{w2} + \frac{1}{3}\sqrt{w1}$$

Create Lagrange function:

$$L = \frac{2}{3}(x - w1) + \frac{1}{3}(x - w2) + \lambda(\frac{2}{3}\sqrt{w1} + \frac{1}{3}\sqrt{w2} - e^2 - \underline{U}) +$$

$$\mu(\frac{2}{3}\sqrt{w1} + \frac{1}{3}\sqrt{w2} - e^2 - \frac{2}{3}\sqrt{w2} - \frac{1}{3}\sqrt{w1})$$

$$= \frac{2}{3}(x - w1) + \frac{1}{3}(x - w2) + \lambda(\frac{2}{3}\sqrt{w1} + \frac{1}{3}\sqrt{w2} - e^2 - \underline{U}) +$$

$$\mu(\frac{1}{3}\sqrt{w1} - \frac{1}{3}\sqrt{w2} - e^2)$$

Find the first-order condition and get:

$$\frac{\partial L}{\partial w1} = -\frac{2}{3} + \frac{4}{3} \frac{\lambda}{\sqrt{w1}} + \frac{2}{3} \frac{\mu}{\sqrt{w1}} = 0$$

$$\frac{\partial L}{\partial w2} = -\frac{1}{3} + \frac{2}{3} \frac{\lambda}{\sqrt{w2}} - \frac{2}{3} \frac{\mu}{\sqrt{w2}} = 0$$

$$\rightarrow \lambda = \frac{1}{6}\sqrt{w2} + \frac{1}{3}\sqrt{w1} > 0, \mu = \frac{1}{3}\sqrt{w1} - \frac{1}{3}\sqrt{w2} > 0$$

Meet participation constraints and incentive constraints:

$$\frac{\partial L}{\partial \lambda} = \frac{2}{3}\sqrt{w1} + \frac{1}{3}\sqrt{w2} - e^2 = \underline{U},$$

$$\frac{\partial L}{\partial \mu} = \frac{1}{3}\sqrt{w1} - \frac{1}{3}\sqrt{w2} - e^2 = 0$$

$$\sqrt{w1} = 2e^2 + \underline{U}, \sqrt{w2} = \underline{U} - e^2$$

$$\text{and } w1 = (2e^2 + \underline{U})^2, w2 = (\underline{U} - e^2)^2.$$

The expected output value of the Tobacco Monopoly Bureau (Company) is $\frac{2}{3}(x - (2e^2 + \underline{U})^2) + \frac{1}{3}(x - (\underline{U} - e^2)^2)$. As a result, those who worked hard received high returns and those who worked hard were punished. In reality, employees are generally risk-neutral. At this time, the utility function becomes $U(w, e) = w - e$. For the low-hardworking, $e=0$. The optimal solution becomes: $w1 = 2e + \underline{U}$, $w2 = \underline{U} - e$. Thus, the employee's requirements are lower. However, employees with relatively high wages and benefits will be "Doing More or Less of the Same" where it is impossible to distinguish between efforts. The result is that everyone becomes less diligent. High performers will also behave as low

effort, leading to inefficiency in the Tobacco Monopoly Bureau (Company), which creates Moral hazard.

III. REVERSE SELECTION IN THE TOBACCO MONOPOLY BUREAU (COMPANY)

We look further at the disguise of high effort. Since not all people are dedicated, if high-effort employees do not receive the income they deserve, they will inevitably disguise themselves as low-effort workers. Because it reduces the negative effect of making effort, which reduces the efficiency of the Tobacco Monopoly (Company) and even causes losses. In order to simplify the model, assuming that the employee is risk-neutral (which is also more in line with the actual situation) and the commune is also risk-neutral. Set the utility function as: $U^G(w, e) = w - e^2$ for high effort; $U^B(w, e) = w - 2e^2$ for low effort. For the Tobacco Monopoly Bureau (Company), the yield function is closely related to the level of effort of employees. That is $\text{Max}_{(w, e)} e - w$. In order to simplify the model further, the probability of high and low efforts can be set to 1/2, and the retention utility is 0. At this time, in the case of information symmetry, the function of the high-effort person should be:

$\text{Max}_{(e^G, w^G)} e^G - w^G, \text{s.t. } w^G - (e^G)^2 \geq 0$ under the case of information symmetry. We can get

$\lambda = 1, e^G = \frac{1}{2}, w^G = (e^G)^2 = \frac{1}{4}$ by solving it. The net output value of the Tobacco Monopoly Bureau (Company) is 1/4. Similarly, the lower effort is $\lambda = 1, e^B = \frac{1}{4}, w^B = \frac{1}{8}$ by solving

another function $\text{Max}_{(e^B, w^B)} e^B - w^B, \text{s.t. } w^B - 2(e^B)^2 \geq 0$.

And the net output value is 1/8, when the total net output value is 3/16. However, information is asymmetric within the Tobacco Monopoly Bureau (Company), and the Bureau also hopes that employees will perform high effort to obtain the maximum net output value. At this time, the planning issue is:

$$\text{Max}_{(w^G, w^B, e^G, e^B)} \frac{1}{2}(e^G - w^G) + \frac{1}{2}(e^B - w^B),$$

$$\text{s.t. } w^G - (e^G)^2 \geq \underline{U}, w^B - 2(e^B)^2 \geq 0$$

$$w^G - (e^G)^2 \geq w^B - 2(e^B)^2$$

$$w^B - 2(e^B)^2 \geq w^G - 2(e^B)^2$$

Due to $w^G - (e^G)^2 \geq w^B - (e^B)^2 \geq w^B - 2(e^B)^2 \geq 0$, the constraints are simplified to:

$$s.t. w^B - 2(e^B)^2 \geq 0$$

$$w^G - (e^G)^2 \geq w^B - 2(e^B)^2, \text{ Create Lagrange}$$

$$w^B - 2(e^B)^2 \geq w^G - 2(e^G)^2$$

function

$$L = \frac{1}{2}(e^G - w^G) + \frac{1}{2}(e^B - w^B) + \lambda(w^B - 2(e^B)^2) +$$

$$\mu(w^G - (e^G)^2 - w^B + 2(e^B)^2) +$$

$$\delta(w^B - 2(e^B)^2 - w^G + 2(e^G)^2)$$

Find the first-order condition and get:

$$\frac{\partial L}{\partial e^G} = \frac{1}{2} - 2\mu e^G + 4\delta e^G = 0$$

$$\frac{\partial L}{\partial w^G} = -\frac{1}{2} + \mu - \delta = 0$$

$$\frac{\partial L}{\partial e^B} = \frac{1}{2} - 4\lambda e^B + 2\mu e^B - 4\delta e^B = 0$$

$$\frac{\partial L}{\partial w^B} = -\frac{1}{2} + \lambda - \mu + \delta = 0$$

$$\mu - \delta = \frac{1}{2}$$

$$\lambda - \mu + \delta = \frac{1}{2}$$

Simplify and get:

$$2\mu - 4\delta = \frac{1}{2e^G}$$

$$4\lambda - 2\mu + 4\delta = \frac{1}{2e^B}$$

$$\lambda = 1 > 0$$

$$\text{Finally, we get: } \mu = \frac{1}{2} + \delta > 0$$

$$\text{Thus, } w^B - 2(e^B)^2 > w^G - 2(e^G)^2.$$

$$\text{We get } e^G = e^B, \delta = 0 \text{ and } \lambda = 1.$$

$$\text{Then, We get } w^B - 2(e^B)^2 > w^G - 2(e^G)^2$$

$$2\mu - 4\delta = \frac{1}{2e^G}$$

$$\text{from } 4\lambda - 2\mu + 4\delta = \frac{1}{2e^B}$$

$$\text{Thus, } \delta = 0 \text{ and } \mu = \frac{1}{2}.$$

$$\text{We get: } e^G = \frac{1}{2}, e^B = \frac{1}{6}, w^B = \frac{1}{18}, w^G = \frac{5}{18}.$$

The expected net output value of the Tobacco Monopoly Bureau (Company) is 1/6. It can be seen that the net output value is still reduced and high-effort employees do not receive the corresponding income under differential distribution. They have incentives to disguise themselves as low-effort employees, which creates Reverse Selection.

IV. CONCLUSION AND POLICY RECOMMENDATIONS

In summary, the problem of Adverse Selection and Moral Hazard exists within tobacco regulation, mainly due to centralization of the Tobacco Monopoly Bureau (Company) and the lack of internal incentives. The main suggestions are:

First of all, we can realize the effective allocation of high and low hard-working people through the free movement of employees, and set up a reasonable promotion mechanism to meet the professional development needs of high hard-working people.

Secondly, establish the internal performance appraisal system, such as the 360-degree performance appraisal method. Differentiate the performance of different employees by using performance wages and rewards. When the interests of high-striving people are affected, they will continue to show high efforts to maximize profits. That is, returns of different benefits are provided, which are.

Thirdly, the establishment of information screening mechanism has enabled high-striving people to obtain information revenue, making them unwilling to disguise themselves as low-striving people, and low-striving people can not impersonate high-striving people. It also enables different types of employees to obtain different incomes. Thus, we can mobilize employees' enthusiasm for improving efficiency, and forming a community of interests between the Tobacco Monopoly Bureau (Company) and employees.

Fourthly, human capital investment is also very necessary. The improvement of personal and overall quality and skills can curb laziness and "Hitchhiking" effectively. The incentive of benefit mechanism can make employees voluntarily invest in human capital.

Finally, the excessive concentration of regulatory power also requires the supervision of relevant departments and society. Otherwise, the long-term existence of Reverse Selection and Moral Hazard will also breed rent-seeking and arbitrage.

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