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WHEN ORGANIZATION ENCOUNTERS UNCERTAINTY IN REGULATORY TIMES

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Abstract: Regulatory policy is a considerable factor in organizational business strategy decisions. This article puts focus on the evaluation of the regulatory policy from the perspective of the organizational cost under uncertainty. In this paper I examine the organizational cost of policy transition in different scenarios, and consider, further, what the impact on the macroeconomic and business policy would be. Three conclusions are reached: 1. The cost of strategy adoption of organizations under regulation in a monopolized industry is only affected by their own risk tolerance of uncertainty and the cost of information; 2. when the regulation is enacted in a more competitive market, the cost of information would raise with a higher expected loss comparing with the same regulation in monopolized market; 3. If the claim of such measurement is true, the net benefit or loss of regulation is exactly the difference between organizational information cost and regulatory benefit. So the policy that guarantees the positive communication and transparent information exchange that helps to reduce the organizational information cost is necessary for an efficient regulatory policy.

Keywords: Regulation; Organization; Contract; Uncertainty

JEL Codes: D81, L22, L51, M38

The world economy is stepping in regulatory times. A considerable number of articles have technically analyzed and summarized the failure of regulation on organization and the global economic downturn (Weber 2010; Levine 2010; Love and Zaidi 2010; Martin and Ventura 2011; etc.). Here I would rather to provide a fresh view of the interaction between organization strategy and regulation. Donaldson (2000) has pointed out the good economic environment should include fair distribution, open government, social cooperation, and inculcation of economic duties. Moreover, these ethic factors-and other factors from which no actor inside the nation can be excluded-can be further categorized to a common but rich concept: Public Wealth (Enderle 2009), including "public goods natural resources in a country, basic security, an effectively functioning rule of law, a relatively corruption-free business environment, a business supportive culture, a decent level of education and health care of the citizens, etc." (Enderle 2010). On the other side, the individual and organizational activities in private sector, or "Private Wealth", are generally based on the principle of utility or profit maximization, as the basic presumption in economics. In most of cases, the economic agents in private sector can affect, and

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also respond to the changes of public environment. Thus the regulation will not only regulate public economic environment, but also significantly influence the strategies of organizations and individuals.

In this article, I would like to examine the optimal strategies of organization under uncertainty, and then derive the efficient regulation requirement by observing these optimal strategies based on organizational rationality. However, I wish not to judge the truth with sophisticated econometric approach, because it is hard to quantify the outcome of the uncertainty (although sometimes I use willingness of payment of premium to describe the level of uncertainty or risk aversion, it still cannot serve as a formal norm), and even the quantitative analysis based on the most accurate data cannot completely explain every aspect of reality. Thus here I only provide an alternative of view towards the impact of uncertainty in regulation.

I refer the word "Regulation" as the meaning of "Public Regulation", which is not only restricted to the regulation on a single industry, but also on the security, income distribution, transportation, public utilities, environment and energy, health care, and other sectors (Fromm 1981). We can easily find that these fields of public regulation aims at are mostly public welfare, which cannot be improved through pure self-interest market competition. However, can regulation cure all economic problems without any unanticipated consequences?

In order to illustrate the ambiguous impact of public regulation with uncertainty, I shall point out three typical and critical areas that public regulation often focuses on, and we can discuss them in following pages:

Security;

Redistribution;

Natural Resource.

SECURITY

One important goal of public regulation aims at is the security, a typical public good that preventing or reducing risk of harm to life and property. The analysis literatures on security have ranged from national legislation of public safety to international political economy (Kirshner 1995).

Regulation on security can also cause uncertainty in economy. The most obvious outcome is that firms have to face raising legal obligations. The most recent case is the European Union Advance Cargo Declaration Regime, which has gone into force since January 1, 2011. According to the regulation, shipping companies transporting goods to or from the European Union must submit specific cargo information with well-prescribed timelines to the relevant customs administrations of European Union Member States, and no common grace period can be warranted to non-compliant economic operators, which has provoked wide complaints of extra administrative and shipping time.

And those regular security regulations, such as national defense and police system, also impose costs on economy. The high budget for security regulation may crowd out other economic investments. Security regulations imply shifting economic resources between actors, including between sellers and buyers and between private and public agents. The existence of such a burden will reduce the efficiency of the market and hence growth. (Brück 2005).

The regulation on security can be discussed respectively in monopolistic market and more competitive market.

The outcome of regulation in monopolistic market is straightforward. In the case of shipping safety inspection, that monopolistic shipping company does not only have to pay specific label printing expense and protracted inspection time as fixed cost, but also the extra concern of the probability of insecurity or accident $\varepsilon(\theta)$, which θ is the risk tolerance of company. Intuitively, the higher θ would cause a lower ε. The expected probability of accident is p, thus the revised expected probability of accident is $p + \varepsilon$. The expected revenue of this shipping work is w, expected loss resulting from the accident is σ. So the payoff of the shipping without accident is $V(w)$, and $V(w-\sigma)$ with accident. Now the expected value of this shipping business is:

$$E(V_1) = (1-p-\varepsilon)\ V(w) + (p+\varepsilon)\ V(w-\sigma)$$

If the company wants to cover the expected loss of accident by fair insurance (suppose the insurance market is always perfect competitive that provides fair insurance, and the slight unfair insurance will be mentioned in a more competitive case) with the price q and indemnity x, to make the value of this trip equal to:

$$E(V_2) = (1-p-\varepsilon)\ V(w-qx) + (p+\varepsilon)\ V(w-\sigma-qx+x)$$

Suppose parameters p, w, σ, q, x stay constant as the given market condition. Then loss value $\sigma = x$, premium $qx = (p+\varepsilon)\sigma$ is the equilibrium[1]; and for most risk aversion function of $V(.)$, $E(V_2) \geq E(V_1)$. So the company will prefer the better payoff from insurance.

The case in a more competitive market seems more complicated. Now assume there are more shipping companies than monopolistic market but still less than perfect competitive market. This market structure allows the insurance companies to change the insurance price for difference shipping company by observing the revised expected probability of shipping accident, rather than keeping a constant insurance price in monopolistic shipping market. Now suppose there are two shipping companies with difference risk tolerance: the higher tolerance θ_1 and the lower tolerance θ_2, so $\varepsilon(\theta_1) \leq \varepsilon(\theta_2)$ according to the notation in the monopolistic market. Thus the insurance company gives a standard price q for the for company θ_1, and a discriminated price δ for company θ_2, because insurance company generally is reluctant to insure a company with higher revised expected probability of accident. Assume that $\theta_1 = \theta$ in monopolistic market. So the payoffs of two shipping companies without insurance are:

$$E(V_3) = (1-p-\varepsilon(\theta_1))\ V(w) + (p + \varepsilon(\theta_1))\ V\ (w-\sigma)$$

And the payoffs with insurance are:

$$E(V_5) = (1-p-\varepsilon(\theta_1))\ V\ (w-qx) + (p+\varepsilon(\theta_1))\ V\ (w-\sigma-qx+x)$$

$$E(V_6) = (1-p-\varepsilon(\theta_2))\ V\ (w-\delta x) + (p + \varepsilon(\theta_2))\ V\ (w-\sigma-\delta x+x)$$

In both monopolistic and competitive markets, shipping companies have to pay the fixed cost of specific label printing expense and protracted inspection time; but in the competitive market, the average premium to cover uncertainty is $\sigma[(p+\varepsilon(\theta_1)) + (p+\varepsilon(\theta_2))]/2$, which is higher than the premium in monopolistic market $\sigma[(p+\varepsilon(\theta_1))$ when $\theta_1 = \theta$. We can conclude that the regulatory policy in a monopolistic market produces less cost than more competitive market to cover the uncertainty.

REDISTRIBUTION

The regulation on income, wealth, and redistribution is another field that regulatory policy often focus, to improve the public wellbeing. However, regulatory redistribution also creates uncertainty in the rate of discount of the future income stream (Lermer and Stanbury 1985). That is, Individual increased wealth that benefit from regulation would be lower in the absence of regulation, and the expected value of future return of earnings originally based on the market price (interest rate, inflation rate, etc.) has distorted by the non-sustainable regulatory redistribution rule with the risk of variance or volatility of regulation policy.

Thus governments do not directly regulating the income distribution, but dictate organizations (firms) to balance the income gap. However, there is also uncertainty in implementing such redistribution rule in organization, because the redistribution rule is set by the head of the organization, and she has no incentive to reduce her profit by processing such redistribution policy. So the employee in organizations prefers relational contract to constrain the decision of organizations and to cover the uncertainty of losing deserved support. Now set the payoff of employee is $s+b-C(a)$, which a is the effort of employees in work which influences the revenue of organization y (to simplify, set $y = a$), $C(a)$ is the cost of employee to exert effort in work, s is the original salary of employee, and b is the compensatory income to balance income gap. So $s + b$ can be regarded as the total revenue and $C(a)$ can be regarded as the total cost of the employee. However, the uncertainty is that the organization has probability $(1-\alpha)$ to refuse to provide compensatory income (just set $b = 0$). Now the equilibrium $(a, b) = (C'(a), a^*(b))^2$. And the payoff of employee becomes $s+a^*(b)^*b-C(a)$, the payoff of the organization is $\pi = y-s-a^*(b)^*b$, So the employee will pay a grim trigger strategy, that is,

1. The employee picks $a^*(b)$ At the first time;
2. If the organization provides $b > 0$ as the redistribution rule requires, employee will still exert $a^*(b)$ At the next time;

3. If ever the organization only offers s without b (refusing to obey the redistribution rule), the employee will always set $a = 0$ (to simplify, set the opportunity cost of staying in the organization is 0).

Now the organization will pay the positive b only if $(y–s–b)+\pi^*p/(1–p)\geq(y–s)^3$

p is the discount rate of the future revenue that can measure the expectation of the organization to the economic condition, which is based on the information of economic signals. Intuitively, when p is high, the head of organization has confidence in economy and is willing to pay compensatory income to support the development of employee; but the low p represents that the head of organization feels the economic prospect is dismal, and then she will not want to reduce the profit.

To sum up, although the optimal redistribution rate b is endogenous, whether this redistribution rule can be implemented depends on the expectation index p, which is decided by the collected information about economic condition. If such information reflects prosperity of economy, the organization will set the optimal redistribution rate of guarantee the fair welfare of employee and high profit of organization at the same time, whereas the organization will defect the redistribution rule if the report says the economic environment is unfavorable.

NATURAL RESOURCE

The industry related to natural resource has more properties of monopoly than job market we have discussed in the last section, since the ownership of natural resource itself can produce strong market power. This paper will not undertake benefit-cost analysis to verify whether such regulation has positive or negative outcome as many professional issues do, but just to depict how the regulation adds uncertainty to organization strategies in regulatory economy.

Now we can assume that the regulation aims at the abatement of pollution of an oil company, which has to purchase equipment to reduce pollution. The payoff in the first stage is $R–F$, which R is the profit without special cost and F Is the special fixed cost of the equipment; and the payoff in rest stages are $R–m$, m is the special cost of maintenance of the equipment. Set p as the discount rate of the future revenue, which can also reflect the expectation of future economic prospect, just as we did in last section. So the expected total payoff of the firm in whole regulation duration is

$$\pi_1 = (R–F) + p(R–m)/(1–p)$$

The firm also has an option to disobey the regulation policy and gets payoff of R. But there is a probability δ that such behavior may be denounced to government at t stage, which is based on the ability of the regulator or the degree of supervision, and the firm will be fined and enforced to buy the pollution control equipment and the total loss is the fine plus price of equipment, $f + F = U$. And then the payoff of the firm is $R–m$, $U>F>m$. Now the expected total payoff is

$$\pi_2=(1-\delta)*R/(1-p)+\delta*[R(1-p^t)/(1-p)+(R-U)*p^t+(R-m)p^{t+1}/(1-p)]$$

The comparison between π_1 and π_2 makes no sense for those big incumbents in this industry, because they are never willing to risk their long-year reputation and friendship with government, but significantly influences the decision of those obscure and small enterprises in such regulatory industry.

Another important player in such market structure is the entrant who wants to entry this regulatory industry. For entrant, the payoff function becomes less complicated because the entrant must purchase the equipment to meet the requirement of entering under regulation:

$$\pi_3 = (R_1-F) + p_1(R_1-m)/(1-p_1)$$

And if this potential entrant enters another industry, the payoff is

$$\pi_4 = R_0/(1-p_0)$$

Where R_1 is the profit without special cost of equipment the entrant can get when it enters in the environment-related industry, and R_0 is the profit in other non-regulated industries. Here $p_0 = p_1 = p$ because p is only the discount rate of future no matter in which industry. It is obvious now that the entrant will enter the regulatory industry if $p > (R_0 - R_1 + F)/(F-m)$, otherwise it should enter other industries.

So the regulation on natural resource and environment not only impacts some incumbents in the industry, but also greatly influences the decision of entrants. There is an uncertainty in such long –run regulation besides discount rate p is the technology, which may change the price or equipment F and maintenance cost m. The impact of F is ambiguous because it exists on both numerator and denominator; but the impact of m is definite, which can be regarded as the mandatory rent if an organization wishes to sustain the business in this industry.

This result also provides policy insight here. From the result, such environment regulation may be not so efficient in blooming economy if the parameters stay constant, since the expectation p would be very high and every enterprise with $p > (R_0-R_1+F)/(F-m)$ will want to enter the environment-related industry, which may lead to heavier pollution. So the regulator should set higher m or add tax on using the equipment every stage to raise m in prosperity times; and should set lower m or offer subsidy in every stage to reduce m when the regulator doesn't want to dampen this industry too much.

In conclusion, this paper sweeps the security, redistribution, and natural resource as the critical fields of regulation. The analysis focuses on the decision making of organization under uncertainty in different content of regulation, by means of insurance, relational contract and game theory to indirectly measure the impact of uncertainty.

In security field, there are two dissimilar effects in monopolistic industry and more competitive industry. In the former one, company has to pay the fixed cost and the premium $(p+\varepsilon)\sigma$ to cover the uncertainty of regulation; and in the later one,

the average cost of uncertainty is higher than the one in monopolistic industry. However, in both cases, the cost of organization is decided by their own risk tolerance parameters;

In redistribution field, the regulation requires organizations to implement the income redistribution according to established redistribution rule. However, the incentive condition $\pi > b^*(1-p])/p$ of organization to under regulation is primarily based on the uncertain discount rate p, which further depends on the collected information of the economic condition, whereas the optimal level of redistribution rate b is endogenous in organization;

In natural environment field, the regulation has little effect on those famous and big companies because the reputation and relationship with governments are more important than the cost of uncertainty, whereas some obscure and small enterprise may have better off from deviating from regulation. And the decision of entrants is also greatly influenced by the estimation of discount rate p and the technology rent m, which are both uncertain in long run regulatory times.

Having said these, the value of information is obvious. The costs of organization to overcome the uncertainty in models are all based on the information the organization can get, and the accurate information does not only influence the organization strategies, but also help regulators to estimate the proper level of regulation from the information of cost of organization. The Sixth Annual MIT Sloan Investment Management Conference asked what we should expect in the uncertain and regulatory economy, and this paper is seeking the answer. That is, the symmetric information can reduce the extra cost of uncertainty in regulation, which calls for, at least, the transparent disclosure and positive communication between the government and organization.

Notes

1. In perfect competitive market of insurance, expected profit $E(\pi) = 0$, and $E(\pi) = (q-p-\varepsilon)x$
   $\therefore q = p+\varepsilon$ $E(V_2) = (1-p-\pi)\ V(w-qx) + (p+\varepsilon)\ V(w-\sigma-qx+x)$
   Or $E(V_2) = (1-p-\varepsilon)\ V(w-(p+\varepsilon)x) + (p+\varepsilon)V(w-\sigma-(p+\varepsilon)x+x)$
   First order condition:
   $dE(V_2)/dx = (p+\varepsilon)\ (1-p-\varepsilon)\ V'(w-(p+\varepsilon)x)+(p+\varepsilon)\ V'(w-\sigma-(p+\varepsilon)x+x)\ (1-(p+\varepsilon)) = 0$
   $w-(p+\varepsilon)x = w-\sigma-(p+\varepsilon)x+x$
   $\sigma = x$
   $qx = (p+\varepsilon)x = (p+\varepsilon)\sigma$
2. Max $s + ab - C(a)$
   First order condition:
   $b = C'(a)$, $a = a^*(b)$
3. The payoff of the organization in whole regulation time is
   $(y-s-b) + \pi p + \pi p^2 + \pi p^3 + ... + \pi p^n = (y-s-b) + \pi^* p/(1-p)$, which must be larger than $(y-s) + 0+0^2 + 0^3 + ... + 0^n = y-s$, if the head of organization has incentive to sustain such relationship and profit gaining.

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