

論文の内容の要旨

Abstract of Doctoral Dissertation

Thesis title:

Three essays on Environmental Economics : A role of extended producer responsibility

(環境経済学に関する 3 つの論文 : 拡大生産責任者責任の役割)

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The solution for environmental problems is an essential at a worldwide level. As far theorists in the field of environmental economics discussed mainly the environment tax, the tradable pollution permits, and the use of natural resources. However recycling plays an important role of solving waste management especially in environmental problems, we have little theory about it. In this thesis we provide how to motivate to producers for disposing of waste in the recycling system.

Recently several scholars in the field of laws and economics have emphasized the necessity of Extended Producer Responsibility (EPR). EPR is the extension of the responsibility of producers, and all entities involved in the product chain, to reduce the cradle-to-cradle impacts of a product and its packaging; the primary responsibility lies

with the producer, or brand owner, who makes design and marketing decisions. (Sierra Club, 2009). It is necessary to incorporate this framework into the area of economics in order to develop a mechanism that encourages producers to take responsibility for their used goods on their own initiative. This is because a regulation is less effective than economic policy in many environmental issues. Remember the reason why a pigovian tax is needed: a pigovian tax is more effective than a regulation in that the enormous cost will be needed to watch violators in a regulation.

Thesis 1: "A motivation of collecting wastes"

In this paper we have extended the model of Gaskin(1974) to analyze the illegal waste problem. The relation between new good markets and secondhand markets was studied lively in the 1970s through the Aluminum Company of America (Alcoa) case of 1945. Milton Friedman has suggested that a competitive recycling sector would tend to push the price of aluminum down to the marginal cost of virgin aluminum production though the law court ruled that Alcoa constituted an illegal monopoly under the law since it ultimately had control of the secondary ingot sector through the stock of scrap aluminum. Gaskin(1974)'s model was assumed that new goods and secondhand goods are perfectly substituted each other. New goods are supplied by the monopolist and the secondhand market is competitive. Gaskin(1974) assumed that the monopolistic producer and the secondhand dealer are another companies, but in our paper the monopolistic producer enters the secondhand market and have priority over other secondhand dealers to collect used goods . We conclude two main claims in this thesis.

We have offered two important implications with this thesis. First, it is a relation to Antitrust law. The reason why ALCOA violated Antitrust law is that ALCOA produced about 70 percent of virgin aluminum; however the secondhand market for aluminum was a perfectly competitive market. The several economists, such as Milton Friedman, insisted that ALCOA would not violate Antitrust law. The stock of used aluminum would increase as time has passed. By that, the price would fall down to the marginal cost on the ground that virgin and used aluminum were complete substitutive. In our paper, if the product is unlawfully abandoned, it is preferable that we leave the monopolistic firm to produce goods and make it collect the used goods under the extend producer's responsibility.

Second, we provide a prototype of a voluntary EPR system through the game theoretic approach. In the areas of laws, a voluntary EPR is translated as an incentive for improving products to scrap and re-build; however, the concept of the voluntary EPR

that we use is different in that we regard it as a strategic interaction between a monopoly producer and secondhand dealers. The scholars studying the secondhand market, such as Gaskin(1974), Swan(1980), Martin(1982), regard the secondhand markets as the system of depriving producers of market power. We suggest that it is useful for the monopolist, which enters the secondhand market, to collect the used goods in order to alleviate the competition in the secondhand market. We point out this effect is one of the voluntary extended producer's responsibility because the firm collects her used good on her own purpose. In short we regard the secondhand market as the device of giving the monopolist incentive to collecting wastes.

Thesis 2: "Regulations and constructions of recycling systems: A game theoretic approach"

In Thesis 1 we assumed that new goods and used goods was completely substitutive, but there was many kinds of recycled or rebuilt goods which was different from the new goods since recycling was processing used waste into new products. For example the scrap recovery factories buy the used cars from salvage companies and take them apart. Some parts, like doors, windows, and engines, are sold to the automobile repair shops, and other parts like body are melted and rebuilt to some kinds of metal.

We suppose that new goods and used goods are different and the monopolistic producer runs also the secondhand dealer. We assume that the dealer which is run by the monopolist deals the wastes in a good manner, but another secondhand dealer which is not run by the monopolist dumped them unlawfully. We research whether the subsidy to the cost of the waste disposal diminishes the waste dumped unlawfully. It depends on the situations because there is the possibility that the reduction of the cost for the waste disposal may lead to the increase in production of new goods. In this model the dealer which is run by the monopolist has incentive to collect waste in order to alleviate the competition in the secondhand market. Moreover we research whether a subsidy for the disposal of waste or the enlargement of the secondhand market diminishes unlawful dumping of garbage.

Thesis 3: "Monitoring Accuracy and Retaliation in Infinitely Repeated Games with Imperfect Private Monitoring: Theory and Experiments"

This paper examines infinitely repeated prisoners' dilemma games that are modeled as being randomly terminated at the end of every round with a fixed probability. We assume *imperfect monitoring*; each player cannot directly observe whether the partner selects the cooperative action or the defective action. Instead, he/she can, indirectly and imperfectly, monitor the partner's action choice through the observation of a noisy signal that is contingent on this choice, i.e., either the good signal or the bad signal. We assume that this monitoring is *private*; whether the occurred signal for a player's action is good or bad is not observable to this player. We also assume that the probability of termination is so low as to provide a rational and self-interested player with the incentive to make the cooperative action choice from the viewpoint of long-term benefit, even if the monitoring technology is inaccurate.

On these assumptions, we experimentally investigate whether and how often the subjects in laboratories make the cooperative action choices, whether and how their behavior takes an influence of the monitoring accuracy, and whether and what the reason why they fail to behave as cooperatively as the game theory predicts. Our experimental results support some aspects of game-theoretical prediction on the basis of rational and self-interested motives; irrespective of the monitoring accuracy, the subjects in laboratories make the cooperative action choices quite often. They make the cooperative action choice when the monitoring technology is accurate more often than when it is inaccurate.

Our experimental results, however, indicate that the subjects in laboratories make the cooperative action choice much less often than the game theory predicts. This paper argues that with imperfect private monitoring and with low probability of termination, the subjects' naïveté and social preference concerning reciprocity might prevent the device of regime shifting between the reward and punishment phases from functioning in implicit collusion.