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INTERNALIZING ENERGY AND ENVIRONMENTAL EXTERNALITIES BY MEANS OF NATIONAL LOTTERY GAMES

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Overview

Most issues on energy and the environment are typically related to externalities: it is apparent that wide spreads of renewable resources, energy efficiency improvement, mitigation of greenhouse gases, and so on are desirable to the society; however, laissez-faire does not seem to work for their attainment. The role of government is to suppress the sources of externalities (such as greenhouse gases) as well as to support alternatives (e.g. energy development, efficiency improvement, new infrastructure, etc.). To do so, governments need to take money from such externality sources, and use it as public investments. Taxation is one of the means. For example, environmental tax helps reduce emissions as well as provides financial sources for technology deployment. Emission permit auctions may be another mean.

While taxation and emission permit auctions are useful means in economic theory, the reality is not that easy. Especially, taxation is one of highly political issues in any country, and thus is difficult to deal with without tough political negotiations. In fact, in Japan, there have been a lot of pros and cons on the possible introduction of carbon tax. Emission permit auctions are also under political debates.

Good news is that we may have another instrument for money transfer to ease externalities, which may be much easier to gain social acceptance. That is, the use of lottery games. Lotteries have a history as financing instruments for public and non-profit enterprises nearly as long as that of charitable donations. Their use in the context of environmental issues is attracting attentions. In fact, some NPOs stressing sustainability in these days sell tickets of "environmental lottery." Bad news is that even though national charitable lotteries have been popular world wide, few studies on the topic can be found in the economic literature.

Methods

This paper discusses the role and use of national lottery games as a mean for energy and environmental fundraising. It develops an analytical model of optimal lottery design. The basic structure of the model is similar with Morgan (2000) and Duncan (2002) in that lotteries are characterized as the combination of possible prizes and their probabilities of winning. What makes our model different from these preceding studies is the conception of optimal design. This feature is intended to deal with an important question that remains unanswered in Morgan and Duncan—that of how the fullest use can be made of lotteries to raise funds for the public welfare.

Results

We first show that lottery games can be a substitute for taxation: they can be used to internalize externalities that often arise in environmental issues. Then, the optimal design of lotteries are discussed, and the rationale of the optimality is derived: for each class of prize, the expected return-total invested money ratio must be equalized to the elasticity of an individual's ticket purchase with respect to the prize amount. Moreover, it is shown that the net revenue of the originator under the optimality is given as $\{1 - \text{the summation of (the$

elasticity of the individual's ticket purchase with respect to the prize amount for each class of prize) \times (total sales).

Conclusions

In such country as Japan, the creation of environmental tax or permit auction is now under pros and cons debates. European countries are on the way ahead. However, even if they are so, the attainment of optimal taxation will not be an easy task in any country. Thus, the use of environmental lottery as a substitute for environmental tax might be worth receiving attention. The rationale of the optimality derived here is quite practical in designing lottery games, which in turn helps policy making in internalizing environmental externalities.

References

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