Designing energy tax rate to optimize energy usage in garment factories using Game Theory

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Energy problem is undoubtedly one of the most serious global problems people all over the world are facing today. Energy resources, especially fossil fuels, are crucial to everyone on the earth. Unfortunately, these resources are non renewable. Besides, great consumption of fossil fuels is also causing severe environmental problems. Therefore, improving energy efficiency is very important to every country in the world. In this paper, we propose a method of designing energy tax rate based on game theory. Using this method, the effect of energy tax on encouraging manufacturers' improvement in energy efficiency is enhanced. Consequently policy makers can reduce the average burden of manufacturers brought by energy tax. Through utilizing game theory in a numerical example, we explain the effect of energy tax on encouraging manufacturers to improve their energy efficiency. The result shows that, given a fixed average tax rate, energy tax with differential tax rates according to manufacturers' energy efficiency is more effective than that with uniform tax rate. Then, based on differential tax rates, a method to determine a proper average tax rate is presented by utilizing theory of Nash equilibrium in game theory. In addition, practicality of the method is simply discussed in the last section.

Key words: Differential rate, Energy efficiency, Energy tax, Game theory, Nash equilibrium

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