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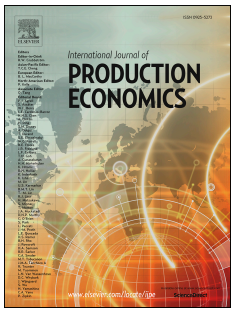

Low-carbon product selection with carbon tax and competition: Effects of the power structure

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Low-carbon product selection with carbon tax and competition: Effects of the power structure

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Abstract: This paper considers product selection strategies of two competitive firms in the presence of carbon tax. Optimal strategies are developed for product selection of the firm with two game structures, namely, the Nash game and the Stackelberg game, by which the paper conducts an analytical examination of the effect of power structure on the product selection strategy of the firm over various levels of carbon tax rate. The critical managerial findings derived with the studies are as follows: (i) Two competitive firms will always adopt the same product strategy with the Nash pricing game, regardless of the carbon tax rate, which is in contrast to that they will adopt a differentiated product strategy over the low carbon tax rates with the Stackelberg pricing game. (ii) Two competitive firms will both select the common or low-carbon product with randomness over the middle carbon tax rates with the Nash product selection game, which is contrast to that the randomness in their product selections is removed with the Stackelberg product selection game, which leads to an existence of the pure strategy Stackelberg equilibrium for their product selection strategies over the middle carbon tax rates. The inherent mechanisms leading to these essential differences are also discussed in the paper.

Keywords: Low-carbon product; power structure; carbon emission; carbon tax; competition

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