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*Publication date:*
2014

*Document version*
Publisher's PDF, also known as Version of record

# Regulation of Hunting with Uncertain Population Levels

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**Abstract**: For hunting an externality arises due to open-access but in all Western countries, including Denmark, regulation of hunting is very complex. Often it involves combining harvest fees, licenses, subsidies, self-reporting and enforcement. Of course such complex regulation raises huge information requirements. For this reason Abildtrup and Jensen (2014) propose to simplify the regulation. The point of departure in Abildtrup and Jensen (2014) is that regulator does not need to measure individual harvest and, therefore, a moral hazard problem arises (see e.g. Laffont and Tirole, 1992). With this observation Abildtrup and Jensen (2014) propose to use a population tax as regulatory instrument. If the population level is larger than a target population level each hunter receives an individual, variable subsidy while an individual, variable tax is used if the target population level is larger than the actual population level. By proper selection of a variable tax and subsidy rate the population tax will secure a first-best optimum. However, the tax in Abildtrup and Jensen (2014) requires that the population level can be perfectly measured. Even though the population level can be roughly estimated from, for example, damage or trees and crops this assumption is of course not reasonable and it is a well-known fact that within hunting population levels is not perfectly measurable. For this reason we treat the population level as a stochastic variable in the present paper. With uncertain population levels we have two market failures (open-access and uncertain population level. With two market failures we need two policy instruments to secure a first-best optimum and following Xepapadeas (1995) and Jensen and Vestergaard (2007) we suggest combining a population tax and a tax on voluntary, self-reported harvest. Provided that individual hunters are risk-averse they will voluntary choose to self-report part of their harvest. The intuition behind this result is that the hunters prefer a certain self-reporting tax over an uncertain population tax if they are risk-averse. In the paper we calculate the value of the population tax rate and self-reporting tax rate. The population tax rate consists of three elements. First, the difference in net benefits between regulator and individual hunters are included. Second, the marginal risk-aversion shall be taken into

account. Third, the marginal value of increased self-reporting tax payments must be incorporated. Concerning the self-reporting tax rate, this rate also takes three elements into account. First, the marginal population tax shall be included. Second, the variance of the uncertain population level is included in the tax rate. Third, the tax rate must take the marginal risk-aversion into account. Note that the combination of a population tax and self-reporting tax secures a first-best optimum because the individual hunter pays the full costs of the two market failures.

**Literature**.

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