Matters of Management, Sustainability, and Efficiency: Essays in Fisheries

By

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THESIS

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Abstract

This thesis addresses three main issues in fisheries management: monitoring and enforcement; profit efficiency; and factors determining profit efficiency. The overall objective is to provide broad theoretical and empirical analysis of fisheries management issues that seek to address sustainability and efficiency questions in the industry.

The first issue investigated is whether monitoring and enforcement, as management policy instruments, can lower illegal harvesting and therefore preserve fish stocks. Using a game theoretic approach the strategic interaction between management and fishers, in the presence of illegal, unreported, and unregulated (IUU), is examined. Results of the analysis show that equilibrium compliance strategies of fishers affect stocks over time. It is further observed that increasing the cost of engaging in illegal activities, through punishment, may be sound economic policy.

The second issue examined is efficiency in the South Australian Rock Lobster Fishery. To do this a new approach, in the context of fisheries, is used to overcome the small sample sizes and negative profit challenges inherent in fisheries. Specifically, the Nerlovian and Directional Distance Function methods are used to decompose profits of the fisheries into technical and allocative efficiencies. In addition, the meta-frontier efficiency technique is used to compare the Northern and Southern Zones, the two fisheries in the South Australian Rock Lobster Fishery. Results show that profit inefficiency in this fishery can be largely attributed to allocative inefficiency. Further, it is observed that there is significant variability between efficiency levels in the Northern and Southern Zones.

The final issue considered is the natural question of what factors, besides technical and allocative inefficiency, may possibly explain profit inefficiencies in the South Australian Rock Lobster Fishery. To answer this question we investigate the effects of incorporating a fixed input on equilibrium profits and biomass. We first set up a theoretical model with an input that is fixed in the short-run (vessel size) but that can be used with a variable input at sub-optimal capacity. We use this model to get predictions for the impact on profits of exogenous changes in biomass, output price and vessel size. These give us interesting theoretical insights into why it is important to incorporate fixed inputs into profit analysis. We then conduct an empirical investigation to gain an understanding of the effects of these non-discretionary

factors on profit efficiency. In particular, we apply a truncated regression with bootstrap methodology to data on individual firm profit efficiency from the South Australian Rock Lobster Fishery. We find empirical support for our predictions that increased biomass and smaller vessel length are associated with higher profits. An additional empirical result is that individual quota management is positively associated with profit efficiency.

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Dedication.

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