The JSFS 85th Anniversary-Commemorative International Symposium
"Fisheries Science for Future Generations"
Symposium Proceedings, No. 13005

Original article

Fishing quotas can be justified under common price of shared resources?

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Keywords: Differential games; Shared resources; Common price of fish; Integrated world market; General equil.

Received: 11 June 2017 / Accepted: 10 September 2017

Introduction

The joint of international trade theory to resource/ fishery economics is [1], where each country has local renewable resource. However in the ocean, to introduce United Nations Convention on the Law of the Sea and EEZ all over the world, the focus is shifted to internationally shared/common renewable resource management. As the evidence of it, peace ocean's Bluefin tuna and Japanese eel are common resources, which are included in the Red List, on the other hand there are five RFMO for international organization of each area's tuna. Traditionally, the concept of internationally shared/common renewable resource management is divided from international trade theory at least politically. Rus [2] and Tanaka et al. [4] adjusted Brander et al. [1] type's model to internationally shared/common renewable resource model, where on the one hand Rus [2] is partially shared, on the other [4] is completely shared. Therefore, to introduce internationally completely shared/common renewable resource management in the trading situation, it is better to introduce management to the model of Takarada et al. [4]. Tanaka et al. [3] considered the situation based on Ricardian trading model with internationally shared renewable resource. Rus [3] uses ad valorem type's revenue tax to internationally shared resource, but both countries' incompletely specialization is excluded from model's situation.

This paper considers the point, that is, each country's non-cooperative welfare maximization to internationally shared renewable resource trading model in the general equilibrium. Usually, the equilibrium that both countries' incompletely specialization may exist under the situation, where grandfathering non-transferable fishing quotas distribution to each country is justified. However, this paper shows that the equilibrium cannot occur under each country's non-cooperative welfare maximization to use differential games. This result can be kept under more general production/harvesting functions, the robustness can be held when the solution concept is whether open-loop solution or Feedback-Nash equilibrium. The key conditions are as follows: (1) the resource is common, (2) the resource good's market is common, (3) the resource good's price is common, (4) each country considers the common price to non-cooperatively welfare maximization, and (5) non-resource good (manufactures) are produced in the world. By this paper, the grandfathering non-transferable quotas' distribution to each country cannot be justified in the case.

Materials and methods

Basic Way: Modern Economics' Theoretical Way with Dynamic General Equilibrium and Differential Games. Model Setting: Two-Country (Resource-Good Importing Country and Resource-Good Exporting Country), Two-Good (Fisheries' Resource-Good [like frozen tuna or Demolished eel] with common price and numeraire non-resource Manufactures), One-Factor (Labor) model with Internationally Shared Resource (like young Thunnus orientalis or glass eel as resource). Optimization: each country's non-cooperative national welfare maximization with national fishing quota considering common fish price's movement satisfying dynamic equation of shared resource and international resource-good market clearing condition as inequality with equal (original equilibrium condition).

Results

Key Conditions are as follows: (1) Internationally Common Shared Resource, (2) Resource-good market is internationally common, (3) Fish price p is internationally common essentially (4) Each country considers fish price p (p is variable), (5) International equil. condition is a "constraint" (with inequality with an equal sign) for each country. Proposition:

(1) Consider the case that each country maximizes each country's economic welfare maximization with output control non-cooperatively considering the common price's movement. Under the case that

the solution concept is open-loop solution, the equilibrium that both countries' incomplete specialization, that is, both countries produces both goods cannot be happened under trade occurs. The case of both countries' incomplete specialization is limited in the situation that no trade situation after finishing autarky.

(2) This result can be derived only the necessary condition of control variables and equilibrium of demand and supply. Moreover, this result can be kept with the solution concept as Feedback-Nash Equilibrium, which is better for economics.

This result has strong robustness with resource harvest function and manufactural production function are general formulation with not only constant return to scale to effort/labor but also decreasing return to scale to effort/labor. Model and Results are in Fig. 1.

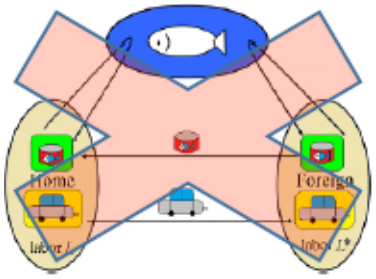

Fig. 1. Model's Figure and Main Result: Fish is drawn as Resource.

Discussion

The premise of justification of non-transferable fishing quota's distribution is broken. Analysis without both countries' incomplete specialization has meaning [4]. Ideal situation: Determination of priority of fishing countries and world's total catch amount: Concentration of fishing countries satisfying total catch amount is better than introducing IQ and IFQ. If both countries' incomplete specializations hold in international trading equilibrium, at least one country does NOT maximize the country's welfare.

Acknowledgements

This paper is supported by Grant-in-Aid for Young Scientists (B) No. 24730206 and 15K21547. This paper is based on ideas when the author is a research assistant of RIETI (Research Institute of Economy, Trade & Industry), and on comments from Kouki Sugarawa (Nagoya Gakuin University) for another paper presented in NMW (Nagoya Macroeconomics Workshop). The author greatful acknowledges to Yasuhiro Takarada (Nanzan University/RIETI), who was the chief of the project in RIETI, Weijia Dong (Nagoya University/Chinese Academy of Social Sciences), who and the author were assistants of the project in RIETI, and Kouki Sugawara who gives the author the key comments.

Additionally, this paper is presented as follows: TEMF (Theoretical Economics, Management and Fisheries) (Tokyo University); Game Theory Workshop 2014 (Tokyo Institute of Technology); JSFS (The Japanese Society of Fisheries Sciences) (Hokkaido University, Tohoku University, and Tokyo University of Marine Science and Technology); REW (Ryukyu Economics Workshop) 2014 (Okinawa University); SWET (Summer Workshop on Economic Theory) 2014 (Otaru Institute of Commerce): JIFRS (Japan International Fisheries Research Society) 2014 (Tokyo University); Economic Research Group by Young Researchers in Kansai Area (Kobe University); Society for Environmental Economics and Policy Studies 2015 (Kyoto University); the Japanese Economic Association 2015 Autumn (Sophia University); the Japan Society for International Economics (Senshu University); WFC (World Fisheries Conference) 2016 (BEXCO, Busan); IIFET (The International Institute of Fisheries Economics and Trade) 2016 (AECC, Aberdeen), KAAE (Korean Association of Applied Economics) 2017 (Ramada Gangwon Sokcho), and JSFE 2017 (Tokyo University of Marine Science and Technology).

The author acknowledges to the following chair-persons, organizers, discussants: Takahiro Matsui (Mie University) (TEMF); Haruo Imai (Kyoto University) (Game Thoery Workshop); Nariharu Yamashita (Hokkaido University) (JSFS); Kenzo Abe (Osaka University) (REW); Jun Oshiro (Okinawa University) (REW); Toshihiro Ichida (Waseda University) (REW); Keisaku Higashida (Kwansei Gakuin University) (JIFRS); Jota Ishikawa (Hitotsubashi University) (SWET); Chisato Shibayama (Otaru Institute of Commerce) (SWET); Kentaro Inomata (Osaka University) (Economic Research Group by Young Researchers in Kansai Area); Yutaka Takeuchi (Kagoshima University) (JSPS); Lee Woohyung (Keimyung University) (KAAE); Lee Woojin (Korea University) (KAAE); Tamotsu Nakamura (Kobe University) (KAAE); and researchers who gave me useful comments or heard my presentations.

Additionally, the author thanks to Chikara Yamaguchi (Hiroshima Shudo University/Hiroshima University), and Hiroki Wakamatsu (National Research Institute of Fisheries Science) for useful comments. Moreover, Atsushi Iwasaki (the University of Electro-Communications) and Tadashi Sekiguchi (Kyoto University) supports me for presentation of this paper. All errors remain mine.

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