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Analysis

Does the use of eco-labels affect income distribution and income inequality of aquaculture producers in Taiwan?

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ABSTRACT

The purpose of eco-labels is to encourage a move towards more environmentally friendly consumption patterns. The eco-label has been recognized as a means of promoting products with lower environmental impact. A considerable body of literature has focused on consumer demand for eco-label use: however, little attention has been paid to producers. Because the adoption decision is voluntary, a better understanding of producers' adoption behaviors towards eco-labels could significantly determine the effectiveness of the program. This paper contributes to this policy issue by assessing the impacts of the *Taiwan Good Agricultural Products* program, a combined eco-label and food traceability system, on the distribution of aquaculture producers' income in Taiwan. Using a unique aquaculture producer survey in Taiwan, we examine the extent to which label use may affect the level of income, income variability and income inequality of the producers. Our findings suggest that eco-label use increases income and that the effect is more pronounced for producers at the higher percentile range of income distribution. Label use also increases income variability, but no significant effect on income inequality is evident.

1. Introduction

With the increased ecological consciousness of consumers, ecological labels (eco-labels) have been proposed as an effective solution to ensure environmental sustainability (OECD, 2005). Eco-labeling is a labeling system for food and other consumer products; it is a form of sustainability measurement directed at consumers.[1] The usefulness of the eco-label in creating a market-based incentive for environment-friendly production was recognized about two decades ago (Gallastegui, 2002). Since the 1990s, eco-label schemes have been developed in most industrialized countries for a wide range of products and sectors (Agnew et al., 2006). In recent years, they have been gaining importance in a number of developing countries (e.g., Brazil, India, Indonesia and Thailand), as well as most developed countries (e.g., Norway, Sweden, Iceland, Finland and Denmark). In Taiwan, a combined eco-label and food traceability system, the *Taiwan Good Agricultural Practices* (TGAP) program, was implemented by the Council of Agriculture in Taiwan in 2004.

In light of the importance of eco-label use on environmental protection and food safety, there has been considerable economic analysis on eco-labels. Research effort on eco-label use has been devoted to various products, such as wood (e.g., Aguilar and Cai, 2010) and coffee (e.g., Beuchelt and Zeller, 2011). Compared to other food products, certificated labels on aquaculture products may be more crucial for consumers. This is because a higher health risk has been observed among aquaculture products. In Taiwan, historical data from the Department of Health in Taiwan shows that 30% of food poisoning resulted from the consumption of fish products between 1981 and 2004 (DOH, 2004).

A growing body of literature has focused on eco-label use of aquatic products, and previous literature mainly concentrated on consumer demand of eco-labels (e.g., Berg et al., 1996; Brecard et al., 2009; Brouhle and Khanna, 2011; Hatanaka, 2010; Moon et al., 2002; Torgler and García-Valiñas, 2007; Wessels et al., 1999). For instance, Brecard et al. (2009) used a random survey of 4748 consumers from European countries to examine the determinants for eco-label demand on fish products. Their results demonstrated that the typical consumer who was more likely to accept eco-labels was better educated and well informed on the state of marine resources. Consumers who are aware of the importance of marine resource preservation have the same profile. Wessels et al. (1999) evaluated consumers' possible acceptance of an eco-label program for seafood products based on a contingent choice survey of 1640 households in the U.S. Their results showed that the design of a successful eco-label program for seafood products cannot follow a simple "cookie-cutter" approach. Moreover, consumers' preferences for eco-labeled fish differ by species, geographic region, consumer group, and certifying agency.

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[1] According to the International Organization for Standardization (ISO), three different types of eco-labels are recognized. Type I is operated by governmental organizations and it is awarded for products and manufacturing processes which meet certain environmental criteria, while Type II is associated with informative environmental friendly claims which are not varied by any independent third party. Type III covers voluntary programs that provide quantified environmental data of a product. We thank an anonymous reviewer for making this distinction.

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In addition to the consumer demand, the effectiveness of the environmental friendly programs also depends highly on producers' adoption decisions. Therefore, a better understanding of the adoption behavior of producers and the potential impacts of the adoption decisions on their economic wellbeing is of particular importance. A considerable body of literature has focused on technology adoption of producers toward environmental friendly practices, such as organic farming (e.g., Mayen et al., 2010; Weber, 2012), and land conservation program (e.g., Chang et al., 2008). For instance, Mayen et al. (2010) compared farm productivity and production efficiency of organic and conventional dairy farms in the U.S. They found little difference in production efficiency between organic and conventional farms. Using a representative sample of coffee growing households in southern Mexico during the growth season 2004–2005, Weber (2012) estimated the price premium and gross income gain from participating in fair-trade-organic markets through grower cooperatives. He found that organic growers received a gross income gain of 5% of total household income or about 26 dollars per household member. Chang et al. (2008) investigated the impacts of participation in the land Conservation Reserve Program in the U.S. on farm household income, consumption, and saving. Using a national representative sample of the farm households in the U.S, they found that participation in the land conservation program increased farm household income and saving.

Compared to considerable interest in producer's adoption decision in environmental friendly practices, not much attention has been paid on eco-label uses. Empirical studies on producers' adoption of ecolabels are scarce due to a lack of data availability (Gallastegui, 2002). In the few studies done on this topic, aggregated level data were commonly used. For instance, Monteiro (2010) used a cross-country dataset to look at the spillover effects of eco-label use across countries. By estimating a spatial probit model, which demonstrates how a government's decision to introduce an eco-label can be influenced by the decision of neighboring countries, he found an importance of a high stage of development, innovation experience and potential scale effects in the implementation of an eco-label scheme. In addition, the existence of strategic interdependence in eco-label decisions was evident. Grolleau and Harbi (2008) used an aggregated dataset of 116 countries to investigate the determinants of the adoption of ecolabeling schemes among countries. They found that economic and political freedoms, innovation capacities and experience with other environmental voluntary approaches play a major, sometimes counter-intuitive, role to explain the diffusion of governmental ecolabeling programs.

This study contributes to the limited empirical evidence of producers' economic analysis on eco-labels. The primary objective of this paper is two-fold. Using a unique aquaculture producer survey in Taiwan, we begin by examining the extent to which socio-demographic characteristics, family, production conditions and environmental factors are associated with the adoption behaviors of aquaculture producers in Taiwan. Given that income has been recognized as a reliable indicator of economic wellbeing (Deaton, 1997), we also assess the impacts of eco-label use on income.[2] In addition to the mean level of income, we further investigate whether or not label use has different effects on aquaculture producers over a range of income levels. Moreover, we demonstrate how eco-label use can affect income variability and income inequality of label users and non-label users differently.

2. An Eco-label System for Aquatic Products in Taiwan

In 2004, the Council of Agriculture (COA) in Taiwan launched the *Taiwan Good Agricultural Practices* (TGAP) system to verify the safe use of the aquatic products. The TGAP is an inspection and certification program. It aims for sanitary management practices to maintain hygienic conditions in production areas and facilitate the production of good quality and safe products. The management practices required by TGAP certificate include using a clean water supply and good sanitary facilities, especially for sewage and wastewater systems. In addition, the TGAP requires the producers to keep detailed records on the sources of seed use, medicines used for disease prevention etc. Documentation regarding the marketing chain is also necessary. The TGAP system is a transmission platform that connects databases from upstream to downstream in the supply chain.[3] In general, the TGAP system can be regarded as a combined system of food traceability and eco-labeling. In total, eleven aquaculture products are eligible to apply for TGAP certification: cobia, tilapia, eel, perch, milkfish, grouper, clam, shrimp, oyster, ayu and snakehead. All certified TGAP products carry certification insignia for a quick identification and guarantee of the safety and quality of fish products for consumers. The COA in Taiwan is responsible for collecting target samples of aquatic products and testing them to insure standard requirements have been met.

Participation in the TGAP system comes with an additional cost for producers. Each participant is required to pay a certain membership fee which varies with the type of aquaculture product. In addition, participation in the TGAP may generate internal costs to producers. Participants are required to document all relevant product information, including seed varieties, harvesting, processing, transportation and storage. On the other hand, producers can benefit from the adoption of TGAP certification in several ways. For instance, a TGAP system can help consumers distinguish a fish product's desirable attributes without having detailed technical knowledge and an overview of the production processes and methods underlying the certification criteria and certification itself. This may increase consumer confidence in product safety. Therefore, consumers would more willing to pay higher prices for safe food (Moon et al., 2002). In addition, farmers can use counseling based on the TGAP record keeping, to improve farm management. In 2010, aquaculture products with TGAP certification accounted for approximately 15% of the total aquatic consumption in Taiwan.

3. Data

Data were drawn from the 2008 *Annual Economic Survey of Offshore Fisheries and Aquaculture* (AESOFA) conducted by the Fisheries Agency, Council of Agriculture (FACOA) in Taiwan. The AESOFA dataset was conducted annually since 1996. In each year's survey, the FACOA first identified a total number of aquaculture producers in each administrative district using the Geographic Information System technique. With an approximated size of the total aquaculture population, the FACOA then determined a random sample of aquaculture firms, which are approximately between 600 and 620 firms each year (Fisheries Agency in Taiwan, 2008). The sample selection criteria considered the geographic locations and fish types of the population of aquaculture producers. In each administrative district, the number of observations of each type of fish firms in the sample is proportional to the entire population of producers. Thus, this random survey is nationally representative of aquaculture firms in Taiwan (Fisheries Agency in Taiwan, 2008).[4] Each selected aquaculture firm will then

[2] Although income has been extensively studied in the economic literature, a growing body of literature has focused on the subjective indicator of the wellbeing. For instance, Frey and Stutzer (2002) provided a comprehensive review to elaborate how *Happiness* can be used to measure the subjective wellbeing of the individual. Since we don't have any information of farmers' happiness in the dataset, we cannot further address this issue.

[3] The TGAP system can be accessed at http://taft.coa.gov.tw.

[4] As one anonymous reviewer pointed out, the representativeness of the AESOFA can be better understood by comparing the sample characteristics to the entire population. Because Aquaculture Statistical Year Book (2008) only reported that an overall inland fishery firms were 27,756 in 2008, and detailed information of the firm characteristics and fish types in each administrative district is not publically available, we cannot compare the distribution of our sample to the entire population.