The Effects of Crop Biodiversity on Agricultural Production: An Empirical Investigation of Rice Genetic Resources

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ABSTRACT

This paper tests whether exogenous shocks including agricultural policies, trade liberalization and financial crisis have impacts on the structural changes in the farm or farm household income. Unlike previous studies that specify break points prior to the estimation of regression, this paper estimates break points by fitting time series models. Tests for the structural breaks show that there is no structural break in the real farm household income whereas real farm income has five break points. Especially the break at 1997 can be interpreted as the impacts of financial crisis. The break points of 1983, 1987 and 1992 approximately match with the timings of agricultural policies that aimed better structure of agriculture and rural area were implemented. The assessed impacts of exogenous shocks at 1970, 1983, 1987 and 1992 are all positive. However, the assessed impacted of the shock at 1997 is negative. The impacts of the shock at 1997 are assessed within the range between -1,141,432 won and -3,167,804 won.

Key words: biodiversity, rice farming, productivity, risk, tolerance-to-pest

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I. Introduction

In general, a loss of biodiversity is known to generate adverse effects on the functioning of ecological system (see Laureau and Hector, 2001). Following this line of research, there has been increasing recognition to the importance of the productive values of biodiversity (as a form of having affluent crop genetic resources) in agricultural production (Sumner et al., 1981; Cooper et al., 1992; Di Falco and Chavas, 2004; Di Falco, 2005; Di Falco et al., 2005; Di Falco and Perrings; Heisey et al., 1997; Smale et al., 1998; Tilman et al.; Widawsky and Rozelle, 1998). In agriculture, the contributing effects of biodiversity to production is particularly relevant since crop genetic resources provide the basis of agricultural production. The productive value of biodiversity in agricultural production is often highlighted at a number of circumstances. One of them is related to the concept of multi-functionality in an agricultural sector. Even though multi-functionality is often related to the non productive values of agriculture (such as food security, maintaining farm landscape and rural community, and preserving cultural heritage, etc.), biodiversity can contribute to multi-functionality of agriculture in the sense that it can bring additional external values when agricultural production is concerned. Despite of these relevant benefits of biodiversity in agricultural production, it is surprising to notice that less attention has been devoted to the empirical analysis of these effects.

One should note that such an empirical work of estimating the productive values of biodiversity might confront several problems. One of them concerns the measurement issues of biodiversity. In agriculture, however, if the scope of biodiversity can be narrowed down to varietal diversity, a task of measuring the benefits of biodiversity becomes empirically tractable. Specifically, given the fact that crop trials data in experimental stations at many countries are ready to use, agricultural economists should have exploited these issues in a timely manner.

Following this line of argument, there has been a few studies abroad. The findings of previous studies on these issues are somewhat inconclusive. While Widawsky and