Impact of diversification strategies on financial performance: A Multinomial Endogenous Switching Regression Approach

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Background

Over the past three decades, the number of farming operations in the US has remained relatively steady, but production has shifted to larger farms. For example, larger farming operations are continually increasing their share in production of agricultural commodities, while the number of small commercial farms and their share in agricultural production is declining (Hoppe, MacDonald and Korb, 2010). Naturally, farm business households face greater production risks, resulting in greater income risks—especially for farming dependent farm households. Additionally, small to medium sized farming business[1] households in the US face greater challenges for continuation and survival through conventional commodity production methods. A recent report suggests that diversified farm households engaged in non-commodity entrepreneurial activities contributed almost 40% of the total value of U.S. agricultural production (Vogel, 2012). The decline in the ability to generate sufficient income from commodity production has caused many farmers to embrace diversification of their agricultural bases and to undertake structural adjustments on the farm.

In a study, Vik and McElwee (2011) found additional income sources as the main motivation to diversify into alternative agricultural activities. It should be noted that many farms have limited land, capital, managerial ability, and skilled labor; with small and medium sized farms often unable to adopt improved technology, new managerial practices, intensive cultivation, and as a result, their most viable option is to introduce other profitable enterprise operations into the farm business (Khanal and Mishra, 2014). Enterprise diversification is regarded as an effective

[1] Farms with annual gross sales less than $350,000

strategy for mitigating risk (McNamara and Weiss 2005; Azam-Ali, 2007; Khanal and Mishra, 2014). The benefits of diversification is based on the utilization of imperfectly correlated net returns from multiple agricultural enterprises, with most of the benefit of diversification coming from hedging against market input and commodity price fluctuations (World Bank, 2004).

Adoption of alternative farm business activities and diversification strategies has been the subject of previous studies. Most of the previous studies report an overview and importance of diversification, factors influencing adoption or participation decisions. However, the relevant discussion and investigation on the impact of such diversification decisions on the economic and financial performance of farm households has been scant. Various on-farm and off-farm income diversification strategies can be broadly classified under: a) income diversification strategies, such as off-farm work; b) farm structural diversification, such as agritourism; c) agricultural diversification, such as organic production, on-farm energy crop cultivation, crop mix, and participation in conservation and environmental programs. Participation decision on each of the above strategies solely and/or simultaneously have an impact on the financial performance (measured as return on assets, farm sales, farm and household incomes) of the farm business.

In the previous studies, common approaches to examining adoption of different strategies and its impact have presented the decision to adopt as a single binary choice. Yet the impact of any diversification strategy (ies) frequently arise from the application of multiple interrelated practices at the farm-level. The strategies are likely interrelated. Additionally, evaluating the impacts of diversification strategies require controlling for potential selection bias as farmers self-select into the decision (or treatment group) to choose a strategy or combination of strategies. The present study fills this gap. We have addressed this limitation by appropriately estimating the impact of each strategy by accounting for self-selection biases and simultaneous

decision making process. The appropriate impact of diversification strategies on financial performance is important as it guides policymakers, farmers, extension agents and farm bureaus on adoption of strategies related to the sustainability and survivability of US farms.

Objective: This study examines the impact of a set of diversification strategies on the financial performance of US farm households. We make novel contributions to the literature by employing a recently developed selectivity-corrected multinomial endogenous switching regression (ERS) model to address possible self-selection biases in strategy choices.

Data: This study uses 2012 Agricultural and Resource Management Survey (ARMS), a nationwide farm-level data from the US farm households. ARMS collects information on farming enterprises on the farm, operator characteristics, as well as economic and financial indicators of farm performance. Our diversification strategy set is shown in the table 1. We control for socioeconomic and demographic factors in each estimation and used return on assets (ROA), total farm sales (TFS), and farm household income (FHI) as indictors of financial performance measures.

Table 1: Strategy set choices analyzed in this study

Strategy Set	I_1	I_0	S_1	S_0	A_1	A_0
$I_0S_0A_0$		√		√		√
$I_1S_0A_0$	√					
$I_0S_1A_0$			√			
$I_0S_0A_1$					√	
$I_1S_1A_0$	√		√			
$I_1S_0A_1$	√				√	
$I_0S_1A_1$			√		√	
$I_1S_1A_1$	√		√		√	

Note: I, S and A refer to strategies on income diversification, structural diversification and agricultural diversification, respectively; subscript '0' denotes non-adoption, while '1' denotes adoption of that strategy.

Econometric method: We used selectivity corrected multinomial endogenous switching regression (ESR) method and compute average treatment effects on treated and untreated (ATTs and ATUs). Also, the ESR has advantage over other methods such as propensity score matching as it enables the construction of a counterfactual based on returns to characteristics of adopters and non-adopters (Kassie et al., 2017). The ESR model allows the strategy set choices (treatment variables) to interact with observable variables and unobserved heterogeneity. This means that the effect of strategy choice is not limited to the intercept of the outcome equations (as assumed by, for example, Zeng et al., 2015), but can also have a slope effect. The ESR model allows interaction by estimating separate regressions for adopters and non-adopters.

Results: Our estimation of financial measures due to adoption decision of different diversification strategies show that the impact of mixed strategy or that of combination is higher than the sole effect in most of the cases. This finding indicates that there is a potential inter-correlation between strategies; combination of diversification strategies result in better outcome for farm households. Additionally, significance in selectivity terms indicate that the impact results would be biased if it is not appropriately addressed for selectivity bias.

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