Title: Heterogeneous farmers' technology adoption decisions: Good on average is not good enough

This research aims to understand the rationale behind farmers’ decisions about agricultural technology adoption in developing countries. Why some farmers adopt fertilizer, some choose intercropping, and others use both technologies or neither technology, given those technologies have been widely adopted in developed countries? I construct a farmer’s decision-making model which explicitly takes into account both the expected value and the variance of a farmer’s profit, and within it I build a farmer's production function that has three special properties: heterogeneous returns, selection bias, and heterogeneous variances for the technology adoption. Unlike most literature, I do not assume a technology which is beneficial in the developed country would naturally be good for African farmers; nor do I assume a technology is valuable to all farmers if it increases yields on average. Estimating the structural model with the Tanzania Living Standards Measurement Study (LSMS) panel dataset, I discover that the mean returns of adopting the same technology vary significantly cross different farmers, and the rationales for agricultural technology adoptions are multidimensional, depending on the characteristics of farmers, the characteristics of technologies, and farmers’ responses to the expectation and the risk. Adopting only fertilizer significantly increases the expected returns in revenues, yet the higher returns are accompanied by larger conditional variances of revenues. On the other hand, adopting only intercropping does not generate additional expected returns, but leads to a significant reduction of the conditional variance of revenues. The decisions of farmers' agricultural technology adoptions are influenced by the expectation of profit positively and the variance of profit negatively. With a precise understanding of farmers’ rationale for agricultural technology adoption decisions, policy makers could design their agricultural development policy prescriptions better and with narrower targets. For example, they could reallocate the ineffective spending from information spreading programs; or they could create insurance programs to nudge capable farmers from the rational but low equilibrium to the high equilibrium, thus improve farmers’ welfare.