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# **Farm Size, Risk Aversion, and Labor Migration under Natural Disaster Risk**

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Land and poverty are interlinked. More than half of farmers are landless in Bangladesh. These farmers also run the very real risk of losing access to food due to natural disaster shocks especially flooding, cyclones, and drought. These shocks often lead to sudden losses of real income and hence cause acute food insecurity. Migration can be an effective strategy to reduce the risk of crop failures from the shocks. But migration itself is costly and risky. In this study, we conceptually and empirically explore how risk-averse farmers make migration decision when they face a risk in natural disasters, and how farm size as an indicator of household wealth affects the decision.

We first develop an economic model with binding labor force and allow farmers to rent or lease lands. We model production technology as stochastic and assume that migrants' expected wage income increases with farm size. This setup generates a portfolio selection problem of labor usage between local farming and out-migration. Our hypothetical farmers' migration decision is jointly determined by the probability distribution of natural disaster risk, farm size that positively associated with migrants' human capital, and farmers' attitudes toward risk.

Based on the theoretical model, we examine the joint effect of farm size and natural disaster risk on labor migration using the longitudinal Bangladesh Integrated Household Survey (BIHS). The BIHS, conducted under the Bangladesh Policy Research and Strategy Support Program (PRSSP), is the most comprehensive, nationally representative survey in Bangladesh that collects detailed data on plot-level agricultural production and practices (Ahmed 2016). The sample design of the BIHS followed a stratified sampling in two stages—selection of primary sampling units (PSUs) and selection of households within each PSU—using the sampling frame developed from the community series of the 2001 population census of Bangladesh. To date, the PRSSP has undertaken two rounds of BIHS respectively from November 2011 to March 2012 and from January to June 2015. The panel BIHS sample consists of 6,500 households in 325 PSUs or villages.

It is important to note that this two-round BIHS was administered on the same samples of households and therefore creates the real longitudinal household survey. This feature distinguishes the BIHS from many other panel surveys which were typically implemented on the same samples of primary sample units such as villages, wards, or communes rather than households. Consequently, we are able to address the potential omitted variable bias resulting from unobserved time-invariant factors associated with households.

We construct several alternative measures of the risk in natural disasters. The first one is the frequency of flooding, cyclones, and drought occurred in the last five years. The second one is the usual flood depth during monsoon season. The third measure is the aggregated precipitation during the monsoon season in (or one year before) the surveyed year. These variables are reported in the survey. We might also consider the long-term (e.g., in the last five

years) average aggregated precipitation during the monsoon season, if we can gather the long-term weather data.

One may expect that farm size is endogenous if farmers buy or sell their lands due to labor migration. We adopt two strategies to address this endogeneity concern. First, we classify sampled farmers into four operated farm size groups: marginal farmers (operating less than 0.5 acre of land), small farmers (operating 0.5 to 1.49 acres of land), medium farmers (operating 1.5 to 2.49 acres of land), and large farmers (operating 2.5 acres or more land). Such a classification can significantly abate the endogeneity if farmers remain in the same groups over time. The second strategy we use to address the endogeneity concern is to eliminate farmers who buy or sell their lands from the analysis and only consider the situation in which farmers' lands were inherited from husband/wife's family.

In addition to the identification strategies discussed above, we address the potential unobserved heterogeneity in several ways. First, we take full advantage of longitudinal data nature and use a full set of household fixed effects to nonparametrically absorb permanent determinants of labor migration specific to each household. Second, we interact the risk measurements with farm size, while controlling for other relevant factors such as household labor force and land rent, to address the heterogeneous attitudes of farmers from different farm size groups in response to the same natural disaster risk. Finally, we distinguish international migration from domestic migration. Households with international migration are typically much wealthier than those with only domestic migration (Mendola 2008).

We expect two principal results. First, labor migration increases with the degree of risk in natural disasters, as those disasters would reduce the labor productivity in agricultural production. Migration can be a risk-reducing strategy to mitigate the negative effect of potential crop failures. Second, the effect of farm size on labor migration is generally undetermined. Multiple effects underlie this indetermination. For example, marginal farmers (including landless farmers) possess limited per capital land resource to cultivate and are more vulnerable than larger farmers to natural disaster shocks. Therefore, marginal farmers have more incentive to migrate. On the other hand, marginal farmers are typically poor and possess relatively low human capital. Thus, their expected wage income from migration is lower than larger farmers'. Further, migration is costly. These constraints may refrain marginal farmers from out-migration.

**References:**

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