SUPPLEMENTARY MATERIAL

Linking crop and livestock diversification to household nutrition: Evidence from Guruve and Mt Darwin districts, Zimbabwe

1. Methodology

1.1. Measurements

1.1.1. Crop and livestock production diversity

We use the number of crop and livestock species produced on a farm as the measure of farm production diversity (Jones et al., 2014). This is a simple, unweighted count measure. Second, we split and use the simple, unweighted count of only species produced on a farm (crop diversity) and livestock species (livestock diversity) separately.

1.1.2. Household dietary diversity

A modified Household Dietary Diversity Score (HDDS) (Swindale & Bilinsky, 2006) was calculated for each household using data on consumption of food groups over the previous 24 hours. The shorter recall period improves the accuracy of estimates compared with longer recall periods (Swindale & Ohri-Vachaspati, 2004). Food items were categorized into 12 different food groups with each food group counting toward the household score if a food item from the group was consumed by anyone in the household in the previous 24 hours. The modified HDDS, then, is a count variable from 0 to 12. The food groups used to calculate the modified HDDS included: cereals, roots and tubers, vegetables, fruits, meat, eggs, fish and seafood, pulses and nuts, milk and milk products, oils and fats, sugar, and condiments.

1.1.3. Food Consumption Score

Food Consumption Score (FCS) is a composite score based on dietary diversity, food frequency, and relative nutritional importance of different food groups (Kennedy et al., 2010; Swindale & Bilinsky, 2006). The FCS is calculated using the frequency of consumption of different food groups consumed by a household during the 7 days before the survey. The consumption frequency of eight food groups (i.e. staple grains and tubers, pulses, vegetables, fruits, meat and fish, dairy products, sugar and oil) is multiplied by a group assigned nutrient weight, and the resulting values are summed to obtain the FCS (Kennedy et al., 2010). The assigned weights for each food group are based on the energy, protein and micronutrient densities of each food group.

2. Estimation strategy

To investigate the relationship between crop and livestock production diversity and nutrition, we estimate the following regression model:

$$DF = b_0 + b_1 crop\ production\ diversity + b_2 livestock\ production\ diversity + b_3 I + b_4 H + \varepsilon$$

where, DF, I and H are the vectors of nutrition outcomes (i.e dietary diversity and food consumption score), individual and household characteristics, respectively; b_i are the parameters to be estimated; and ε is an error term. Here b_1 and b_2 capture how crop and livestock diversification is correlated with nutrition outcome, controlling for a set of observable individual and household characteristics. A positive and significant estimate for b_1 and b_2 implies that higher crop and livestock diversity is associated with higher dietary diversity and food consumption, as is commonly assumed. The dietary diversity is a count variable that can take values between 0 and 12 and is not normally distributed. Similarly, the FCS is a count variable that can take the value of 0 and 96. Following Greene (2012) we used a Poisson estimator with a

maximum-likelihood procedure for estimating the dietary diversity model. The coefficient estimates from Poisson estimator can be interpreted as semi-elasticities. Thus, a coefficient estimate states by what percentage the dietary diversity changes when the explanatory variable changes by one unit (Greene, 2012). The Negative binomial which is suitable for over-dispersed data was used for the food consumption model. The interpretation of negative binomial regression is pretty much the same as poisson regression (Hilbe, 2011; Long & Freese, 2014). The choice of control variables was based on literature on the determinants of household dietary diversity and food consumption (Jones et al., 2014; Romeo et al., 2016).

3. Limitations of the study

This article is based on cross sectional data and establishing causality is a challenge. This was even complicated because we were unable to find a good instrument to eliminate endogeneity problems. Despite controlling for many confounding variables, it is worth mentioning than unobserved characteristics still pose a challenge with respect to estimated magnitude of association between farm production diversity and nutrition.

References

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