

Title: Incorporating micro-level data in multi-market CGE: the case of livestock in Africa

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ABSTRACT

The links between international markets and household economics in developing countries are rather blurred. Our research focuses on African countries, since a high proportion of poor and rural households in these countries keep livestock as an important source of income generation. Livestock is an important source for the provision of high protein food to local and international consumers. Livestock keeping also provides services to other enterprises of the farm, e.g. through its supply of oxen draft power or the generation of manure, and animal husbandry can be used by the household to smooth consumption in times of aggregate income shocks. While there are many studies analyzing the significance of these effects at the micro-level, there is a lack of literature on the various impacts of the livestock sector on the whole economy.

Several approaches have tried to tackle this issue by incorporating different household types in standard computable general equilibrium (CGE) models. The extension of CGE models gives the possibility of studying the importance of livestock keeping for households and its impact on other markets and/or countries. Since the relevance of livestock varies by the income situation of households and their geographical region, the standard CGE approach of one representative regional household is not a viable approach. As case studies, recent studies on Eastern African countries have incorporated herd dynamics into multi-market models (Gelan and Engida, 2011; Gelan et al., 2012). To avoid capturing net effects of the complex livestock sector, Gelan et al., 2012 found that it is useful to distinguish livestock by type (cattle, poultry, etc.), sex and age in the social accounting matrix (SAM).

Our study investigates the different methods that take into account the income sources of households as well as the regions they are located. Among them, the top down approach is predominantly employed in the African context (e.g. Dorosh and Thurlow, 2009; Gelan and Engida, 2011; Gelan et al., 2012). In this approach, the CGE models estimates the macroeconomic changes in a first step. The consequences of macro-level simulations on households are investigated in a second step. The regional household of the standard CGE is split into several household groups, following specific criteria. For each group, parameters are taken from an analysis of micro-level household data. After the CGE model has been run, it is possible to investigate how projected scenarios at the whole-economy-level change income and expenditure patterns at the household level (e.g. via growth-poverty elasticities, see Dorosh and Thurlow, 2009).

With the development of the MyGTAP extension by Minor and Walmsley (2013), the incorporation of different household groups as well as several livestock activities into the SAM has become much more straightforward. There are however other procedures that attempt to avoid the limitations of assuming a single representative household. One of them is the method of Rutherford et al. (2005), who directly included households of a representative survey into the CGE. While this method allows for feedback between household responses and the macro-level economy, it usually is hard to handle within a CGE, as the reconciliation of data between the macro and micro level results is complex.

Our study investigates the advantages and drawbacks of each of these approaches for research on African agriculture, with the focus on livestock. We furthermore examine whether existing databases (e.g. living standard surveys or recent livestock-specific survey modules (Ciamarra et al., 2011)) provide household data that can be conciliated with CGE models to analyze the importance of livestock in a macro-micro context. We further discuss what characteristics have to be considered into future surveys to allow an appropriate investigation of the livestock sector with CGE models that incorporate several household types and livestock activities.

Keywords: agricultural modeling, micro-macro modeling, household data, livestock sector, international markets

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