

The Importance of Land Heterogeneity in Trade Liberalization Analyses

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Food supply and food distribution have been among the most important issues playing a role in the global political arena. In this context the issue of reforming agricultural support policies in industrialized countries and improving market access, in particular for developing countries, have been important subjects of The Doha Development Round of World Trade Organization (WTO). Given this Doha Round agenda, many shifts in the agricultural and trade policies are expected in the coming years. These expected changes in trade regimes coincide with other societal changes like growth in world population and global welfare. Consequently, the world food demand will experience huge changes. These developments need to be analyzed in an integrated manner focusing on shifts in global food supply market and vulnerability of environmental conditions.

So far, future agricultural scenarios are mostly provided by economic models, focusing on economic consequences of changes in trade regimes. In these economic analyses the biophysical circumstances like land availability, soil quality and atmospheric conditions are poorly accounted for. This leads to incomplete estimations of food production growth.

The aim of this paper is twofold. First, we analyze the expected impact of macro –economic and policy developments using economic and biophysical indicators, focusing on land-use change. Second, we analyze the importance of including biophysical factors in macro-economic tools. The analysis will be done using an extended version of the macro-economic model of the Global Trade Analysis Project (GTAP) in conjunction with the biophysical tool ‘Integrated Model to Assess the Global Environment’ (IMAGE). Here, we implemented biophysical knowledge of the IMAGE model into the GTAP framework via endogenous land supply curves. These land supply curves, which are specified per world region, allow to take into consideration the land heterogeneity within a world region and also region specific effect of climate change

Our preliminary simulation results show that inclusion of biophysical factors in the GTAP affects the overall production level of the agricultural sector significantly. The model without land supply functions underestimate the increase of agricultural production and use of agricultural land and overestimate intensification of the agricultural production process. Endogenous land use supply implies lower pressure on land prices and a decrease of the real world price of agricultural products while in a case when the agricultural land is fixed, the land and food prices increase. In general, the agricultural production is higher and land use intensity is lower when the agricultural land is endogenous what has important environmental consequences. Endogenization of land supply creates more trade in the agricultural products and changes the

regional production distribution because the comparative advantage of the big producers such as Brazil increase as they can easily take more land into production.

This paper fits the conference Background and Purpose in the topic area “climate change and land use/land cover interactions”. The method and approach use belongs to “database-related and modeling” and “multi-disciplinary/integrated” approach.