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Title: Specialization in food production and global food security: a bipartite network analysis

Food demand has been steadily growing over the last decades pushing on the limited land and water resources of the planet. In this context, understanding the specialization patterns of countries in food production can provide relevant insights for the evaluation and policy design seeking to achieve food security and a sustainable development. Using data from agricultural production from FAO for the period 1993 to 2013, we build bipartite networks in order to find the relatedness of products according to the capabilities needed for their production and the relatedness of countries according to their production baskets. This allows us to understand the restrictions that countries face at diversifying their agricultural baskets and detect communities of products and countries. Using methods from complex system analysis, we derive network based statistics of country competitiveness (fitness) and product complexity. The latter hinting on the importance of specific capabilities –technological, natural, institutional, and others– for producing agricultural products. We build different econometric models to study how country fitness, coherence of production baskets, and concentration of production affect food supply. We find that there is a positive relation between fitness and food supply, implying that more competitive countries are better able to achieve food security. Additionally, we find that concentration reduces food supply while coherence of the production basket increases food supply at the country level. Our results indicate that promoting diversification of agricultural production, rather than specialization, contributes positively to minimizing the risk of facing a food deficit. In brief, we show that how and what countries produce in agriculture affect their available food supply. Thus, our study has implications for policies seeking to promote a more sustainable development of agricultural production and food security, which have become one of the greatest challenges of economic policy worldwide.