IGC Policy Brief

Title: Agricultural Policy, Gravity and Welfare

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I. Policy Motivation for Research:

Agriculture is an important industry for most poor countries as it not only represents a large share of household expenditures but is also often an important source of income. Despite the critical nature of these industries for developing countries these markets are often shaped by the policies of a handful of developed countries. This paper examines the welfare (terms of trade) implications of reducing trade protection (tariff and non-tariff barriers) and subsidies in markets for grains and sugar. We focus on how decreases in these distortions affect welfare in the major importing and exporting countries as well as some of the world's poorest countries. To achieve our goals, we rely on recent developments in the theoretical and in the empirical gravity literature, which allow us to work with a fully estimated (rather than calibrated), tractable general equilibrium gravity model that enables us to obtain the important general equilibrium effects that result from trade liberalization and removal of domestic production in developed agricultural markets. This represents an important contribution to a literature that often relies on partial equilibrium models or calibration.

II. Policy Impact:

There are differing views on how liberalization of agricultural markets by the US and the EU will affect developing countries. This paper sheds light on the implications of liberalization by developing a tractable general equilibrium model that identifies the incidence of trade distorting barriers and production subsidies. See Section IV for further details.

III. Audience:

We expect this work to be of interest to academics and policy makers.

IV. Implications:

Our model and empirical analysis generate clear patterns of welfare implications due to trade liberalization and removal of domestic production support in the developed world (EU and US).

A. Trade Liberalization Effects

1. The largest effects of trade liberalization in the developed world are on consumers and producers in the liberalizing regions themselves. For most commodities, when a major importer with significant trade barriers liberalizes, we see that domestic producers and consumers experience significant price decreases.

a. We find these effects to be stronger for commodity categories, such as Rice and Sugar, in which the liberalizing regions are relatively small producers but import a lot.

b. We estimate smaller effects for country-commodity combinations, such as US-Wheat and US-Grains, in which the liberalizing markets are net exporters and/or they already have relatively low trade barriers.

c. Importantly, our estimates provide evidence that producer losses in the liberalizing markets are outweighed by gains for consumers. This is encouraging evidence in support of the argument pro trade liberalization.

2. Trade liberalization in the European Union and in the United States has significant effects, via various channels, on consumers and on producers in the rest of the world.

   a. Countries that have previously had preferential access to the large EU and US markets are hurt by trade liberalization in these regions. This is the case for Canada and Mexico as major US trading partners.

   b. On the EU side, we observe similar effects for some small, less developed countries, such as Tanzania, Malawi and Uganda for example, who suffer large losses from EU agricultural trade liberalization. The reason is that these economies benefit significantly from the Union's Generalised System of Preferences and the Everything But Arms (EBA) Regulation in 2001 and any opening of the EU market to freer trade with other, more efficient producers will hurt them.

3. More intense competition and geographical proximity are also important determinants of the effects of trade liberalization in the developed world on outside countries.

   a. In the case of European Union trade liberalization, we find that producers and consumers in some smaller, non-member European countries, such as Albania, Cyprus and Turkey will lose, probably due to more intense competition in the Union's market. On the other hand, other European nations, such as Poland and Romania for example, will gain because, after being granted equal access to the large EU market, they will be able to take advantage of their proximity to the rest of Europe.

4. Producers of Wheat in some less developed nations (e.g. Botswana and Uganda) will suffer lower producer prices due to trade liberalization in the US, even though these nations do not export almost any Wheat to the US. The reason is that the lower farm-gate prices for US producers, due to trade liberalization, are transferred to these smaller economies because US is essentially their largest supplier of this good.

B. Subsidy Reductions

1. Without any exception, the removal of domestic subsidies has huge negative impact on the income of domestic farmers and leads to a relatively small increase in domestic prices, which is not sufficient to offset the decrease in production.

2. In some instances, for example EU-Rice, the removal of domestic production support benefits the largest producers in the world but also some less developed nations. Comparative advantage is the natural explanation for the first result, while preferential access to the EU market via the Generalised System of Preferences and the Everything But Arms Regulation explains the second.

3. In other cases, such as EU-Wheat and US-Wheat, the biggest winners from the removal of production subsidies are countries that have easier, due to proximity, and/or preferential access to the market where domestic support is removed. Examples include series of small European and less developed countries in the case of EU and Canada, Mexico and some other Latin American Economies in the case of US.

4. In the case of US-Wheat, we find significant effects on prices in some small, less developed nations that heavily rely on Wheat imports from the US. These effects are very similar in nature, but work in the opposite direction of the effects on the same small economies from trade liberalization in US.

5. Finally, our estimates of the effects of production subsidies on consumers in the world reveal that in addition to helping their own producers, both US and the EU essentially subsidize consumption in the rest of the world.

V. Summary of Research:

The goal of this paper is to examine the impact of reductions in subsidies and trade barriers, including both tariffs and non-tariff trade policy tools, on producers and consumers of some of the world's most important grains. In particular, we estimate welfare (terms of trade) effects of trade protection and domestic production support for Grains, Rice, Sugar and Wheat and for sixty nine countries in 2001. In addition, we decompose the incidence of these effects on consumers and farmers.

To achieve that, we rely on recent developments in the gravity literature. In particular, Anderson and van Wincoop (2003) and series of papers by Anderson and Yotov (2010, 2011a and 2011b), which improve on existing partial and conditional general equilibrium studies in two important ways: First, these methods extend the standard conditional general equilibrium gravity setting, where output and expenditure shares are exogenously given, to a full general equilibrium framework (even though under fairly restrictive assumptions). Second, this methodology allows us to capture the general equilibrium

effects of bilateral trade policies and production subsidies and to decompose their incidence on consumers and producers in each country via changes in producer (farm-gate) prices, used here to measure effects on producers, and the inward multilateral resistance (IMR) indices, used to evaluate effects on consumers by consistently aggregating the incidence of bilateral trade costs on consumers of each product as if they are consuming from a unified world market. Decomposing the incidence of trade policies and production support on sellers and buyers at the commodity-level is particularly important in the case of agriculture, as many studies show that these effects depend crucially on the net exporter status of each country and aggregation may produce misleading results.

We start the empirical analysis by estimating the gravity equation, at the commodity level for the four agricultural categories of interest in this study (Grains, Rice, Sugar and Wheat) and for an aggregate manufacturing sector that we use for comparison purposes and to be able to construct aggregate welfare effects. To estimate gravity we employ the Poisson pseudo-maximum-likelihood (PPML) estimator, proposed by Santos-Silva and Tenreyro (2007), which simultaneously takes into account the information contained in the zero trade flows and also controls for heteroskedasticity in the trade data, and we use directional fixed effects to account for the unobservable multilateral resistance terms.

Disaggregated gravity works well and we view our estimates as fairly convincing. We view the good performance of the gravity model for agricultural commodities as a contribution by itself. The reason is that we are not aware of other studies that successfully estimate gravity at the sectoral level for agricultural commodities. We attribute the good performance of our estimates to correct structural specification, good data, and the use of an appropriate econometric technique. The estimates of the coefficients of the standard gravity variables for each of the agricultural commodities in our sample have expected signs and the variability in their magnitudes makes intuitive sense. In addition, we obtain reasonable estimates of the elasticities of substitution for both manufacturing and agriculture, which clearly reflect the fact that agricultural commodities are much more homogeneous. The good performance of our disaggregated gravity estimates gives us confidence to use them, along with the actual protection and gravity data, to construct the bilateral trade costs needed in the counterfactual welfare experiments. In that sense, our model is fully estimated, which is a significant advantage over many standard, calibrated computable general equilibrium (CGE) models aimed to address similar questions. Policy implications from our counterfactual experiments are described in the previous section, IV.

VI.Implementation:

In thinking about implementation it is important to keep in mind several shortcomings of our approach. First, we have focused on short-run implications of liberalization as we have not considered how production decisions might changes as prices change. This could be significant as increases in production and growing investment in agriculture in developing countries might have a significant impact on global food supplies. This could lead to additional welfare gains from liberalization. To allow for estimating long-run welfare effects, we would need to put more structure on the production side. This as well will require more data and more sophisticated econometric analysis. All of the above are

valid concerns that need to be addressed in future work. Second, it should be remembered that our sample does not include data all agricultural commodities and services data. The lack of these sectors in the current project renders our aggregate estimates biased downward. Finally, we believe that the model may benefit from a more sophisticated modeling of subsidies. One possible way to do this is to introduce two channels through which domestic support will affect farmers' income: (a) through changes in factory gate prices and (b) through changes in output. In order to implement this approach, one would need to estimate the elasticity of output with respect to production support. This would require more data and careful econometric analysis, however such analysis will contribute to the existing literature as such elasticity estimates are currently not available.

VII. Further Reading:

Please refer to the reference section of the paper for related readings.